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Umatilla National Forest

Final Environmental Impact Statement

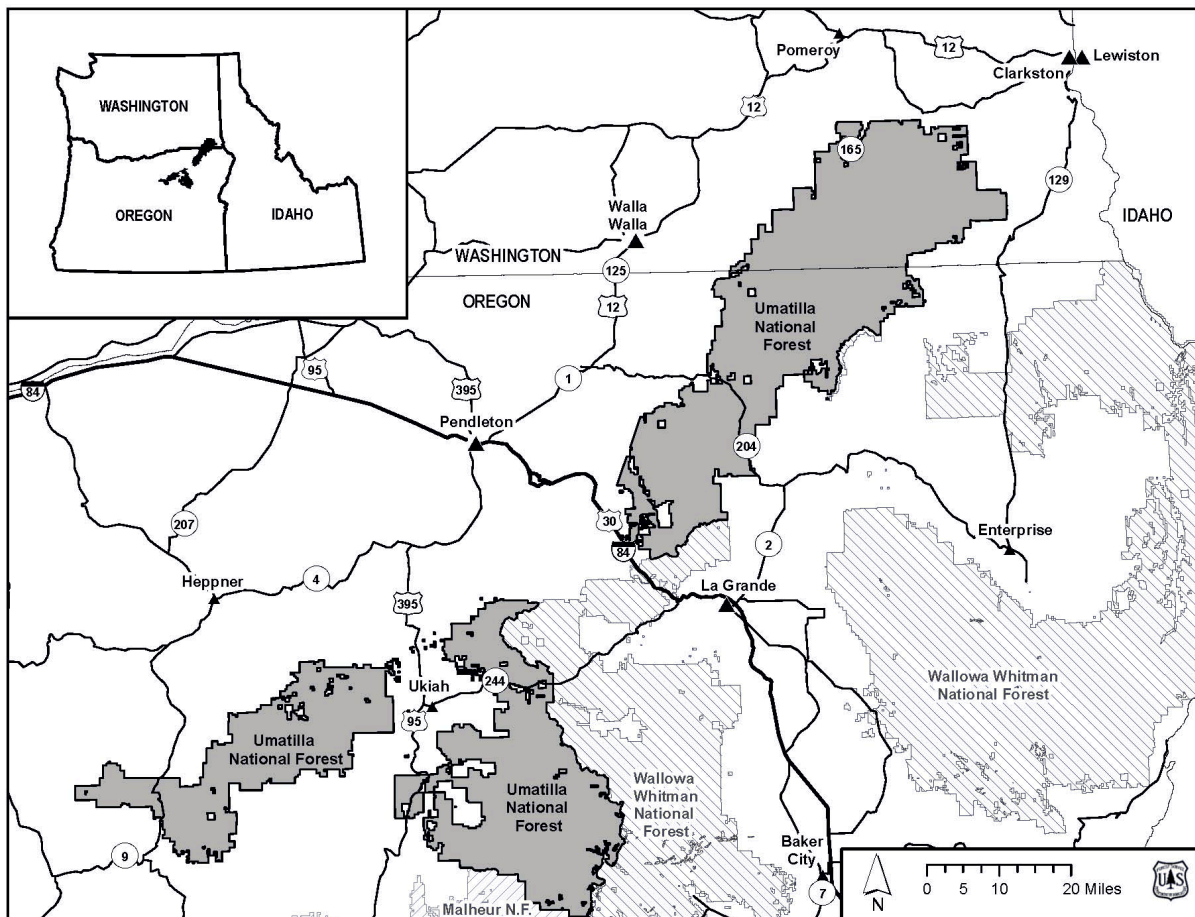
Invasive Plants Treatment Project

Counties: Asotin, Columbia, Garfield, and Walla Walla in Washington; Grant, Morrow, Umatilla, Union, Wallowa, and Wheeler in Oregon

Picture Courtesy of Julie Laufman



Umatilla National Forest Vicinity Map



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Invasive Plant Treatment Project Final Environmental Impact Statement

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Umatilla, Union, Wallowa, and Wheeler Counties in Oregon**

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Abstract

This Final Environmental Impact Statement (FEIS) discloses the effects of treating invasive plants on the Umatilla National Forest. Invasive plant species were identified by the Chief of the Forest Service as one of the four threats to forest health (for more information see <http://www.fs.fed.us/project/four-threats>). Invasive plants are displacing native plants, potentially destabilizing streams, reducing the quality of fish and wildlife habitat, and degrading natural areas.

Strong public concern has been expressed regarding Forest Service response to invasive plants. Several organizations and individuals have offered to cooperate with the Forest Service in this endeavor. The Forest Service is responding to a crucial need for timely containment, control, and/or eradication of invasive plants, including those that are currently known and those discovered in the future. The purpose of this project is to treat invasive plants in a cost-effective manner that complies with environmental standards.

Approximately 24,649 acres are currently estimated to need treatment, including but not limited to spotted and diffuse knapweed, yellow starthistle, hound's tongue, Dalmatian and yellow toadflax, scotch thistle, and rush skeletonweed. This Final Environmental Impact Statement (FEIS) also analyzes the effects of treating new infestations and new invasive species presently unknown or non-existent, but discovered during the life of this project. This FEIS includes detailed consideration of four alternatives:

- Alternative A, the no action alternative, would continue to implement treatments according to existing plans; no new invasive plant treatments would be approved.
- Alternative B, the proposed action alternative, would apply an initial prescription, along with re-treatment in subsequent years, until the site was restored with desirable vegetation. Herbicide treatments would be part of the initial prescription for most sites, but the use of herbicides would be expected to decline in subsequent entries as populations became small enough to treat

manually or mechanically. Ongoing inventories would confirm the location of specific invasive plants and effectiveness of past treatments.

Two action alternatives were developed in response to public issues related to herbicide use:

- Alternative C, No Broadcast Spraying in Riparian Areas, would not allow broadcast applications of herbicides in riparian areas; however, spot spraying or hand applications such as wiping or wicking of herbicides would be allowed. Except for this limitation imposed on broadcast spraying, the features of this alternative are the same as alternative B. This alternative addresses human health issues associated with contamination of drinking water supplies from herbicide drift, as well as potential impacts to non-target wildlife, plant species, soils, aquatic biota and riparian ecosystems. Alternative C would minimize herbicide impacts, but would increase treatment costs and decrease treatment effectiveness.
- Alternative D, No Aerial Application, would eliminate the option to aerially apply herbicides. This addresses the issues expressed regarding potential effects of herbicide drift to human health through drinking water supplies, also to non-target wildlife and plant species, soils, aquatic biota and riparian ecosystems, both in the area being treated, and areas adjacent to it. Alternative D would minimize herbicide impacts, but would increase treatment costs and decrease treatment effectiveness. Treatment of some sites would not occur due to inaccessibility or because access to the site is determined unsafe. Except for this limitation imposed on aerial spraying, the features of this alternative are the same as alternative B.

The Forest Service preferred alternative is the Proposed Action (Alternative B).

General Changes between the DEIS and the FEIS

Some of the descriptions of the issues and the proposed action and alternatives have been updated since the release of the Draft EIS to respond to internal and external requests for clarification. Some portions of the analysis in chapter 3 have been rearranged or edited for conciseness. The results of endangered species consultation resulted in some changes to the findings and determinations related to fish. None of the changes resulted in substantive differences to the alternatives or the analysis.

The major changes to Chapters 1 and 2 will be listed at the beginning of each Chapter. Important changes in Chapter 3 are listed before each resource section.

Chapter 4 updates the consultation process and distribution list.

A new chapter, Chapter 5 has been added to capture the response to comments on the DEIS.

The appendices have been rearranged and added to the main body of the EIS.

Appendices B-Botany, and D-Soils have been updated and reprinted in this FEIS; Appendices A-Forest Plan, C-Wildlife, E-Aquatics, and F-Aerial Guidelines were published in the DEIS and removed from this document. They are available upon request from the Umatilla National Forest, or on line at <http://www.fs.fed.us/r6/uma/projects/readroom/>. Appendix G-Adjuvants and Surfactants is a new appendix added to this FEIS.

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Appendices

Appendix A – Forest Plan – Published in the DEIS. Not updated or reprinted here.
Available on request or online at <http://www.fs.fed.us/r6/uma/projects/readroom/>

Appendix B – Botany – Added an implementation plan and reprinted for this document

Appendix C – Wildlife – Published in the DEIS. Not updated or reprinted here.
Available on request or online at <http://www.fs.fed.us/r6/uma/projects/readroom/>

Appendix D – Soil and Water – Added a site-specific table and reprinted for this document

Appendix E – Aquatics – Published in the DEIS. Not updated or reprinted here.
Available on request or online at <http://www.fs.fed.us/r6/uma/projects/readroom/>

Appendix F – Aerial Guidelines – Published in the DEIS. Not updated or reprinted here. Available on request or online at <http://www.fs.fed.us/r6/uma/projects/readroom/>

Appendix G – Adjuvants and Surfactants – New in this FEIS to provide additional information based on public comment

List of Acronyms

APHIS	Animal and Plant Health Inspection Service
ATV	All terrain vehicle
BA	Biological Assessment
BE	Biological Evaluation
BECA	Bald Eagle Consideration Area
BEMA	Bald Eagle Management Area
BLM	Bureau of Land Management
BO	Biological Opinion
BPA	Bonneville Power Authority
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CWA	Clean Water Act
DEIS	Draft Environmental Impact Statement
DN	Decision Notice
DO	Dissolved oxygen
DPS	Distinct Population Segments
EA	Environmental Assessment
EEC	Expected exposure concentration
EDRR	Early detection rapid response
EFH	Essential fish habitat
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESU	Ecologically Sustainable Unit
FACTS	Forest ACTivity Tracking System
FDA	Food and Drug Administration
FEIS	Final Environmental Impact Statement
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FOSS	Federal OSHA Safety Standard
FS	Forest Service
FSH	Forest Service Handbook
FSM	Forest Service Manual
FWS	United States Fish and Wildlife Service
GIS	Geographical information system
GLEAMS	Groundwater Loading Affects of Agricultural Management Systems
GPS	Global positioning system
HQ	Hazard quotient
HUC	Hydrologic Unit Codes
ICBEMP	Interior Columbia Basin Ecosystem Management Project
IDT	Interdisciplinary Team
INFISH	Inland Native Fish Strategy
IWM	Integrated weed management
LAU	Lynx analysis units

LCAS	Lynx Conservation Assessment and Strategy
LOAEL	Lowest observed adverse effect level
LOC	Level of concern
LOP	Limited operating period
LRMP	Land and Resources Management Plan
LWD	Large Woody Debris
LWM	Large woody material
MIG	Minnesota IMPLAN Group
MIS	Management Indicator Species
MPI	Matrix of Pathways and Indicators
MSA	Magnuson Stevens Act
NEPA	National Environmental Policy Act
NF	National Forest
NFMA	National Forest Management Act
NFJD	North Fork John Day
NFS	National Forest System
NMFS	National Marine Fisheries Service
NOA	Notice of Availability
NOAEL	No observed adverse effect level
NOEC	No observable effect concentration
NOI	Notice of Intent
NPE	Nonylphenol Polyethoxylate
NRIS	Natural Resource Inventory System
NVUM	National Visitors Use Monitoring
ODA	Oregon Department of Agriculture
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
OHV	Off-highway vehicles
OR	Oregon
ORV	Off-road vehicles
PA	Proposed Action
PACFISH	Pacific Native Fish Strategy
PCE	Primary Constituent Elements
PDF	Project design feature
PETS	Proposed Endangered Threatened and Sensitive
PNV	Present Net Value
PNW	Pacific Northwest
POEA	Polyoxyethylene alkylamine
PVG	Potential vegetation groups
R6	Forest Service Region Six
RHCA	Riparian Habitat Conservation Area
RM	River mile
RMO	Riparian management objective
ROD	Record of Decision
SERA	Syracuse Environmental Research Associates, Inc
SOLI	Species of local interest
SRI	Soils Resource Inventory

TAC	Technical Advisory Committee
TCP	trichloro-2-pyridinol
TDS	Total dissolved solids
TES	Threatened, Endangered and Sensitive
TMDL	Total maximum daily load
TNC	The Nature Conservancy
USDA	United States Department of Agriculture
USDI	United States Department of Interior
USFS	United States Forest Service
USGS	United States Geological Survey
WA	Washington
WDFW	Washington Department of Fish and Wildlife
WSDOA	Washington State Department of Agriculture
WQMP	Water Quality Management Plan
WSR	Wild and Scenic River

Final Environmental Impact Statement

Umatilla National Forest

Invasive Plants Treatment Project

Summary

Land managers for the Umatilla National Forest propose to treat invasive plants and restore treated sites (seeding/mulching/planting). Invasive species were identified by the Chief of the Forest Service as one of the four threats to forest health (for more information see <http://www.fs.fed.us/projects/four-threats>). Invasive plants are displacing native plants and degrading natural areas, potentially destabilizing streams and reducing the quality of fish and wildlife habitat. The integrated weed management program includes a) herbicide and non-herbicide treatment of existing infestations, b) early detection and rapid response to new infestations, c) restoration of treated sites, d) reducing the rate of spread of invasive plant species through adopting prevention practices, and e) interagency and public education and coordination.

The focus of this Final Environmental Impact Statement (FEIS) is on the part of our program related to treatment and restoration of invasive plant sites on the Umatilla National Forest. New invasive plant management direction has recently been approved by the Pacific Northwest (R6) Regional Forester, allowing for a wider range of herbicide options and specific treatment and restoration standards (USDA 2005b, the *Pacific Northwest Invasive Plant Program Record of Decision*, referred to herein as the R6 2005 ROD).

With this project, the Forest Service is responding to the need for timely containment, control, and/or eradication of invasive plants, including those that are currently known and those discovered in the future. Strong public concern has been expressed regarding Forest Service response to invasive plants. Several organizations and individuals have offered to cooperate with the Forest Service in this endeavor.

The purpose of this project is to treat invasive plants in a cost-effective manner that complies with the new management direction. Proposed treatment methods include a limited amount of aerial spraying, herbicide broadcast along roadsides, and spot and selective herbicide treatments that target individual invasive plants in combination with manual, mechanical and cultural (fertilization, soil amendments, and/or competitive planting) treatments. Biological control agents (bio-controls, approved for release for certain invasive plants by the Animal and Plant Health Inspection Service (APHIS), are part of the treatment/restoration program.

Treatments are proposed for existing and unpredictable new infestations, including new plant species that currently are not found on the Forest. Project design features (PDFs) would be applied to new infestations that occur within treatment areas, or in similar sites outside treatment areas, to ensure that treatments are within the scope of this EIS.

Four alternatives are considered: The no action (also referred to as alternative A), the proposed action (also referred to as alternative B), and two additional action alternatives, alternative C, which restricts broadcast spraying of herbicides in riparian areas, and alternative D, which does not allow aerial spraying anywhere.

In the no action alternative (alternative A), no new treatments beyond those previously approved in the 1995 *Umatilla National Forest Environmental Assessment for the Management of Noxious Weeds*

would be implemented. Under the 1995 EA, invasive plant treatments would be limited to approximately 2,771 acres.

The '95 EA' approved use of herbicides on 587 sites (1391 acres) on the Umatilla National Forest (USDA 1995). Amendments to this decision added an additional 59 sites (383 acres) approved for chemical treatments (USDA 1998). The total area identified for treatment using all methods was 3,154 acres. The total number of sites approved for chemical treatments represents 36 percent of the total number of sites presently mapped. New infestations have been and would continue to be treated with manual and mechanical methods. The 1995 EA (as amended) allowed for biological treatments on 1,339 acres, manual treatments on approximately 41 acres, and a combination of manual, chemical, and cultural methods on an estimated 1,744 acres. Herbicide applications would utilize spot or ground based broadcast methods utilizing glyphosate, dicamba, or picloram. However, the R6 2005 ROD does not allow the use of dicamba; so herbicide use is limited to the other two chemicals listed. Aerial application of herbicides is not allowed under the current program.

Mapping from 2006 indicates there are approximately 24,649 acres of invasive plant infestations on the Forest. The proposed action (alternative B) is the Forest Service preferred alternative, and would approve an effective range of treatment methods according to project design features that minimize the risk of adverse effects from herbicide and other types and methods of treatment (see chapter 2).

Proposed treatments include chemical, physical, cultural and biological methods. Potential treatments based on existing mapped sites (See figures 2-6 in chapter 2) include:

- Approximately 20,691 acres of proposed herbicide treatments for known sites
- Approximately 17,478 acres are proposed for ground based (hand or boom) broadcast treatments
- Approximately 3,022 acres are proposed for hand or non-aerial broadcast treatments within riparian/wetlands
- Approximately 2,538 acres of proposed non-broadcast (wicking, wiping or stem injection) herbicide application on known riparian/wetlands
- Approximately 675 acres treated by aerial spraying herbicides
- Approximately 3,958 acres of known invasive sites where treatment methods do not include herbicides

There is concern that detrimental effects could occur from broadcast spraying herbicide chemical in riparian areas. Alternative C (See chapter 2 for a full description) would not allow broadcast applications of herbicides in riparian areas. However, spot spraying, or hand applications like wiping or wicking of herbicides would be allowed.

There is concern that aerial application of herbicides could cause detrimental effects to areas targeted, and to adjacent areas where chemical drift could impact non-target environments. Alternative D (See chapter 2 for a full description) would eliminate this concern by eliminating the option to aerially apply herbicides.

The analysis in the FEIS considers a range of treatments applied to a range of conditions throughout the road systems and other areas that are vectors of invasive plant spread. Project design features (chapter 2) have been developed to limit the potential for adverse effects associated with treatments. Buffers (tables 5, 6, 7, and 8 in chapter 2) would limit herbicide selection and method application to ensure exposures are below thresholds of concern for people and the environment.

This FEIS focuses on treatment of invasive plants and restoration of treated sites. It is tiered to the broader scale *Pacific Northwest Region Invasive Plant Program Preventing and Managing Invasive Plants FEIS* (R6 2005 FEIS), April 2005 along with its *Record of Decision (ROD) for Invasive Plant Program Management* (R6 2005 ROD) on October 11, 2005, which addresses other aspects of the invasive plant management program including preventing invasive plant spread during land uses and management activities.

This project in no way attempts to diminish or modify other Umatilla National Forest programs. Each Forest program is responsible to manage activities in ways that will minimize the potential for invasive plants to become established and spread. With this understanding it is our firm belief that the result of this project acting in the context of past, present and foreseeable future actions will reduce the influence of invasive species. This would improve native plant communities, their ecologic functions and thereby improve overall forest health.

Chapter 1 – Purpose and Need for Action

Changes between the DEIS and FEIS for Chapter 1

- As a whole, and in particular the purpose and need (section 1.3), proposed action (section 1.4), and issues (section 1.9), have been edited for clarity and conciseness.
- A portion of Section 1.5 listing goals and objectives was removed and is now in appendix A.
- Section 1.6 clarified the decisions facing the Responsible Official.
- Section 1.7 addressed tribal water quality standards based on public comment.
- Section 1.10: What this EIS does not Include – based on internal comment this section has been removed. The scope of the project is defined by what *is* explicitly included in the Proposed Action.

1.1 Background

The Umatilla National Forest (See vicinity map above), located in the Blue Mountains of northeast Oregon and southeast Washington covers 1.4 million acres of diverse landscapes and plant communities. The lands are in Grant, Morrow, Umatilla, Union, Wallowa, and Wheeler Counties of Oregon, and Asotin, Columbia, Garfield, and Walla Walla Counties of Washington. The Forest has some mountainous terrain, but consists mostly of v-shaped valleys separated by narrow ridges or plateaus. The landscape also includes heavily timbered slopes, grassland ridges and benches, and bold basalt outcroppings. Elevation ranges from 1,600 to 8,000 feet above sea level.

Interstate Highway 84 divides the Forest roughly in half. The north half is bordered partially on the west by the Umatilla Indian Reservation and flanked by the Wallowa-Whitman National Forest to the southeast. The south half is bordered on the east by the Wallowa-Whitman National Forest and on the south by the Malheur National Forest. The headwaters of four large drainage basins are on the Forest: The Umatilla, John Day, Walla-Walla and Grande Ronde Rivers.

Invasive plants are defined as “non-native plants whose introduction do or are likely to cause economic or environmental harm or harm to human health” (Executive Order 13112). Dale Bosworth (Then Chief of the Forest Service), declared invasive species as one of the four main threats to ecosystem health (USDA 2003). The threat is considered serious because invasive plants have the potential to displace or alter native plant communities, and can increase fire hazards, degrade fish and wildlife habitat, eliminate rare and endangered plants, impair water quality and watershed health, and adversely affect a wide variety of other resource values such as recreational opportunities.

An extensive, thorough inventory of invasive plant infestations was completed by the Umatilla National Forest staff in 2006. The inventory, conducted district by district, compiled all known weed infestations, and includes those documented in the 1990 inventory completed for the 1995 EA, the districts’ annual monitoring since then and an inventory completed in 2006 that completed a database of all known infestations (see table 1 in this section and figures 3-6 in chapter 2).

At present, 20 different invasive plant species are known to occur within the boundaries of the Forest. Species of greatest concern include spotted and diffuse knapweed, yellow starthistle, hound’s tongue, dalmatian and yellow toadflax, scotch thistle, and rush skeletonweed, among others. Our ability to prevent or minimize the adverse impacts to native plant communities by these and other invasive plants is greatest if populations can be treated while they are small and in the early stages of invasion. Many of our current infestations occupy small areas, less than an acre. Treatment options and the likelihood of their success are greater for small or new invasive populations and can be controlled at lower costs than once the infestation becomes large.

Umatilla National Forest proposes to contain, control and eradicate invasive plant infestations across the Forest. Nearly 25,000 acres of invasive plant infestations have been identified and mapped. Approximately 3,000 invasive species sites have been mapped.

Table 1. Invasive plants Identified on the Umatilla NF and Number of Sites by District

Scientific Name	Common Name	Districts Number of sites			
		Heppner	Pomeroy	North Fork John Day	Walla Walla
<i>Acroptilon repens</i>	Russian knapweed				1
<i>Articum minus</i>	Lesser burdock	7	1	3	6
<i>Cardaria draba</i>	Whitetop		2	6	1
<i>Carduus nutans</i>	Musk thistle			2	3
<i>Centaurea stoebe</i>	Spotted knapweed	1	54	63	98
<i>Centaurea diffusa</i>	Diffuse knapweed	442	151	131	463
<i>Centaurea solstitialis</i>	Yellow starthistle		22	2	18
<i>Chondrilla juncea</i>	Rush skeletonweed				3
<i>Cirsium arvense</i>	Canada thistle	15	48	26	240
<i>Cynoglossum officinale</i>	Houndstongue	10	26	110	154
<i>Cytisus scoparius</i>	Scotch broom	3			2
<i>Euphorbia esula</i>	Leafy spurge			2	53
<i>Hieracium caespitosum</i>	Meadow hawkweed				4
<i>Hypericum perforatum</i>	St John's wort	242	36	36	247
<i>Linaria dalmatica</i>	Dalmatian toadflax	82	29	7	6
<i>Linaria vulgaris</i>	Butter and eggs	4	1	8	1
<i>Onopordum acanthium</i>	Scotch thistle	6	19	8	6
<i>Potentilla recta</i>	Sulphur cinquefoil		2	88	62
<i>Senecio jacobaea</i>	Tansy ragwort	3	7	11	70
<i>Taeniatherum caput-medusae</i>	Medusahead			4	15
Total (individual species occurrences)		815	398	507	1453
Total All Districts All Species		3,077 sites (about 2,000 sites when multiple species overlap is removed)			

The Pacific Northwest Region published the programmatic *Pacific Northwest Region Invasive Plant Program Preventing and Managing Invasive Plants FEIS* (USDA Forest Service 2005a), in April 2005 along with its accompanying *Record of Decision for Invasive Plant Program Management* (USDA Forest Service 2005b) on October 11, 2005. This decision amended all Forest Plans in the Region, adding new direction for containing, controlling or eradicating invasive plant species using prevention practices, various mechanical and hand treatments, and chemical treatments. This decision allowed for the use of chemicals from an updated list of herbicides for effectively responding to invasive plant threats.

The new herbicides offer many advantages over the more limited set of herbicides allowed previously, including greater selectivity, less harm to desired vegetation, reduced application rates, and lower toxicity to animals and people. The proposed action is aimed at containing, controlling, or eradicating, invasive plants using the new herbicides.

The Umatilla National Forest has been treating invasive plants under direction found in the 1995 decision implementing the *Umatilla National Forest Environmental Assessment (EA) for the Management of Noxious Weeds* (USDA Forest Service 1995). The recommended treatment methods required years of manual or mechanical treatments on a site prior to the use of herbicides. Within that decision three herbicides were approved for use, glyphosate, dicamba, and picloram. The decision did not provide the ability to respond quickly to new infestations because the process covered only those sites known at the time of the 1995 decision.

Ten years of monitoring shows that the treatments under the 1995 decision have not successfully reduced the impact and spread of invasive plant species (1991-2000 annual monitoring reports, USDA 2001). The reasons for this are:

- Only known sites were covered, so new infestations since 1995 cannot be treated under this decision
- The delay in the use of herbicides has allowed some infestations to become well established and spread
- Manual and mechanical treatments require expensive multiple visits to sites each year and the budget is not always adequate
- The three herbicides that were approved for use are not effective on some invasive species found on the Forest

The Umatilla National Forest staff acknowledges the need for a new strategy that would (1) treat known infestations safely and effectively, and (2) identify and treat new infestations. Thus, the purpose of the proposed action is to (1) treat and restore desirable vegetation in areas known to contain invasive plants, and (2) treat new infestations. This EIS analyzes the effects of a project proposal that would achieve those two purposes in a manner consistent with the LRMP.

1.2 Desired Future Condition

The diversity, function, and sustainability of desired native plant communities and other natural resources is maintained or improved because invasive plants are eradicated, contained, or controlled on known sites, and newly detected sites.

1.3 Purpose and Need

Invasive plants pose one of the greatest ecological threats to public lands in the United States. Sizeable infestations can displace or alter native plant communities and cause long-lasting economic and ecological problems within and outside the National Forests. Invasive plants can and do occur almost anywhere on the landscape. Common sites of infestations include rangelands, timber harvest areas, along roads and road rights-of-way (including decommissioned roads), along trail routes, at dispersed and developed recreation sites, wilderness areas, national recreation areas and on other disturbed sites (i.e. fires, flood events, and rock quarries).

Botanical species of local interest are threatened by invasive plants at approximately 35 infested sites. Riparian areas and fish habitat quality is threatened by invasive plants in over 5,500 acres of riparian areas. Tribal resources and subsistence gathering can be degraded by the invasive plants. Range land quality is being degraded. Wildlife habitat quality may be affected by invasive plants. Roadless, wilderness, wild and scenic rivers, research natural areas and botanical areas are all high priority areas for treatment due to the value of the resources at risk from invasive plants.

Weeds can spread rapidly across the landscape to noninfested areas, unimpeded by ownership or administrative boundaries, because of their strong reproductive and competitive abilities. The R6 2005 FEIS estimated that invasive plants are spreading regionwide by about 40,000 acres per year;

prevention of invasive plants may reduce the rate of spread, however a large backlog of inventoried sites needs to be treated.

Specifically, there is an underlying need on the Forest to: (1) implement treatment and site restoration actions to contain, control or eradicate the extent of invasive plants at existing inventoried sites, and (2) rapidly respond to new or expanded invasive plant sites as they are detected in the future. Without action, invasive plant populations will become increasingly difficult and costly to control, and will further degrade forest and grassland ecosystems. Untreated infested areas will also contribute to the spread of invasive plants onto neighboring lands.

Invasive plant treatments were proposed in 1995 and 1998 to address about 2,771 acres (773 sites) known at that time. The present inventory of nearly 25,000 acres of weed infestations (over 3,000 sites) suggests an alarming expansion of invasive plant species despite the efforts of the existing weed program. The existing program does not allow for a full range of effective treatments because: (1) most of the current infested area cannot be treated with herbicides, and (2) the three herbicides available for sites that existed in 1995 are not effective for many invasive plants known on the Forest. Thus, there is a need to contain, control or eradicate approximately 25,000 acres of invasive plant infestations that have been inventoried and mapped on the Umatilla National Forest. Further, there is a need to treat new infestations (including new species) soon after they are detected on the landscape so they can be controlled while they are still small. These invasive plants will likely continue to expand and spread every year that effective treatment is not applied. At some point, individual populations of invasive plants can get so large as to be impossible to eradicate or cost-effectively control.

This purpose of the project is to control invasive plant species according to invasive plant direction in the Umatilla Forest Plan, as amended by the R6 2005 ROD.

1.4 Proposed Action

The proposed action would allow a range of effective treatments on about 25,000 acres of known invasive plant sites. Approximately 675 acres are proposed for aerial herbicide application, about 14,500 acres are proposed for ground broadcast herbicide applications, and about 5,560 acres are proposed for spot and selective (backpack, wicking, wiping, stem injection) herbicide application on currently known sites. In addition, approximately 3,900 acres are proposed for biological controls. Approximately 41 acres are proposed for manual treatments.

Herbicide application method is based on the extent, location, type and character of an infestation. Non-herbicide methods could also be used in combination with herbicides. Cultural/restoration treatments such as competitive seeding with native grass and forbs species (also mulching, fertilizing) would occur in combination with other treatments as needed to facilitate natural plant recovery. The priority for treatments would vary by District and are subject to change over time.

The proposed action would also approve treatment of new detections of invasive plants. Early detection/rapid response (EDRR) is proposed to increase effectiveness and decrease risks from treatment. Early detection/rapid response refers to treatment of new sites or invasive target species so long as the treatment needed for the new site is included in the analysis and final decision.

1.5 Law, Regulations, Policy and Management Direction

This EIS process and documentation has been completed according to direction contained in the National Forest Management Act (NFMA), the National Environmental Policy Act (NEPA), and the Council on Environmental Quality regulations, Clean Water Act, and the Endangered Species Act. The project is consistent with all applicable Federal, State and local laws. This EIS tiers to the

Umatilla National Forest Land and Resource Management Plan Final Environmental Impact Statement and Record of Decision (1990) and incorporates by reference the accompanying *Land and Resource Management Plan* (LRMP, also called the Forest Plan) (1990), as amended by the Pacific Fish Strategy (PACFISH) (1995) where appropriate, and the R6 2005 FEIS and R6 2005 ROD.

The Umatilla National Forest Plan was amended by PACFISH in 1995 to establish stream, wetland and landslide-prone area protection zones called Riparian Habitat Conservation Areas (RHCAs), setting standards and guidelines for managing activities that potentially affect conditions within the RHCAs. They also established Riparian Management Objectives (RMOs) that provide guidance with respect to key habitat variables.

The Federal Noxious Weed Act of 1974, as amended (7 U.S.C 2801 et seq.) requires cooperation with state, local, and other federal agencies in the application and enforcement of all laws and regulations relating to management and control of noxious weeds (a summary of this act can be viewed at: <http://ipl.unm.edu/cwl/fedbook/fedweed.html>). This Act directs the Secretary of Agriculture to develop and coordinate a management program for control of undesirable plants which are noxious, harmful, injurious, poisonous, or toxic on Federal lands under the agency's jurisdiction, to establish and adequately fund the program, to complete and implement cooperative agreements and/or memorandums, and to establish integrated weed management to control or contain species identified and targeted under cooperative agreements and/or memorandums.

U.S. Forest Service Manual 2080 directs the Forest Service to use an integrated weed management approach to control and contain the spread of noxious weeds on National Forest System lands and from National Forest System lands to adjacent lands (USDA Forest Service 1995b). Integrated weed management is an interdisciplinary pest management approach by which one selects and applies a combination of management techniques that, together, control a particular invasive plant species or infestation efficiently and effectively, with minimum adverse impacts to non-target organisms. Integrated weed management is typically species- and site-specific, and includes education, preventive measures, early detection of infestations through inventory and mapping, and combinations of treatment methods as needed to effectively control the target species. Forest Service Handbook (FSH) 2109.14 Pesticide Use and Coordination provides additional direction related to implementation of invasive plant management, and FSM 2150 Pesticide Use and Coordination provide policy direction.

Executive Order 13112 (1999) directs federal agencies to reduce the spread of invasive plants. Invasive species have been identified by the current Chief of the Forest Service as one of the four threats to ecosystem health.

The Forest Service Guide to Noxious Weed Prevention Practices (USDA Forest Service 2001b) provides management guidance in the form of goals along with prevention practices. Forest Service policy identifies prevention of the introduction and establishment of noxious weed infestations as an agency objective. This Guide provides a comprehensive directory of weed prevention practices for use in Forest Service planning and wildland resource management activities and operations.

In October 2004, the Chief of the Forest Service released a *National Strategy and Implementation Plan for Invasive Plant Species Management* (USDA Forest Service 2004c). It focuses on four key elements: preventing invasive species before they arrive; finding new infestations before they spread and become established; containing and reducing existing infestations; and rehabilitating and restoring native habitats and ecosystems.

Up until recently, Forests in Region Six followed management direction introduced to all Land and Resource Management Plans in Region Six by the *Record of Decision for Managing Competing and Unwanted Vegetation* (USDA Forest Service 1988), and the subsequent *Mediated Agreement* (USDA

Forest Service 1989). The 1988 ROD specified and limited the tools available for the treatment of competing and unwanted vegetation, but did not provide administrative mechanisms for adapting new technologies. Herbicides approved for use by the Forest Service at that time were developed before 1980.

The *Pacific Northwest Region Invasive Plant Program – Preventing and Managing Invasive Plants Record of Decision* (USDA 2005b) supersedes direction from those documents to provide invasive plant management direction to Forests in Region Six.

This FEIS for invasive plant treatments on the Umatilla National Forest tiers to the R6 2005 FEIS. The R6 2005 ROD added goals, objectives and standards for invasive plant management to the Umatilla National Forest LRMP (See Forest Direction section) and replaces the requirements of the Mediated Agreement (1989) dealing with the treatment of invasive plants. All other vegetation management activities on the Forest will still be bound by the Mediated Agreement.

Current management direction for the treatment of invasive plants on the Umatilla National Forest considers the following sources:

- The *Umatilla National Forest Land and Resource Management Plan* (Forest Plan as amended by the *Pacific Northwest Region Invasive Plant Program, Record of Decision* (2005))
- The *Umatilla National Forest Environmental Assessment for the Management of Noxious Weeds and Forest Plan Amendment 4* (USDA Forest Service 1995 and 1998)

Specific Standards and Guidelines from the Forest Plan that apply to this project are in appendix A (available upon request or online at <http://www.fs.fed.us/r6/uma/projects/>).

1.5.1 Best Available Science

The best available science is considered in preparation of this EIS. However, what constitutes best available science might vary over time and across scientific disciplines as new science is brought into play. We show consideration of the best available science when we insure the scientific integrity of the discussions and analyses in the project NEPA document. Specifically, this EIS and the accompanying project record identifies methods used, references reliable scientific sources, discusses responsible opposing views, and discloses incomplete or unavailable information, scientific uncertainty, and risk (See 40 CFR, 1502.9 (b), 1502.22, 1502.24).

The Project Record references scientific information considered: papers, reports, literature reviews, review citations, academic peer reviews, science consistency reviews, and results of ground-based observations to validate best available science. This EIS incorporates by reference (as per 40 CFR 1502.21) the Project Record, including specialist reports and other technical documentation used to support the analysis and conclusions of this EIS. The project record is located at the Umatilla National Forest Office in Pendleton, Oregon. An index to the record and/or specific documents is available on request.

1.6 Decision Framework

The Responsible Official is the Forest Supervisor, who will make the following decisions based on the interdisciplinary analysis:

- Whether or not to treat invasive plants using design features, buffers and other criteria included in the alternatives
- What monitoring is required

The Forest Supervisor will base the decision on how well the alternative meets the purpose and need for action, as indicated by:

- Whether or not the alternative includes treatment of newly discovered infestations
- Treatment cost and effectiveness
- The degree to which the alternative minimizes potential adverse impacts to human health and the environment, based on issue indicators shown below

The scope of the decision is limited to invasive plant treatments using chemical, physical, biological, and cultural methods.

1.7 Tribal Involvement

1.7.1 Introduction

The proposed Invasive plant treatments occur within areas ceded to the United States government by the following recognized tribes: the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) by the TREATY WITH THE WALLA WALLA, CAYUSE, ETC., 1855; the Nez Perce Tribe by the TREATY WITH THE NEZ PERCE, 1855; and the Confederated Tribes of the Warm Springs Reservation in the TREATY WITH THE TRIBES OF MIDDLE OREGON, 1855. The Forest Service, through the Secretary of Agriculture, is vested with statutory authority and responsibility for managing resources of the National Forests. No sharing of administrative or management decision-making power is held with any other entity. However, commensurate with authority and responsibility to manage is the obligation to consult, cooperate, and coordinate with recognized Indian Tribes in developing and planning management decisions regarding resources on National Forest System (NFS) lands that may affect tribal rights established by treaty or Executive Order.

As a result of the treaties and Executive Orders, elements of Indian culture, such as tribal welfare, land, and resources were entrusted to the United States government. The Forest Service shares in the Federal government's overall trust responsibility where treaty, laws, Executive Orders, case law or other legally defined rights apply to National Forest System (NFS) lands. Trust responsibilities resulting from the Treaties or Executive Order dictate, in part, that the United States government facilitates the execution of treaty rights and traditional cultural practices of recognized tribes. The Forest Service assists with this shared responsibility by working with the tribes on a government-to-government basis and in a manner that attempts a reasonable accommodation of their needs, without compromising the legal positions of the Tribe or the Federal government.

Tribes have expressed rights reserved in the treaties. The treaties state "That the exclusive right of taking fish in the streams running through and bordering said reservation is hereby secured to said Indians; and at all other usual and accustomed stations, in common with citizens of the United States, and of erecting suitable houses for curing the same; also the privilege of hunting, gathering roots and berries, and pasturing their stock on unclaimed lands, in common with citizens, is secured to them." (TREATY WITH THE TRIBES OF MIDDLE OREGON and TREATY WITH THE WALLAWALLA, CAYUSE, ETC. The TREATY WITH THE NEZ PERCE has similar language.) It is the responsibility of the Forest Service to take into account cultural resources when managing the Forest's natural resources and to address tribal interests when managing and restoring habitat to support healthy, sustainable, and harvestable populations of culturally significant vegetative floral and faunal species.

Utilization of NFS lands for all Federally recognized Tribes is protected by American Indian Religious Freedom Act, Executive Order 13007 – Sacred Sites, Executive Orders 13084 & 13175 – Consultation and Coordination with Indian Tribal Governments, and Executive Order 12898 – Environmental Justice and the National Historic Preservation Act which includes protections for properties of traditional religious and cultural importance.

1.7.2 Tribal Issues Identified

Letters were sent to Tribal leaders of the Nez Perce, Confederate Tribes of the Umatilla Indian Reservation (CTUIR), and Confederate Tribes of the Warm Springs Reservation in April of 2006. None of tribes responded to the letter. The Forest had meetings with various tribal resource staff. During these meetings the tribes were supportive of the Forest's efforts to treat invasive plants and being able to use all the tools/methods described in the proposed action. The experience of the CTUIR using aerial treatments for yellow starthistle is described as successful when integrated with other land owners. The Nez Perce felt that biological treatments should be an integrated approach used on the landscape. All tribes have a concern about coordinating herbicide treatments with traditional gathering activities and areas. A process will be developed for notifying each tribe when herbicides are being used as required by the project design features in chapter 2.

The Forest has incorporated concerns voiced by the tribes in the past into this project. These concerns include:

- The Forest Service has Federal Trust Responsibility to take into account the Tribes' treaty rights when decisions are made such that cultural practices can be exercised and that treaty related resources are protected. Actions should not hinder the ability of the tribes to access traditional use areas. There is concern that traditional uses would not be able to continue or the use of herbicides would contaminate traditional gathering areas. Conflicts with the timing of herbicide use and gathering activities would be avoided by having a method for the Forest to contact the tribes prior to using herbicides each year. The proposed invasive plant treatments do not close roads or change existing access to National Forest System lands.
- There is also concern about the use of herbicides in riparian areas and its potential impact to water quality that may interfere with recovery efforts for anadromous fish, a traditional economic resource. The CTUIR have spent years reestablishing salmon in the Umatilla River and Meacham Creek systems and have made efforts in the Walla Walla River and Lookingglass Creek in the Grande Ronde basin. They feel that protection of pristine riparian and upland habitat is important to the recovery of fish populations. There is support for the Northwest Power Planning Council's approach to Subbasin planning that focuses on connecting areas of high quality habitat and working toward population goals through both natural and hatchery production. This concern has been incorporated into project design features in chapter 2 and effects disclosed in chapter 3.
- The CTUIR expresses its concern for managing resources through the cultural aspects of First Foods and their importance on the land that sustains their culture. First Foods – water, salmon, deer, cous, and huckleberry - represent groupings of similar species that are served in their Longhouse and represent a healthy environment that is important to their cultural traditions.
- The Nez Perce has focused management actions in the uplands for provide quality habitat for game and cultural plant species. Biological control methods are important to them and they have developed insect control methods.

Tribal concerns have been incorporated into all alternatives through the use of project design features (See chapter 2). Concerns voiced about potential impacts to plants, animals, and fish are similar to those heard from the public during scoping. The analysis incorporated uncertainty of potential effects by placing restrictions on herbicide use such that effects become immeasurable and much less than disclosed in research.

Project design features require the Forest Service to notify the Tribes of areas proposed for treatments each year. The Public Notification Plan requires areas proposed for treatment to be mapped, information shared and posted, and warning signs posted at the locations treated with herbicides. Water quality and fisheries habitat is also protected through the use of project design features that restrict herbicide use in riparian and near stream areas. The proposed invasive plant

treatments do not close roads or change existing access to National Forest System lands. Herbicide treatments may cause plants to not be available for a season, depending on when the treatment occurs.

Because of the project design features, all alternatives are responsive to Tribal cultural needs. The differences between alternatives are the amount and methods of broadcast and aerial herbicide treatments.

1.8 Public Involvement

Scoping began officially on April 6, 2006 when the Notice of Intent (NOI) to Prepare an Environmental Impact Statement was published in the Federal Register Volume 71, No. 66/April 6, 2006 on pages 17435-17437. This project was listed on the Umatilla National Forest Schedule of Proposed Actions (SOPA) since April 1, 2006. The SOPA is mailed four times a year to over 200 interested persons, organizations, and agencies. A scoping letter, dated April 3, 2006, was mailed to 128 individuals and organizations. The letter was signed by Forest Supervisor, Kevin D. Martin. The scoping proposal was also posted on the Forest website at the following address: <http://www.fs.fed.us/r6/uma/projects/readroom/invasive-plants/>.

A Notice of Availability for the DEIS was published in the Federal Register (Vol. 72, No. 120) on Friday, June 22, 2007. The Forest documented and responded to public comments to the DEIS, and recorded these in Chapter 5 of the FEIS.

1.9 Issues

Twelve comment letters were received during scoping. All comments were considered, and public issues were identified based on these scoping comments. Many important public issues are addressed through the design of the proposed action. An example is human health, an issue of great public concern. All alternatives avoid the type of herbicide use associated with harmful exposures to workers and/or the public. The issue of human health is discussed throughout this document because it is of such great importance to the public; however is not the basis for alternative comparison because all alternatives equally address this issue.

Some significant issues are not fully addressed by the proposed action and thus became the basis for two action alternatives discussed in chapter 2 of this EIS. Aerial spraying and broadcast spraying within riparian areas were identified by the R6 2005 ROD Monitoring Framework as high risk projects in relation to potential effects on wildlife and fish species of local concern. Some members of the public have requested these methods be avoided. However, avoiding these treatment methods has the potential to reduce the effectiveness or raise the cost of treatment.

Significant public issues are:

- Human health
- Treatment effectiveness
- Social and economic
- Non-target terrestrial plant and animal species
- Soils, water quality and aquatic organisms

1.9.1 Human Health

Many people have expressed concern that exposure to herbicides may have serious human health consequences. People wonder if they could be sickened by brushing up against contaminated vegetation or eating berries, mushrooms, fish or game that may have been exposed to herbicides.

They worry that they might drink water contaminated by herbicides. People are concerned about the health and safety of forest workers who are more likely to be exposed to herbicides. Some believe that the potential cost to human health is too high and other methods should be used to treat invasive plants.

Response: This is a significant public issue that led to including detailed analysis in the R6 2005 FEIS and this EIS. Project design features were developed to minimize the potential for harmful human exposure to herbicides.

The R6 2005 FEIS found that workers exposed to some herbicides could suffer nausea, headache, dizziness, eye or skin irritation, and/or coughing. Exposure by the general public is far less likely (herbicide risk assessments indicate risk of public health impacts with the type of treatments proposed approaches zero). The type, rate, and method of application have been limited in all alternatives to the extent that predicted exposures are below a level of concern. National policy, Forest Plan standards, label guidance, and state laws all require herbicide applicators to use personal protective equipment to avoid harmful herbicide exposure.

Alternatives A, C and D restrict the acreage subject to herbicide use; however, all of the alternatives include design features to prevent exposure to workers and the public in response to this issue.

Refer to section 3.7 for more information about the effects of herbicide use on workers and the public.

- Unit of Measurement:
 - Character of PDFs minimizing potential for worker and public exposure to herbicides

1.9.2 Treatment Effectiveness

Some commenters noted that limitations on the availability of treatment methods and herbicide options reduce the potential for invasive plants to be effectively treated. Fully integrated strategies are needed to effectively treat invasive weeds while minimizing effects to humans and the environment. Not using herbicides will result in the continued spread of invasive plants, resulting in the loss of ecosystem function and wildlife habitat loss.

Response: All alternatives involve some herbicide use and include some limitations to minimize adverse effects to people and the environment. This is necessary to meet applicable laws, policies, standards and plans.

Alternative B has the fewest limits on the use of treatment methods by allowing aerial application of herbicides and allowing broadcast applications where needed in riparian areas. Alternatives C and D limit the amount of acres that may be treated with herbicides as well as methods available to apply herbicide. These limitations are likely to reduce treatment cost effectiveness.

Refer to section 3.2.4 in chapter 3 for more information about treatment effectiveness. By limiting options as a response to other issues, Alternatives C and D may result in a loss of treatment effectiveness. The alternatives differ in their potential effectiveness and are compared by:

- Unit of Measurement:
 - Number of herbicide options
 - Character of limitation on integrated treatment options
 - Percentage of infested acreage where the full range of effective treatments are available

1.9.3 Social and Economic

Cost of each treatment acre influences the number of acres that can be treated with the same total budget. There are also concerns that the surrounding community should be informed of activities and economic costs of the project.

Response: The alternatives differ in the average cost per acre. All action alternatives incorporate Treatment Restoration Standard 23 from the Umatilla Forest Plan as amended by the R6 2005 ROD, which requires timely public notification of treatment activities.

Refer to section 3.9 for more information about economics. Alternatives A, C and D may result in loss of cost effectiveness. This is because broadcast and aerial methods cost less per acre than spot and hand treatments.

- Unit of Measurement:
 - Average cost per acre
 - Total cost for treating all acres
 - Average annual cost

1.9.4 Non-target Botanical and Terrestrial Wildlife Species

There is a concern that herbicide exposure, particularly when applied through aerial or broadcast spraying, may harm terrestrial wildlife species and non target plants. Specifically, herbicide drift, primarily from broadcast and aerial applications of herbicides could cause harm to non-target plants and animals.

Response: This issue is specifically addressed through adherence to the Umatilla Forest Plan as amended by standard 19 from the R6 2005 ROD. All action alternatives include PDFs that would minimize potential for herbicide exposure to non-target plants and wildlife; however, aerial and broadcast spraying involves a greater risk of runoff and drift from herbicide application.

Alternative C was developed to respond to concerns about broadcast treatments specifically in riparian areas. Alternative D was developed to respond to concerns about aerial spraying. Alternative A does not include aerial spraying and does not include as much broadcast spraying in riparian areas. Refer to sections 3.2 and 3.3 for more information about effects on non-target botanical species and wildlife.

- Unit of Measurement:
 - Character of PDFs that apply to wildlife and plants
 - Acres of broadcast application
 - Acres of aerial treatment

1.9.5 Soil, Water Quality and Aquatic Organisms

There is concern that there may be potential adverse effects of herbicide treatment on soils and the potential for leaching into ground water.

There is concern that there may potentially be adverse effects of herbicide treatment on riparian areas that would impact water quality and aquatic ecosystems. Specifically some believe that application of herbicide in riparian areas could contaminate water and cause mortality to fish, organisms that support fish and other aquatic species. Fish and other aquatic organisms may also be impacted by manual and mechanical treatments, which may change dissolved oxygen levels, nutrients, water temperature, turbidity, fine sediment and riparian structure.

Response: The R6 2005 ROD acknowledges that aerial application and ground broadcast in riparian areas pose potentially higher risks of delivery to surface waters. This is because there is more potential for drift during application, applications cover more ground each day, and often more herbicide is applied to each acre with broadcast treatments than more selective treatments. This is also due to the inherent loss of operator control associated with broadcast and aerial treatments compared to spot and selective treatments. This is not to imply that all aerial or broadcast treatments involve great risk of impact to surface waters; the degree of risk is greater, but the intent of all treatments, including aerial and broadcast, is to minimize drift and herbicide contact with surface water.

Chapter 2 describes the project design features and buffers in all action alternatives designed to avoid herbicide delivery to water and eliminate risk of concentrations and of concerns for water quality and fish, domestic water sources and other aquatic organisms. Alternative C was developed to respond to concerns about broadcast treatments specifically in riparian areas. Alternative D was developed to respond to concerns about aerial spraying. Alternative A does not include aerial spraying and does not include as much broadcast spraying in riparian areas.

Unit of Measurement:

- Character of PDFs that apply to soils and water
- Acres of broadcast herbicide application within riparian areas
- Acres of aerial treatment

1.9.6 Non-Significant Issues

The Council of Environmental Quality requires the USDA Forest Service to identify and eliminate from detailed study the issues that are not significant (40 CFR 1501.7). Issues may be eliminated from further analysis when the issue is:

- Outside the scope of the EIS
- Already decided by law, regulation, Forest Plan, or other higher level decision
- Not clearly relevant to the decision to be made
- Conjectural and not supported by good scientific or factual evidence

The following issues fit in one or more of the non-significant categories. Issues are identified and an explanation of why they are not significant is given.

Some comments suggested adding aspects of the project covered by other programs such as road management. Decisions to build, open, or close roads are made in the transportation management program and individual projects that require access. The relationship between road management and invasive plant prevention is addressed in the R6 2005 FEIS. The R6 2005 ROD included management direction for prevention of invasive plants that are assumed to occur regardless of the decision made under the scope of this project.

- “Roads are a major weed vector. The analysis must consider closing or revegetating unneeded roads. No new road should be constructed if you are serious about controlling weeds.”

Some comments suggested adding aspects of the project that are not subject to NEPA, such as coordination with land managers and land owners for adjacent public and private lands.

- “There is a concern that lack of coordination with other land owners/managers will not lead to effective control of invasive weeds.”

Some comments made speculative or unsupportable claims. Such comments are not supported in peer-reviewed literature, and are therefore considered non-significant issues. Examples include:

- “Herbicide spraying causes all kinds of cancer”
- “Herbicide spraying destroys essential ecosystem functions”

Some comments made requests that were outside the scope of the proposed project. While some such requests might be a good idea, they go well beyond the level of analysis NEPA requires. Examples include:

- “Stop all logging. Stop all grazing, which is harmful and brings in invasive weeds, as does logging.”
- “Have an independent contractor study the effectiveness of past Forest Service chemical and non-chemical control types in each district, including adequacy of timing and repetition of control types and publicly disclose the results.”
- “Do a feasibility study of the effectiveness needs for further research and logistical parameters for non-chemical alternative control methods for each invasive plant at issue, and make this available to all district offices.”

Some comments raised issues about complying with laws. These were mostly reminders to complete tasks that are already part of the process of completing an EIS. Examples include:

- “Impacts on non-target plants, soils, water quality, human health, wildlife and fish must be properly analyzed and disclosed. Cumulative effects must be disclosed.”
- “The National Forest Management Act requires the Forest Service to “provide for diversity of plant and animal communities.” 16 U.S.C. § 1604(g)(3)(B)”
- “Note that pursuant to Section 7 of the ESA, the Forest Service has an independent duty to conserve and protect the threatened and endangered species that depend on the public lands it is charged with managing and ensure it does not jeopardize species or adversely modify critical habitat.”
- “This project must comply with the Clean Water Act, which may require a National Pollutant Discharge Elimination System (NPDES) permit for the herbicide application” (currently permits are not required (2009 R6 Pesticide News and Notes #2).

Some commenters expressed the opinion that herbicides should be used only as a last resort when other methods fail. This approach was analyzed in the R6 2005 FEIS. The R6 2005 ROD stated that such an approach deviated from IWM principles. Rather, the R6 2005 ROD required that we: “select methods for ...containing and controlling noxious weeds in coordination with other resource management activities to achieve optimum management goals and objectives (page 6).”

The current program (alternative A) addresses this concern to a degree by only allowing herbicide use on sites identified by the 1995 and 1998 weed program EA. The effectiveness of this program will be analyzed and compared to the three action alternatives.

Chapter 2 – Alternatives

Changes between the DEIS and FEIS for Chapter 2

Chapter 2 has been generally rewritten based on public comments and internal review. Some sections have been consolidated and some areas of redundancy have been removed. Important specific changes are listed below.

- The estimate that EDRR would be approximately 10 percent of the Forest’s annual treatment has been removed due to public and internal comment. This estimate could not be validated.
- Section 2.2.1 more clearly communicates the development of the proposed action, and why additional action alternatives were brought into the analysis as well as how they differ from the proposed action
- Section 2.2.2-Alternative A - No Action, added an ‘Alternative at a Glance’ table that displays proposed invasive plant treatment activities at the beginning of the section
- Section 2.2.3-Alternative B - Proposed Action:
 - added an ‘Alternative at a Glance’ table that displays proposed invasive plant treatment activities at the beginning of the section
 - added Cultural/Restoration as a treatment method included in the action alternatives
 - replaced Treatment Decision Tree with Treatment Decision and Implementation Planning Process
 - reorganized the Common Control Measures table in alphabetical order by common name of target species, added information on the relative potential for each herbicide to be used based on those effective on known sites , and added a column pertaining to treatment for each target species
 - moved Project Design Features from table format to text format for clarity and ease of reading. Some specific PDFs were edited for clarity. Some PDFs were removed because they were found to be unnecessary or redundant.
- Section 2.2.4-Alternative C
 - added an ‘Alternative at a Glance’ table that displays proposed invasive plant treatment activities at the beginning of the section
- Section 2.2.5-Alternative D
 - added an ‘Alternative at a Glance’ table that displays proposed invasive plant treatment activities at the beginning of the section
- Section 2.3.7 was added as an alternative not considered in detail based on public comment.

2.1 Introduction

Chapter 2 describes and compares alternatives considered for invasive plant treatment on the Umatilla National Forest in the State of Oregon and Washington. This chapter provides a summary of the effects of implementing alternatives and displays how they are responsive to the Purpose and Need for action, and issues identified during public scoping.

An invasive plant inventory was completed in 2006. It identified invasive plants on about 25,000 acres widely distributed across the Forest. Appropriate treatment priorities, methods, and strategies for invasive plants are described in the *Pacific Northwest Region Invasive Plant Program – Preventing and Managing Invasive Plants Final Environmental Impact Statement* (R6 2005 FEIS) (USDA Forest Service 2005a).

2.2 Alternatives Considered in Detail

2.2.1 Proposed Action and Alternative Development Process

The process for developing the proposed action included determining the most effective treatment methods for known infested sites, characterizing the risk to people and the environment associated with these treatments, and developing design features that minimize these risks.

Each invasive plant site in the inventory was assigned a site-specific treatment method (e.g. chemical, biological), a priority for treatment (1 through 5), and a control strategy (e.g. eradicate, contain). Figure 1 displays a map showing a sample of known weed infestations and proposed treatments. Maps of weed sites can be viewed at the Umatilla Forest Website (www.fs.fed.us/r6/uma/projects/readroom/invasive-plants.shtml).

Project design features (PDFs) were developed to respond to the adverse effects disclosed in the R6 2005 FEIS. PDFs provide a layer of caution intended to minimize adverse effects that may occur from the range of treatment methods proposed to treat known sites.

A range of alternatives was considered to address public and interagency issues; two alternatives to the proposed action were brought forward for detailed analysis. Other alternatives were not carried forward, because they would not effectively meet the purpose and need or because they were similar to one of the alternatives brought forward for analysis or because they would not be consistent with the Umatilla Forest Plan as amended by the R6 2005 ROD.

The R6 2005 ROD Monitoring Framework noted that broadcast application in riparian areas and aerial applications inherently pose higher risk to the environment. The two alternatives to the proposed action analyzed in this document were developed to avoid these higher risks. Alternative C eliminates broadcast treatment in riparian areas, and alternative D eliminates aerial treatment altogether.

The action alternatives vary in the following ways:

- Whether or not broadcast methods would be available for use on approximately 5,500 acres of Forest System land infested with invasive plant species that is located in riparian areas and wetlands
- Whether or not aerial methods would be available for use anywhere on the Umatilla National Forest to treat invasive plants



2.2.2 Alternative A – No Action

Alternative at a Glance

Activity	Approximate Value
Acres identified for treatment	3,154
Maximum percent of total Forest landbase treatable annually	0.01
Percentage of treatment sites where full range of effective treatments are available	0
Number of herbicides available for use	2
Acres of proposed herbicide treatments for known sites	1,774
Acres identified for aerial spraying of herbicides	0
Approximate total acres of ground based (hand or boom) broadcast treatments proposed for known sites*	1,774
Acres of hand or non-aerial broadcast treatments within riparian/wetland areas	0
Approximate total acres of spot spraying or selective (wicking, wiping, stem injection) herbicide application on known sites	unknown
Acres of invasive sites where treatment methods do not include herbicides	1,380
EDRR includes chemical methods	no
Average Cost per Treatment Acre	\$814

A majority of ground-based treatments use backpack sprayers.

The no action alternative is a requirement of the NEPA process to provide a baseline against which the effects of the other alternatives can be compared. By definition, under the No Action alternative, the need for action would not be addressed. Under No Action, (Alternative A) treatment of invasive plants would occur according to existing management direction.

The Umatilla National Forest has been treating invasive plants under direction found in the 1995 decision implementing the *Umatilla National Forest Environmental Assessment for the Management of Noxious Weeds* (USDA Forest Service 1995), and *Forest Plan Amendment 4* (1998). This program would continue where appropriate under the Alternative A.

The 1995 EA approved treatment of approximately 2,771 acres (773 sites), including use of herbicides on 1,391 acres (587 sites). Biological agents were approved for redistribution on 1,339 acres. Manual treatments were approved on 41 acres. Amendments to this decision approved an additional 59 sites (383 acres) for herbicide treatments (USDA Forest Service 1998), for a total of 1,774 acres of herbicide approved. Herbicide applications included spot or ground based broadcast methods utilizing glyphosate, dicamba, and/or picloram (no aerial treatment was included).

In addition to the 1995 and 1998 decisions, manual treatments are authorized throughout the National Forest as a part of administrative site and roadside maintenance. Such activities do not require a decision document.

Under no action, herbicide treatment would continue to be limited to the sites identified in 1995 and 1998. Such treatments would focus on eradication of residual populations in these sites. However, the R6 2005 ROD does not allow the use of dicamba, so herbicide use would be limited to the other two chemicals listed. Aerial application of herbicides is not allowed under the current program. Manual and mechanical (e.g. lawn mowing) methods would continue within administrative sites and roadsides throughout the Forest where appropriate.

Some of the treatments approved in existing NEPA documents have been effective; nevertheless invasive plants have continued to spread throughout the Forest, resulting in the current inventory of 25,000 acres that now need treatment. No action would not be consistent with invasive plant management direction described in chapter 1, and would not meet the purpose and need for action.

No action is presented to provide a baseline to compare the risks and benefits of the action alternatives.

2.2.3 Alternative B – Proposed Action

Alternative at a Glance

Activity	Approximate Value
Acres identified for treatment	24,649
Average maximum Percent of Total Forest landbase treated annually	0.03
Percentage of treatment sites where full range of effective treatments are available	100
Number of herbicides available for use	10
Acres of proposed herbicide treatments for known sites	20,691
Acres identified for aerial spraying of herbicides	675
Approximate total acres of ground based (hand or boom) broadcast treatments proposed for known sites*	17,478
Acres of hand or non-aerial broadcast treatments within riparian/wetland areas	3,022
Approximate total acres of non-broadcast (wicking, wiping, stem injection) herbicide application on known riparian/wetland areas	2,538
Acres of known invasive sites where treatment methods do not include herbicides	3,958
EDRR includes chemical methods other than aerial	Yes
Cost estimate per effectively treated acre of known sites	\$197

A majority of ground-based treatments use backpack sprayers.

Introduction

The proposed action (alternative B) would approve herbicides and other treatments on about 25,000 acres of known sites. The proposed action was developed to allow for a high degree of treatment cost-effectiveness while minimizing adverse effects on human health, botanical species, wildlife species, soils, water quality and aquatic species. The methods to be used, treatment strategy, and sequence of treatments would depend on the species, size, density, priority, objectives, and species to be treated. Re-treatment would often be necessary for a period of 10 to 15 years to achieve control objectives. New detections would be subject to the early detection rapid response (EDRR) process described in this chapter.

This section provides a detailed description of the strategies and methods for treating invasive plants, and discusses how cultural and restoration treatments would be integrated with invasive plant removal to encourage the revegetation of native plants. Maps of the known infestations are shown with the proposed treatment method (physical, chemical, biological). Common control measures are listed for target species known on the forest along with site specific considerations that might influence the treatment measure ultimately implemented. The proposed action also includes project design features and herbicide use buffers that would influence the final treatment prescription. The proposed action description also defines the Early Detection and Rapid Response (EDRR) process and outlines the process the Forest will use to develop an annual implementation plan that ensures the appropriate treatment is selected for any given site.

Management Strategies for Invasive Plant Treatments

Strategies for known sites include eradication, control or containment of invasive plants. The control strategies are defined below.

- **Eradicate** - Totally eliminate an invasive plant species from a site. This objective generally applies to small infestations of aggressive species such as yellow star thistle, spotted knapweed, leafy spurge, and hawkweed; and/or higher priority treatment areas. At some point, larger infestations can become impossible to eradicate.

- **Control** - Reduce the size of the infestation over time; some level of infestation would be acceptable. This objective applies to target species such as Russian knapweed and whitetop.
- **Contain** - Prevent the spread of the weed beyond the perimeter of patches or infestation areas mapped from current inventories.
- **Early Detection Rapid Response (EDRR)** - EDRR refers to newly inventoried invasive plant infestations, including previously undiscovered invasive plant infestations or new infestations that would occur over the life of this project. Ongoing inventory and monitoring would look for infestations of new invasive plant species or new locations of existing weeds. Newly discovered infestations or sites would likely receive a high priority for treatment to eradicate the invasive plants while the infestation is small and easily treatable.

Treatment Methods

A range of treatment methods are proposed for the known inventory of invasive plants on the Umatilla National Forest: chemical (herbicide), physical, biological, and cultural. A range of herbicide application methods would be used, including: aerial, ground broadcast and spot spraying, as well as selective (wicking, wiping, and stem injection). Non-herbicide methods would be used in conjunction with herbicides for some sites, and approximately 3,958 acres would be treated with methods other than herbicides because biological and/or physical treatments are expected to be effective on these sites. Manual and mechanical (e.g. lawn mowing) methods would continue within administrative sites and roadsides throughout the Forest where appropriate as described under No Action. These types of treatments do not require a decision document.

Detailed 1:24000 scale maps of all known existing treatment sites are available on the Umatilla National Forest website www.fs.fed.us/r6/uma/projects/readroom/invasive-plants.shtml (also see map example in figure 1. Figures 2-6 display sites and methods proposed for treatment within each Ranger District. The legend item “chemical-riparian” refers to areas where aquatic labeled herbicides must be considered for use (additional discussion about herbicide use under the Proposed Action follows.)

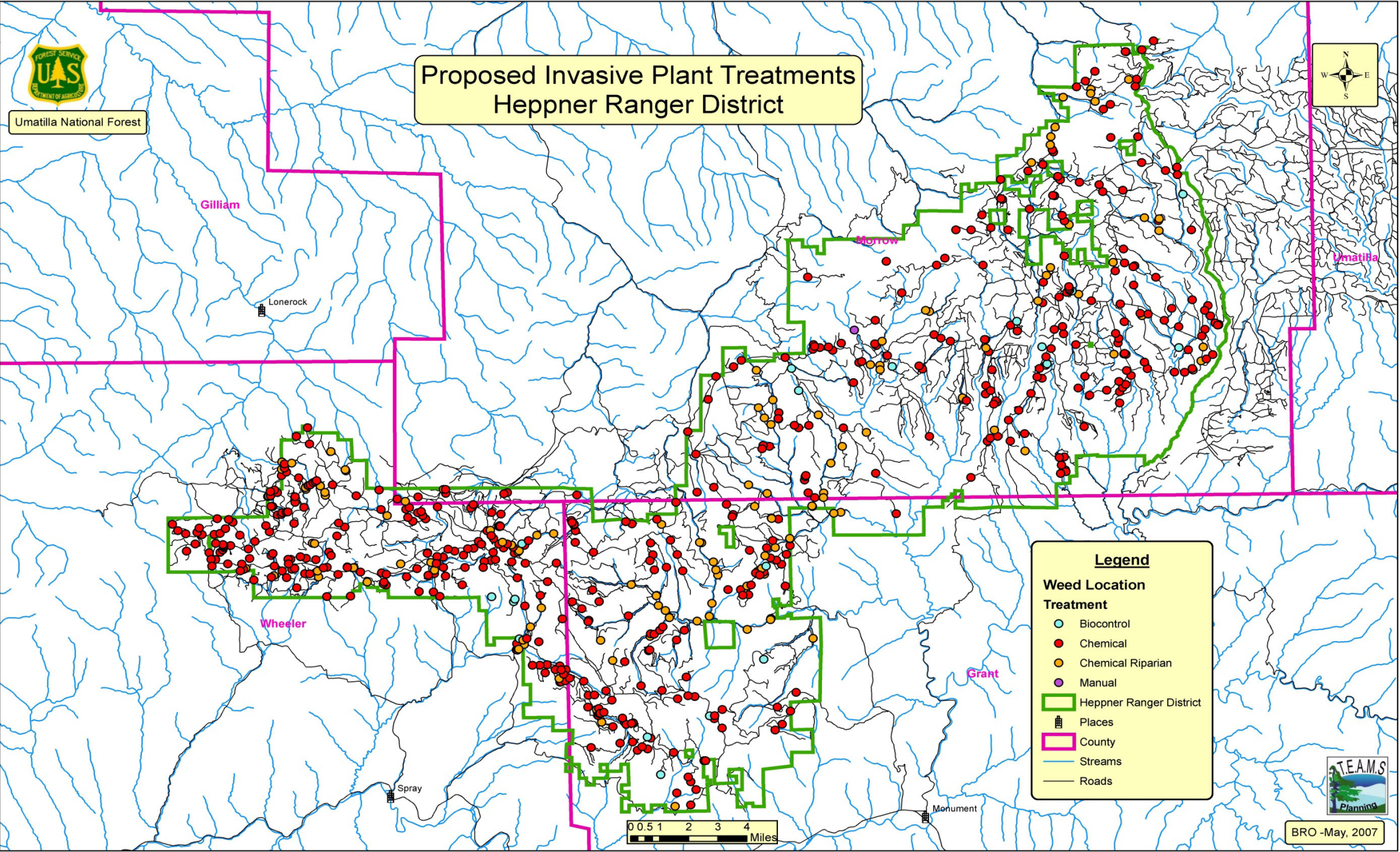


Figure 2. Heppner Ranger District Proposed Invasive Plant Treatments

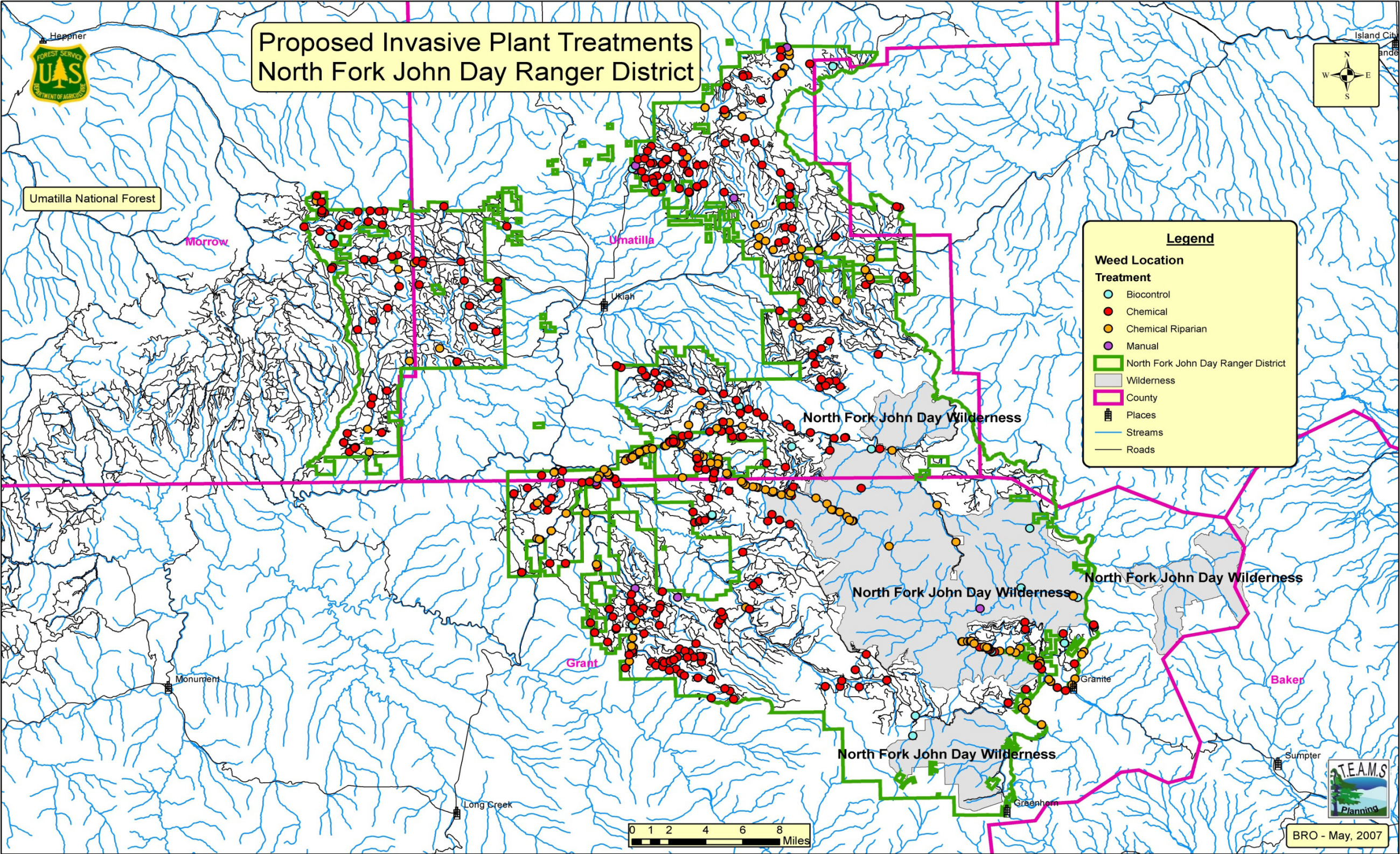


Figure 3. North Fork John Day Ranger District Proposed Invasive Plant Treatments

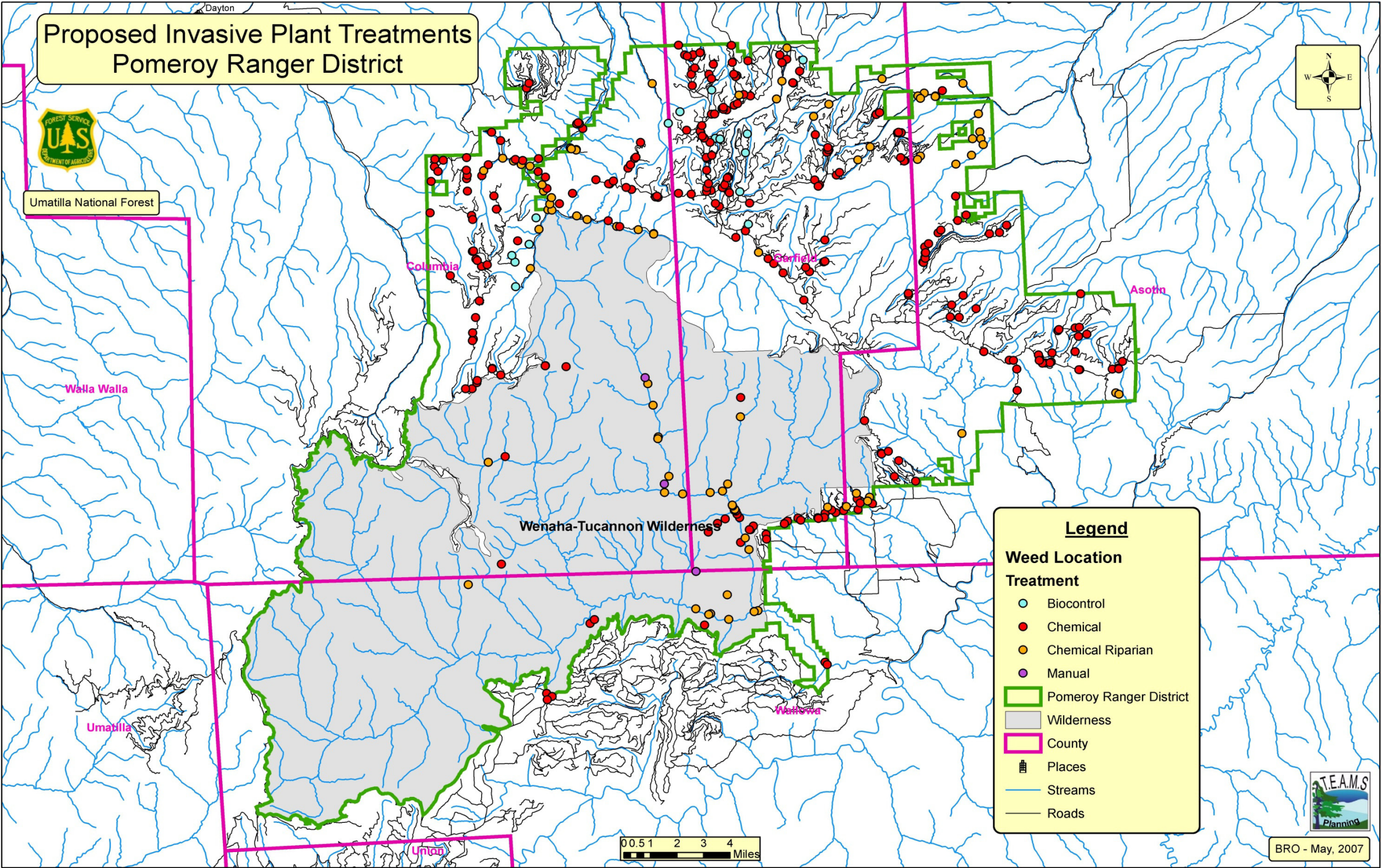


Figure 4. Pomeroy Ranger District Proposed Invasive Plant Treatments

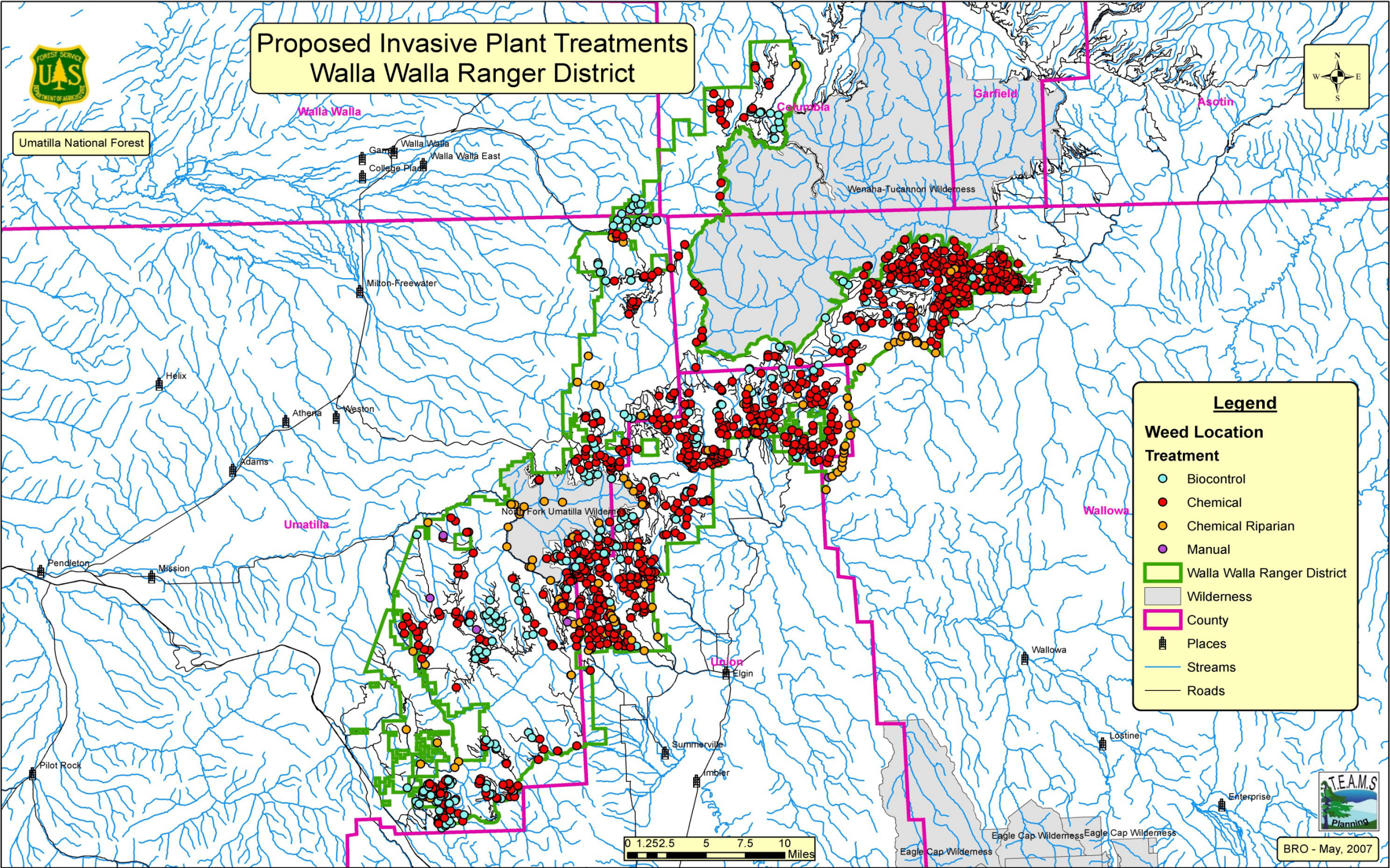


Figure 5. Walla Walla Ranger District Proposed Invasive Plant Treatments

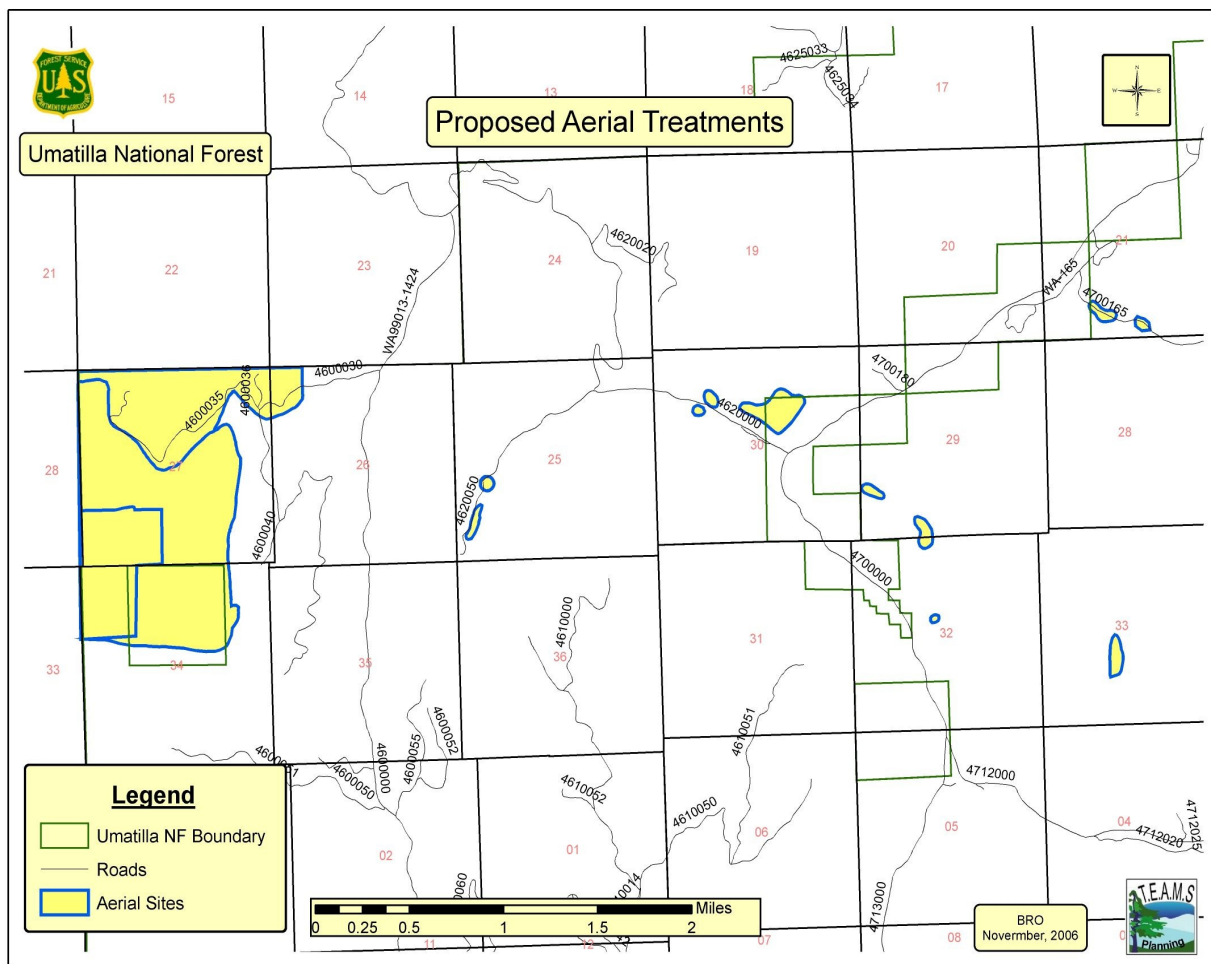


Figure 6. Acres Proposed for Aerial Application of Herbicide on the Pomeroy Ranger District

Chemical Methods

Chemical methods include use of herbicides and surfactants according to standards in the Umatilla Forest Plan (as amended by the R6 2005 ROD). The effectiveness, risks and properties of the herbicides and application methods proposed for use vary widely.

Ground-based or aerial application of herbicides would be used based on accessibility, topography, the size of treatment area and the expected efficiency and effectiveness of the method selected. The eventual goal is to reduce dependence on herbicide applications and maintain sites using non-herbicide methods.

The following are examples of the proposed methods of application:

Spot spraying – This method targets individual plants and is usually applied with a backpack sprayer. Spot spraying can also be applied using horse mounted spray tanks with pumps, or a hose off a truck-mounted or ATV-mounted tank.

Wicking – This hand method involves wiping a sponge or cloth that is saturated with chemical over the plant. This is used in sensitive areas, such as near water, to avoid getting any chemical on the non-target vegetation, soil, or water.

Stem injection – A new hand application technique currently is being used on Japanese knotweed in western Oregon and Washington.

Hand broadcast – Herbicide would be applied by hand using a backpack or hand spreader to cover an area of ground rather than individual plants.

Boom broadcast – This involves using a hose and nozzle from a tank mounted on a truck, or ATV. Herbicide is applied to cover an area of ground rather than individual plants. This method is used in areas where invasive plants occupy a large percentage of cover on the site and the area to be treated makes spot spraying impractical.

Aerial applications – In areas where physical features, such as topography, raise applicator safety concerns or where the cost of ground application is prohibitive, invasive plants may be treated with the use of helicopters. Aerial application of clopyralid would occur on 675 acres of the Pomeroy Ranger District (see figure 6).

Herbicide formulations and mixtures can contain one or more of the following 10 active ingredients: chlorsulfuron, clopyralid, glyphosate, imazapic, imazapyr, metsulfuron methyl, picloram, sethoxydim, sulfometuron methyl, and triclopyr. The application rates and method depend on the presence of the target species, condition of non-target vegetation, soil type, depth to the water table, the distance to open water sources, riparian areas, special status plants, and requirements of the herbicide label. Applications would be scheduled and designed to minimize the potential impacts to non-target plants and animals (R6 2005 FEIS, appendix 1-5, 1-6) by applying project design features. Monitoring of treated sites would determine what follow-up treatments would be needed if treatment methods need to be changed or if a more effective herbicide should be used.

Though the invasive plant inventory was thorough, it is reasonable to assume not all invasive plants sites have been located and that new sites will emerge on the landscape. Therefore, ongoing monitoring of treated sites would also look for new infestations. Newly discovered infestations would likely receive a high priority for treatment under the early detection rapid response (EDRR) strategy. Such treatments would be done under the same guidance of the Umatilla Forest Plan as amended by the R6 2005 ROD, other Forest Plan standards, product labels, and PDFs used for known treatment sites.

Table 2 displays 10 herbicides proposed for use in the proposed action (PA). The range of application rates for each chemical was derived during the SERA Risk Assessments, which are the basis for the herbicides analyzed in the R6 2005 FEIS. Most of the time application rates would not exceed the typical rate and effects analyses assumes the typical rate; however the actual effective rate may vary depending on application method, target species, and project design features (site-specific measures of protection). Broadcast applications would not exceed typical label rates shown in Table 2. Non-broadcast methods such as spot spraying, wicking, wiping or stem injection may infrequently be applied at rates greater than typical, where necessary to be effective.

Effects analysis models assume all applications are broadcast, modeled at typical rates; non-broadcast methods are typically less likely to result in herbicide exposure and potential delivery to streams than predicted for broadcasting. Nonbroadcast methods are labor intensive and fewer acres can be completed in a day – this also results in less exposure than predicted for broadcast

in a 24 hour period (based on 10 acres, a daunting target for hand treatments such as stem injection).

Table 2. High, Typical, and Low Application Rates for Herbicides

Herbicide	Highest Application Rate ¹ Lbs. a.i./acre	Typical Application Rate Lbs. a.i./acre	Lowest Application Rate Lbs. a.i./acre
Chlorsulfuron	0.25	0.056	0.0059
Clopyralid	0.50	0.35	0.10
Glyphosate	7.00	2.00	0.50
Imazapic	0.19	0.13	0.031
Imazapyr	1.25	0.45	0.03
Metsulfuron Methyl	0.15	0.03	0.013
Picloram	1.00	0.35	0.10
Sethoxydim	0.38	0.30	0.094
Sulfometuron Methyl	0.38	0.045	0.03
Triclopyr	10.00	1.00	0.10

Additives and Impurities

***Adjuvants** are compounds added to the formulation to improve its performance. They can either enhance the activity of an herbicide's active ingredient (activator adjuvant) or offset any problems associated with its application (special purpose or utility modifiers). For example, surfactants are one type of adjuvant that makes the herbicide more effective by increasing absorption into the plant. Project design features have been developed to reduce potential impacts from adjuvants.*

***Inert compounds** are those that are intentionally added to a formulation, but have no herbicidal activity and do not affect the herbicidal activity. Inert additives facilitate the herbicide's handling, stability, or mixing.*

***Impurities** are inadvertent contaminants in the herbicide, usually present as a result of the manufacturing process.*

Physical Methods

Physical treatment type includes manual and mechanical control methods.

Manual Control Methods

These include non-mechanized approaches, such as hand pulling or using hand tools (e.g., grubbing), to remove plants or cut off seed heads. Manual treatments are labor intensive, effective only for relatively small areas, and require repeated treatments several times throughout the growing season depending on the species. Manual treatments can be effective for annual and tap-rooted weeds, but are ineffective against perennial weeds with deep underground stems or roots, or fine rhizomes that can be easily broken and left behind to re-sprout.

¹ Maximum rates reflect the annual cumulative maximum application rate per acre. Some formulations have one-time maximum application rates that are substantially lower than the annual maximum rate.

Manual treatments are typically used to treat selected plants, small infestations, and sensitive areas to avoid potential negative impacts to non-target species or water quality. Where sites are small or there are few individual target species, handsaws, axes, shovel, rakes, machetes, grubbing hoes, mattocks, brush hooks, and hand clippers may all be used to remove invasive plant species. Axes, shovels, grubbing hoes, and mattocks are also used to dig up and cut below the surface to remove the main root of plants. To meet control objectives or reduce the risk of activities spreading invasive plants, seed heads and flowers are removed and disposed of properly. Other manual methods could include mulching, hot water steaming, foaming, or solarization techniques such as using black plastic to cover invasive species in order to shade out and kill pieces of roots (i.e. rhizomes). These techniques could be used in specific areas where there is a desire to minimize herbicide use such as areas with an abundance of sensitive wildlife or plant species.

Mechanical Control Methods

This method uses hand power tools and includes such actions as mowing, weed whipping, road brushing, root tilling methods, or foaming, steaming, infrared and other techniques using heat to reduce plant cover and root vigor. Choosing the appropriate treatment depends on the characteristics of undesired species present (for example, density, stem size, brittleness, and sprouting ability); the size of the treatment area, seedbed preparation and revegetation; the sites location (inside or outside a riparian area), and soil or topographic considerations. These activities would typically occur along roadsides, rock sources, or other confined disturbed areas and dispersed use areas.

Mowing and cutting would be used to reduce or remove above ground biomass. Seed heads and cut fragments of species capable of re-sprouting from stem or root segments may be collected and properly disposed of to prevent them from spreading into noninfested areas.

Biological Methods

Animal and Plant Health Inspection Service (APHIS) and State approved insects or plant pathogens that are proven control agents of specific weed species would be released to selectively suppress, inhibit, or control herbaceous and woody target species.

The insect or plant pathogen attacks and weakens the targeted weed species and reduces its ability to compete or reproduce. Biological control release would be used when the target species occupies extensive portions of the landscape, other methods of control are prohibitive based on cost and location, and an effective biological control regime exists. Biological weed control activities typically include the release parasitic, “host specific” insects, mites, nematodes and pathogens. Presently, insects are the primary biological control agent in use. Treatments do not eradicate the target species but rather reduce target plant densities and competition with desired plant species for space, water and nutrients.

Biological control activities may include collection of beetles/insects, development of colonies for collection, transporting, and transplanting parasitic beetles/insects, and supplementing stocking of existing populations. Bio-control agents are transported in containers that safely enclose the agent until release.

In some situations, a suite of biological control agents is needed to reduce weed density to a desirable level. As an example; a mixture of five or more biological control agents may be needed to attack flower or seed heads, foliage, stems, crowns and roots all at the same time or

during the plant's life cycle. Typically, 15 to 20 years are needed to bring about a successful control level.

The treated areas would continue to be inventoried and monitored to determine the success of the treatments and when the released bio-control agents have reached equilibrium with the target species. Repeat visits may need to be made several times a season, and over a series of years to determine if additional releases are needed or if a different agent needs to be released.

The use of biological control usually results in delayed effectiveness, often requiring 5-10 years for successful reduction of infestations. However, the increase of native vegetation is simultaneously occurring that often eliminates the need for restoration. Because of this fact, it is the preferred method in remote areas where access is limited, and on species where bioagents are available and proven successful.

Cultural Treatment Methods/Restoration

Cultural controls are defined in the R6 2005 FEIS as: "The establishment or maintenance of competitive vegetation, use of fertilizing, mulching, prescribed burning, or grazing animals to control or eliminate invasive plants" (page 10). Any of these methods except prescribed burning and grazing animals may be used in this project.

Cultural treatment methods would be used in the context of encouraging native vegetation to out-compete invasive plants. Some infestations can be treated once and some require multiple treatments to be effective. Mulching, seeding, planting and fertilizing are the cultural treatments that could be integrated with chemical, physical or biological methods to encourage native plant growth and spread. Native seed would be used to help native species re-establish, enhance competition over invasive plants, and provide erosion protection. In other areas, where 30 percent or more of the desirable vegetation exists, it may naturally replace target invasive plant species that have been removed.

Restoration and competitive plantings of native flora is essential to long term control of invasive plants. Restoration can be accomplished in some areas by removing competition from invasive plants and allowing native flora to occupy a site. Other areas would require active restoration, which would include competitive seeding with native plants, mulching, and/or outplanting. Meadows and forested areas are most likely to respond favorably to passive restoration, while roadsides and other highly disturbed areas may require active assistance through mulching and/or competitive seeding/planting with desirable vegetation. The intent is to re-establish competitive local, native vegetation post-treatment to promote resilient habitat conditions that are less susceptible to invasive plants.

Cultural treatments and restoration would follow *Guidelines for Revegetation for Invasive Weed Sites on National Forests and Grasslands in the Pacific Northwest* (Erickson et al. 2003). The revegetation guidelines state:

"Plan ahead for revegetation. First assess the need for revegetation. It may not always be necessary if a healthy native population is already in place. Not every inch of bare ground needs to be revegetated. If revegetation is needed, make sure you have materials available to seed or plant treated sites as soon after treatment as possible... The planting of competitive desirable species *can sometimes be the most effective method of control available for an invasive species.*"

Local native species are always preferred, but use of other desirable species such as non-native species that do not persist could be used as an interim step. A combination of native and desirable non-natives could be an initial mix for revegetation. A fast growing desirable non-native such as sterile wheatgrass can germinate quickly and start filling in bare ground until a slower to germinate native species can start competing effectively.

Evaluation for site restoration may occur before, during and after herbicide, manual and mechanical treatments. Passive site restoration would be favored in areas having a stable, diverse, native plant community and sufficient organics in the soil to sustain natural revegetation. If the soils lack sufficient organics, mulch and/or mycorrhizae could be added. Deep-rooted shrubs may also be seeded or planted to more fully utilize resources from the lower soil profile, especially late in the growing season. Shrubs allow for easier establishment of understory species by increasing water availability and reducing understory temperatures and evapotranspiration.

The degree of disturbance, as indicated by the proportion of the existing plant cover that consists of desirable native species, will also affect revegetation outcome. Ten to twenty percent native cover is considered a minimum required to facilitate natural recovery of a site (James 1992, Sheley et al. 1996, Goodwin and Sheley 2003). The diversity, abundance, and viability of plant propagules of desirable species in the seed bank or within the immediate vicinity are additional important determinants in natural recruitment and recovery.

Project design features in group P (in this section) address restoration for areas that are highly disturbed and for areas where potential re-infestation by new or nearby invasive plants threatens the introduction of, or existing, native vegetation as well as soils.

Treatments Not Included

Additional invasive plant treatment methods exist but are not being considered for this project. They include:

- Prescribed burning
- Plowing/tilling/digging/scarification with heavy equipment
- Grazing
- Flooding/drowning

Projects utilizing these methods would be outside the scope of this EIS.

Treatments on other lands are not included. This action does not include experimental trials of herbicides conducted by the U.S. Environmental Protection Agency (EPA) to test new products. Treatment of floating and/or submerged aquatic invasive plants is not included.

The proposal assumes that invasive plant prevention measures will be applied to all land uses as required by the standards that were added to the Umatilla Forest Plan (R6 2005 ROD). Invasive plant prevention activities are incorporated into individual projects carried out under regulation and guidance of those individual land use programs. Invasive plant treatments may also occur in the context of other projects or programs such as transportation planning, timber management, livestock grazing, etc. Weed prevention and treatment activities are incorporated into individual projects carried out under regulation and guidance of those programs.

Common Control Measures

Table 3 that follows in this section summarizes species-specific integrated control measures that would be applied to known invasive species on the Umatilla National Forest. The table shows

known acreages infested with each species, the range of effective treatment options, and site-specific considerations important to the final prescription. The priority and intensity of treatment needed varies widely based on site conditions, values at risk from invasion, and the range and aggressiveness of individual target species.

The Common Control Measures summary table in this document is a distillation of the common control measures prepared by Linda Mazzu (R6 2005 FEIS), and updated by Vicky Erickson (Invasive Weed Specialist), Julie Laufmann (TEAMS Botanist), Joan Frazee (Forest Botanist), with incorporated comments from M. Porter (Wallowa Resources, Enterprise, OR) D. Sharratt (Oregon Department of Agriculture), the Pacific Northwest's Least Wanted List: Invasive Weed Identification and Management, Oregon State University Extension Service, EC1563, 2003), and Nature Serve (www.natureserve.org). It displays the specific herbicides known to be effective for each species, along with the other integrated methods described above. Appendix B offers additional information.

This analysis considers a wide range of treatment options applied to a wide range of site conditions so that practitioners are provided necessary flexibility to increase effectiveness of treatment, reduce cost of treatment, and minimize potential for adverse effects from treatment. As we learn from implementation through monitoring, specific control measures are expected to be adjusted. Adjustments would be subject to NEPA Section 18 reconsideration process.

Widespread species such as cheatgrass and ventenata are not shown in this table. Thousands of acres of common non-native plants are known on the Forest; these are not the focus of treatment in this document; however, some cheatgrass or ventenata sites may be treated if they are associated with other infestations treated within the scope of this document. Widespread invasive plants such as cheatgrass may be included in the treatment plan for some areas, such as wilderness or other natural areas. However, non-native species such as cheatgrass would not be considered non-target species for the purposes of protection (i.e. project design features intended to protect non-target plants).

Acres of treatment are estimated based on the existing inventory; density of the infestation within any given acre varies from a few plants to near total coverage. Analysis in Chapter 3 assumes herbicides would cover an entire acre, however, the treatments would target individual and groups of plants and would likely result in less herbicide actually used on many acres.

Table 3. Common Control Measures Summary – Range of effective treatment options and site-specific considerations by target species

Target Species - Common Name and Growth Habit	Acres and Number of Sites*	Range of Effective Treatment Options	Site Specific Considerations
Canada thistle (CIAR4) (<i>Cirsium arvense</i>) Perennial-rhizomatous	4,482 ac 339 sites	The only manual technique would be hand cutting of flower heads, which only suppresses seed production. Mowing may be effective in rare cases if done monthly. Herbicide treatment is most effective: • Clopyralid • Picloram • Glyphosate	10 acres (7 sites) of Canada thistle are proposed for chemical treatment in riparian areas. Herbicide use buffers (see Tables 5, 6 and 7) would be applied. Picloram, glyphosate and chloresulfuron would be spot applied to Canada thistle only if >50 feet from water and broadcast application would only

Target Species - Common Name and Growth Habit	Acres and Number of Sites	Range of Effective Treatment Options	Site Specific Considerations
		Chlorsulfuron Timing: Apply in spring before to rosettes and prior to flowering. • Or apply in fall to rosettes; season is dependent upon herbicide used.	occur if > 100 feet from water. Clopyralid would be spot applied to Canada thistle if > 15 feet from water (broadcast only if >100 feet from water). Buffers for dry intermittent streams may be smaller – see table 6. The aquatic formulation of glyphosate would be spot applied up to water's edge. 8 sites of Canada thistle occur on clay soils, 4 sites are on coarse soils and 2 sites include both coarse and clay soils. Chlorsulfuron would not be used on sites with clay soils and picloram would not be used on coarse soils. See appendix D for listing of these sites.
Dalmatian Toadflax (LIGEDA) (<i>Linaria genistifolia</i> ssp <i>dalmatica</i>) Butter 'n' Eggs (LIVU) (<i>Linaria vulgaris</i>) <i>Rhizomatous Perennials</i>	93 ac 124 sites	Hand pull or dig small, easily accessible populations. Ensure all plant parts are completely removed. Plants can be left on site, but may reduce germination of desirable species due to mulching effect. If plants have flower heads with seeds, bag and remove from site. Mowing/cutting stems in spring or early summer will eliminate plant reproduction, but not the infestation. Biocontrols available (See appendix B) Herbicides with manual follow up treatment: 1- Picloram 2- Chlorsulfuron 3- Imazapic (Use in native grass stands; fall application only) 4- Aquatic-labeled Glyphosate Timing: Apply during active growth in spring before bloom or in late summer or fall during re-growth. Revegetate with desirable species at high priority sites when possible. Plant communities in good condition may recover without replanting. Notes: Revisits will be necessary; the number of which is dependent on the chemical used and the seedbank. This control could vary by site. Even after three years of consecutive treatments, control may range widely. These treatments may take up to ten years due to long term seed viability.	16 acres (12 sites) of Dalmatian toadflax and 19 acres (4 sites) of butter 'n' eggs are proposed for chemical treatment in riparian areas. Herbicide use buffers (see Tables 5, 6 and 7) would be applied. Picloram and chlorsulfuron would be spot applied to toadflax and/or butter 'n' eggs only if >50 feet from water and broadcast application would only occur if > 100 feet from water. Imazapic would be spot applied if > 15 feet from water and broadcast if >100 feet from water. Buffers for dry intermittent streams may be smaller – see table 6. The aquatic formulation of glyphosate would be spot applied up to water's edge. 3 sites of Dalmatian toadflax occur on sites with clay soils. Chlorsulfuron would not be used on these sites. See appendix D for listing of these sites.

Target Species - Common Name and Growth Habit	Acres and Number of Sites	Range of Effective Treatment Options	Site Specific Considerations
		Biocontrol agents have been shown to be very successful on lands in and around the Umatilla National Forest	
Hounds tongue (CYOF) <i>(Cynoglossum officinale)</i> Biennial	2,606 ac 300 sites	Hand pull or dig small populations. Entire root system must be removed. Plants could be left on site if no seed pods are present. 1- Metsulfuron methyl 2- Chlorsulfuron 3- Picloram 4- Imazapic 5- Glyphosate Timing: Apply during active growth, preferably basal rosette stage.	126 acres (31 sites) of hounds tongue are proposed for chemical treatment in riparian areas. Herbicide use buffers (see Tables 5, 6 and 7) would be applied. Metsulfuron methyl and imazapic would be spot applied if > 15 feet from water and broadcast if >100 feet from water. Chlorsulfuron, picloram, and glyphosate would be spot applied to hounds tongue only if >50 feet from water and broadcast application would only occur if > 100 feet from water. Buffers for dry intermittent streams may be smaller – see table 6. The aquatic formulation of glyphosate would be spot applied up to water's edge. 3 sites of hounds tongue occur on clay soils and 21 sites are on coarse soils. Chlorsulfuron would not used on sites with clay soils and picloram would not be used on coarse soils. See appendix D for listing of these sites.
Leafy Spurge (EUES) <i>Euphorbia esula</i> <i>Rhizomatous perennial</i>	35 ac 55 sites	Requires combination of techniques for successful control. Multiple entries per year are required. Repeated mowing or hand cutting can control seed production but must be used with herbicides for adequate control of the site. Biocontrols available (See appendix B) Herbicides in combination with manual, mechanical and biological controls. 1- Picloram 2- Glyphosate or Imazapic 3- Aquatic-labeled Glyphosate	25 acres (56 sites) of leafy spurge are proposed for chemical treatment in riparian areas. Herbicide use buffers (see Tables 5, 6 and 7) would be applied. Picloram and glyphosate would be spot applied only if >50 feet from water and broadcast application would only occur if > 100 feet from water. Imazapic would be spot applied if > 15 feet from water and broadcast if >100 feet from water. The aquatic formulation of glyphosate would be spot applied up to water's edge and broadcast if spurge is >100 feet from water. Buffers for dry intermittent streams may be smaller– see table 6. There are no sites with coarse or clay soils (see appendix D).
Lesser burdock (ARMI2) (Arctium minus)	184 acres 17 sites	Hand pulling and mechanical control may prove to be successful since common burdock cannot tolerate cultivation. When cut down or uprooted, any root fragment that is left behind can grow into an entirely new plant and can	148 acres (18 sites) of lesser burdock are proposed for chemical treatment in riparian areas. Herbicide use buffers (see Tables 5, 6 and 7) would be applied.

Target Species - Common Name and Growth Habit	Acres and Number of Sites	Range of Effective Treatment Options	Site Specific Considerations
Biennial		contribute to spread. An effective control is to cut off emerging flower buds. The plants will have to be monitored throughout the summer as buds can reform after cutting. Herbicides: 1- Metsulfuron methyl 2- Clopyralid+Triclopyr 3- Glyphosate Timing: Apply during active growth, before flowering Notes: Seeds remain viable for 2 and reported up to 10-20 years.	Metsulfuron methyl would be spot applied if > 15 feet from water and broadcast if >100 feet from water. Triclopyr would be spot applied 150 feet from water's edge with no broadcast application allowed. Glyphosate would be spot applied to lesser burdock only if >50 feet from water and broadcast application would only occur if > 100 feet from water. Buffers for dry intermittent streams may be smaller – see table 6. The aquatic formulation of glyphosate would be spot applied up to water's edge. There are no sites with coarse or clay soils (see appendix D).
Meadow Hawkweed (HICA10) (<i>Hieracium caespitosum</i>) Perennial	1 ac 4 sites	Manual treatments are difficult since hawkweeds have stolons and will re-sprout from any fragments. Therefore, pulling must be done during moist soil conditions to get as much of the root as possible. Remove seed heads if control is attempted later in the season to reduce seed spread. Mowing of plants can cause plants to respond by sending up shorter stems and quickly flowering again. Herbicides are the most effective treatment: • Picloram • Clopyralid • Aquatic-labeled glyphosate Notes: Seed bank is not long-lived but yearly visits may be warranted to ensure no re-sprouting. Herbicides have been shown to be more effective when combined with fertilizer for grass species.	No riparian sites of yellow hawkweed are proposed for chemical treatment. There are no sites with coarse or clay soils (see appendix D).
Medusahead (TACA8) (<i>Taeniatherum caputmedusae</i>) Annual grass	56 ac 19 sites	Repeated cutting/mowing with herbicide treatment is effective. Manual removal can be effective with small populations. A combination of prescribed fire (in June), herbicide application, and reseeding with native grasses is considered highly effective. Repeated treatments may be needed Active restoration (seeding of a competitive desirable species) is important. Herbicide: 1- Imazapic	1 site (<1 acre) is proposed for chemical treatment in a riparian area. Herbicide use buffers (see Tables 5, 6 and 7) would be applied. Imazapic would be spot applied if > 15 feet from water and broadcast if >100 feet from water. Chlorsulfuron, sulfometuron methyl, sethoxydim and glyphosate would be spot applied to medusahead only if >50 feet from water and broadcast application would only occur if >100 feet from water. Buffers for dry intermittent streams may be smaller

Target Species - Common Name and Growth Habit	Acres and Number of Sites	Range of Effective Treatment Options	Site Specific Considerations
		2- Sulfometuron methyl + Chlorsulfuron 3- Sulfometuron methyl 4- Sethoxydim 5- Glyphosate Timing: Treatment should be done before seed formation or during the fall through early winter.	– see table 6. The aquatic formulation of glyphosate would be spot applied up to water's edge. There are no sites with coarse or clay soils (see appendix D).
Musk thistle (CANU4) (<i>Carduus nutans</i>) Biennial	42 ac 5 sites	Any manual method that severs the root below the soil surface will kill these plants. Effective control requires cutting at the onset of blooming. Treatment before plants are fully bolted results in re-growth. Mowing should be specifically conducted close to full flower stage (within 2 days). Biological controls may be helpful to suppress populations in combination with other methods (see appendix B). Herbicide treatments are effective in combination with mechanical/manual/biological controls: 1- Picloram or Clopyralid 2- Metsulfuron methyl 3- Glyphosate 4- Chlorsulfuron Timing: Apply in spring before rosettes and prior to flowering. • Or apply in fall to rosettes; season is dependent upon herbicide used. •	No riparian sites of musk thistle are proposed for chemical treatment. One site of musk thistle occurs on a site with both coarse and clay soils. Neither picloram nor chlorsulfuron would be applied at this site. See appendix D for a listing of this site.
Rush skeletonweed (CHJU) (<i>Chondrilla juncea</i>)	1 ac 3 sites	No manual techniques recommended. A 1-cm section of the extensive and deep tap and lateral root system can re-sprout aerial parts if damaged Frequent mowing of plants infested with gall mites may decrease the rate of spread. Biocontrols available (See appendix B) Herbicides can be effective (Application may be difficult due to lack of leaf surface): 1- Clopyralid (late fall or early spring only) 2- Picloram 3- Metsulfuron methyl Timing: Apply to rosette in late fall or up to early bolting stage in spring. Plants less than 5 years old respond best. Number of repeated treatments will be dependent on the herbicide	1 site is proposed for chemical treatment in a riparian area. Herbicide use buffers (see Tables 5, 6 and 7) would be applied. Clopyralid and metsulfuron methyl would be spot applied to rush skeletonweed if >15 feet from water (broadcast only if >100 feet from water). Picloram would be spot applied to rush skeletonweed only if >50 feet from water and broadcast application would only occur if > 100 feet from water. Buffers for dry intermittent streams may be smaller – see table 6. There are no sites with coarse or clay soils (see appendix D).

Target Species - Common Name and Growth Habit	Acres and Number of Sites	Range of Effective Treatment Options	Site Specific Considerations
		used and the seed bank. Notes: The pappus on each seed allows the seed to be carried up to 20 miles by wind currents. A healthy plant can produce 1500 flower heads with the capability of producing 20000 viable seeds. Where sexual reproduction is prevented, the plant can re-grow from root fragments. Some seeds may remain viable up to 5 years in the seed bank.	
Russian Knapweed (ACRE3) (<i>Acroptilon repens</i>) <i>Perennial with adventitious shoots</i>	3 ac 1 site	Hand-pulling is very difficult, but can be effective for small infestations during the establishment year only. Pull plants when soil is wet and before seeds have formed. Remove all plant parts from site. Cutting or mowing reduces the current year growth and will eliminate seed production, but will not kill the roots of this species. Cut/mow several times annually (at least 3 times/year) to control existing top growth; re-emerging plants will be smaller in size and lower in vigor. Biocontrol available, however not effective in region (See appendix B). Lasting control requires an integration of mechanical, manual, biocontrols and herbicide: 1- Chlorsulfuron 2- Clopyralid 3- Clopyralid + Triclopyr (Redeem) 4- Glyphosate, Imazapic, or Metsulfuron Note: Late fall/early winter application is critical for Clopyralid Competitive plantings are usually necessary.	3 acres (1 site) of Russian knapweed is not in a riparian area and there are no sites with coarse or clay soils (see appendix D). Site is located on roadside 6401-030 and is proposed for chemical treatment.
Scotch Broom (CYSC4) (<i>Cytisus scoparius</i>) <i>Perennial woody shrub</i>	6 ac 5 sites	Hand pull, cutting, weed wrenching or digging small populations or when regular volunteers are available. Hand pulling or weed wrenching is most effective in moist soils. Plants can be left on site if no seed pods are present. Cutting will require multiple visits in one year. These treatments may take up to ten years due to long term seed viability. Biocontrols available (appendix B); moderate control effects noted. Herbicides:	One site of less than 1 acre in size of Scotch broom is proposed for chemical treatment in a riparian area. Herbicide use buffers (see Tables 5, 6 and 7) would be applied. Picloram and glyphosate would be spot applied to Scotch broom only if >50 feet from water and broadcast application would only occur if > 100 feet from water. Triclopyr would be spot applied 150 feet from water's edge with no broadcast application allowed. Buffers for dry intermittent streams may be smaller – see table

Target Species - Common Name and Growth Habit	Acres and Number of Sites	Range of Effective Treatment Options	Site Specific Considerations
		1- Triclopyr 2- Picloram 3- Glyphosate Timing Apply during active growth preferably in the spring to young plants. Notes: Mowing prior to fruiting and follow up with spot spray to individual plants will reduce herbicide use.	6. Aquatic triclopyr-TEA would be spot applied if >15 feet from water's edge. The aquatic formulation of glyphosate would be spot applied up to water's edge. There are no sites with coarse or clay soils (see appendix D).
Scotch Thistle (ONAC) <i>Onopordum acanthium</i> <i>Biennial</i>	231 ac 39 sites	Cutting and mowing can be effective when combined with revegetation of native species. Repeated mowing, in combination with other management methods, often is necessary for long-term control. Manual removal is effective when entire aboveground plant growth is removed. Herbicide treatment is the most effective control. 1- Picloram or Clopyralid 2- Chlorsulfuron 3- Metsulfuron 4- Aquatic-labeled Glyphosate Timing: Spray in the spring before plants bolt or during the fall on the rosettes.	222 acres (5 sites) are proposed for chemical treatment in riparian areas. Herbicide use buffers (see Tables 5, 6 and 7) would be applied. Picloram and chlorsulfuron would be spot applied to Scotch thistle only if >50 feet from water and broadcast application would only occur if > 100 feet from water. Clopyralid and metsulfuron would be spot applied to Scotch thistle if >15 feet from water and broadcast application would only occur if >100 feet from water. Buffers for dry intermittent streams may be smaller – see table 6. The aquatic formulation of glyphosate would be spot applied up to water's edge. 1 site of Scotch thistle occurs on coarse soils and 3 sites include clay and coarse soils. Picloram would not be used where coarse soils are present. Chlorsulfuron would not be used where clay soils are present. See appendix D for listing of these sites.
Spotted knapweed (CEST8) <i>(Centaurea stoebe)</i> Diffuse knapweed (CEDI3) <i>(Centaurea diffusa)</i> <i>Tap rooted Biennials or Perennials</i>	2,413 ac 216 sites 9,968 ac 1,187 sites	Biocontrols available for some knapweed species (see appendix B) Herbicides with manual and mechanical treatment as follow-up. 1- Clopyralid, or Picloram 2- Glyphosate Timing: Preferred treatment is spring before bud stage or early summer. Hand pull or dig small populations or when regular volunteers are available. Multiple entries per year are required. Revegetate with desirable species, at high priority sites when possible.	649 acres (64 sites) of spotted knapweed and 1604 acres (241 sites) of diffuse knapweed are proposed for chemical treatment in riparian areas. Herbicide use buffers (see Tables 5, 6 and 7) would be applied. Picloram would be spot applied to knapweed only if >50 feet from water and broadcast application would only occur if > 100 feet from water. Clopyralid would be spot applied to knapweed if > 15 feet from water (broadcast only if >100 feet from water). Buffers for dry intermittent streams may be smaller – see table 6. The aquatic formulation of glyphosate would be

Target Species - Common Name and Growth Habit	Acres and Number of Sites	Range of Effective Treatment Options	Site Specific Considerations
		Effective methods of control would likely vary based on species and site specific conditions.	spot applied up to water's edge. 16 sites of spotted knapweed and 77 sites of diffuse knapweed occur on sites with coarse soils. Picloram would not be used where coarse soils are present. See appendix D for listing of these sites. 1 site of spotted and 1 site of diffuse knapweed occur with a shallow water table; neither picloram nor clopyralid would be applied.
St John's wort (HYPE) (<i>Hypericum perforatum</i>) perennial	2,783 ac 561 sites	Hand removal of small populations or isolated stems is possible, but repeated treatments will be necessary as lateral roots give rise to new plants. Pulled or dug plants must be removed from the area and burned. • These treatments may take up to ten years due to long term seed viability. Biocontrols available (appendix B). Biological controls will most likely not be effective in damp, cool climates. Herbicides: 1- Metsulfuron methyl 2- Picloram 3- Glyphosate Timing: Apply metsulfuron methyl when plants are fully emerged and in active growth. • Apply picloram in early growth stages before bloom.	239 acres (29 sites) of St John's wort are proposed for chemical treatment in riparian areas. Herbicide use buffers (see Tables 5, 6 and 7) would be applied. Metsulfuron methyl would be spot applied if > 15 feet from water and broadcast if >100 feet from water. Picloram and glyphosate would be spot applied to St. John's wort only if >50 feet from water and broadcast application would only occur if > 100 feet from water. Buffers for dry intermittent streams may be smaller – see table 6. The aquatic formulation of glyphosate would be spot applied up to water's edge. 10 sites of St. John's wort occur on coarse soils and picloram would not be used at these sites. See appendix D for a listing of these sites.
Sulphur cinquefoil (PORE5) (<i>Potentilla recta</i>) Perennial	260 ac 152 sites	Hand-pulling is effective on small infestations provided the entire root is removed. Mechanical control by disking shown to be effective if reseeded. Mowing is not effective Herbicides: 1- Picloram 2- Metsulfuron methyl (by itself not particularly an effective treatment) Timing: Apply to actively growing plants or during the rosette to flower stage of growth. Notes: Repeated applications are needed to	137 acres (46 sites) are proposed for chemical treatment in riparian areas. Herbicide use buffers (see Tables 5, 6 and 7) would be applied. Picloram would be spot applied to sulphur cinquefoil only if >50 feet from water and broadcast application would only occur if > 100 feet from water. Metsulfuron methyl would be spot applied if > 15 feet from water and broadcast if >100 feet from water. Buffers for dry intermittent streams may be smaller – see table 6. Chemical treatment would not be used for sulfur cinquefoil growing <15 feet from water.

Target Species - Common Name and Growth Habit	Acres and Number of Sites	Range of Effective Treatment Options	Site Specific Considerations
		for the first couple of years ensure re-establishment does not occur. Seeds remain viable for 1 to 5 years	Two sites of sulphur cinquefoil occur on coarse soils and therefore picloram would not be used at these sites. See appendix D for a listing of these sites.
Tansy ragwort (SEJA) (<i>Senecio jacobaea</i>) Biennial or short-lived perennial	100 ac 91 sites	Hand pulling is effective if done in moist soils. This is most effective after the population has been brought under control. Mowing is the most common technique and is effective if done prior to flowering. These treatments may take up to ten years due to long term seed viability. Biocontrols available (appendix B). Ensure biological controls are present nearby or request their introduction. Herbicides: 1- Clopyralid 2- Chlorsulfuron 3- Picloram 4- Glyphosate Timing: During active growth, up through flowering stage.	12 acres (5 sites) are proposed for chemical treatment in riparian areas. Herbicide use buffers (see Tables 5, 6 and 7) would be applied. Clopyralid would be spot applied to tansy ragwort if > 15 feet from water (broadcast only if >100 feet from water). Chlorsulfuron, picloram, and glyphosate would be spot applied to tansy ragwort only if >50 feet from water and broadcast application would only occur if > 100 feet from water. Buffers for dry intermittent streams may be smaller – see table 6. The aquatic formulation of glyphosate would be spot applied up to water's edge. One site of tansy ragwort occurs on coarse soil. Picloram would not be applied at this site. See appendix D for a listing of this site.
Whitetop (CADR) (<i>Cardaria draba</i>) Perennial	104 ac 9 sites	Hand pulling or digging can control small infestations, but plants must be completely removed within 10 days after emergence throughout growing season for two to four years Mowing followed a month later by herbicide may be effective. Mowing must be done during full flowering. Herbicide is most effective control method: • Metsulfuron methyl • Chlorsulfuron, • Sulfometuron methyl • Glyphosate Notes: Multiple applications are probably necessary for control. Handing pulling will stimulate plant growth if all plant parts are not removed.	96 acres (10 sites) are proposed for chemical treatment in riparian areas. Herbicide use buffers (see Tables 5, 6 and 7) would be applied. Metsulfuron methyl would be spot applied if > 15 feet from water and broadcast if >100 feet from water. Chlorsulfuron, sulfometuron methyl, and glyphosate would be spot applied to whitetop only if >50 feet from water and broadcast application would only occur if >100 feet from water. Buffers for dry intermittent streams may be smaller – see table 6. The aquatic formulation of glyphosate would be spot applied up to water's edge. There are no sites with coarse or clay soils (see appendix D).
Yellow starthistle (CESO3) (<i>Centaurea</i>)	1,257 ac 42 sites	Hand-pull small patches. Remove all above ground material and get well below the root crown. Pull after bolted but before it produces viable seed.	69 acres (4 sites) of yellow starthistle are proposed for chemical treatment in riparian areas. Herbicide use buffers (see Tables 5,

Target Species - Common Name and Growth Habit	Acres and Number of Sites	Range of Effective Treatment Options	Site Specific Considerations
<i>solstitialis</i>) Annual		On relatively large populations of < 40 acres, start removing plants at outward edge of population and work toward interior (Bradley Method). Mowing can be useful but timing is critical (before viable seed production, but too early can result in rapid re-growth), Mazzu (2005) discusses biological control. Biological control insects can reduce seed production by 90 to 100 percent. (Wilson et al. 2003, Biology and Biological Control of Yellow Starthistle). Variable success results reported from eastern Oregon releases (appendix B). Herbicides are most effectively applied in rosette to seedling stage before flowering from late winter to May: 1- Clopyralid or Picloram 2- Glyphosate	6 and 7) would be applied. Picloram and glyphosate would be spot applied to yellow starthistle only if >50 feet from water and broadcast application would only occur if > 100 feet from water. Clopyralid would be spot applied to yellow starthistle if > 15 feet from water (broadcast only if >100 feet from water). Buffers for dry intermittent streams may be smaller – see table 6. The aquatic formulation of glyphosate would be spot applied up to water's edge. 8 sites of yellow starthistle occur on sites with coarse soils. Picloram would not be used where coarse soils are present. See appendix D for listing of these sites. Aerial application of clopyralid is proposed for some sites of yellow starthistle.

Please note: Herbicides listed in numerical order represent a preferential order; no numerical listing indicates no preference for control, no chemical listed indicates no information is available. If future research indicates that one of our listed chemicals is effective on an invasive species that it is not listed for now, then they could be used. New herbicides may be considered in the future given appropriate risk assessment. Other target species may be added assuming treatment is covered in the range of treatments described in this EIS.

*The totals represent the acres of sites where the herbicide would be effective. Because some invasive plants can be controlled by more than one herbicide, the site's acres have been counted more than once.

The common control measures shown above reveal that picloram, clopyralid, glyphosate and chlorsulfuron are the herbicides that are most often prescribed. The table and graphic below shows the acreage and percentage of known sites effectively treated by each of these herbicides, as well as the additional six herbicides approved for use in Region 6. PDFs may impact the choice of herbicides via buffers and other limitations. The decision about which herbicide to use would be made as part of the implementation plan. Table 4 displays design features specific to the ten herbicides approved for use in Region 6, as well as the gross acres and percentage of known sites where each herbicide would be effective.

Table 4. Design features specific to the ten herbicides approved for use in Region 6, gross acres and percentage of known sites where each herbicide would be effective

Active Ingredient Selected Herbicide Brand Names	Acres of known sites where this herbicide may be effective*	Percentage of known sites where this herbicide may be effective	Project design features Specific to the Herbicides Approved for Use in Region 6
Chlorsulfuron (Telar, Glean, Corsair)	7,391	30	Not labeled for aquatic use. No aerial application proposed. F-7 Soils evaluated prior to treatment. Treatment of powdery, ashy dry soil, or light sandy soil can only be treated if rainfall is expected within 24 hrs of treatment. H -5 Avoid use of chlorsulfuron on soils with high clay content.
Clopyralid (Transline™)	18,451	74	Not labeled for aquatic use. May be aerially sprayed but not within 100 feet of dry streams and 300 feet of flowing streams. F-8o: Aerial application rates for clopyralid would not exceed 0.35lb. ai/acre. H-4: Avoid use of clopyralid on high-porosity soils (coarser than loamy sand). J-3g: Clopyralid would not be used within 1.5 miles of peregrine nest more than once per year.
Glyphosate 35 formulations, including Roundup™, Rodeo™, Accord XRT™, Aqua master™	21,252	85	Aquatic label available. No aerial application proposed. H-2: No broadcast of non-aquatic formulation on roads that have a high risk of delivery to water (generally roads in RHCAs).
Imazapic (Plateau™)	2,793	11	Not labeled for aquatic use. No aerial application proposed.
Imazapyr (Arsenal™, Arsenal AC™, Chopper™, Stalker™, Habitat™)	<1	<1	Aquatic formulation available. No aerial application proposed. I-4: Only hand methods (wiping, stem injection, etc.) when vascular or non-vascular SOLI plant species are within 10 feet of saturated or wet soils at the time of herbicide application. F4. Do not exceed a rate of 0.70 lb active ingredient (a.i.)/acre with broadcast and spot applications.
Metsulfuron methyl (Escort XP™)	3,105	12	Not labeled for aquatic use. No aerial application proposed. F-7 Soils evaluated prior to treatment. Treatment of powdery, ashy dry soil, or light sandy soil can only be treated if rainfall is expected within 24 hrs of treatment.

Active Ingredient Selected Herbicide Brand Names	Acres of known sites where this herbicide may be effective*	Percentage of known sites where this herbicide may be effective	Project design features Specific to the Herbicides Approved for Use in Region 6
Picloram (Tordon K™, Tordon 22K™)	19,064	76	Not labeled for aquatic use. No aerial application proposed. H-2: No broadcast on roads that have a high risk of delivery to water (generally roads in RHCAs). F-4; Lowest effective label rates would be used and broadcast applications would not exceed typical label rates. H-6: Avoid use of picloram on shallow or coarse soils (coarser than loam.) according to herbicide labels. No more than one application of picloram would be made within a two-year period. I-4: Only hand methods (wiping, stem injection, etc.) within 10 feet of botanical SOLI where soils are saturated at the time of application.
Sethoxydim (Poast™, Poast Plus™)	56	<1	Not labeled for aquatic use. No aerial application proposed. H-2: No broadcast on roads that have a high risk of delivery to water (generally roads in RHCAs).
Sulfometuron methyl (Oust™, Oust XP™)	56	<1	Not labeled for aquatic use. No aerial application proposed. F-7 Soils evaluated prior to treatment. Treatment of powdery, ashy dry soil, or light sandy soil can only be treated if rainfall is expected within 24 hrs of treatment. H-7: Avoid use of sulfometuron methyl on shallow or coarse soils (coarser than loam.) No more than one application of sulfometuron methyl would be made within a one-year period. O-1b: Backpack Application - Sulfometuron methyl application rate will not exceed 0.2 lb a.i./ac
Triclopyr (Garlon 3A™, Garlon 4™, Forestry Garlon 4™, Pathfinder II™, Remedy™, Remedy RTU™, Redeem R&P™)	193	1	Aquatic labeled formulation available. No aerial or broadcast application proposed. L-1: Triclopyr would not be applied to foliage in areas of known special forest products or other wild food collection areas. O1a: Triclopyr backpack application rates would be lower than 1.0lb a.i. per acre.

* The totals represent the acres of sites where the herbicide would be effective. Because some invasive plants can be controlled by more than one herbicide, the site's acres have been counted more than once.

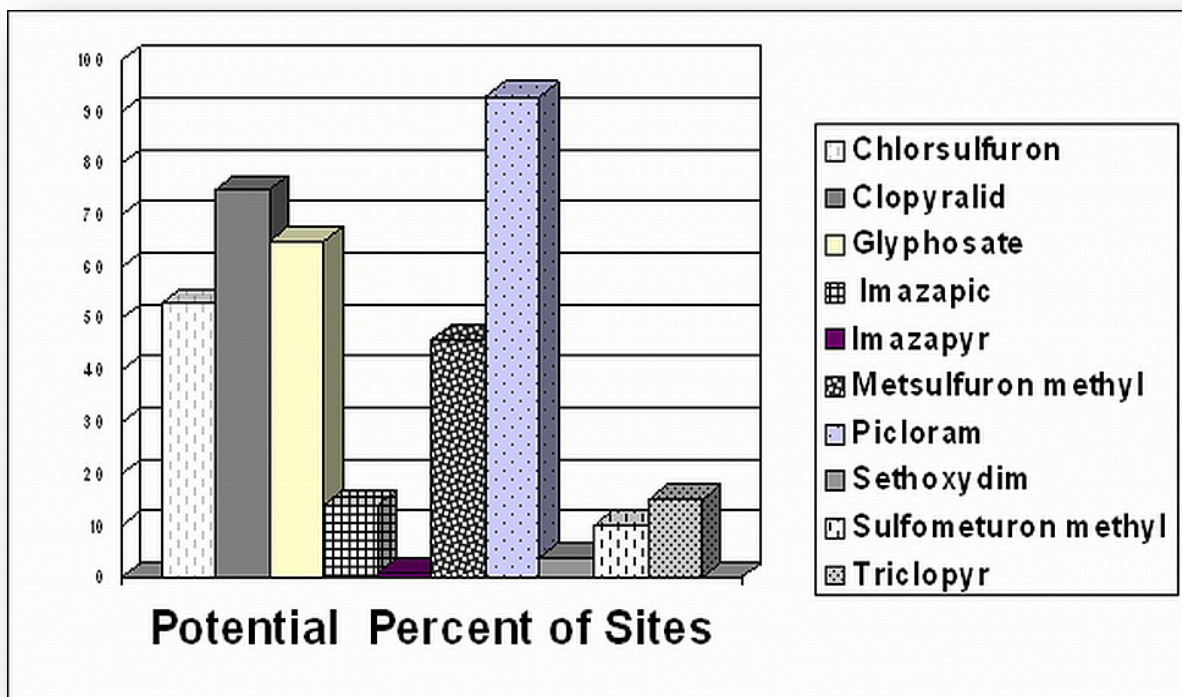


Figure 7. Potential percent of acres available for use per herbicide

Project Design Features

The following project design features (PDFs) minimize the potential adverse impacts of invasive plants treatment and provide sideboards for EDRR. The PDFs are in addition to, and do not duplicate, the Forest Plan standards and guidelines. The PDFs were developed to respond to the site-specific resource conditions within the treatment areas, including (but not limited to) the current invasive plant inventory, the presence of special interest species and their habitats, potential for herbicide delivery to water, and the social environment. Implementation of the PDFs would be mandatory. The analysis assumes buffers approximate horizontal (map) distances.

The effectiveness of the PDFs is addressed throughout chapter 3. In some cases, the PDFs eliminate an herbicide exposure of concern, for instance, limits the method or rate of herbicide application to avoid a specific type of exposure that risk assessments indicate is over a level of concern for people or the environment. In other cases, the PDFs reduce potential for herbicide exposure to have an effect, but do not necessarily eliminate that potential. The purpose and source of each PDF is provided in the list below.

These PDFs were developed for application to new detections as well as known sites, to ensure that the effects of treating new sites are similar to the effects of treating existing sites. The PDFs have been edited for clarity or to reduce redundancy since the release of the DEIS, however the substance remains the same.

A-Pre-Project Planning

A-1: Prior to treatment, confirm species/habitats of local interest, sensitive areas (e.g. streams, lakes, roadside treatment areas with higher potential to deliver herbicide to water, municipal watersheds, domestic water sources, shallow water table), recreation and administrative sites, and range allotments. Apply appropriate PDFs described in the following text.

For EDRR sites follow the decision process (Chapter 2, figure 9) to determine the type and method of treatment and apply applicable PDFs.

- Purpose: Ensure project is implemented appropriately.
- Source: This approach follows several previous NEPA documents. Pre-project planning also discussed in the previous section.

B-Coordination with Other Landowners and Agencies

B-1: Work with owners and managers of neighboring lands to respond to invasive plants that straddle multiple ownerships. Coordinate treatments within appropriate distances based on invasive plant species reproductive characteristics, and current use of area. Cooperators within the National Forest System will be informed of any proposed treatments within their areas of interest (such as the PNW Research Station for treatments within or adjacent to Research Natural Areas).

- Purpose: To ensure that neighbors and cooperators are fully informed about planned herbicide use and to increase the effectiveness of treatments on multiple ownerships
- Source: A variable distance based on site and species specific characteristics was chosen because it adjusts for various conditions that exist in these areas. All PDFs related to riparian areas and buffer distances will be followed.

C-To Prevent the Spread of Invasive Plants during Treatment Activities

C-1: Ensure vehicles and equipment (including personal protective clothing) does not transport invasive plant materials.

- Purpose: A prevention measure to minimize risk of spreading invasive plants
- Source: Umatilla LRMP as amended by the R6 2005 ROD Standard #1

D-Wilderness Areas²

D-1: For EDRR in wilderness, invasive plants could be treated using non-mechanical hand methods or herbicides. Herbicide treatments may use application methods such as wicking, stem injection, spray bottle, hand pressurized pumps, battery or solar powered pumps and propellant based systems such as those that use pressurized carbon dioxide.

- Purpose: To reduce the effects of invasive plant treatments on the untrammeled quality of wilderness character

E-Non-herbicide Treatment Methods

E-1: Limit the numbers of workers on any one site at any one time while treating areas within 150 feet of creeks.

² Invasive plant eradication within Wilderness meets the “no impact” intent of the Wilderness Act and associated land use policies

- Purpose: To minimize trampling, protect riparian and aquatic habitats, and prevent potential invasive plant spread via waterway dispersal
- Source: The distance of 150 feet was selected because it incorporates the Aquatic Influence Zone for fish bearing streams³

E-2: Fueling of gas-powered equipment with tanks larger than 5 gallons would not occur inside the RHCA unless there is no other alternative.

- Purpose: To protect riparian and aquatic habitats
- Source: The distance of 150 feet was selected because it incorporates the Aquatic Influence Zone for fish bearing streams

F-Herbicide Application

F-1: Herbicides would be used in accordance with label instructions, except where more restrictive measures are required as described below. Herbicide applications would only treat the minimum area necessary to meet site objectives. Herbicide formulations would be limited to those containing one or more of the following 10 active ingredients: chlorsulfuron, clopyralid, glyphosate, imazapic, imazapyr, metsulfuron methyl, picloram, sethoxydim, sulfometuron methyl, and triclopyr. Herbicide application methods include wicking, wiping, injection, spot, and broadcast, as permitted by the product label and these project design features. The use of triclopyr is limited to spot and hand/selective methods. Herbicide carriers (solvents) are limited to water or specifically labeled vegetable oil.

- Purpose: To limit potential adverse effects on people and the environment
- Source: Umatilla LRMP as amended by the R6 2005 ROD Standards 16 and 18, Pesticide Use Handbook 2109.14

F-2: Herbicide use would comply with standards in the Forest Plan, as amended by the R6 2005 ROD, including standards on herbicide selection, restrictions on broadcast use, tank mixing, licensed applicators, and use of adjuvants, surfactants and other additives. An average of 4,000 acres per year (maximum 40,000 acres total) would be treated with herbicides over the life of the project.

- Purpose: To limit potential adverse effects on people and the environment
- Source: Umatilla LRMP as amended by the R6 2005 ROD Treatment/Restoration Standards (see chapter 1)

F-3: POEA surfactants, urea ammonium nitrate or ammonium sulfate would not be used in applications within 150 feet of surface water, wetlands or on roadside treatment areas having high potential to deliver herbicide.

- Purpose: To protect aquatic ecosystems
- Source: The distance of 150 feet was selected because it is wider than the largest buffer and incorporates the Aquatic Influence Zone for fish bearing streams. This

³The Aquatic Influence Zone is defined by the innermost half of the RHCA. For instance, a 300 foot RHCA established for a fish bearing stream would have an aquatic influence zone of 150 feet.

distance is sufficient to avoid harm to the aquatic environment, based on risk assessments, previous monitoring, and studies related to chemical behavior in the environment (see chapter 3).

F-4: Lowest effective label rates would be used. No broadcast applications of herbicide or surfactant will exceed typical label rates. NPE surfactant would not be ground-based broadcast at a rate greater than 0.5 lbs. a.i./ac (pounds of active ingredient per acre). Favor other classes of surfactants wherever they are expected to be effective. Use Washington state approved surfactants in aquatic influence zones.

- Purpose: To eliminate possible herbicide or surfactant exposures of concern to human health, wildlife, and aquatic organisms
- Source: SERA Risk Assessments

F-5: Herbicide applications would occur when wind velocity is between two and eight miles per hour to reduce the chance of drift. During application, weather conditions would be monitored periodically by trained personnel.

- Purpose: To ensure proper application of herbicide and reduce drift
- Source: These restrictions are typical so that herbicide use is avoided during inversions or windy conditions

F-6: To minimize herbicide application drift during broadcast operations, use low nozzle pressure; apply as a coarse spray, and use nozzles designed for herbicide application that do not produce a fine droplet spray, e.g., nozzle diameter to produce a median droplet diameter of 500-800 microns.

- Purpose: To ensure proper application of herbicide and reduce drift
- Source: These are typical measures to reduce drift. The minimum droplet size of 500 microns was selected because this size is modeled to eliminate adverse effects to non-target vegetation 100 feet or further from broadcast sites (see chapter 3 for details).

F-7: Use of sulfonylurea herbicides (Chlorsulfuron, Sulfometuron methyl and Metsulfuron methyl), will require soils on site to be evaluated prior to treatment. Treatment of powdery, ashy dry soil, or light sandy soil can only be treated if rainfall is expected within 24 hrs of treatment.

- Purpose: To avoid herbicide drift caused by wind erosion of dry soils containing sulfonylurea chemical residue
- Source: Label advisory

F-8 - Additional design features specific to aerial application

F-8a: Aerial application of herbicide will not be used for treatment of EDRR sites.

- Purpose: To reduce potential adverse effects to non-target species

F-8b: Chlorsulfuron, metsulfuron methyl, sulfometuron methyl and triclopyr will not be applied aerially⁴.

- Purpose: To reduce potential adverse effects to non-target species
- Source: Umatilla LRMP as amended by the R6 2005 ROD

F-8c: Provide a minimum buffer of 300 feet for aerial application of herbicides near developed campgrounds, recreation residences and private land (unless otherwise authorized by adjacent private landowners).

- Purpose: To minimize impacts to human health
- Source: Umatilla LRMP as amended by the R6 2005 ROD

F-8d: Prohibit aerial application of herbicides within congressionally designated municipal watersheds.

- Purpose: To protect water supplies
- Source: Umatilla LRMP as amended by the R6 2005 ROD

PDFs F8-e and -f were removed; these were redundant with existing management direction or other PDFs.

F-8g: Buffer distances for federally listed SOLIs will follow Recovery Plan recommendations. No aerial application would occur within 300 feet of non-federally listed SOLIs. Spray cards to monitor drift can be used in conjunction with monitoring to adjust buffers if needed.

- Purpose: To protect SOLIs and reduce non-target effects. To comply with Umatilla LRMP as amended by the R6 2005 ROD Standards 19 & 20
- Source: Forest Service Manual 2670 and applicable federally listed recovery plans

F-8h: Aerial spraying of invasive species will not occur in areas with 30 percent or more live tree canopy cover. For live tree canopy cover between 10-29 percent an on-site decision whether or not to aerial spray would be based on factors such as target invasive species, herbicides (specificity) proposed for treatment, and potential impacts to non-target tree species.

- Purpose: To reduce potential adverse effects to non-target species
- Source: Common measure

F-8i: Aerial spray units (and perennial seeps, ponds, springs, and wetlands in proposed aerial units) will be ground-checked, flagged and marked using GPS prior to spraying to ensure only appropriate portions of the unit are aerially treated. A GPS system will be used in spray helicopters and each treatment unit mapped before the flight to ensure that only areas marked for treatment are treated. Plastic spray cards will be placed out to 350 feet from and perpendicular to perennial creeks to monitor herbicide presence.

- Purpose: To reduce potential adverse effects to non-target species

⁴ Clopyralid is the only herbicide currently proposed for aerial spraying.

- Source: Common measure

F-8j: Press releases will be submitted to local newspapers indicating potential windows of treatment for specific areas. Signing and on-site layout will be performed one to two weeks prior to actual aerial treatment.

- Purpose: To ensure public is aware of and can avoid activities
- Source: Umatilla LRMP as amended by the R6 2005 ROD Standard #23

F-8k: Grazing permittees will be notified at annual permittee meeting that aerial application will be conducted. Permittee will also be notified of specific time frames in which treatment would occur to ensure grazing animals are removed from the area.

- Purpose: To ensure grazing animals are not exposed to aerial herbicide applications

F-8l: Enforceable temporary area, trail, and road closures will be used.

- Purpose: To ensure public safety during aerial spray operations
- Source: Umatilla LRMP as amended by the R6 2005 ROD Standard #23

F-8m: Constant communications will be maintained between the helicopter and the project leader during spraying operations. Ground observers will have communication with the project leader. Observers will be located at various locations adjacent to the treatment area to monitor wind direction and speed as well as to visually monitor drift and deposition of herbicide.

- Purpose: To prevent effects to non-target species

F-8n: Aerial swath displacement buffers would be applied as needed (see table 10 below)

- Purpose: To minimize drift
- Source: Common Measure

F-8o: Aerial application rates for clopyralid would not exceed 0.35lb ai/acre.

- Purpose: To prevent adverse effects of aerial application
- Source: SERA Risk Assessments, aerial drift modeling

G-Herbicide Transportation and Handling Safety/Spill Prevention and Containment

G-1: An Herbicide Transportation and Handling Safety/Spill Response Plan would be the responsibility of the herbicide applicator. At a minimum the plan would:

-Address spill prevention and containment.

-Estimate and limit the daily quantity of herbicides to be transported to treatment sites.

-Require that impervious material be placed beneath mixing areas in such a manner as to contain small spills associated with mixing/refilling.

- Require a spill cleanup kit be readily available for herbicide transportation, storage and application (minimum FOSS Spill Tote Universal or equivalent).*
- Outline reporting procedures, including reporting spills to the appropriate regulatory agency.*
- Ensure applicators are trained in safe handling and transportation procedures and spill cleanup.*
- Require that equipment used in herbicide storage, transportation and handling are maintained in a leak proof condition.*
- Select transportation routes to minimize exposure to traffic, domestic water sources, and adjacent water sources.*
- Specify conditions under which guide vehicles would be required.*
- Specify mixing and loading locations away from water bodies so that accidental spills do not contaminate surface waters.*
- Require that spray tanks be mixed or washed further than 150 feet of surface water.*
- Ensure safe disposal of herbicide containers.*
- Identify sites that may only be reached by water travel and limit the amount of herbicide that may be transported by watercraft (see H12).*

- Purpose: To reduce likelihood of spills and contain any spills.
- Source: FSH 2109.14

H- Soils, Water and Aquatic Ecosystems

H-1: Herbicide use buffers have been established for perennial and wet intermittent streams; dry streams; and lakes and wetlands. These buffers are depicted in table 5, table 6, and table 7 below. Buffers vary by herbicide ingredient and application method. Tank mixtures would apply the largest buffer as indicated for any of the herbicides in the mixture.

- Purpose: To reduce likelihood that herbicides would enter surface waters in concentrations of concern
- Source: Treatments within RHCAs are allowed if they meet Riparian Management Objectives (RMOs) including minimizing adverse effects to listed fish; therefore, buffers are based on label advisories, SERA risk assessments and Berg's 2004 study of broadcast drift and run off to streams. Buffers are intended to demonstrate compliance with Umatilla LRMP as amended by the R6 2005 ROD Standards 19 and 20.

H-2: No broadcast of picloram, non aquatic glyphosate, and/or sethoxydim on roads that have a high risk of delivery to water (generally roads in RHCAs).

- Purpose: To ensure high risk herbicides are not delivered to streams in concentrations that exceed levels of concern
- Source: SERA Risk Assessments, R6 2005 FEIS Fisheries Biological Assessment

H-3: In riparian and aquatic settings, vehicles (including all terrain vehicles) used to access invasive plant sites for invasive plants treatment, apply foam, or for broadcast spraying would remain on roadways, trails, parking areas to prevent damage to riparian vegetation, soil, water quality and aquatic habitat.

- Purpose: To protect riparian and aquatic habitats
- Source: Common measure

H-4: Avoid use of clopyralid on high-porosity soils (coarser than loamy sand).

- Purpose: To avoid leaching/ground water contamination
- Source: Label advisory

H-5: Avoid use of chlorsulfuron on soils with high clay content (finer than loam).

- Purpose: To avoid excessive herbicide runoff
- Source: Label advisory

H-6: Avoid use of picloram on shallow or coarse soils (coarser than loam.) according to herbicide labels. No more than one application of picloram would be made within a two-year period.

- Purpose: To reduce the potential for picloram to enter surface and/or ground water and/or accumulate in the soil. Picloram has the highest potential to impact organisms in soil and water, and tends to be more persistent than the other herbicides.
- Source: SERA Risk Assessment. Based on quantitative estimate of risk from worst-case scenario and uncertainty

H-7: Avoid use of sulfometuron methyl on shallow or coarse soils (coarser than loam.) No more than one application of sulfometuron methyl would be made within a one-year period.

- Purpose: To reduce the potential for sulfometuron methyl accumulation in the soil; sulfometuron methyl has some potential to impact soil and water organisms and is second most persistent.
- Source: SERA Risk Assessments: Based on quantitative estimate of risk from worst-case scenario and uncertainty

H-8: Lakes and Ponds – No more than half the perimeter or 50 percent of the vegetative cover within established buffers or 10 contiguous acres around a lake or pond would be treated with herbicides in any 30-day period. This limits area treated within riparian areas to keep refugia habitat for reptiles and amphibians.

- Purpose: To reduce exposure to herbicides by providing some untreated areas for some organisms to use
- Source: SERA Risk Assessments: Based on quantitative estimate of risk from worst-case scenario and uncertainty regarding effects to reptiles and amphibians

H-9: Wetlands would be treated when soils are driest. If herbicide treatment is necessary when soils are wet, use aquatic labeled herbicides. Favor hand/selective treatment methods where effective and practical. No more than 10 contiguous acres or fifty percent individual wetland areas would be treated in any 30-day period.

- Purpose: To reduce exposure to herbicides by providing some untreated areas for some organisms to use
- Source: SERA Risk Assessments. Based on quantitative estimate of risk from worst-case scenario, uncertainty in effects to some organisms, and label advisories

H-10: Foaming would only be used on invasive plants that are further than 150 feet from streams and other water bodies.

- Purpose: To limit the amount of foam that may be delivered to streams and other water bodies
- Source: No label regulations are associated with this naturally occurring organic compound. The distance of 150 feet was selected because it incorporates the Aquatic Influence Zone for fish bearing streams

H-11: Herbicide use would not occur within 100 feet of wells or 200 feet of spring developments. For stock tanks located outside of riparian areas, use wicking, wiping or spot treatments within 100 feet of the watering source.

- Purpose: Safe drinking water. Also to reduce the potential chance of herbicide delivery to watering systems used for grazing animals
- Source: Label advisories and state drinking water regulations

H-12: When chemicals need to be carried over water by boat, raft or other watercraft, herbicides will be carried in water tight, floatable containers.

- Purpose: Lower the risk of herbicide being delivered to streams in concentrations that exceed levels of concern

H-13: In aquatic settings, herbicide applications from water's edge to bank-full width will be limited to 2 acres within a 6th field HUC. Treatments above bankfull, within the aquatic influence zone (riparian area), would not exceed 10 acres along any 1.6 mile of stream length per 6th field HUC.

- Purpose: Limits the extent of treatment from the water's edge through the aquatic influence zone so that adverse effects are within the scope of analysis
- Source: Analyses based on SERA risk assessment worksheets. Ten acres is based on GLEAM model factors.

I - Vascular and Non-Vascular Plant and Fungi Species of Local Interest (SOLI)

I-1: Botanical surveys may be necessary prior to treatment applications to identify vascular and non-vascular SOLI occurrence in or near areas proposed for invasive plant treatments. Lists of target SOLI to include in each treatment area will be developed by qualified botanical personnel based on the range and distribution of SOLI species and the presence of suitable SOLI habitat. If surveys are deemed necessary, they will be conducted within the proposed treatment area and immediately adjacent to the treatment area as follows: 300 to 1000 feet of planned aerial treatments (see I-7), 100 feet of planned broadcast treatments, and 10 feet of planned spot treatments and/or 5 feet of planned hand herbicide treatments.

- Purpose: To ensure SOLI are protected and survey are conducted when appropriate
- Source: Forest Service Manual 2670 and applicable federally listed recovery plans

I-2: If surveys are deemed necessary (see I-1) but circumstances will not permit surveys prior to treatment, suitable SOLI habitat will assume to be occupied.

- Purpose: To ensure SOLI are protected and surveys are conducted when appropriate
- Source: Forest Service Manual 2670 and applicable federally listed recovery plans

I-3: Modify treatments to protect SOLI occurrences based on their distance from the treatment area:

Greater than 100 feet: All ground based treatments are permitted (see I6 and aerial section for additional buffer restrictions) 100 to 10 feet: Manual and mechanical methods permitted. Broadcast herbicide methods permitted if SOLI can be completely protected using a protective cover, otherwise use other protective measures such as low-pressure spot-spray, directed spray applications or hand application methods to eliminate any potential for drift.

Less than 10 feet: No broadcast spraying is permitted. Spot treatment using hand application methods is permitted. For saturated or wet soils see I-6. Manual treatment methods are permitted. Precautions must be taken to avoid any contact with individual SOLI.

- Purpose: To ensure SOLI are protected and surveys are conducted when appropriate
- Source: Forest Service Manual 2670 and applicable federally listed recovery plans

I-4: When vascular or non-vascular SOLI plant species are within 10 feet of saturated or wet soils at the time of herbicide application, only hand methods (wiping, stem injection, etc.) would be used.

- Purpose: To ensure SOLI are protected and surveys are conducted when appropriate
- Source: Forest Service Manual 2670 and applicable federally listed recovery plans.

I-5: Picloram will not be used within 50 feet of the threatened plant species *Silene spaldingii*.

- Purpose: To ensure protection of emerging seedlings and potential non-target plant root uptake due to herbicide soil persistence

- Source: US FWS Conservation Strategy (2004).

I-6: Aerial herbicide applications will follow Recovery Plan recommendations for listed species (FWS). Presently, one federally listed species (*Silene spaldingii*) is documented on the forest. The recovery plan recommends no aerial herbicide within 1000 feet of occurrence for *S. spaldingii*. For non-federally listed SOLI, no aerial herbicide applications would occur within 300 feet of known location of SOLI and spray cards to monitor drift would be used to monitor drift and adjust buffers if needed.

- Purpose: To ensure SOLI are protected and surveys are conducted when appropriate
- Source: Forest Service Manual 2670 and applicable federally listed recovery plans.

I-7: Compliance monitoring would occur before implementation to ensure that prescriptions, contracts and agreements integrate appropriate project design features. This will be done via a pre-work review. Monitoring would also occur during implementation to ensure Project Design Features are implemented as planned. An implementation monitoring form will be used to document daily field conditions, activities, accomplishments and/or difficulties. Contract administration mechanisms would be used to correct deficiencies. Herbicide use will be reported as required by the Forest Service Health Pesticide Use Handbook (FSH 2109.14)

- Purpose: To ensure SOLI are protected
- Source: Pesticide Use Policy

I-8: Effectiveness monitoring results will be used to refine buffers in order to adequately protect vascular and nonvascular plant species of local interest.

- Purpose: To prevent any repeated effects to SOLI populations, thereby mitigating any long term effects
- Source: Broadcast buffer sizes are based on tests on vascular plants (Marrs 1989). Spot and hand/select buffer distances are based on reports from experienced applicators. Uncertainty about effects on non vascular plants would be addressed through monitoring (See I-9)

I-9: The impacts of herbicide use on plant Species of Local Interest (SOLI) are uncertain, especially regarding lichen and bryophytes. The potential for variances in aerial drift due to uncontrolled weather conditions during treatment may also be uncertain. To manage this uncertainty, representative samples of herbicide treatment sites adjacent to vascular and non-vascular plant SOLIs would be monitored. Non-target vegetation within 1000 feet of aerial treatment sites, 500 feet of herbicide broadcast treatment sites and 20 feet of herbicide spot and hand treatment sites would be evaluated before treatment, immediately after treatment, and two to three months later as appropriate. Treatment buffers would be expanded if damage is found as indicated by: (1) Decrease in the size of the SOLI plant population, or (2) Leaf discoloration or chlorophyll change

- Purpose: To prevent any repeated effects to SOLI populations, thereby mitigating any long term effects

I-10: In the vicinity of *S. spaldingii*, and all other SOLI, restoration and cultural treatments, including seeding and/or use of fertilizer, will be under the direct supervision of the district or forest botanist to ensure that plant communities are restored to their desired condition without negative impacts to existing SOLI populations or individuals. The vicinity areas will be evaluated on a case by case basis.

J - Wildlife Species of Local Interest

J-1: Bald Eagle

J-1a: Treatment of areas within 0.25 mile, or 0.50 mile line-of-sight, of bald eagle nests would be timed to occur outside the nesting/fledging season of January 1 to August 31, unless treatment activity is within ambient levels of noise and human presence (as determined by a local specialist). Occupancy of nest sites (i.e. whether it is active or not) would be determined each year prior to treatments.

- Purpose: To minimize disturbance to nesting bald eagles and protect eggs and nestlings
- Source: Bald Eagle Management Guidelines for OR-WA (Anonymous); U.S. Fish and Wildlife Service 2003, p. 9

J-1b: Noise-producing activity above ambient levels would not occur between October 31 and March 31 during early morning or late afternoon near known winter roosts and concentrated foraging areas. Disturbance to daytime winter foraging areas would be avoided.

- Purpose: To minimize disturbance and reduce energy demands during stressful winter season
- Source: Bald Eagle Management Guidelines for OR-WA (Anonymous); t Programmatic BO (U.S. Fish and Wildlife Service 2003, p. 9)

J-2: Gray Wolf

J-2a: Treatments within 1 mile of active wolf dens would be timed to occur outside the season of occupancy (April 1 through June 30)

- Purpose: To minimize disturbance and reduce energy demands on denning wolves
- Source: Federal Register, Vol, 68, No, 62 4(d)

J-2b: Treatments within 0.50 mile or 0.50 mile line-of-sight of occupied rendezvous sites would be timed to occur outside the season of occupancy unless treatment activity is within acceptable ambient noise levels and human presence would not cause wolves to abandon the site (as determine by a local specialist)

- Purpose: To minimize disturbance/impacts to wolves at rendezvous sights.
- Source: Buffer is based on expected range of disturbance

J-2c: Consultation with FWS would be reinitiated (unless determined otherwise by FWS) if/when wolf dens or rendezvous sites are discovered in the vicinity of treatment sites.

J-3 Peregrine Falcon

J-3a: Seasonal restrictions (J3-c to g) will be applied based on the spatial and temporal factors listed in J3-b. Restrictions would apply to all known peregrine falcon nest sites for the periods listed below based on the following elevations:

Low elevation sites (1000-2000 ft 01 Jan - 01 July

Medium elevation sites (2001 - 4000 ft) 15 Jan - 31 July

Upper elevation sites (4001+ ft) 01 Feb - 15 Aug

- Purpose: To reduce disturbance to nesting falcons and protect eggs and nestlings. Agitated parents can damage the eggs with thin shells resulting in failed reproduction for that nest.
- Source: Pagel J. 2006. Peregrine falcon nest site data, 1983-2006.

J-3b: Seasonal restrictions would be waived if the site is unoccupied or if nesting efforts fail and monitoring indicates no further nesting behavior. Seasonal restrictions would be extended if monitoring indicates late season nesting, asynchronous hatching leading to late fledging, or recycle behavior which indicates that late nesting and fledging would occur. The nest zones associated with those nest sites are described below:

(1) Primary: average of 0.5-mile radius from the nest site. Site-specific primary nest zones would be determined and mapped by a local Biologist for each known nest site.

(2) Secondary: average of 1.5- mile radius from the nest site. Site-specific secondary nest zones would be determined and mapped for each known nest site.

(3) Tertiary: a three-mile radius from the nest site including all zones. The tertiary nest zones are not mapped; they apply to a circular area based on the three-mile radius.

- Purpose: To reduce disturbance to nesting falcons and protect eggs and nestlings. Agitated parents can damage the eggs with thin shells resulting in failed reproduction for that nest.
- Source: Pagel J. 2006. Peregrine falcon nest site data, 1983-2006

J-3c: Protection of nest sites would be provided until at least two weeks after all young have fledged.

- Purpose: To reduce disturbance to nesting falcons and protect eggs and nestlings. Agitated parents can damage the eggs with thin shells resulting in failed reproduction for that nest
- Source: Pagel J. 2006. Peregrine falcon nest site data, 1983-2006

J-3d: Invasive plant activities within the secondary nest zone requiring the use of machinery would be seasonally restricted. This may include activities such as mulching, chainsaws, vehicles (with or without boom spray equipment) or other mechanically based invasive plant treatment.

- Purpose: To reduce disturbance to nesting falcons and protect eggs and nestlings. Agitated parents can damage the eggs with thin shells resulting in failed reproduction for that nest.

- Source: Pagel J. 2006. Peregrine falcon nest site data, 1983-2006

J-3e: Non-mechanized or low disturbance invasive plant activities (such as spot spray, hand pull, etc.) within the secondary nest zone would be coordinated with the wildlife biologist on a case-by-case basis to determine potential disturbance to nesting falcons and identify mitigating measures, if necessary. Non-mechanized invasive plant activities such as back pack spray, burning, hand-pulling, lopping, and/or re-vegetation planting may be allowed within the secondary nest zone during the seasonal restriction period.

- Purpose: To reduce disturbance to nesting falcons and protect eggs and nestlings. Agitated parents can damage the eggs with thin shells resulting in failed reproduction for that nest.
- Source: Pagel J. 2006. Peregrine falcon nest site data, 1983-2006

J-3f: All foot and vehicle entries into Primary nest zones would be seasonally prohibited except for the following reasons:

1. Biologists performing monitoring in association with the eyrie and coordinated with the District Biologist.
 2. Law enforcement specialists performing associated duties with notice to the District Ranger.
 3. Access for fire, search/rescue, and medical emergencies under appropriate authority (Forest Service line officer or designee).
 4. Trail access, when determined by a biologist to be non-disturbing.
 5. Other exceptions on a case-by-case basis as determined by the Deciding Official
- Purpose: To reduce disturbance to nesting falcons and protect eggs and nestlings. Agitated parents can damage the eggs with thin shells resulting in failed reproduction for that nest.
 - Source: Pagel J. 2006. Peregrine falcon nest site data, 1983-2006

J-3g: Picloram and clopyralid would not be used within 1.5 miles of peregrine nest more than once per year.

- Purpose: To reduce exposure to hexachlorobenzene, which has been found in peregrine falcon eggs
- Source: Pagel J. 2006. Peregrine falcon nest site data, 1983-2006

J-4 Columbia Spotted Frog and Leopard Frog

J-4a: Avoid broadcast spraying herbicides, and avoid spot spraying glyphosate with POEA surfactant, sulfometuron methyl, and NPE-based surfactants, in occupied or suitable (within 150 feet) spotted or leopard frog habitat. Coordinate treatment methods, timing, and location with local Biologist.

- Purpose: To minimize exposure of frogs to herbicides or surfactants that pose risk to frogs.
- Source: Appendix P of the R6 2005 FEIS; SERA 2003, 2004; Bakke 2003

J-5 Painted Turtle (discussed in Appendix C of the DEIS, now available on line)

J-5a: The local Forest Service Biologist will review treatment locations, timing, and methods to minimize adverse impacts to painted turtles. PDF H-8 defines herbicide treatment limitations to protect amphibian habitat.

- Purpose: To minimize disturbance, trampling, and herbicide exposure to painted turtles
- Source: David Anderson, WA Dept. of Fish and Wildlife, personal communication, 2005

K-Public Notification

K-1: The public would be notified about upcoming herbicide treatments via the local newspaper or individual notification, fliers, and posting signs. Forest Service and other websites may also be used for public notification.

- Purpose: To reduce the risk of inadvertent public contact with herbicide
- Source: Umatilla LRMP as amended by the R6 2005 ROD Standard 23

L-Special Forest Products

L-1: Triclopyr would not be applied to foliage in areas of known special forest products or other wild food collection areas.

- Purpose: To reduce the chance that people might be exposed to harmful doses of triclopyr
- Source: Appendix Q of the R6 2005 FEIS

L-2: Special forest product gathering areas may be closed for a period of time to ensure that no inadvertent public contact with herbicide occurs.

- Purpose: To reduce the risk of inadvertent public contact with herbicide
- Source: Umatilla LRMP as amended by the R6 2005 ROD Standard 23

L-3: Popular berry and mushroom picking areas would be posted, marked on the ground or otherwise posted.

- Purpose: To reduce the risk of inadvertent public contact with herbicide
- Source: Umatilla LRMP as amended by the R6 2005 ROD Standard 23

L-4: Special forest product gatherers would be notified about herbicide treatment areas when applying for their permits. Flyers indicating treatment areas may be included with the permits, in multi-lingual formats if necessary. See section K.

- Purpose: To reduce the risk of inadvertent public contact with herbicide
- Source: Umatilla LRMP as amended by the R6 2005 ROD Standard 23

M- American Indian Tribal and Treaty Rights

M-1: American Indian tribes would be notified annually as treatments are scheduled so that tribal members may provide input and/or be notified prior to gathering cultural plants.

- Purpose: To ensure that no inadvertent public contact with herbicide occurs and that cultural plants are fully protected.
- Source: Government to government agreements between American Indian tribes and the Umatilla National Forest

M-2: The Forest Archaeologist will annually assess areas where mechanical treatment that could cause damage to cultural resources is proposed. Weed wrenching and grubbing techniques will not be used in known archaeological sites. Instead, treatment methods that would have no potential to affect cultural resources will be used.

- Purpose: To avoid adverse impacts to cultural resources
- Source: Common practice

N-Rangeland Resources

N-1: Permittees will be notified of annual treatment actions at the annual permittee operating plan meeting, and/or notified within two weeks of planned treatments of infestations greater than one acre in size.

- Purpose: To ensure permittee has knowledge of activities occurring within the allotment
- Source: Common practice

N-2: Follow most current EPA herbicide label for grazing restrictions

- Purpose: To ensure grazing animals are not exposed to chemicals
- Source: EPA labeling requirements

O-Human Health (See R6 2005 FEIS, Appendix Q for more information)

O-1: Backpack application rate for Sulfometuron methyl will not exceed 0.2 lb a.i./ac., and for NPE surfactant it will not exceed 1.67 lb a.i./ac

- Purpose: To reduce the potential of adverse effects to human health

O-2: Spot spray application rate for Picloram will not exceed 0.35 lb a.i./ac., and for Sulfometuron methyl it will not exceed 0.12 lb a.i./ac

- Purpose: To reduce the potential of adverse effects to human health

O-3: Triclopyr application rate will not exceed 1.0 lbs a.i./ac. Use spot spraying techniques to further reduce dermal exposure. Favor other herbicides wherever they are expected to be effective

- Purpose: To reduce the potential for adverse effects to human health from dermal contact or consumption of contaminated vegetation

P-Restoration

P-1: Long-term site strategy for highly disturbed areas that have high potential for weed invasion such as old fields or old homesteads, follow guidelines and techniques outlined in *Guidelines for Revegetation for Invasive Weed Sites on National Forests and Grasslands in the Pacific Northwest* (Erickson et al.2003)

- Purpose: To ensure highly invisible/disturbed sites are successfully restored or revegetated with desirable vegetation
- Source: Umatilla LRMP Standard #12

P-2: On dry grassland habitat below 3000 feet in the highly disturbed areas where live vegetative groundcover will be reduced by 70 percent of existing vegetation by herbicide treatment, restoration and/or revegetation would occur following *Guidelines for Revegetation for Invasive Weed Sites on National Forests and Grasslands in the Pacific Northwest* (Erickson et al.2003) and Umatilla National Forest LRMP as amended by the R6 2005 ROD standards

- Purpose: To ensure highly invisible/disturbed sites are successfully restored or revegetated with desirable vegetation,
- Source: *Guidelines for Revegetation for Invasive Weed Sites on National Forests and Grasslands in the Pacific Northwest* (Erickson et al. 2003), Water Erosion Prediction Project (WEPP) erosion data, and Goodwin et al. 2002, Umatilla LRMP Standard #12

P-3: In areas where broadcast herbicide is used to treat highly infested areas, evaluation of potential re-infestation by new or nearby invasive plant species would be considered, and restoration and/or revegetation measures would be implemented to ensure protection of native vegetation and soils. Also see treatment restoration standard #12 in the Umatilla Forest Plan as amended by the R6 2005 ROD.

- Purpose: To ensure those sites are successfully restored with desirable vegetation
- Source: Treatment Restoration Standard 3, 12 (RFEIS), and Guidelines for Revegetation for Invasive Weed Sites on National Forests and Grasslands in the Pacific Northwest (Erickson et al. 2003)

Herbicide Use Buffers

Herbicide treatments would become more restrictive as they occur close to water. PDFs and herbicide use buffers within the aquatic influence zone were developed based on label advisories; SERA risk assessments, and various studies of drift and runoff to streams such as Berg 2004.

Tables 5, 6, and 7 specify buffers according to treatment methods, herbicides used, risk, and type of aquatic zone.

Ephemeral streams exist in the project area but are not buffered. These areas flow rarely during very high water events when herbicide use would not likely occur. By the time water flowed in these areas, the herbicides would not be biologically active. The amount of precipitation necessary to cause ephemeral streams to flow would rapidly dilute any herbicide present in the watershed.

Table 5. Herbicide Use Buffers in feet – Perennial and Wet Intermittent Streams - Proposed Action

Herbicide	Perennial and Wet Intermittent Stream			
	Aerial	Broadcast	Spot	Hand/Select
Aquatic Labeled Herbicides				
Aquatic Glyphosate	Not proposed	100	Water's edge	Water's edge
Aquatic Triclopyr-TEA	None Allowed	None Allowed	15	Water's edge
Aquatic Imazapyr*	Not proposed	100	Water's edge	Water's edge
Low Risk to Aquatic Organisms				
Imazapic	Not proposed	100	15	Bankfull
Clopyralid	300	100	15	Bankfull
Metsulfuron Methyl	None Allowed	100	15	Bankfull
Moderate Risk to Aquatic Organisms				
Imazapyr	Not proposed	100	50	Bankfull
Sulfometuron Methyl	Not proposed	100	50	5
Chlorsulfuron	Not proposed	100	50	Bankfull
High Risk to Aquatic Organisms				
Triclopyr-BEE	None Allowed	None Allowed	150	150
Picloram	Not Proposed	100	50	50
Sethoxydim	Not proposed	100	50	50
Glyphosate	Not proposed	100	50	50

Table 6. Herbicide Use Buffers in feet – Dry Intermittent Streams - Proposed Action (Alternative B)

Herbicide	Dry Intermittent Stream			
	Aerial	Broadcast	Spot	Hand/ Select
Aquatic Labeled Herbicides				
Aquatic Glyphosate	Not proposed	50	0	0
Aquatic Triclopyr-TEA	None Allowed	None Allowed	0	0
Aquatic Imazapyr*	Not proposed	50	0	0
Low Risk to Aquatic Organisms				
Imazapic	Not proposed	50	0	0
Clpyralid	100	50	0	0
Metsulfuron Methyl	None Allowed	50	0	0
Moderate Risk to Aquatic Organisms				
Imazapyr	Not proposed	50	15	Bankfull
Sulfometuron Methyl	None Allowed	50	15	Bankfull
Chlorsulfuron	None Allowed	50	15	Bankfull
High Risk to Aquatic Organisms				
Triclopyr-BEE	None Allowed	None Allowed	150	150
Picloram	Not Proposed	100	50	50
Sethoxydim	Not proposed	100	50	50
Glyphosate	Not proposed	100	50	50

Table 7. Herbicide Use Buffers in Feet–Wetlands-Proposed Action (Alternative B)

Herbicide	Wetlands			
	Aerial	Broadcast	Spot	Hand/ Select
Aquatic Labeled Herbicides				
Aquatic Glyphosate	Not proposed	100**	Water's edge	Water's edge
Aquatic Triclopyr-TEA	None Allowed	None Allowed	15	Water's edge
Aquatic Imazapyr*	Not proposed	100**	Water's edge	Water's edge
Low Aquatic Hazard Rating				
Imazapic	Not proposed	100	15	high water mark
Clpyralid	300	100	15	high water mark
Metsulfuron Methyl	Not proposed	100	15	high water mark
Moderate Aquatic Hazard Rating				
Imazapyr	Not proposed	100	50	high water mark
Sulfometuron Methyl	None Allowed	100	50	5
Chlorsulfuron	None Allowed	100	50	high water mark
Greater Aquatic Hazard Rating				
Triclopyr-BEE	None Allowed	None Allowed	150	150
Picloram	Not proposed	100	50	50
Sethoxydim	Not proposed	100	50	50
Glyphosate	Not proposed	100	50	50

*Aquatic Imazapyr (Habitat) may not be used until the risk assessment (currently underway) is completed for inert ingredients and additives.

** If wetland, pond or lake is dry, there is no buffer.

Table 8. Buffer widths required for aerial application

Buffer width for a 25 foot release height, 7-8 mph winds	Buffer width for a 35 foot release height, 7-8 mph winds	Buffer width for a 50 foot release height, 7-8 mph winds
Designated buffer	Add 1 swath width to buffer	Add 2 swath widths to buffer

Ensure little to no drift by applying these buffers and low drift technology (i.e. nozzle design and/or additives), as directed in PDFs

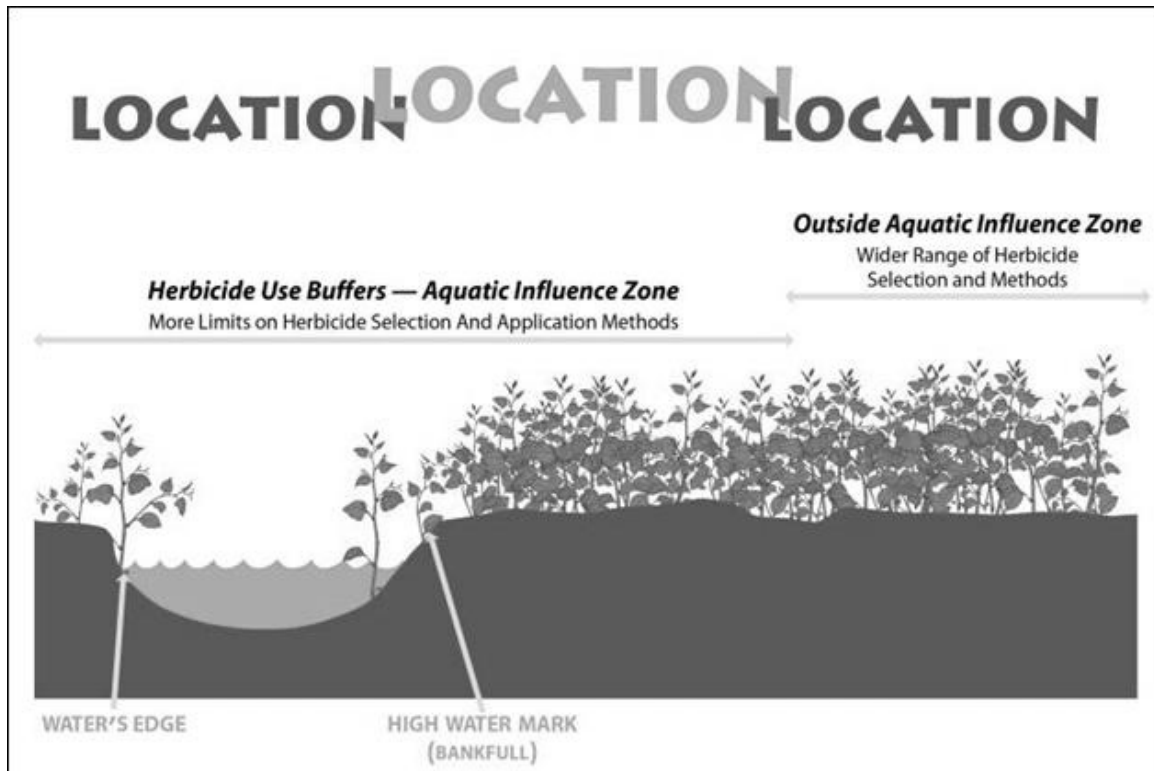


Figure 8. Illustration of how herbicide selection and application methods in the established buffer widths are more limited in Aquatic Influence Zones

Figure 8 illustrates how the Aquatic Influence Zone restricts application methods and herbicides to only those approved for use in aquatic areas. “Aquatic Influence Zone” is not equal to the “buffer widths” listed in the tables above. For purposes of analysis in this EIS, the Aquatic Influence Zone is defined by the innermost half of the RHCA. For instance, a 300-foot RHCA would have an aquatic influence zone of 150 feet. Establishing buffer widths reduces the potential for herbicides to come in contact with water via drift, leaching, and runoff at or near concentrations of concern.

Early Detection and Rapid Response

As described previously, Early Detection/Rapid Response (EDRR) is aimed at controlling new infestations that are small in size thus decreasing cost and the need for repeated applications. It is also advantageous because: 1) the precise location of individual target plants is subject to rapid and/or unpredictable change; and 2) presently known infestations may grow during the time it typically takes to complete the NEPA process. The 2006 inventory is an extensive list of existing sites, however these sites may be spreading and new sites may likely become established during the life of the project.

The proposed action would allow treatment of new detections, as long as the treatment method is within the scope of this EIS. Limitations associated with the PDFs would apply to new as well as existing sites. Invasive plant sites that are discovered subsequent to the current invasive plant inventory would require evaluation to determine that the invasive plants treatments and environmental impacts are consistent with those analyzed in this EIS.

New sites would be treated under the auspices of this project, even if it involves a new invasive species, as long as the effective treatment is similar to the common control measures and treatment methods described previously. The exception to this is aerial treatment; no aerial treatment is authorized under EDRR. New sites that require aerial treatment would be subject to additional NEPA analysis. If a new site needs a treatment that has not been analyzed in this document, or if PDFs cannot be applied effectively to a new site, additional NEPA analysis may also be required.

New detections are usually small in size and would likely have a higher priority for treatment. The annual herbicide treatment cap averaging 4,000 acres, and life of the project treatment cap of 40,000 acres include EDRR as well as known sites. EDRR sites would be subject to the following herbicide use decision process. Annual and life of the project treatment caps are assumed to include herbicide use in riparian areas.

This process does not apply to ongoing manual treatments along roadsides or within administrative sites. 1. Is the target population associated with a size, phenology, density or distribution that warrants herbicide use (alone or in combination with other methods)? Consider whether or not herbicides are required for treatment effectiveness and/or whether or not the use of herbicides substantially increases cost-effectiveness of treatment? Consult common control measures. Consider whether volunteers may be available to reduce the cost of manual treatments. Determine that annual or life-of-the-project caps have not been reached.

Yes (use herbicides): List potential herbicide choices and integrated prescription. Review label directions and project design criteria. Consider non-target vegetation surrounding treatment sites and use selective herbicides as appropriate. Consider soil conditions at the treatment site. Consider previous treatments that have occurred on the site. Were they effective? Would another herbicide or combination of methods be more effective? Also note that triclopyr may not be used in areas of known special forest product or subsistence collection. Go to 2.

No: Use non-herbicide methods.

2. Do the size, density and/or distribution of invasive plants warrant the broadcast application method? Would another herbicide besides triclopyr be effective? (Please note that triclopyr may not be broadcast)

Yes: Is the treatment site within the aquatic influence zone and/or on a road that has high potential to deliver herbicide to surface waters? Is the site in a wildlife habitat that has specific restrictions to broadcasting? Go to 3a.

No: Go to 3b.

3a. Apply surface water buffers as appropriate. Is this site within an area where broadcasting is prohibited?

Yes: Do not broadcast. Go to 4.

No: Go to 3b.

3b. Are there botanical species of local interest/suitable habitat within 100 feet of the proposed broadcast site?

Yes: Survey as needed within suitable habitats. Apply botanical buffers as appropriate (see table 25). Broadcast may still be acceptable if botanical species of local interest are covered by barrier. Go to 4.

No: Broadcasting is an acceptable treatment method for herbicides except triclopyr. Use lowest effective label rates for each given situation. Do not exceed typical label rates. Favor other surfactants besides NPE and do not broadcast NPE at a rate exceeding 0.5 lbs. active ingredient per acre. Do not broadcast imazapyr at a rate greater than 0.7 lbs per acre. Consider wildlife habitats in the area and implement seasonal restrictions if required.

4. Will spot and/or selective methods be reasonably effective in this situation?

Yes: Apply spot/selective buffers and use aquatic labeled herbicides as appropriate.

No: Seek approval for treatment through additional decision process (NEPA Section 18 or a new NEPA process).

Figure 9. EDRR Herbicide Use Decision Process

Annual Implementation Planning Process

This section outlines the process for making sure the selected alternative is properly implemented. The method follows Integrated Weed Management principles (R6 2005 FEIS, 3-3) and satisfies pesticide planning requirements at FSH 2109.14. It applies to currently known and new sites found during ongoing monitoring (EDRR)⁵. Appendix B includes an itemized example of a site-scale prescription derived following this process.

1. Characterize the invasive plant infestation to be treated. This includes:

- Map and describe the target species, density, extent, treatment strategy, and site conditions.
- List any resource of concerns and determine if additional surveys are needed. Coordinate with resource specialists to get additional information or new information about specific locations. Identify and perform pre-treatment surveys for species of local interest and/or their habitats.

2. Develop site prescriptions

- Use Integrated Weed Management principles (R6 2005 FEIS, 3-3) to identify possible effective methods of treatment. Non-herbicide treatments should be considered when sites are small or target plant densities are low, particularly after several years of herbicide treatments. Prescribe herbicides as needed based on the biology of the target species and size of the infestation (for instance, manual treatment alone cannot effectively eradicate rhizomatous species). Determine that the prescribed treatment is within the scope of those analyzed in the EIS.⁶
- Apply appropriate project design features. Consider the soil texture and type and potential for ground water contamination to ensure that label guidance and PDFs related to soils are followed. Consider the presence of small unmapped small wetlands and ensure PDFs are appropriately applied.
- Determine that the prescribed treatment is consistent with the ESA consultation. Review updated lists of species of local interest and prepare supplemental information report as needed (FSH 1909.15).
- Review compliance criteria for the Forest Plan and any other environmental standards indicated by the label or state regulations. Develop a public notification plan, and coordinate with local Tribes.
- Complete Form FS-2100-2, Pesticide Use Proposal. This form lists treatment objectives, specific herbicide(s) that would be used, the rate and method of application, and project design features that apply. Apply for any herbicide application permits when needed for treatments in Riparian Areas.
- Confirm that acceptable plant or mulch materials are available for cultural treatments/restoration.
- Coordinate with adjacent landowners, water users, agencies, and partners.

⁵ This process does not apply to manual and mechanical treatments along roadsides or within administrative sites that are part of ongoing maintenance for which a decision document is unnecessary.

⁶ For EDRR sites, the decision to use herbicides follows the decision protocol shown in figure 9. If treatments would not be effective once project design features are applied, further NEPA would also be required to authorize the effective treatment.

- Apply herbicide treatment caps including:
 - An average of 4,000 acres per year Forest-wide
 - A maximum for the life of the project of 40,000 acres

3. Accomplishment and Compliance Monitoring

- Develop a project work plan for herbicide use as described in FSH 2109.14.3. This plan presents organizational and operational details including treatment objectives, the equipment, materials, and supplies needed; the herbicide application method and rate; field crew organization and lines of responsibility, and a description of interagency coordination. The plan will also include a job hazard analysis to assure applicator safety.
- Ensure contracts and agreements include appropriate prescriptions and that herbicide ingredients and application rates meet label requirements, Standards 16 and 18, and site specific project design features.
- Document and report herbicide use and certify applicator information in the National Pesticide Use Database, via the Forest Service Activity Tracking System (FACTS).
- The Biological Opinions written by NMFS and FWS include reasonable and prudent measures to minimize “take” of species listed under federal Endangered Species Act (fish). Two of these measures are reporting requirements:
 - *Report annual invasive plant control proposals to the Service via the Level 1 Team by March 1, prior to the start of the spray season (2009 to 2018). The proposals will include the treatment methods, herbicide application methods and rates, objectives of treatments, locations, maps of treatment areas, acreages, proposed start and stop dates, and special mitigation measures that will be applied.*
 - *Provide an annual report by January 31 to the Service on activities implemented during the 2009 to 2018 seasons and the results of Regional monitoring efforts. If no activities occur, a report of no action is still required by January 31, following each spray season (2009 to 2018).*
- Document the implementation of the public notification plan.

4. Post Treatment Monitoring

- Post-treatment reviews would occur on a sample basis or when required by a Project Design Feature to determine whether treatments were effective, if damage to non-target species occurred, or whether or not passive restoration occurred as expected.
- Post-treatment monitoring would also be used to detect whether project design features were appropriately applied and effective. Contract administration and other existing mechanisms would be used to correct deficiencies.
- Additional monitoring may be done consistent with the Umatilla National Forest Plan (R6 2005 ROD Monitoring Framework).

2.2.4 Alternative C

Alternative at a Glance

Activity	Approximate Value
Acres identified for treatment	24,649
Percent of total Forest landbase affected by known sites	0.03
Percentage of treatment sites where full range of effective treatments are available	88
Number of herbicides available for use	10
Acres of proposed herbicide treatments for known sites	20,691
Acres identified for aerial spraying of herbicides	675
Approximate total acres of ground based (hand or boom) broadcast treatments proposed for known sites*	14,456
Acres of hand or non-aerial broadcast treatments within riparian/wetland areas	0
Approximate total acres of non-broadcast (wicking, wiping, stem injection) herbicide application on known riparian/wetland areas	5,560
Acres of invasive sites where treatment methods do not include herbicides	3,958
EDRR includes chemical methods other than aerial	Yes
Cost estimate per effectively treated acre of known sites	\$201

A majority of ground-based treatments use backpack sprayers.

Alternative C was developed to respond to issues about the detrimental effects associated with broadcast spraying in riparian areas. Invasive plants have been inventoried on about 6,300 acres within riparian area and wetlands. This alternative would not allow broadcast applications of herbicides in these areas. The features of this alternative are the same as alternative B, with the exception of the limitations imposed on broadcast spraying in riparian areas. New detections in riparian areas would be subject to the same limitations as the known sites under this alternative; therefore broadcast herbicide applications would not be allowed.

However, along with the lower risk, alternative C also increases cost and reduces the potential for effectiveness compared to alternative B. This is because broadcast applications are more cost-effective in dense and/or extensive infestations such as roadsides.

Alternative C includes all of the PDFs and buffers associated with alternative B; though, eliminates all broadcast treatments in riparian and wetland areas.

Issue 1 – Effects on Human Health: Alternative C was developed to reduce the potential for herbicides to be delivered to surface water systems and contaminate drinking water.

Issue 2 – Treatment Effectiveness: Alternative C allows use of a full range of herbicides throughout the project area.

Issue 3 – Social and Economic: Alternative C does not involve substantial increases in cost because only a portion of the landbase is affected by the additional mitigation. The cost of using methods other than broadcasting in these areas is not substantially increased.

Issue 4 – Effects on Non Target Plants and Animals and Issue 5 -Effects on Soils, Water and Aquatic Organisms: Alternative C reduces the risk to non-target plants, animals, soils, water and aquatic organisms associated with broadcasting of herbicide in riparian areas. Broadcasting in riparian areas was identified as high risks in the R6 2005 ROD

Monitoring Framework (appendix 1). Alternative C avoids this higher risk, while still allowing herbicide treatment applications in riparian using lower risk spot spraying, wicking, foliar applications, injections, etc. With this level of control specificity, potential contact with water or aquatic organisms from chemical drift is virtually eliminated. For these reasons, spot and selective application treatments were NOT considered high risk in the R6 2005 ROD (even in riparian areas).

2.2.5 Alternative D

Alternative at a Glance

Activity	Approximate Value
Acres identified for treatment	24,649
Percent of total Forest landbase affected by known sites	0.03
Percentage of treatment sites where full range of effective treatments are available	97
Number of herbicides available for use	10
Acres of proposed herbicide treatments for known sites	20,691
Acres identified for aerial spraying of herbicides	0
Approximate total acres of ground based (hand or boom) broadcast treatments proposed for known sites*	18,153
Acres of hand or non-aerial broadcast treatments within riparian/wetland areas	3,022
Approximate total acres of non-broadcast (wicking, wiping, stem injection) herbicide application on known riparian/wetland areas	2,538
Acres of invasive sites where treatment methods do not include herbicides	3,958
EDRR includes chemical methods other than aerial	Yes
Cost estimate per effectively treated acre of known sites	\$200

A majority of ground-based treatments use backpack sprayers.

Alternative D was developed to respond to concerns that detrimental effects could occur from aerial spraying of herbicide. Aerial spraying has the greatest potential of all application methods for drift and non-target impacts. Alternative D is the same as the proposed action, except approximately 642 acres would be treated using methods other than aerial.

Issue 1 – Effects on Human Health: Alternative D was developed to reduce the potential for drift or other exposure mechanism associated with aerial spraying.

Issue 2 – Treatment Effectiveness: Alternative D allows use of a full range of herbicides throughout the project area. By allowing herbicide treatment using other application methods, the degree to which options are reduced is limited to about 33 acres which would not be treated at all, because aerial is the only reasonable treatment method for these acres.

Issue 3 – Treatment Cost: Alternative D does not involve substantial increases in cost even though the average costs of aerial treatment are less than other herbicide application methods. .

Issue 4 – Effects on Non Target Plants and Animals and Issue 5 -Effects on Soils, Water and Aquatic Organisms: Alternative D reduces the risk to non-target plants, animals, soils, water and aquatic organisms associated with aerial spraying of herbicides. Aerial spraying was identified as a high risk in the R6 2005 ROD Monitoring Framework

(appendix 1). Alternative D avoids this higher risk while still allowing herbicide treatment applications using lower risk ground broadcast, spot spraying, wicking, foliar applications, injections, etc.

2.3 Alternatives Not Considered in Detail

2.3.1 High Potential for Spread Areas of Priority 1 and 2 Species

There is concern that the herbicide treatments proposed are unnecessarily extensive. By potentially treating so many acres for so many years, the concern is that cumulatively there would be detrimental environmental effects. Some of those concerned reason that many invasive plant sites do not pose as serious threat to the human environment as the herbicides proposed to control them.

To respond to this issue and reduce the amount of acres proposed for treatment an alternative was developed to limit herbicide use to high priority areas only, including areas with high potential for weeds to spread, and/or areas with priority 1 or 2 invasive weed species. However, under this alternative, approximately 300 acres would have been dropped from herbicide treatment; which is insignificant compared to the approximately 20,691 acres proposed for herbicide treatment in the proposed action. Thus, an alternative to limit herbicide use to Priority 1 and 2 species was not developed since it would have been very similar to the proposed action.

2.3.2 Invasive Plants Managed through Natural Processes

Some commenters believe that if National Forest use is restricted enough, natural processes will displace invasive plant infestations with native plant populations. Specifically, suggestion was made to remove livestock and ORVs from the National Forest. It was reasoned that removing resource uses or activities would allow native plant communities to recover where invasive weeds now dominate.

National Forests exist to provide a variety of goods and services to the American people. National Forests are managed through many programs to provide these benefits to national forest visitors and users. These uses are acknowledged by the Forest Plan and are permitted uses. The proposed invasive plant treatment program (alternative B) would focus on directly reducing weed populations, not on limiting existing national forest programs or establishing prevention measures for other activities (see Purpose and Need in chapter 1). Preventative measures would be incorporated in this project at specific locations needed for treatment or removal of invasive plants; however, weed prevention measures for other activities will be administered through other programs such as livestock grazing and transportation management when those activities occur to meet Forest plan Standards and Guidelines for invasive plants.

A project based on weed prevention alone would not satisfy the Purpose and Need of this project to contain, control or eradicate existing and future invasive plants populations. Invasive plants have been expanding for decades. The present weed treatment program has had some success, yet invasive plant populations continue to expand. There is no credible scientific research that suggests that a passive, prevention program alone would reverse this trend because the species are wide spread and occur in many high use areas. A review of activities allowed by the Forest Plan could take place if there was a demonstrated need. The proposal to limit other national forest programs that benefit forest visitors and users would not be appropriate. For these reasons, this alternative was not considered in detail.

2.3.3 No Herbicides

Some commenters expressed the belief that herbicide use is unacceptably toxic to the human environment and to native ecosystems. They acknowledge that herbicides kill target weeds, but are concerned that containing, controlling or eradicating weeds using herbicides comes at an unacceptable cost to humans and the natural environment. Therefore, they propose an invasive plant treatment project that uses methods other than herbicides to address weed populations.

The *Umatilla National Forest Environmental Assessment for the Management of Noxious Weeds* (USDA 1995a) and the R6 2005 FEIS considered alternatives to manage weeds without using herbicides. The 1995 EA considered such an alternative in detail. That alternative was rejected because the likelihood of controlling weeds without herbicides was low (USDA Forest Service 1995a). The alternative that was selected allows herbicide use, but only after other methodologies has proven ineffective. The current invasive treatment program has been based on this alternative. It also represents the no action, or ‘no change from the current program’ alternative (alternative A) in this EIS. Invasive plant populations continue to grow; therefore, this alternative has not contained, controlled or eradicated weeds as we now hope to do under the current Purpose and Need statement. Thus, another alternative proposal to treat weeds without herbicide applications will not be considered in detail because it would not be consistent with invasive plant management direction and would not be effective in achieving the purposes and needs for action.

2.3.4 Guidelines from 1995

The current program established by an environmental assessment (EA) completed in 1995 and amended in 1998, allows herbicide treatment on 1,774 acres only if non-chemical treatment proved ineffective. Some believe that the safeguards of this program, limiting how and when herbicides can be used should be continued without restricting where herbicides can be used. In other words, the current program should be continued without limiting herbicide use to pre-designated sites. Instead, other features of that integrated weed management (IWM) program would limit herbicide treatment.

This alternative would not take advantage of the advances made both in herbicide effectiveness and safety, because it would only allow two of the nine chemicals approved by the R6 2005 FEIS. In fact, dicamba, approved for use in the 1995 EA has been removed from the list of US Forest Service Region 6 approved chemicals because of toxic concerns. Other limitations of this program would require that non-herbicide treatments be used on new sites first. Herbicide application would only occur if non-herbicide treatments proved ineffective.

The present inventory of invasive plants suggests that the weed problem is growing, not shrinking. The present program has successfully addressed some weed sites; however, overall, the program has not been as effective because it has severely restricted the circumstances of herbicide use. Because only two herbicides would be used and because the present program would not meet this project’s Purpose and Need, this alternative was not considered in detail.

2.3.5 Deviations from Existing Approved Herbicide List

There is a concern that limiting herbicide use to the approved list provided by the R6 2005 ROD prevents use of effective herbicides coming on the market and future chemicals that may be developed during the life of this project.

Therefore, an alternative was considered that would add new EPA approved herbicides that were not available or not analyzed at the time of the regional assessment.

While future improvements in herbicide products may be attractive, it is costly and time consuming to do a chemical assessment for each new product. This diverts funds and staff from the primary Purpose and Need of containing, controlling or eradicating invasive infestations. The current list of approved herbicides is considered safe and effective for most priority invasive plants in most circumstances. For these reasons this alternative was not considered in detail.

2.3.6 Limiting Herbicide Use and No Aerial Applications

In addition to desiring no aerial applications of herbicides, this alternative came from a public concern to eliminate NPE, triclopyr and/or picloram specifically to prevent those herbicides from coming in contact with bighorn sheep, wolverine, and wolves. This alternative was considered but eliminated from detailed study because:

- Exposures to triclopyr that exceed a level of concern are not plausible because triclopyr cannot be broadcast sprayed. This reduces potential exposure below a level of concern.
- At typical application rates, picloram “worst case” exposures did not exceed any level of concern for birds or mammals. There is no scientific basis for a restriction of picloram in bighorn sheep, wolverine or gray wolf habitat.
- At 0.5 lb/ac NPE does not exceed any level of concern for mammals, so there is no scientific basis for a restriction for bighorns, wolverines, or wolves.
- At typical application rates, none of the herbicides that could be aerially applied exceeded any levels of concern for mammals, so there is no scientific basis for a restriction.

2.4 Alternatives Compared

The following tables display information about each alternative.

Table 9. Alternatives compared by activity

Activity	Alt A	Alt B	Alt C	Alt D
Acres identified for treatment	3,154	26,469	26,469	26,469
Average Annual and Life-of-the-project Herbicide Use Caps	NA	4,000 acres per year, 40,000 acres total (including EDRR)	4,000 acres per year, 40,000 acres total (including EDRR)	4,000 acres per year, 40,000 acres total (including EDRR)
Acres of proposed herbicide treatments	1,774	20,691	20,691	20,691
Acres proposed for aerial treatment	0	675	675	0
Number of herbicides available for use	2	10	10	10
% of Forest land base potentially treated with Herbicides; life of project	0.002	0.03	0.03	0.03
% of forest landbase potentially treated with herbicides annually	0.002	0.005	0.005	0.005
Includes EDRR for new sites (all methods within the scope of the project, except aerial).	No	Yes	Yes	Yes

Activity	Alt A	Alt B	Alt C	Alt D
Percentage of sites where all effective methods are available	0	100	88	97
Average Cost Per Acre	\$814	\$197	\$200	\$201
Degree to which adverse effects to people and the environment are minimized	Minimal risks from project	Minimal risks from project: Aerial and broadcast include inherent risks	Minimal risks from project: Broadcast in riparian areas eliminated	Minimal risks from project: Aerial treatment eliminated
Projected time to contain or control currently inventoried infestations	Containment or control would not be achieved	19 Years	Same as B	Same as B

Table 10. Alternative comparison relative to significant issues

Issue Component	Unit of Measurement	(No Action) Alternative A	(Proposed Action) Alternative B	Alternative C	Alternative D
1 - Human Health.	Character of PDFs reducing worker and public exposure to herbicides	Forest Plan standards and project design features eliminate plausible harmful exposure scenarios in all alternatives. The R6 2005 FEIS displayed herbicide exposure scenarios that could result in human health impacts (such as nausea, skin rash, breathing trouble) based on risk assessments. Worst case exposure scenarios for workers and the public were studied. This project does not involve any exposure scenarios of concern for people. Rates of herbicide and surfactant application are limited in the PDFs, which eliminate the worst-case scenarios that could hurt people. The only scenario of concern remaining is drinking out of a pond contaminated by a direct spill of large proportions. This is not likely to occur given all of the safeguards associated with the project. In addition, there are many PDFs related to coordination with landowners, tribal members, forest products gatherers, and others to make sure inadvertent exposures do not occur. Public notification and sign posting would occur (see implementation plan).			
2 -Treatment Effectiveness	Number of herbicide options	2	10	10	10
	Character of limitation on integrated treatment options	Greatest degree of limitation. Does not allow herbicide treatment of most inventoried sites, or the full range of treatment options at any given site.	Allows for aerial and broadcast treatment where needed according to PDFs and buffers.	Does not allow broadcast within approximately 3,000 acres where this may be most effective method.	Does not allow aerial treatment on 675 acres where this method would be most effective.

Issue Component	Unit of Measurement	(No Action) Alternative A	(Proposed Action) Alternative B	Alternative C	Alternative D
	Percentage of known sites where all effective treatments are available	0%, many effective treatment options were not available in 1995 EA	100	88	97
3 - Social and Economic	Average Cost per Acre	\$814	\$197	\$201	\$200
	Total cost for one time treatment of all available acres	\$641,695	\$3,887,460	\$3,963,010	\$3,942,840
	Average cost per year	NA	\$539,030	\$549,790	\$546,950
4 - Effects on Botanical and Terrestrial Wildlife Species	Character of PDFs that apply to wildlife and plants	Herbicide exposure limited because herbicide treatment limited by only being used if non-herbicide treatments are ineffective; PDFs not specifically applied to this alternative	PDF Groups I and J minimize non-target plant and animal impacts. PDF Group I minimizes non-target botanical species impacts by reducing potential for damage from drift or run off in specific locations. Some individual sensitive botanical species may be impacted but risks from invasives would be abated at all 44 sites currently threatened. PDF Group J minimizes impacts to wildlife by limiting the ingredients, rate, or application method of herbicides in specific locations	In addition to alternative B, herbicide exposure further minimized by eliminating broadcast applications methods in riparian areas	In addition to alternative B, herbicide exposure further minimized by eliminating aerial application of herbicides and the potential for associated drift

Issue Component	Unit of Measurement	(No Action) Alternative A	(Proposed Action) Alternative B	Alternative C	Alternative D
	Acres of broadcast spraying	1,774	17,478	14,456	18,153
	Acres of Aerial Spraying	0	675	675	0
5 - Effects on Soils, Water, and Aquatic Organisms	Character of PDFs that apply to soils	Limited treatments	PDF group H includes restrictions on use of clopyralid, chlorsulfuron, picloram and sulfometuron methyl due to their potential to impact soil biology and/or leaching.	Same as B	Same as B
	Acres of broadcast herbicide application within riparian areas	0	3,022	0	3,022
	Acres of aerial treatment	0	675	675	0

2.5 Monitoring

Invasive plant treatment and restoration activities are likely to be complex, involve multiple land ownerships and will take years to implement, due to the nature of invasive plant problems. It is possible that a site will be treated multiple times over the years. Tracking these efforts and subsequent progress will be crucial to determining success. The Umatilla National Forest Plan has a monitoring plan, and monitoring results are reported by the Forest annually. In addition, the R6 2005 ROD established an invasive plant treatment framework for project and program monitoring (see appendix 1-7 to 11 of the R6 2005 ROD). The Forest staff will follow Forest Plan and R-6 monitoring requirements, and contribute data to the framework.

The monitoring framework begins with the Umatilla National Forest invasive plant inventory that followed the NRIS/Terra protocol. It suggests beginning a monitoring regime once treatment of a site has started, which includes annual monitoring for the first 3-5 years, decreasing in frequency to every other year for the next 5-10 years and further decreasing monitoring frequency to every 3 years for the next ten years. With the current inventory in place, two types of monitoring would be included in the framework for all action alternatives. They are:

Implementation/Compliance Monitoring – This type of monitoring basically answers the question, “Did we do what we said we would do?” For example, did we use only the chemicals analyzed and approved in the places and under the constraints we set forth? Did we adhere to the buffers established? Answers to these and other questions would ultimately answer the initial question.

Implementation and compliance monitoring is addressed in the Implementation Planning Process and PDF group I.

Treatment Effectiveness Monitoring – This type of monitoring would answer the following questions:

- Have the number of new invasive plant infestations increased or decreased on the Forest?
- What changes in distribution, amount, and proportion of invasive plant infestations have resulted due to treatment activities on the Forest?
- Has the infestation size for a targeted invasive plant species been reduced regionally or at the project level?
- Which treatment methods, separated or in combination, are most successful for specific invasive plant species?
- Which treatment methods have not been successful for the specific invasive plant species?
- Do follow-up treatments demonstrate a reduction of herbicide use or the selected method on treated sites?

Treatment Effectiveness Monitoring would be done to determine need for re-treatment, adaptations in methods to increase treatment efficacy, and ensure the proper containment strategy has been applied. Treatment effectiveness is reported annually in the FACTS database.

In FACTS, the acres treated are entered, as is the percent effectiveness of the treatment (e.g. 80% of treated weeds were killed or browned), and the number of acres monitored. "Monitoring" means a visual survey of the treated acres to come up with the percent browned/killed number. The percent effectiveness is used to calculate an "outcome" of priority acres restored. If the total number of acres monitored for the forest does not meet or exceed 50 percent of the total acres treated for the forest, then the forest does not get credit for the invasive plant acres treated target, nor the priority acres restored.

Over time, trends in population size may be revealed via ongoing NRIS inventory and mapping. However, reductions in population sizes will not become apparent for more than a decade because even though treatments may be effectively reducing the *density* of invasive plants within an area, the *size* of the area on maps may stay the same.

- **Project Design Feature Effectiveness monitoring** would be required; 1) where aerial herbicide applications occur and 2) where broadcast application of herbicide occurs in riparian areas, ditches or water corridors connected to habitat for listed fish; or proximity to federally listed plants. The Pacific Northwest Region of the Forest Service is field testing GPS swathing technology for aerial spraying, passive and grab water sampling protocols, drift detection devices (drift sensitive cards), and other monitoring methods for these type of projects.

The implementation planning and monitoring would ensure that effective treatments are completed according to PDFs, and undesired effects are minimized.

Chapter 3 – Affected Environment and Environmental Consequences

3.1. Introduction

This chapter describes both the existing conditions of the Project Area, and the environmental impacts (effects) of implementing the alternatives described in chapter 2. Effects are defined as:

- **Direct effects** occur at the same time and in the same general location as the activity causing the effects.
- **Indirect effects** are those that occur at a different time or location from the activity causing the effects.
- **Cumulative effects** result from the incremental impacts of the proposed actions/alternatives when added to other past, present, and reasonably foreseeable actions, both on the Forest and as well as other adjacent federal, state, or private lands.

All three types of effects can be either adverse or beneficial, and are described in terms of increases or decreases, intensity, duration, and timing.

Effects include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative (40 CFR 1508.7 and 1508.8).

The order of the major sections of this chapter is provided here to assist the reader:

3.1 Introduction: discusses Herbicide Risk Assessments, Climate Change, Treatment Effectiveness, Cumulative Effects Overview, and Incomplete and Unavailable Information	3.9 Social and Economic Impacts
3.2 Botany	3.10 Heritage Resources
3.3 Terrestrial Wildlife	3.11 Impacts to Cultural and Treaty Rights
3.4 Soil and Water	3.12 Irreversible and Irretrievable Use of Resources
3.5 Aquatic Organisms and Habitat	3.13 Effects of Short-term Uses and Maintenance of Long-term Productivity
3.6 Recreation	3.14 Consistency with Forest Service Policies and Plans
3.7 Effects of Herbicide Use on Workers and the Public	3.15 Conflicts with Other Plans
3.8 Range Resources	3.16 Adverse Effects that Cannot be Avoided

Changes between the DEIS and FEIS for Section 3.1

Section 3.1 has been rewritten for clarity based on public comments and internal review. The original information from the DEIS remains, although may be numbered differently. This section adds 3.1.3 Climate Change, 3.1.4 Treatment Effectiveness, and 3.1.6 Incomplete and Unavailable Information

Section 3.1.5 Cumulative Effects - This section is reworded to describe the incremental impacts of the proposed action and alternatives when added to other past, present, and reasonably foreseeable actions, both on National Forest System lands and other adjacent federal, state, or private lands.

3.1.1 Project Area

The Umatilla National Forest is located in the northern portion of the Blue Mountains in northeastern Oregon and southeastern Washington. There are over 1.5 million acres within the Forest boundary, of which 1.4 million are National Forest System lands. Interstate Highway 84 passes through the Forest dividing it into two halves. The north half extends into Washington and is bordered partially by the Umatilla Indian Reservation on the west and by the Wallowa-Whitman National Forest on the southeast flank. The southern half is bordered on the east by the Wallowa-Whitman National Forest and by the Malheur National Forest on the south (USDA 1990).

The Umatilla National Forest is the home of a collection of diverse landforms and ecotypes. The Forest lies within the headwaters of four large drainage basins: Umatilla, John Day, Walla Walla, and Grande Ronde river basins. The north and south forks of the Umatilla, north and south forks of the Walla Walla, Touchet, Grande Ronde, Wenaha, Tucannon, and North Fork John Day are the local rivers. The waters of the latter are recognized for their high quality anadromous fisheries. There are also a few small lakes and reservoirs greater than five acres in size. The Forest provides timber and other wood products, water, recreation, and supports one of the largest Rocky Mountain elk herds. Elk hunting is a particularly popular activity in the area. There are also three wildernesses covering 304,400 acres, and twenty-two roadless areas total 281,000 acres (USDA 1990).

The Forest most directly influences ten counties: Asotin, Columbia, Garfield, and Walla Walla in Washington; and Grant, Morrow, Umatilla, Union, Wallowa, and Wheeler in Oregon. The local economy and lifestyle tend to revolve around agriculture, ranching, government, and the timber industry. Portions of Umatilla and Morrow counties along the Columbia River in Oregon are more industrialized (USDA 1990).

3.1.2 Herbicide Risk Assessments

The effects from the use of any herbicide depends on the toxic properties (hazards) of that herbicide, the level of exposure to that herbicide at any given time, and the duration of that exposure. The R6 2005 FEIS relied on herbicide risk assessments to evaluate the potential for harm to non-target plants, wildlife, human health, soils and aquatic organisms from the herbicides considered for use on the Umatilla National Forest.

Risk assessments were done by Syracuse Environmental Research Associates, Inc using peer-reviewed articles from the open scientific literature and current EPA documents, including Confidential Business Information. Information from laboratory and field studies of herbicide toxicity, exposure, and environmental fate was used to estimate the risk of adverse effects to non-target organisms.

Table 11 displays the risk assessments available by chemical; these may be accessed via the Pacific Northwest Region website at <http://www.fs.fed.us/r6/invasiveplant-eis/Risk-Assessments/Herbicides-Analyzed-InvPlant-EIS.htm>

Table 11. Risk Assessments for herbicides considered in this EIS

Herbicide	Date Final	Risk Assessment Reference
Chlorsulfuron	November 21, 2004	SERA TR 04-43-18-01c
Clopyralid	December 5, 2004	SERA TR 04 43-17-03c
Glyphosate	March 1, 2003	SERA TR 02-43-09-04a
Imazapic	December 23, 2004	SERA TR 04-43-17-04b
Imazapyr	December 18, 2004	SERA TR 04-43-17-05b
Metsulfuron methyl	December 9, 2004	SERA TR 03-43-17-01b
Picloram	June 30, 2003	SERA TR 03-43-16-01b
Sethoxydim	October 31, 2001	SERA TR 01-43-01-01c
Sulfometuron methyl	December 14, 2004	SERA TR 03-43-17-02c
Triclopyr	March 15, 2003	SERA TR 02-43-13-03b
NPE	May 2003	USDA Forest Service, R-5

In addition to the analysis of potential hazards to human health from every herbicide active ingredient, Forest Service/SERA Risk Assessments evaluated available scientific studies of potential hazards of other substances associated with herbicide applications: impurities, metabolites, inert ingredients, and adjuvants. There is usually less toxicity data available for these substances (compared to the herbicide active ingredient) because they are not subject to the extensive testing that is required for the herbicide active ingredients under FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act).

In some cases, toxicity data on inerts and adjuvants is produced to comply with other federal laws that regulate non-herbicide uses of these chemicals, such as the Federal Food, Drug, and Cosmetic Act.

The risk assessments considered worst-case scenarios including accidental exposures and application at maximum label rates. The project design features described in chapter 2 were developed to abate hazards indicated by the assessments. Although the risk assessments have limitations (see R6 2005 FEIS pages 3-95 through 3-97), they represent the best science available. The risk assessment methodologies and detailed analysis is incorporated into references of conclusions about herbicide toxicology in this document.

Herbicide Toxicology Terminology

The following terminology is used throughout this chapter to describe relative toxicity of herbicides proposed for use in the alternatives.

Hazard Quotient (HQ)

The definition of hazard quotient for this analysis is the ratio of the estimated level of exposure to a substance from a specific pesticide application, to the level of the acceptable exposure or toxicity. A HQ less than or equal to one is presumed to indicate an acceptably low level of risk for that specific application.

Exposure Scenario

Exposure scenarios consider both the toxicity of a given chemical and the mechanism by which an organism may encounter it. The application rate and method influences whether a person, animal or non-target plant could be adversely affected by exposure to a particular herbicide.

Plausible Effects

The analysis in chapter 3 focuses on whether effects that are possible based on risk assessments are plausible, given site conditions, life history of organisms in an area, herbicide application methods and other project design features. Project design features are often used to minimize or eliminate the plausibility of effects indicated as possible in the risk assessments.

Uncertainty Associated with Risk Assessments

SERA (2001b) discusses how the risk assessments apply generally accepted scientific and regulatory methodologies to encompass these uncertainties in predictions of risk. SERA risk assessments identify and evaluate incomplete and unavailable information that is potentially relevant to human health and ecological risks. Each risk assessment identifies and evaluates missing information for that particular herbicide and its relevance to risk estimate. Such missing information may involve any of the three elements needed for risk assessments: hazard, exposure, or dose-response relationships. A peer-review panel of subject matter experts reviews the assumptions, methodologies and analysis of significance of any such missing information. SERA addresses and incorporates the finding of peer review in the final herbicide risk assessment.

Herbicide use on the Umatilla National Forest would be below the rate thought to cause lethal or nonlethal adverse impacts. The herbicides 2,4-D and Dicamba were not approved for use in the R6 2005 ROD, and restrictions on application method for many herbicides were included in Standard 16 (ibid.). Project design features (PDFs) would ensure proposed herbicide exposures do not exceed conservative thresholds of concern for people and botanical, wildlife, and aquatic Species of Local Interest. The analysis throughout chapter 3 demonstrates that herbicide use under the proposed action is unlikely to result in exposures of concern. This is true for known infestations as well as those found in the future, because the PDFs limit the rate, type and method of herbicide application sufficiently to eliminate exposure scenarios that would cause concern, based on the site conditions at the time of treatment. The implementation planning and monitoring processes described in chapter 2 ensure that effective treatments are completed according to PDFs and undesired effects are indeed minimized.

3.1.3 Climate Change

Effects of Climate Change on Invasive Species

Global climate change is predicted to alter precipitation and seasonal temperature patterns as a result of increased levels of atmospheric carbon dioxide (CO₂) and other factors (Mote 2004). Most recent studies on the interaction between climate change and invasive plants conclude that climate change is likely to favor invasive plant species to the detriment of native plant species for individual ecosystems (Chornesky et al. 2005, Climate Change Science Program 2008, Dukes and Mooney 1999, Hellmann et al. 2008, Pyke et al. 2008). In some studies, invasive plant species have demonstrated increased growth rates, size, seed production, and carbon content in the presence of elevated CO₂ levels (Rogers et al. 2008; Rogers et al. 2005; Smith et al. 2000; Ziska 2003). Warming climates may remove elevation barriers to invasive plant distribution that currently exist (Tausch 2008).

Many invasive plants are species that can thrive in the presence of disturbance and other environmental stressors; they have broad climatic tolerances, large geographic ranges, and possess other characteristics that facilitate rapid range shifts. The predicted changes in climate are thought to contribute additional stressors on ecosystems, including those on National Forests, making them more susceptible to invasion and establishment of invasive plant species (Joyce et al. 2008).

Predicted conditions may also make management of invasive species more difficult. Some current treatments used on invasive plants may be less effective under conditions of climate change scenarios and/or elevated CO₂ (Hellmann et al. 2008, Pike et al. 2008, Ziska, Faulkner, and Lydon 2004).

It is more difficult to predict how climate change will affect invasive plants, and invasive plant management, at the local or even regional scale than are these general indications. Anticipated changes in the climate for the Pacific Northwest (e.g. more rain, less snow, warmer temperatures (Mote 2004, Mote et al. 1999, National Assessment Synthesis Team 2000)) or elevated CO₂ may not be realized at a local area, particularly within the time frame of this analysis. Growth of invasive plants under elevated CO₂ conditions will also be influenced by environmental conditions such as soil moisture, nutrient availability, and the plant community in which the invasive species occurs (Curtis, Drake, and Whigham 1989; Dukes and Mooney 1999; Johnson et al. 1994; Taylor and Potvin 1997). The complex interaction of multiple and uncertain variables make site-specific predictions speculative.

Climate change may alter the seasonal distribution of precipitation and seasonal temperature patterns in ways that could favor invasive species. In the West in particular, a warming climate may lead to an upward elevation migration of plant species. On harsher sites like lower elevation south slopes, climate change could favor spread of invasive plants because of stressed plant communities that tend to have fewer species and sparser vegetative cover. Native plant species may be lost from their lower-elevation limits faster than they will be able to migrate upward and establish into newly created habitat.

Climate change is expected to favor invasive species spread in most circumstances; however, an exception might be native species that can migrate from adjacent areas or regions into locations where they previously were excluded by climate as the new locations become more suitable. It is also possible that on more productive sites, increased precipitation could favor native plant populations by allowing them to more completely occupy sites, making invasive plants establishment more difficult.

Current science is insufficient to precisely determine a cause and effect relationship between climate change and the proposed action for the project area. A general conclusion, based on the preponderance of current literature, suggests that “most of the important elements of global change are likely to increase the prevalence of biological invaders” (Dukes and Mooney 1999). The National Forest landscape may become more vulnerable to the establishment of invasive plants infestations, actual acreage affected by invasive plants could increase, and control strategies may become less effective. Recommended management responses to these predictions are early detection (resulting from regularly scheduled monitoring) followed by a rapid response to eradicate initial infestations (Hellmann et al. 2008, Joyce et al. 2008, Tausch 2008).

Alternative A would be considered least effective at controlling the spread of invasive plants that may be encouraged by climate change factors, because it does not allow an effective ‘early detection rapid response’ strategy. There is insufficient information to discern any meaningful differences between alternatives B, C and D given that all action alternatives include control of invasive plants

with an ‘early detection rapid response’ component, and the large uncertainties regarding effects of climate change at any specific location over the time frame of this project. All actions are consistent with recommendations for management response in the face of potential influences of climate change on invasive plants.

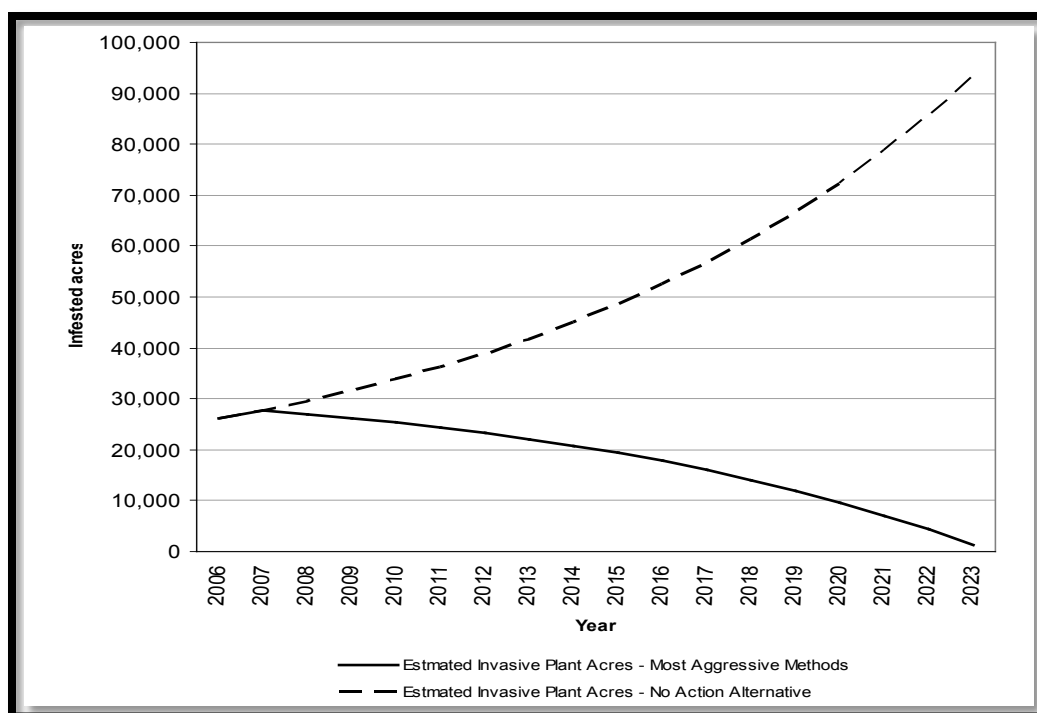
3.1.4 Treatment Effectiveness

This section describes treatment effectiveness related to each treatment type proposed in this EIS (as tiered to the R6 2005 FEIS). Forestwide, treatment effectiveness typically increases with the number of treatment options available and the percentage of infested lands that may be treated. Early detection, rapid response to newly discovered infestations also increases treatment effectiveness and reduces potential effects of herbicide treatment on non-target vegetation. The effectiveness of an alternative to treat the diverse group of invasive plants depends on the variety of tools available. Thus, alternatives that limit the variety of tools also limit the effectiveness of treatments. Strategies such as integrated weed management, cooperation with private and public landholders, prevention, EDRR and site restoration and revegetation practices apply to all alternatives proposed in this EIS and are described in this section.

The ability of the Forest Service to meet the purpose and need for action, achieve desired future conditions and contribute to cooperative efforts throughout Oregon, is directly correlated to the treatment strategy and effectiveness of invasive plant control and the ability of the impacted area to recover. Treatment strategies such as control, contain and eradicate are fully described within this EIS. Treatment types as described in chapter 2 include chemical, physical, biological and cultural. Multiple treatment methods are possible under each treatment type such as manual, mechanical, broadcast herbicide etc. and are fully described in the R6 2005 FEIS. Forestwide, treatment effectiveness typically increases with the number of treatment options available and the percentage of infested lands that may be treated. Applying the early detection rapid response process to newly discovered infestations also increases treatment effectiveness, and reduces potential future effects of herbicide treatment on non-target vegetation. The effectiveness of an alternative to treat the diverse group of invasive plants depends on the tools available within that alternative; limited tools equal limited treatment effectiveness. Strategies such as integrated weed management, cooperation with private and public landholders, prevention, and EDRR, apply to all action alternatives.

Effective treatments are defined as those that reduce the extent of invasive plants so that the area can reach its desired condition. Invasive plants are considered to be effectively controlled when acres of plant spread is less than or equal to the annual acres successfully treated (USDA, 2005b). Treatment effectiveness increases with the number of treatment options available and the percentage of infested lands that may be treated. Rapid response to newly discovered infestations also increases treatment effectiveness. Treatment effectiveness is often enhanced by using a combination of treatment methods and prevention activities applied according to IWM principles. A study by Brown et al. (2001) showed that a combination of manual or mechanical and herbicide treatments was more effective than herbicides alone when dealing with persistent species like spotted knapweed. Herbicide treatment alone was found to be most cost effective in the short-term but the combination of treatments maintained better control in the long-term. For example, biological control combined with herbicides could prove more cost effective if insects could establish and maintain long-term control. The R6 2005 FEIS suggests that with prevention standards implemented in combination with use of chemical treatments are approximately 94-96 percent effective in reducing the rate of invasive species spread (USDA 2005, and Bulkin 2006).

The Umatilla National Forest presently treats invasive weeds according to the *Umatilla National Forest Environmental Assessment for Managing Noxious Weeds* (USDA 1995). This document incorporated the integrated weed management (IWM) practices emphasizing prevention and non-chemical control strategies prior to the use of herbicides. Under this 1995 EA, 157 sites (1,339 acres) became eligible for biological treatment, 29 sites (41 acres) remained eligible for manual treatment and 587 sites (1,391 acres) were eligible for herbicide treatment using three herbicides, glyphosate, dicamba, and picloram. One additional project (1998 Eden Timber Sale) added 59 additional



invasive species sites (383 acres) approved for herbicide treatments.

Figure 10. Estimated invasive species spread for the No Action Alternative and the Proposed Action Alternatives.

Alternative A – No Action

Invasive plant sites have continued to increase over the years and, if left untreated, will continue to expand based on projections of spread (figure 10). These expanding, spreading populations would become increasingly more difficult and costly to control in the future and further degrade native plant habitats. Invasive plants would continue to displace native plant species, thereby decreasing vegetative diversity, not to mention serve as additional seed sources for new infestations both on and off federal lands. Herbicide use is limited to two herbicides approved for this alternative (glyphosate and picloram). Based on treatment effectiveness estimates (see Social Economic section later in this chapter), Alternative A would take approximately 31 years to complete treatments on the currently approved areas. Table 12 describes the number of herbicides available for use and treatment effectiveness by alternative.

Table 12. Treatment Effectiveness Indicators

Indicator	Alternative A – No Action	Alternative B – Proposed Action	Alternative C – Restricted Riparian	Alternative D – No Aerial Application of Herbicide
# of herbicide formulations available for use	2	10	10	10
Percentage of sites where all effective methods are available	0	100	88	97
Acres of proposed herbicide treatments	1,774	20,691	20,691	20,691
% of Total Forest Land Base Treated with Herbicides	0.01	0.03	0.03	0.03

About 8-9 percent of infested acres would be approved for herbicide treatments - With only 8-9 percent of the acres available for herbicide treatment and approximately only 5 percent treated with bio-control methods. All remaining acres (21,536) would need to be treated manually and would likely need multiple years of repeated treatment to control and in some cases may not ever control. This less effective method of control would likely lead to the continued displacement of native plant species and increased spread of invasive species.

Fewer treatment and herbicide options would be available - Available herbicides are not as effective on target invasive species as currently approved and proposed herbicides in other alternatives. For instance, the preferred herbicides for some of the most abundant invasive plant species would not be available for use e.g. clopyralid on knapweeds, metsulfuron methyl on houndstongue and sulfometuron methyl for medusahead. Limited use of herbicides, combined with less effective herbicides for target species would result in additional loss of native plants and habitats.

Continued spread of invasive species forest wide - The known inventory would never be controlled, and new infestations would not be promptly treated with the most effective potential methods.

Alternative B – Proposed Action

Under the proposed action alternative all currently mapped invasive plants would be treated with the most effective methods, including the 10 herbicides and surfactants approved in the Umatilla Forest Plan, with the objective to control, contain or eradicate. As directed by PDFs, the use of all treatment methods combined with prevention and restoration methods (integrated weed management) decrease existing invasive species populations over time. In addition to the increased effectiveness of treatment options, EDRR will also decrease the potential for continued spread and new establishment of invasive plants on the Forest.

More sites, acres and more effective methods would be available for treatment under this alternative compared to the no action alternative. Where feasible, this alternative also allows more broadcast spraying of herbicides than alternative C. This alternative allows aerial application of herbicides on specific identified sites which is not allowed under alternative A or D.

More acres could be treated more efficiently, therefore increasing overall treatment effectiveness where necessitated by size and density of the invasive plant population. This alternative would allow aerial broadcast spraying of herbicides on sites presently proposed that fit PDF criteria and application guidelines. Aerial spraying would more efficiently address large infestations particularly

on steep rocky slopes and soils that otherwise are difficult to access safely. Future sites identified during EDRR that are determined to need aerial treatment would require a new NEPA analysis and decision.

Expected effectiveness of this alternative combined with projected annual rate of spread would address the public concerns of continued spread of invasive species across the Forest (figure 11 this section).

The known inventory could be controlled in approximately 19 years if 4,000 acres per year were treated with herbicides annually (methodology in Social Economic section later in this chapter).

Alternative C – No Broadcast Herbicide Treatment in Riparian Areas

With this alternative there is an increased potential for spread in riparian areas that could serve as a source to infest upland sites. This would likely result in more herbicide treatment over time and add cost to the project; however, the effectiveness of this alternative is significantly greater in comparison to the no action alternative because it authorizes treatment of many more known infestations and allows for herbicide use of EDRR sites prohibited under the no action alternative.

The elimination of broadcast treatment as an option in this area would reduce the effectiveness of the treatment especially for species that are widespread and where the seedbank or underground vegetative parts are capable of prevalent re-establishment in future years (such as yellow starthistle). Effectively controlling species that exhibit this type of growth morphology would require multiple repeated treatments over a period of years.

Expected effectiveness of this alternative in combination with projected annual rate of spread is expected to be much higher than the no action alternative and more similar to effectiveness of alternative B because of more sites are approved for a variety of different treatment options in combination with EDRR strategy. Although there is a potential for less effective treatments to be used in the areas where broadcast methods are not possible, these estimates are worst case scenarios and it is likely that not all of these acres could be or would be broadcast treated.

The costs would be higher under this alternative (see economic analysis), but overall effectiveness would likely be similar to the Proposed Action. Limitations on broadcast spraying would affect up to 12 percent of the known acres.

Alternative D – No Aerial Herbicide Treatment

The elimination of the aerial treatment method in currently mapped and future sites could reduce the effectiveness of treatment in these areas because some sites may not ever be treated due to safety issues or costs associated with alternative methods of treatment (i.e. hiking in with backpack sprayers). These sites may also be dropped to a lower priority for treatment due to cost factors.

Due to the steepness and remoteness of these proposed aerial sites the use of mechanical equipment such as ATVs for broadcast treatment or mowers is not possible. Therefore, any treatment of these areas would require work crews to hike in and treat the areas and if the terrain is too steep and poses a safety hazard the area will not be treated. The elimination of aerial treatment reduces treatment effectiveness in these areas now or in the future due to the potential inability to treat either from a safety or monetary standpoint. Sites that are presently proposed for aerial herbicide application consist of high priority aggressive invasive species (spotted and diffuse knapweeds and yellow starthistle), if left untreated expected increase in these infested acres is anticipated.

Estimates of effectiveness associated with this alternative in combination with projected annual rate of spread is expected to be much higher than the no action alternative and more similar to effectiveness of alternative B because of more sites are approved for a variety of different treatment options in combination with EDRR strategy. Although there is a potential for less effective treatments to be used in the areas because the proposed aerial sites would be treated with the most efficient methods, the presently proposed areas would still receive treatment (via backpack sprayers or other methods). Additionally there is a potential for unknown future sites to establish where access issues may be a problem however, EDRR strategies are expected to address these issues in most cases and quickly eradicate areas before they are spread. This alternative is also expected to effectively address public concerns that the increase of invasive species across the forest would continued. Except for the aerial sites, treatment effectiveness would likely be similar to the Proposed Action. Except for the aerial sites, treatment effectiveness would likely be similar to the Proposed Action.

3.1.5 Cumulative Effects Analysis Overview

Introduction

This section is a general discussion of cumulative effects for this project; whereas each of the following resource sections includes a resource-specific cumulative effects discussion. Cumulative effects are defined as: *the incremental impacts of the proposed action and alternatives when added to effects of other actions both on National Forest System lands and other adjacent Federal, State, or private lands* (40 CFR 1508.7). Adverse and beneficial direct and indirect effects are predicted as a result of implementing any of the alternatives (and are discussed at length throughout chapter 3). How these effects might interact with other actions is difficult to discern because invasive plants are dynamic; some infestations may stay relatively static for a time, at the same time other infestations may be expanding rapidly, and new infestations may be introduced in areas that are not currently infested. In addition, ongoing land uses are likely to result in continued introduction and spread of invasive plants and natural events such as drought, weather events, and wildfires, also affect the spread of invasive plants.

There are 42 invasive weed sites (approximately 3,600 acres) proposed for treatment on the Forest that are adjacent to other land ownerships. These invasive sites likely cross property lines and infest the other landowners' properties as well. Effective treatment of these areas would reduce the potential for spread onto the other ownerships. Effective treatment of adjacent populations of invasive plant species off Forest System lands would increase the effectiveness of the overall treatment.

Alternative A would not result in cumulative beneficial effects from effectively treating these populations. Alternative B would have the greatest potential effectiveness. Restrictions in Alternatives C and D may result in less cumulative benefit of integrated treatments occurring on and off Forest. Spread of invasive plants would result in increased future costs to the Forest Service and thus to tax payers to treat larger, more widespread populations that would continue to develop over time.

The specific timing, place and prescription for invasive plant treatments using the EDRR process are not known. A catalog of foreseeable actions for the life of the project is not possible to detail because of inherent uncertainty in predicting future actions. Thus, the cumulative effects analysis must rely on certain assumptions and past reports to characterize the potential cumulative effects of the alternatives.

CEQ regulations do not require the consideration of the individual effects of all past actions to determine the present effects of past actions. With respect to past actions, during the scoping process and subsequent preparation of the analysis, the agency must determine what information regarding past actions is useful and relevant to the required analysis of cumulative effects. Cataloging past actions and specific information about the direct and indirect effects of their design and implementation could in some contexts be useful to predict the cumulative effects of the proposal. The CEQ regulations, however, do not require agencies to catalogue or exhaustively list and analyze all individual past actions. Simply because information about past actions may be available or obtained with reasonable effort does not mean that it is relevant and necessary to inform decision making (40 CFR 1508.7).

Human activities are known to have influenced the spread of invasive plants into North America, the Pacific Northwest and specific sites within the project area. A catalog of past actions is not necessary to understand how land uses have contributed to the current distribution of invasive plants. The vectors and mechanisms of invasive plant spread are discussed at length in the R6 2005 FEIS. This FEIS tiers to that document; therefore, the cumulative effects analysis in the R6 2005 FEIS is hereby incorporated by means of this reference. The baseline for cumulative effects analysis is the current condition as described in the affected environment sections throughout chapter 3.

In terms of present and foreseeable future actions, the analysis assumes that current land uses will continue. On the Umatilla National Forest, invasive plant prevention measures will be applied to land uses and activities, which would help address specific vectors of invasive plant spread. Invasive plant prevention measures, including those currently implemented on the Umatilla National Forest, are predicted to reduce rates of, but not stop, invasive plant spread (R6 2005 FEIS). However, Forest Service projections suggest recreational use of roads and trails, both motorized and non-motorized will continue to increase and will continue to be conduits for the distribution of invasive plants. Other land management and use activities such as grazing, vegetation management, fuels management (Healthy Forest Initiative), wildfire, and fire suppression will continue to cause ground disturbances that can contribute to the introduction, spread and establishment of invasive plants on National Forest System lands (USDA 2005). Many of these uses and activities on adjacent ownerships will continue in the vicinity of the Umatilla National Forest.

All invasive plant treatment methods have the potential for minor, short-term adverse effects to non-target plants, including SOLI; can result in disturbance to wildlife; can accelerate erosion through ground disturbance and impact water quality/aquatic organisms; have the potential to injure a worker or result in other accidents; create jobs and cost money. The focus of the following section is on the cumulative effects of herbicide use. The potential for non-herbicide treatments to result in effects of concern to the public is very low. The potential for cumulative effects from such treatments were discussed in the R6 2005 FEIS and are incorporated by reference.

Existing Herbicide Use in Oregon and Washington

Herbicides are commonly applied for a variety of agricultural, landscaping and invasive plant management purposes. Herbicide use occurs on tribal lands, state and county lands, private forestry lands, rangelands, utility corridors, road rights-of-way, and private property. Studies (see sections below) have shown that pesticides are commonly found in surface waters. However, no studies have shown that the herbicide use proposed in this project would result in harmful concentrations of herbicide in water. The likelihood that this project would contribute to measurable, detectable herbicide concentrations in downstream waters from any of the alternatives is low. The extent of treatment in relation to the size of the total Umatilla National Forest landbase is small: less than 0.03 percent of the total Umatilla National Forest landbase would be treated annually with herbicides

under any of the action alternatives. Herbicide use on national forests is a small fraction of total herbicide use (R6 2005 FEIS estimated 3 percent of the herbicide use within Oregon and Washington is on national forests).

The following section discusses herbicide use in the state of Oregon (no comparable database for Washington state herbicide use exists). Beginning in 2007, the State of Oregon required Pesticide Use Reporting to a centralized database (http://www.oregon.gov/ODA/PEST/purs_index.shtml). Reporting requirements applied to those who use pesticides in the course of business or any other for-profit enterprise, to government entities, and for use in locations intended for public access. Herbicide use was reported at the large river basin scale. The reporting system has since been discontinued, and the data inconsistencies were reported (ibid). However, the report does provide a way to contrast the potential for herbicide use under the alternatives to total use at the river basin scale. For 2007, approximately 5,732 reporters filed 284,984 reports of pesticide use into the Oregon System. Approximately 551 active ingredients were used in the State. The top five active ingredients, by pounds, for the entire State were:

- Metam-sodium (42%) [soil fumigant],
- Glyphosate (9%) [herbicide],
- Copper naphthenate (7%) [wood preservative],
- 1, 3-dichloropropene (5%) [soil fumigant], and
- Aliphatic petroleum hydrocarbons (4%) [insecticide].

Of these, glyphosate is the only herbicide. It was the second-most used active ingredient and accounted for 9 percent of all pesticide use reported statewide. The vast majority was agricultural use. Statewide reported glyphosate use was over 3.5 million pounds.

The Umatilla National Forest lies primarily within the Middle Columbia, John Day and Lower Snake River water basins. Pesticide use in Washington is not accounted for by the Oregon report. Pesticide use in the Middle Columbia Basin was by far the highest of any basin in Oregon, due to the predominant agriculture use, with over 22 million pounds of active ingredients applied. Of the top five ingredients used in this water basin, glyphosate is the only herbicide that is also proposed for use on the Umatilla National Forest. Just over 1.5 million pounds of glyphosate was used in the basin. In the John Day Basin, there were almost 153,000 pounds of glyphosate applied.

By contrast, the entire Umatilla National Forest applied 3 pounds of glyphosate in 2007 (FACTS Pesticide Use Report 2007). This level of use would continue under No Action (alternative A). At the typical application rate, glyphosate is proposed for use on an average of 4,000 acres per year on the Umatilla National Forest under this project, which would amount to about 8,000 pounds per year. A portion of this total would contribute to the total amount used in each water basin, but this additional glyphosate use is very unlikely to contribute to any cumulative effects. Glyphosate is quickly taken up by plants or bound up with soils, so that it is not mobile in the environment very soon after application. Effects of glyphosate from invasive plant treatments are very limited in time and space to the immediate area of the treatment. If vegetation adjacent to or emergent from flowing water is treated, glyphosate may be detected downstream from the treatment. However, very likely it is bound to organic matter and not biologically active and very unlikely to cause any effect. Therefore, glyphosate use as proposed in the action alternatives would not create cumulative effects with glyphosate use from other lands in the water basins.

Similarly, the effects (if any) from use of other herbicides in the action alternatives, are very unlikely to accumulate with potential effects from herbicide use in other areas because of the limited spatial

and temporal scale at which use would occur. Most of the proposed herbicides have limited mobility in the environment so effects would be restricted to areas immediately adjacent to the treatment sites. The project design features and buffers ensure that harmful levels of herbicide would not enter surface waters or harm species of local interest. Most of the herbicides proposed for use do not persist in the environment for more than a few weeks or months, and those that remain longer have PDFs limiting the frequency of use so that effects do not accumulate at the treatment site.

Three other herbicides proposed for use in the alternatives are within the top 100 reported statewide in 2007: imazapyr, sulfometuron methyl, and triclopyr. Few acres are currently proposed for use of imazapyr in the alternatives; sulfometuron methyl is an effective herbicide for about 56 acres of known sites on the Umatilla National Forest (amounting to about 2.5 pounds of herbicide active ingredient total, as compared to 2007 statewide use of more than 21,000 pounds); and triclopyr is an effective herbicide on about 193 acres of known sites (amounting to 193 pounds of herbicide active ingredient total, as compared to 2007 statewide use of nearly 216,000 pounds).

These data demonstrate the low amount of herbicide use compared to river basin or statewide use. The Forest Service contribution to this amount would remain low in all alternatives (between 3 and 8,000 pounds per year of glyphosate, for example, compared to 153,000 pounds in the John Day Basin and over 3.5 million pounds statewide).

No water quality issues related to pesticides have been identified for waters in the project area (none of the streams in the area are 303d listed for chemical contamination). However, detectable levels of pesticides are likely to currently exist within rivers on the Umatilla National Forest, based on the studies described below:

NWQAP Pesticide Study

Since 1991, the National Water Quality Assessment Program (NWQAP) has implemented interdisciplinary assessments in 51 of the Nation's most important river basins and aquifers, referred to as Study Units, and the High Plains Regional Ground Water Study (see accompanying map and list of studies). Collectively, these areas account for more than 70 percent of total water use (excluding thermoelectric and hydropower) and more than 50 percent of the population's supply of drinking water. The areas are representative of the Nation's major hydrologic landscapes, priority ecological resources, and agricultural, urban, and natural sources of contamination.

The USGS published a report: "Pesticides in the Nation's Streams and Ground Water, 1992–2001" (Gillom and others 2006) that presented evaluations of pesticides in streams and ground water based on findings for the first decadal cycle of NAWQA. The study found that undeveloped streams had one or more detectable pesticides or degradates 65 percent of the time. The study stated that presence of pesticide compounds in predominantly undeveloped watersheds⁷ may result from past or present uses within the watershed for purposes such as forest management or maintenance of rights-of-way, uses associated with small areas of urban or agricultural land, or atmospheric transport from other areas. None of the herbicides proposed for use in this project were detected in the national samples (however it is acknowledged that glyphosate is widely used but was omitted from the study).

The report discusses the many delivery mechanisms of pesticides to surface and ground water:

Pesticides are transported to streams and ground water primarily by runoff and recharge. Nonpoint sources of pesticides originating from areas where they were applied—rather than

⁷ Refers to urban and rural developments; roads and forest management activities may be occurring in these areas.

point sources such as wastewater discharges—are the most widespread causes of pesticide occurrence in streams and ground water (Modified from Majewski and Capel 1995). The atmosphere is often overlooked as a source of pesticides, which return to earth with precipitation and dry deposition and can reach streams and ground water. Streams are particularly vulnerable to pesticide contamination because runoff from agricultural and urban areas flows directly into streams along with both dissolved and particle-associated pesticides. Ground water is most susceptible to contamination in areas where soils and the underlying unsaturated zone are most permeable and drainage practices do not divert recharge to surface waters.

The study also stated:

Pesticide occurrence in streams and ground water does not necessarily cause adverse effects on aquatic ecosystems or humans. The potential for effects can be assessed by comparing measured pesticide concentrations with water-quality benchmarks, which are based on the concentrations at which effects may occur. No streams draining undeveloped land, and only one stream in a watershed with mixed land uses, had an annual mean concentration greater than a human-health benchmark.

Clackamas River Pesticide Study

Closer to home, a study about the background levels of pesticides in surface waters was done on the Clackamas River, part of the Willamette River Basin in western Oregon. The Pesticide Occurrence and Distribution in the Lower Clackamas River Basin, Oregon, 2000–2005 (Carpenter and others 2008) was done as part of the NAWQA.

The Clackamas study took place from 2000–2005. Within 119 water samples from the Clackamas and its tributaries, 63 pesticide compounds: 33 herbicides, 15 insecticides, 6 fungicides, and 9 pesticide degradates were detected. Fifty-seven pesticides or degradates were detected in the tributaries (mostly during storms), whereas fewer compounds (26) were detected in samples of source water from the lower mainstem Clackamas River, with fewest (15) occurring in drinking water.

The study stated that the two most commonly detected pesticides were the triazine herbicides simazine and atrazine, which occurred in about one-half of samples. It also said that the active ingredients in the “common household herbicides” RoundUP™ (glyphosate) and Crossbow™ (triclopyr and 2, 4-D) also were frequently detected together. These three herbicides often made up most of the total pesticide concentration in tributaries throughout the study area.

Pesticides were most prevalent in the Clackamas River during storms, and were present in all storm-runoff samples — averaging 10 individual pesticides per sample from these streams. Two tributaries contained 17–18 different pesticides each during a storm in May 2005. These medium-sized streams drain a mix of agricultural land (row crops and nurseries), pastureland, and rural residential areas. Two small streams that drain the highly urban and industrial northwestern part of the lower basin had the greatest pesticide loads. Streams draining predominantly forested basins contained fewer pesticide detections (2–5 pesticides). The study stated that pesticide use on the Mount Hood National Forest, which comprises most of the Federal land in the upper Clackamas River Basin, was a relatively insignificant contribution.

None of the detections related to any of the herbicides proposed for use on the Umatilla NF were above a threshold of concern in the Clackamas study. However the study noted that the thresholds do

not account for simultaneous exposure to multiple pesticides and degradates, and that it is difficult to determine the cumulative effect of such a mixture.

The Clackamas River has a different mix of land uses and is in a different biological region than rivers on the Umatilla National Forest. However, similar to the Clackamas situation, Forest Service invasive plants treatments are likely insignificant to the overall presence of pesticides in surface waters, and the type of herbicides proposed for use are those that have not been found to accumulate downstream in concentrations over a threshold of concern. The effects analysis acknowledges that storm runoff is a delivery mechanism of herbicides to surface waters.

BLM Herbicide Use Proposals

The Bureau of Land Management has proposed vegetation treatments using herbicides on BLM lands in Oregon. Five alternatives, including continuation of current use and no herbicide use, are being considered in a Draft EIS published in 2009. The BLM currently uses herbicides to treat noxious weeds on approximately 9,700 acres east of the Cascade Mountains in Oregon. They propose to increase this use to up to 39,800 acres under the action alternatives (including use for invasive and native plant control). The herbicide use proposals are not specific enough to use to model cumulative effects at the watershed scale; the BLM Draft EIS notes that their contribution to cumulative effects would also be relatively low compared to other statewide use.

Scientific Basis for Cumulative Effects Analysis

The cumulative effects analyses throughout chapter 3 are based on assumptions about herbicide use given the information available. The previous discussions make clear that pesticides occur at some level in streams and rivers within and adjacent to Forest System lands. At the current time, beneficial uses of surface waters on the Umatilla National Forest are not adversely affected by pesticide use. The baseline for cumulative effects analysis is the current condition.

The cumulative effects analysis assumes that invasive plants will be treated off Forest System lands using integrated methods, including herbicide. Herbicide applicators would likely be repeatedly exposed to herbicides. Other people and animals could theoretically be exposed to repeated doses of herbicides. However, risk assessments and the R6 2005 FEIS found that repeated exposures would not result in cumulative effects because the herbicides proposed for use are rapidly eliminated from the bodies of people and animals. For effects of repeated exposures to be additive, the repeated exposure would have to be simultaneous, such as a person contacting herbicide directly, while eating sprayed vegetation and drinking contaminated water.

AgDisp⁸ modeling and field monitoring both indicate that effects from drift would be limited to the immediate time and place where herbicides are applied. AgDisp modeling results indicate the concentration of herbicides drops off to very low levels within 200-300 feet of aerial application sites (see discussion under water quality). Previous monitoring studies show drift from aerial applications to actually travel less than 60 feet under similar conditions to those expected for this project (ODF 2004). AgDisp modeling also indicates that the concentration of herbicide reaches very low levels within 100 feet from ground broadcast treatment sites (see figure 19). Several factors influence drift, including weather, equipment, and height at which the spray is released. During broadcast applications, applicators would endeavor to minimize or eliminate drift so that non-target plants

⁸ AgDisp is a model developed by the Forest Service to predict how far drift may travel and impact non-target resources given aerial spray of different herbicides under specific conditions. More information on AgDisp is provided in the Soil and Water later in this chapter.

growing away from the infested area are not likely to be killed. Drift would be virtually eliminated with spot and selective treatments that direct spray to individual plants.

Monitoring of aerial treatments was conducted on national forests in Montana. Continuous automated water samples were taken after aerially spraying Mormon Ridge area of the Lolo National Forest. Analysis of the water samples (conducted by the Montana Department of Public Health and Human Services Chemistry Lab) indicated no herbicide entered the stream to a detection level of 1 part per 10 billion (U.S. Department of Agriculture-FS 1996). No picloram was detected in Mormon Creek when tested at a level 5,000 times lower than the Montana Water Quality standard. Drift cards were also placed along Mormon Creek to monitor drift toward the creek. The cards indicated that no detectable drift reached the creek.

The Mormon Ridge pilot project area was aerially treated with picloram again in 1999 and 2003 to control weeds that germinated from the soil seed bank after the herbicide decomposed. The same mitigation measures were used to protect Mormon Creek. Drift cards did not detect herbicide within 150 feet of Mormon Creek in 1997 and 300 feet in either of the successive applications.

In addition to Mormon Ridge, 24 other aerial herbicide projects have been conducted on the Lolo National Forest between 1992 and spring 2005. On 12 of those projects, herbicides were aerially applied within 300 feet of live water or other sensitive resources. Thirty-six drift card lines were placed and monitored to ensure herbicides did not reach the identified sensitive resource (usually water). Thirty-five of these lines indicate that herbicide did not reach the sensitive resource. One drift card line showed 1percent detection at 0 feet from a small low flow unnamed creek.

Bitterroot National Forest Aerial Application Monitoring: On 9/30/04 and 10/1/05, the Bitterroot National Forest (USDA 2005) implemented an aerial spray project in two areas to control weed species. Water quality sampling was carried out before, during, and after the aerial spraying on both of the sites treated that fall 2005. Three-hundred-foot-wide riparian buffer strips were established and marked with white feed sacks for pilot identification. Drift cards were placed at set intervals across the buffer, between the stream and the marked line. Results from the lab indicated herbicide detection as “below detection limit” for all tested chemicals in all samples. No herbicides used in the spraying operation were detected in the water samples. All drift cards were visually scanned for droplet presence. No cards were found with visible droplets after the spray treatments.

Herbicide use along streams and roadside ditches may also result in some runoff reaching streams. Herbicide use (10 acres along 1.6 miles of stream) was modeled in the risk assessments and at the project scale to indicate how much herbicide might reach the water and the potential for aquatic organisms to become exposed for harmful concentrations of herbicide. Where potential for harm might exist (HQ over 1 in the SERA Risk Assessments), PDFs and buffers were established to eliminate the scenario of concern. Project modeling results also indicate there is no potential of herbicide used in this project to wash or run off, enter surface waters, and combine with other chemicals in a harmful manner (see Soils and Water and Aquatic Organisms sections later in chapter 3). The PDFs and buffers address uncertainty about the time, place and exact nature of treatment at any one time.

The acreage proposed for treatment is relatively small and the invasives to be treated are widely scattered. This also dilutes the potential for impacts from this project to overlap with impacts of other projects. Therefore, while this project may occur throughout the Forest and over an extended period of time, the impacts (if any) at any one time and place are very small. This limits the potential for this project to combine with another project and cause cumulative adverse effects on people or the environment.

Summary

In summary, factors that limit the potential for cumulative effects from herbicide use proposed in the action alternatives include the following:

- The risk of adverse effects of invasive plant treatments in all action alternatives have been minimized by the project design features (PDFs). Buffers minimize risk of herbicide concentrations of concern near water (specific PDFs and buffers can be reviewed in chapter 2.2.3). The project design features and buffers eliminate the potential for new infestations or spread of existing infestations to result in exposures beyond those analyzed in the EIS. These exposures are small in context of overall herbicide exposure likely found downstream and are not likely to cause harm to people or the environment.
- In general, invasive plant sites are small and scattered. Sixth field watersheds within the project area containing more than 10 acres of riparian infestations were reviewed and in all cases, infestations near surface waters were also found to be small and scattered. This dilutes the potential for impacts at the 6th field watershed scale, which is the scale that is most meaningful as an indicator of cumulative effects to water quality.
- Assuming private landowners are using herbicides according to label, and based on the 2007 data that shows glyphosate would likely make up the majority of use, potential for additive exposures to result in cumulative adverse effects is low. Glyphosate is not biologically active once it binds to organic matter and is rapidly absorbed by target plants.
- Early detection rapid response is part of all action alternatives, and is considered in the direct, indirect and cumulative effects analysis. Effects of treatments each year under early detection rapid response, by definition, would not exceed the annual and life of the project caps. These caps further restrict the spatial and temporal extent of impacts from this project.
- Multiple herbicide exposures on Forest System lands are unlikely to occur in close enough proximity in time or space with other applications to trigger cumulative effects beyond those analyzed and disclosed in the risk assessments and impact statements. Infestations that cross ownership boundaries are often treated cooperatively, reducing the number of times an area is entered and therefore limiting the effects from treatment activities.

3.1.6 Incomplete and Unavailable Information

Any project involving herbicide use in a natural setting will contain many sources of uncertainty. The diversity of invasive plant species is large and compounded by wide range of ecological conditions in areas where treatments may occur. Data on herbicide toxicity and environmental fate is limited to those conditions and species tested for registration purposes and investigated by independent researchers. Available data on surfactants, inerts, and dyes is even more limited. It is not possible to obtain all the data necessary to significantly reduce this incomplete and unavailable information. For example, the sheer number of species and single herbicide test combinations is overwhelming; numbering over 450 for just the wildlife that are federally listed as Threatened or Endangered under the Endangered Species Act, and Forest Service Sensitive on the Umatilla National Forest. Each rigorous laboratory test conducted to determine the toxicity of a chemical to an animal is extremely expensive. If we add to this data required to more adequately address synergistic, additive, or antagonistic effects from chemical combinations, it is clearly not possible to obtain all data that would be relevant to making a decision.

In addition, invasive and native plants, wildlife, soil and water bodies are dynamic resources that change locations and characteristics depending upon time, season, weather patterns, land use activities, random events, and other influences. This limits our ability to precisely predict effects

(e.g. amount and duration of herbicide exposures, spread and impact of invasive plants, nature and amount of background contamination, etc.) even if more toxicity information were available.

In response to this uncertainty, adverse effects to organisms are assumed to occur at doses well below lethal levels, using the best available models for predicting herbicide concentrations in water using worst case scenarios, relying on widely used and accepted risk assessment methodology, and including project design features that restrict certain applications and require some monitoring.

Plants

Data on the susceptibility of different non-target plant species and families to particular herbicides is conducted with agricultural crop species and not those that may better represent non-target plants in the natural environment. Specific locations of rare plants, as well as invasive plants, change from year to year, making it impossible to precisely predict risk from treatments. The current analysis uses the best available science on susceptibility, herbicide drift, and risk assessments to determine likely effects. Required project design features, monitoring, and practical information and expert opinion are utilized in response to the uncertainty.

Terrestrial and Aquatic Organisms (Fish and Wildlife)

Research has not been conducted on the effects of these herbicides to most free-ranging wildlife species, so the relevant data to specifically evaluate effects to different wildlife species is incomplete or unavailable. Specifically,

- There are no data on herbicide effects to reptiles or butterflies found in Region Six.
- There are only limited data available on herbicide effects to amphibians found in Region Six.
- Analysis of effects for any project involving herbicide use relies upon extrapolations from laboratory animals to free-ranging wildlife and controlled conditions to the natural environment.
- There are more data available for mammals than for birds, which require the use of mammal toxicity values in bird exposure scenarios for some of the herbicides considered in this FEIS.
- Very few studies are available on sublethal effects to fish from acute exposures. Of studies that are available, some indicate temporary effects at low herbicide concentrations (e.g. Tierney et al. 2006).

Better estimates of risk could be calculated if laboratory data on the toxicity of the herbicides considered in this FEIS were available for more groups of animals and more individual species. We would have more information on the comparative sensitivities of different wildlife groups and the types of adverse effects that may occur in different species.

However, because of the dynamic nature of wildlife and their habitat (behavior, weather, nutrient availability, contaminant presence, etc.), significant uncertainties would remain for predicting short and long-term reactions to herbicide presence in natural settings even if more laboratory data were available.

Limitations notwithstanding, there exists substantial scientific data on the toxicity of these herbicides to birds and mammals, and some amphibians and some invertebrates. The data is generated by manufacturers to meet EPA regulations before an herbicide may be registered for use, and by independent researchers that have published findings in peer-reviewed literature. This data is then analyzed according to standard risk assessment methodology to reach a characterization of risk for

each herbicide. The summary of the available scientific evidence and our evaluation of reasonably foreseeable impacts are detailed in the following sections.

Soil and Water Resources

Herbicide toxicity and fate varies with environmental variables such as pH, temperature, and presence or absence of organic matter. These variables fluctuate widely depending upon season, weather, disturbance, adjacent land uses, and other factors, making precise predictions of existing conditions and effects impossible. Data on effects to soil organisms is limited and may not reflect the actual community of organisms present at any given treatment site. In response to this uncertainty, the current analysis uses the best available scientific information on soil mapping, watershed analysis, water monitoring, and the best available predictive models for potential contamination and drift. In addition, project design features are added to action alternatives to restrict herbicide ingredients, application method, and/or rate on certain soils and in proximity to water.

Human Health

Toxicity data is not obtained on humans directly, but rather extrapolated from laboratory animals using standardized tests required by EPA. Human susceptibility to toxic substances can vary substantially. In response to this uncertainty, standard risk assessment methodology assigns uncertainty factors to toxicity data to account for extrapolation from laboratory animals and for sensitive individuals. However, some individuals may be unusually sensitive; so individual susceptibility to the herbicides proposed in this EIS cannot be predicted specifically. Factors affecting individual susceptibility include diet, age, heredity, pre-existing diseases, and life style. In response to this uncertainty, measures designed to reduce the likelihood or amount of exposure are required in this EIS. EPA-approved labels list protective gear required when herbicides are applied and project design features in this EIS and in the forest plan amendment (2005) restrict application methods, locations, and require public notification of applications.

3.2. Botany

Changes between the DEIS and FEIS for Section 3.2

Section 3.2.1 adds a table displaying issues identified by the public and indicators for Botany

Section 3.2.4 Impacts of Treatments to Native Vegetation including SOLI – This section combines information found in the draft in sections 3.2.4-3.2.6; rewritten for ease of reading based on public comment and internal review. Treatment Effectiveness was removed from this section to chapter 1. Information about Colony Collapse Disorder was added

3.2.1. Introduction

This section discloses the potential risks to non-target vegetation, including botanical species of local interest (SOLI: threatened and endangered species, regional forester sensitive species and other species of local interest). The following table summarizes the indicators for public issues related to botany and treatment effectiveness. All of the alternatives may impact sensitive plant species and habitats. Alternative A has the greatest potential to adversely affect botanical SOLI because invasives would continue to threaten SOLI at 44 existing sites and new sites would not be effectively treated. The action alternatives would reduce risks for invasives at these sites; however there is some risk that herbicides would kill or injure parts of individual non-target plants. Project design features are in place to provide protection measures to prevent non-target impacts, especially SOLI.

Since the time the DEIS was circulated, there have been changes to the TES lists. These changes are ongoing and will be considered during implementation. Regional policy is that these changes need not be considered in ongoing environmental analysis.

Table 13. Summary of indicators for public issues related to botany

Issue Component	Unit of Measurement	(No Action) Alternative A	(Proposed Action) Alternative B	Alternative C	Alternative D
4 - Effects on Non Target Plants	Character and effectiveness of PDFs that apply to wildlife and plants	Herbicide exposure limited because herbicide treatment limited by only being used if non-herbicide treatments are ineffective; PDFs not specifically applied to this alternative	PDF Group I minimizes non-target botanical species impacts by reducing potential for damage from drift or run off in specific locations. Some individual sensitive botanical species may be impacted but risks from invasives would be abated at all 44 sites currently threatened	In addition to alternative B, herbicide exposure further minimized by eliminating broadcast applications methods in riparian areas	In addition to alternative B, herbicide exposure further minimized by eliminating aerial application of herbicides and the potential for associated drift
	Acres of broadcast spraying	1,774	17,478	14,456	18,153
	Acres of Aerial Spraying	0	675	675	0

3.2.2. Affected Environment

An invasive plant is a non-native plant whose introduction does or is likely to cause economic or environmental harm or harm to human health (Executive Order 13112). Invasive plants are distinguished from other non-native plants in their ability to spread (invade) into native ecosystems. Some species of invasive plants are listed by the Secretary of Agriculture or by the responsible State official as “noxious weeds.” This analysis includes all State-listed noxious weeds plus other invasive species that are of concern because of their impacts to ecosystem health. The term “invasive plants” more broadly encompasses all invasive, aggressive, or harmful non-indigenous plant species, whether designated noxious or not.

Invasive plants pose threats to biological diversity of native plant communities by altering ecosystem processes, and can completely displace native plant species and cause a decline in overall species richness. Invasive plants are highly adept at capturing available moisture and nutrients, and often spread quickly. They have been detected on approximately 24,649 acres of the 1.4 million-acre Umatilla National Forest located in northeast Oregon and southeast Washington.

Presently, 20 different invasive plant species are known to occur within the boundaries of the Forest (table 14). In the past 13 years, about 3,000 invasive plant sites have been mapped covering approximately 25,000 gross acres. Additional invasive plant sites likely exist but have not yet been detected by annual inventory and mapping efforts. Some species, such as cheatgrass (*Bromus tectorum*), North Africa grass (*Ventenata dubia*) and Russian and Canada thistle (*Salsola kali* and *Cirsium arvense*, respectively), occur in such abundance that many sites have either not been mapped or have been dropped from existing databases and vary from district to district. These species are sometimes considered as low priority for treatment due to task force and/or monetary constraints, or species naturalization.

Infestation sites range in size from one plant to numerous plants scattered over large acreages (see table 15). The majority of inventoried sites (77 percent) are less than 10 acres in size. Infestations located in high-spread areas such as, roadsides, trails, quarries, range structural improvements, developed recreations sites, and parking areas represent 50 percent of the total acres infested (12,339 acres). The remaining acres are found throughout forest lands. Table 16 provides a forest-wide invasive plant summary by species, priority and acres. It lists the primary target species that have the greatest abundance or highest priority at each particular treatment site. Multiple species can and do occur within a primary target species site. Each Ranger District determines invasive species priority ranking based on local circumstances. Priority ranking differences among species can vary based on whether a species is established on a district, rapidly expanding and invading into native plant and wildlife habitats, or whether a species is a new invader that needs to be controlled before it becomes established. Although Table 16 lists current species priority, this ranking can change in the future to adjust to changing environmental conditions or management activities.

Table 14. Invasive plant species documented from inventory efforts and the number of sites within each district

Scientific Name	Common Name	Districts Number of sites			
		Heppner	Pomeroy	North Fork John Day	Walla Walla
<i>Articum minus</i>	Lesser burdock	7	1	3	6
<i>Cardaria draba</i>	Whitetop		2	6	1
<i>Carduus nutans</i>	Musk thistle			2	3
<i>Centaurea stoebe</i>	Spotted knapweed	1	54	63	98
<i>Centaurea diffusa</i>	Diffuse knapweed	442	151	131	463
<i>Centaurea repens</i>	Russian knapweed				1
<i>Centaurea solstitialis</i>	Yellow starthistle		22	2	18
<i>Chondrilla juncea</i>	Rush skeletonweed				3
<i>Cirsium arvense</i>	Canada thistle	15	48	26	240
<i>Cynoglossum officinale</i>	Houndstongue	10	26	110	154
<i>Cytisus scoparius</i>	Scotch broom	3			2
<i>Euphorbia esula</i>	Leafy spurge			2	53
<i>Hieracium caespitosum</i>	Meadow hawkweed				4
<i>Hypericum perforatum</i>	St John's wort	242	36	36	247
<i>Linaria dalmatica</i>	Dalmatian toadflax	82	29	7	6
<i>Linaria vulgaris</i>	Butter and eggs	4	1	8	1

Scientific Name	Common Name	Districts Number of sites			
		Heppner	Pomeroy	North Fork John Day	Walla Walla
<i>Onopordum acanthium</i>	Scotch thistle	6	19	8	6
<i>Potentilla recta</i>	Sulphur cinquefoil		2	88	62
<i>Senecio jacobaea</i>	Tansy ragwort	3	7	11	70
<i>Taeniatherum caput-medusae</i>	Medusahead			4	15
Total (individual species occurrences)		815	398	507	1453

Table 15. Range of invasive plant site sizes

Size of Infestation	Number of Invasive Plant Sites	Percent of Known Sites
Less than 1 acre	531	26
1 to <5 acres	814	39
5 to < 10 acres	247	12
10 to < 50 acres	370	18
50 to < 100 acres	64	3
More than 100 acres	43	2
Total	2,069⁹	100%

Table 16. Primary target invasive plant species on the Umatilla National Forest by species priority and acres

Primary Target species	Priority	Number of sites	Acres	Estimate Net infested Acres	Other Documented Invasive Plant Species within a priority site (one or all)
Lesser burdock	3,4	17	184	46	
Whitetop	1,3	9	104	57	diffuse knapweed, hounds tongue, scotch thistle, sulphur cinquefoil
Musk thistle	1	5	42	10	spotted knapweed, diffuse knapweed, tansy ragwort
Spotted knapweed	1,2	217	2,413	603	hounds tongue, yellow hawkweed, dalmatian toadflax, yellow toadflax, scotch thistle, sulphur cinquefoil, diffuse knapweed, tansy ragwort
Diffuse knapweed	1,2	1187	9,968	2,492	tansy ragwort, sulphur cinquefoil, scotch thistle, yellow toadflax, dalmatian toadflax, yellow hawkweed, hounds tongue, rush skeletonweed, yellow starthistle
Russian knapweed	2	1	3	1	tansy ragwort
Yellow starthistle	1	42	1,257	314	diffuse knapweed, spotted knapweed, sulphur cinquefoil, tansy ragwort, scotch thistle

⁹ There are about 3,000 sites where individual species have been mapped, and about 2,069 sites when different species in the same location are counted.

Primary Target species	Priority	Number of sites	Acres	Estimate Net infested Acres	Other Documented Invasive Plant Species within a priority site (one or all)
Rush skeleton weed	1	3	1	1	
Canadian thistle	4	329	4,482	1,120	diffuse knapweed, spotted knapweed, sulphur cinquefoil, scotch thistle, tansy ragwort
Houndstongue	2	300	2,606	651	sulphur cinquefoil, tall hawkweed, scotch thistle
Scotch broom	1,3	2	6	1	sulphur cinquefoil
Leafy spurge	1	55	35	9	diffuse knapweed
Meadow hawkweed	1	4	1	<1	
St John's wort	4	561	2,783	695	sulphur cinquefoil, tansy ragwort
Dalmatian toadflax	1	124	93	23	yellow toadflax
Yellow toadflax	1	4	19	5	
Scotch thistle	1	39	231	58	sulphur cinquefoil, tansy ragwort
Sulphur cinquefoil	2	152	260	64	diffuse knapweed, tansy ragwort
Tansy ragwort	1	91	100	25	
Medusahead	3,4	19	56	14	
Approximate Totals		3161	25,000	6,188	

Native Vegetation

The Umatilla National Forest contains a wide diversity of plant species and communities due to varying elevation and precipitation zones that occur within eastern Oregon. Invasive plants pose threats to biological diversity of native plant communities by altering ecosystem processes and can completely displace native plant species and cause a decline in overall species richness. Invasive plants are highly adept at capturing available moisture and nutrients, and often spread quickly.

The complex geologic history of the area which included floods, volcanic eruptions, landslides and erosion have shaped the landscape of the Umatilla National Forest into a unique combination of landforms and vegetation patterns. The unique combination of geology and topography has produced a distinctive, mosaic pattern of dense, heavily timbered slopes interspersed between open, rugged grasslands. The Forest lies at the extreme eastern edge of the Cascade Range's rain shadow. This high-desert climate is characterized by hot, dry summers (less than 10 inches of precipitation per year) in the lower valleys and moist maritime conditions influenced by the Columbia River at the higher elevations (over 80 inches of precipitation per year). This variety of landform, elevation and climate results in a diversity of plants.

Ecological habitats ranging from low to high elevation include: juniper, sage, grasslands, ponderosa pine, mixed conifer, sub-alpine fir, Engelmann spruce, and alpine plants. Biophysical settings are aggregations of plant associations and represent a combination of temperature and moisture regimes for the Umatilla National Forest (See table 17). Given this combination of physiographic and climate, habitats are highly variable and retain a legacy of botanical diversity.

Plant communities can be classified by a variety of factors such as vegetation structure, site moisture, overstory, and understory. The 2005 R6 FEIS used broad potential vegetation groups (PVGs) to rate the susceptibility of vegetation.

Table 17 provides a summary of the PVGs found in the Project Area, their susceptibility to damage from invasive plants, the local plant community types that correspond to these broad PVG types, and mapped acres of invasive plants within the plant community types.

Table 17. Potential Vegetation Groups on the Umatilla National Forest's 1.4 million acres and their susceptibility to invasive plants

Potential Vegetation Group	Susceptibility to Invasion ¹	Percent of Forest	Infested acres (all species) ²
Cold Forest	Moderate	12	1725
Cold Grassland	Moderate	<1	182
Cold Shrubland	Moderate	<1	46
Dry Upland Forest	Moderate-high	33	7254
Dry Grassland	High	11	3622
Dry Riparian Forest	High	<1	3
Dry Riparian Shrubland	High	<1	1
Dry Shrubland	High	<1	104
Dry Woodland	High-moderate	<1	---
Impounded Water	-----	<1	4
Moist Upland Forest	Moderate-high	29	6897
Moist Grassland	Moderate-high	3	780
Moist Upland Shrubland	Moderate-high	3	332
Moist Upland Woodland	Moderate-high	2	205
Wet Riparian Forest	Moderate	<1	60
Wet Riparian Shrubland	Moderate	<1	7
Riparian Herbland	Moderate	<1	48
Unvegetated Rock	Moderate	<1	45
Unknown	-----	3	3506

1 Susceptibility ratings (derived from R6 FEIS, V. Erickson, and J. Wood): High = high susceptibility to invasion. Invasive plant species invades the cover type successfully and becomes dominant or co-dominant even in the absence of intense or frequent disturbance; Moderate = moderate susceptibility to invasion. Invasive plant species is a "colonizer" that invades the cover type successfully following high intensity or frequent disturbance that impacts the soil surface or removes the normal canopy; Low = low susceptibility to invasion. Invasive weed species does not establish because the cover type does not provide suitable habitat.

2 Some mapping error due to overlap in species occurrences in duplicate potential vegetation groups in GIS database

Since the time of the pioneers, movement of people into the area and the associated establishment of invasive weed spread vectors (highways, railroads, canoes, rafts, and other transportation methods) have continued to alter habitats and vegetation types across the landscape. For example, many areas within the forest have become permanently altered by cheat grass, which has become naturalized. It is highly probable that in the past, this permanent alteration of habitat has affected native vegetation and species of local interest (SOLIs).

Eastside forests are more susceptible to invasive plants than other forests in the region (USDA 2005b). In general, their grasslands, riparian areas, and relatively dry, open forests are more susceptible to invasion than are dense moist forests and high montane areas (USDA 2005b).

The grasslands, riparian areas, and relatively dry, open forests have frequent gaps in the plant cover, which favor invasive plant establishment. The moist forests and high montane areas have relatively closed plant cover or have extreme climate or soils, which are tolerated by fewer invasive plant species.

Invasive plants tend to colonize disturbed ground along and around developments such as roads, highways, utility (power line) corridors, recreational residences, trails, campgrounds and quarries. These are all places where native vegetation has been removed and disturbance has been created areas for invasive plants to establish.

Botanical Species of Local Interest

SOLI are vascular and nonvascular (bryophytes and lichens) botanical plant species that are:

- Threatened and/or endangered species (federally listed or proposed for listing under the Endangered Species Act
- Regional Forester Sensitive or Proposed Sensitive Species (Forest Service Manual 2670)
- Plant species endemic to the forest, Oregon and Washington State, and/or Oregon and Washington Natural Heritage Program endangered, threatened, or sensitive species; and
- Species of Local Interest to the Forest

Departmental Regulation 9500-4 – This regulation directs the Forest Service to manage habitats for all existing native and nonnative plants, and fish, and wildlife species on National Forest System lands in order to maintain at least viable populations of such species.

Forest Service Manual (FSM) 2670.5 defines sensitive species as those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by significant current or predicted downward trends in population numbers, density, or habitat capability that would reduce a species' existing distribution.

In FSM 2670.22, the management objective for sensitive species is, in part, to develop and implement management actions to ensure that species do not become threatened or endangered because of Forest Service actions and to maintain viable populations of all native and desired nonnative wildlife, fish, and plant species in habitats throughout their geographic range on National Forest System lands. A viable population is a population that has the estimated numbers and distribution of reproductive individuals to ensure the continued existence of the species throughout its existing range (or range required to meet recovery for listed species) within the planning area.

Prefield Review

A review of available information was completed in order to identify sensitive plant species known or potentially occurring in the project area.

The following sources were consulted for the prefield review:

- Regional Forester's Sensitive Species List (July 2004) modified by J. Wood (July, 2006)¹⁰

¹⁰ The sensitive species list was updated in 2008, however the cover letter attached to the list stated: "Projects initiated prior to the date of this letter may use the updated RFSS list transmitted in this letter or the RFSS list that was in effect when the project was initiated (RF Linda Goodman, January 2008)." Changes to the sensitive species list will be reviewed during implementation and new sensitive species will be treated as botanical SOLI for the purposes of applying PDFs, however the analysis in this section was not updated to reflect the new lists.

- Oregon Natural Heritage Information Center's (formerly the Oregon Natural Heritage Program) Rare, Threatened and Endangered Species List (May 2004)
- US Forest Service sensitive plant survey GIS layer and associated databases
- US Forest Service personnel (Forest Botanists and Ecologists)
- Literature (see References)

One federally listed species, *Silene spauldingii* (Spaulding's catchfly) is documented on the forest. There are presently 44 SOLI documented or suspected to occur on the Umatilla National Forest (see table 18). Four bryophytes and six lichen species (non-vascular) recently suspected of occurring on the forest and considered of local interest are listed in table 19.

Baseline surveys of prime habitat for the bryophytes and lichen species are nearly complete and no species occurrences are documented.

Table 18. Sensitive plant species documented (D) or suspected (S) to occur on the Umatilla National Forest

Scientific Name	Common Name	Documented or Suspected	Documented habitat
<i>Allium campanulatum</i>	Sierran onion	D	Dry open areas surrounded by ponderosa pine and juniper wetlands. Usually found growing in clay soils with considerable gravel. Elevation range is 3,000 to 7,400 feet.
<i>Allium diction</i>	Blue mountain onion	D	Openings in subalpine fir stands, Southeast aspects; cobbly shallow soils. Elevation range is 5,200 to 5,500 feet.
<i>Astragalus arthurii</i>	Arthur's milkvetch	D	Moist grasslands, Northerly aspects; shallow, stony soils. Moderate elevations (4,000 feet).
<i>Astragalus cusickii</i> var. <i>cusickii</i>	Cusick's milkvetch	D	Canyon grasslands (Snake and Grande Ronde rivers; loose, fine-textured basalt soils on cliffs, road-cuts and areas of vegetation cover < 50%.
<i>Bolandra oregano</i>	Oregon bolandra	D	Moist rocky seeps, springs, waterfalls, wet road banks. Low to moderate elevations 2,000 to 5,000 feet.
<i>Botrychium crenulatum</i>	Crenulate moonwort	D	Partially shaded or open settings, primarily in sedge/forbs communities associated with seeps, small streams, drainages and edges of wet meadows. Engelmann spruce and stands of grand fir, Douglas fir and lodgepole pine.
<i>Botrychium hesperium</i>	Windowleaf moonwort	D	Same as above
<i>Botrychium lanceolatum</i>	Lance-leaf grapefern	D	Same as above
<i>Botrychium lunaria</i>	Moonwort grapefern	D	Same as above
<i>Botrychium minganense</i>	Mingan moonwort	D	Same as above
<i>Botrychium montanum</i>	Peculiar moonwort	D	Same as above

Scientific Name	Common Name	Documented or Suspected	Documented habitat
<i>Botrychium paradoxum</i>	Northern moonwort	D	Same as above
<i>Botrychium pedunculatum</i>	Stalked moonwort	D	Same as above
<i>Botrychium pinnatum</i>	Northern moonwort	D	Same as above
<i>Calochortus longebarbatus</i> var. <i>longebarbatus</i>	Long-bearded mariposa lily	D	Seasonally wet meadow and stream margins. Ponderosa, lodgepole pine and juniper forest openings and forest edges of vernal moist grassy meadows, occasionally along seasonal streams.
<i>Calochortus macrocarpus</i> var. <i>maculosus</i>	Nez Perce mariposa lily	D	Pristine grassland on steep slopes, rocky outcrops and cliffbands with basaltic soils over a wide elevation range
<i>Calochortus nitidus</i>	Broadfruit mariposa	S	Palouse grasslands, deep soils.
<i>Camissonia pygmaea</i>	Dwarf suncap	S	Sagebrush steppe at 1800' – 2000' elevation
<i>Carex cordillerana</i>	Back's sedge	D	Wet meadows, streams, springs, seeps, moist conifer forest.
<i>Carex hystericina</i>	Porcupine sedge	D	Wet to moist conditions in riparian zones; in or along ditches/canals in prairies and wetlands.
<i>Carex stenophylla</i> (C. <i>eleocharis</i>)		S	Open, dry to moderately moist places, often with grasses, over a wide elevation range.
<i>Cypripedium fasciculatum</i>	Clustered lady slipper	D	Wet forests dominated by grand fir overstory to, more commonly, drier forest types such as ponderosa pine and/or Douglas fir overstory with pinegrass (<i>Calamagrostis rubescens</i>) understory. Found near springs and creeks in moist plant associations, as well as in drier environments in duff and moss under Douglas fir and oceanspray (<i>Holodiscus discolor</i>), and Douglas fir and ninebark (<i>Physocarpus malvaceus</i>). Elevations of 1,600 to 8,000 feet.
<i>Erigeron disparipilus</i>	Snake river daisy	D (only sensitive in OR)	Ridgetops and forest openings at moderate elevations in the Blue Mountains and Snake River regions.
<i>Eleocharis bolanderi</i> ¹	Bolander's spikerush	D	Intermittent stream channels, edges of wet meadows, and roadside ditches; in dry bunchgrass and scrub communities on basaltic substrates
<i>Haplopappus liatroides</i>		S	Native, undisturbed, prairie grasslands, including shrubland and open forest verges. Elevation ranges generally below 3,000 feet.
<i>Leptodactylon pungens</i> ssp. <i>hazeliae</i>	Prickly phlox	D	Sheer rock outcrops and talus-covered slopes. Low elevations (below 2,000 feet).

Scientific Name	Common Name	Documented or Suspected	Documented habitat
<i>Lomatium cusickii</i>		S	Open slopes with rocky soils in bunchgrass communities, mid to high elevations
<i>Lomatium rollinsii</i>	Rollins' biscuitroot	D	Open slopes in bunchgrass communities of the canyonlands of the Blue Mountain and Snake River ecoregions.
<i>Lomatium salmoniflorum</i>	Salmon-flowered lomatium	S	Open, rock slopes at lower elevations.
<i>Lupinus sabinianus</i>	Sabin's lupine	S	Open grassy slopes in mixed coniferous forest; road-cuts and disturbed soils. Low to moderate elevations (3,300 to 5,500 feet).
<i>Lycopodium complanatum</i>	Ground cedar	S	Coniferous forest with thick duff. Often on rotting wood or in acidic soils. Also in meadows and on open ridgetops. Moderate elevation (4,300 feet).
<i>Mimulus clivicola</i>	Bank monkey-flower	S	Open rocky slopes. Southerly aspects with steep slopes. Shallow soils at low to moderate elevations (2,500 to 5,500 feet)
<i>Montia diffusa</i>	Branching montia	S(sensitive only in WA)	Moist forest with Douglas fir, on disturbed soils over a wide elevation range.
<i>Pellaea bridgesii</i>		D	This small, evergreen fern favors south and east aspects of rocky outcrops and talus slopes of metamorphic and igneous origin. Elevation ranges between 4000 to 9500 feet.
<i>Phacelia minutissima</i>		S	Streambanks in sagebrush communities and in aspen stands. In the Blue Mountains it occurs in association with false hellebore (<i>Veratrum californicum</i>) and white mules ears (<i>Wyethia helianthoides</i>) in vernal moist meadows and small scablands at elevations 5000 to 7000 feet.
<i>Phlox multiflora</i>	Many-flowered phlox	S	Dry, rock areas; cliffs to ridgetops and open slopes. Wooded, rock areas as well as open sites. Loose substrate at elevations around 3,500 feet.
<i>Ranunculus populago</i>	Mountain buttercup	D	Wet meadows, streamside, and in bogs, and seeps at mid-montane elevations.
<i>Salix farriae</i>	Farr's willow	D	Wet meadows, lakeshores, and streambanks. Elevation range is 7,000 to 8,000 feet.
<i>Silene spaldingii</i>	Spalding's silene	D	Native, undisturbed, prairie grasslands. Elevation ranges between 1,200 to 4,500 feet.
<i>Spiranthes porrifolia</i>		S	Wet meadows, bogs, streambanks and seepage areas from 60 to 6800 feet in elevation.

Scientific Name	Common Name	Documented or Suspected	Documented habitat
<i>Suksdorfia violacea</i>		S	Rock crevices, mossy banks, cliffs, and shaded sandy areas, usually at least vernal wet.
<i>Thelypodium eucosmum</i>	Arrow-leaved thelypod	D	Moist, seepy areas on ashy-clay soils in Grant and Wheeler Counties. Sites include steep drainages along the John Day River.
<i>Trifolium douglasii</i>	Douglas clover	D	Moist to wet meadows and forested wetlands and streambanks, with ponderosa pine, Douglas fir, and lodgepole pine.
<i>Trifolium plumosum</i> var. <i>plumosum</i>	Pussy clover	S	Dry hillsides and forest edges with ponderosa pine, Douglas fir and lodgepole pine.

Table 19. Non-vascular species of local interest suspected to occur

Bryophytes	Lichens
<i>Rhizomnium nudum</i> (Oregon only)	<i>Dermatocarpon luridum</i>
<i>Schistostega pennata</i>	<i>Leptogium burnetiae</i> var. <i>hirsutum</i>
<i>Scouleria marginata</i>	<i>Leptogium cyanescens</i>
<i>Tetraphis geniculata</i>	<i>Nephroma bellum</i> (Washington only)
	<i>Peltigera neckeri</i>
	<i>Peltigera pacifica</i>

Field Surveys

Extensive botanical surveys have been conducted on the Umatilla National Forest (J. Wood 2006). Survey routes and documented occurrences and habitats for SOLI are on file at the Umatilla National Forest Supervisor's Office. Due to the extensive surveys conducted on the Forest no additional surveys are proposed for this project. Databases and records from the Umatilla National Forest were used to identify SOLIs within 100 feet of identified treatment areas. The table below lists the 13 plant SOLIs on 44 sites within 100 feet of identified invasive plants proposed for treatment

Table 20. SOLI occurrences within 100 feet of an identified invasive species site

District	Scientific Name	Common Name	Number of occurrences within 100 feet of invasive species	Invasive Species	Previously Treated under "95 EA"
Pomeroy	<i>Astragalus arthurii</i>	Arthur's milkvetch	2	Diffuse knapweed, yellow starthistle, scotch thistle	NO
Walla Walla	<i>Botrychium lanceolatum</i>	Lance-leaf grapefern	6	Spotted and diffuse knapweed, Canada thistle, tansy ragwort,	Yes, hand pulling, chemical on 2

District	Scientific Name	Common Name	Number of occurrences within 100 feet of invasive species	Invasive Species	Previously Treated under "95 EA"
				houndstongue	sites for knapweeds
Walla Walla	<i>Botrychium minganense</i>	Mingan's moonwort	5	Diffuse knapweed, Canada thistle, tansy ragwort	Yes, 4 sites. 1 site hand pulling for diffuse knapweed and tansy ragwort, 3 sites chemical for knapweed
Walla Walla	<i>Botrychium Montanum</i>	Mountain Grapefern	1	Diffuse knapweed,	NO
Walla Walla	<i>Botrychium Pedunculosum</i>	Stalked moonwort	1	Diffuse knapweed	NO
Walla Walla	<i>Botrychium pinnatum</i>	Northern moonwort	6	Diffuse and spotted knapweed, tansy ragwort, Canada thistle	Yes, 4 location, hand pull and chemical for tansy ragwort and knapweeds
Walla Walla	<i>Carex cordillerana</i>	Back's sedge	5	Common burdock, diffuse knapweed, sulphur cinquefoil, tansy ragwort	Yes, 2 locations. Hand pulling and chemical for common burdock, knapweed, tansy ragwort
Pomeroy	<i>Carex hystericina</i>	Porcupine sedge	1	Scotch thistle	NO
Pomeroy	<i>Calochortus macrocarpus var. maculosus</i>	Nez Perce mariposa lily	7	Yellow starthistle, scotch thistle, diffuse knapweed, tansy ragwort	NO
Walla Walla	<i>Eleocharis bolanderi</i>	Bolander's spikerush	4		Yes, 1 location, chemical
Pomeroy	<i>Leptodactylon pungens ssp. hazeliae</i>	Prickly phlox	1	Diffuse knapweed	NO
Pomeroy and John Day	<i>Trifolium douglasii</i>	Douglas clover	4	Diffuse knapweed, houndstongue, St john's wort	NO

District	Scientific Name	Common Name	Number of occurrences within 100 feet of invasive species	Invasive Species	Previously Treated under "95 EA"
District	Federally Listed Species	Common Name	Number of occurrences within 1000 feet of invasive species	Invasive Species	Previously Treated under "95 EA"
Pomeroy	<i>Silene spaldingii</i> – Federally listed	Spaulding's catchfly	1	Yellow starthistle, diffuse knapweed	NO
Total		13 Species	44 Occurrences	NA	5 species 13 occurrences

3.2.3 Environmental Consequences

The public has expressed concerns that there is and will continue to be a loss of vegetation diversity within native plant communities from invasive plants. The public has also expressed concern that the application of herbicides has the potential to adversely affect non-target plant species. Determination of effects assumes implementation of all PDFs as listed in chapter 2.2.3 and follows all standards outlined in the Umatilla Forest Plan as amended by the R6 2005 ROD.

Continued loss of vegetation diversity is addressed through the analysis of treatment effectiveness towards the reduction of invasive plants. Treatment effectiveness is measured by the decrease or elimination of the invasive species, and the concomitant recovery of the area with native vegetation. Effectiveness for non-herbicide methods was derived from a thorough review of literature, including technical handbooks such as *The Nature Conservancy Weed Control Handbook* (Tu et al. 2001), county and state extension service or weed control board publications, and peer reviewed journal articles. A compilation of this review, *Common Control Measures for Invasive Plants of the Pacific Northwest Regions* (Mazzu 2005) can be found in the project record of this EIS

Concerns related to impacts from treatments to non-target plant species including SOLI were addressed through herbicide risk assessments (R6 2005 FEIS) and a thorough review of the literature including non-herbicidal effects to plants, risk to pollinators of native plant communities (ibid), and peer reviewed scientific papers.

Risks to non-target species including SOLI were based on the combination of treatment effectiveness between alternatives and direct and indirect effects from invasive plant treatments.

Treatment effects to native plant communities and pollinators associated with these communities is evaluated at a forest wide scale. Effects to individual SOLI are based on individual site occurrences, proposed treatment to nearby invasive species, and overall risk of treatment effectiveness by alternative

Changes in plant diversity or species composition can occur due to invasive plants, changes can also occur due to treatments. Short-term changes in species dominance can lead to long-term shifts in plant community composition and structure. Repeated treatments over time could favor tolerant species, which in turn could shift pollinators available to a community. DiTomaso (2001) points out that continuous broadcast use of one or a combination of herbicides will often select for herbicide

tolerant plant species. When broadleaf selective herbicides are used, noxious annual grasses such as medusahead, cheatgrass or barbed goatgrass may become dominant. Population shifts through repeated use of a single herbicide may also reduce plant diversity and cause nutrient changes. Alternatively, plant diversity is reported to be maintained on sites with repeated applications of picloram and clopyralid for control of spotted knapweed in Montana (Rice et al. 1997). Additionally, analyses based on 60 published studies of terrestrial plants and animals in temperate zone forests and agro-ecosystems indicate species richness and diversity of vascular plants was either unaffected or increased (particularly herbaceous species) in response to glyphosate (Sullivan and Sullivan 2003).

Where native communities are largely intact the tradeoff is less apparent. Habitats that may be affected are the highly invasible dry grassland. Approximately, 2,505 acres are slated for broadcast spraying within the 3,068 acres of dry grassland on the Forest. The mixed conifer and shrubland plant communities are more resistant to effects of herbicides because they have fewer, sensitive herbaceous species.

For dry grassland communities, broadcast herbicide application has higher risk associated with the elimination of non-target species. This risk may lead to short-term reductions in plant diversity with concomitant impacts to soil microbial communities; especially given that much of the diversity may be represented by forb richness (Pokorny et al. 2004). Further, the risk for spraying one target species must be balanced with the risk for invasion by another species. Ortega has preliminary findings with winter range restoration that suggest cheatgrass is increasing in response to spraying for spotted knapweed (Ortega 2005). To address this risk, the Umatilla National Forest is directed to the long-term strategy of weed management in Standards 12 and 13 of the Forest Plan (as amended by R6 2005 ROD).

Knapweeds and star thistle have very high invasive potential. Broadcast methods as proposed in this alternative would have the greatest effectiveness in lowering potential for these noxious weeds to expand in dry grassland habitat, particularly in the southern portion of the Forest. Reeve et al. (2003) suggested clopyralid would only have short-term decreases on nontarget species as long as spray intervals were greater than one year. PDF Group F8 addresses aerial application. Drift would be minimized in aerial and other broadcast application by controlling as many of the factors in the table below as possible.

Table 21. Summary of the Influence of Various Factors on Spray Drift

Factor	More drift	Less drift
Spray particle size	Smaller	Larger
Release height	Higher	Lower
Wind speed	Higher	Lower
Spray pressure	Higher	Lower
Nozzle size	Smaller	larger
Nozzle orientation (aircraft)	Forward	Backward
Nozzle location (aircraft)	Beyond 85% rotor length	Less than 85% rotor length
Air temperature	Higher	Lower
Relative humidity	Lower	Higher
Nozzle type	Produce small droplets	Produce larger droplets
Air stability	Vertically stable air	Vertical movement of air
Herbicide volatility	Volatile	Non-volatile

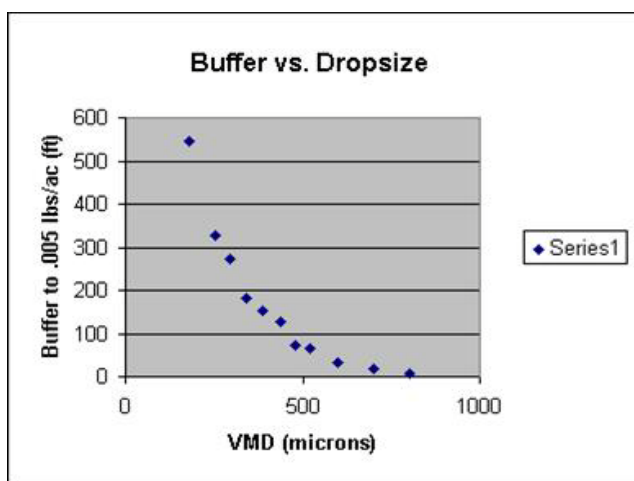


Figure 11 demonstrates the relationship between droplet size and buffer distance for ground broadcast spraying. Dr. Harold Thistle, a physical scientist from the USDA in Morgantown, WV, specializes in computer modeling of herbicide drift. He modeled the potential for glyphosate to impact non-target vegetation from drift. The model predicted a 100-foot broadcast buffer would prevent glyphosate from harming plant species that are further away (Spray Drift Task Force 2001).

Figure 11. Droplet size and drift distance

Factors affecting droplet size are nozzle type, orifice size and spray angle, as well as spray pressure, and the physical properties of the spray mixture.

Wind speed restrictions also substantially contribute to a reduction in drift (Spray Drift Task Force, 2001). By simply changing the type of nozzle (diameter of pore size) used during broadcast treatments, the drift potential of herbicide can be effectively and substantially decreased as the droplet size forced out the nozzle is increased in size.

Spray nozzle pressure, the amount of water applied with the herbicide, and herbicide release height are also controllable determinants of drift potential. Weather conditions such as wind speed and direction, air mass stability, temperature and humidity and herbicide volatility also affect drift.

Commercial drift reduction agents are available that are designed to reduce drift beyond the capabilities of the determinants previously described. These products create larger and more cohesive droplets that are less apt to break into smaller particles as they fall through the air. They reduce the percentage of smaller, lighter particles that are the size most apt to drift.

Marrs et al. (1989) in the study, "Assessment of the Effects of Herbicide Spray Drift on a Range of Plant Species of Conservation Interest", examined the distances in which drift affected non-target vascular plants using ground based broadcast treatment methods similar to those considered in this analysis. The study is consistent with drift-deposition models in which the fallout of herbicide droplets has been measured. The maximum safe distance at which no lethal effects were found was 20 feet, but for most herbicides the distance was 7 feet.

Generally, damage symptoms were found at greater distances than lethal effects, but in most cases there was rapid recovery by the end of the growing season. No effects were seen to vascular non-target vegetation further than 66 feet from the broadcast treatment zone. The study concluded: "In summary, the effects of severe damage by herbicide-droplet drift from simulation experiments set up to cover a range of high-risk herbicides under realistic application conditions, with standard hydraulic sprayers, suggest that buffer zones surrounding nature reserves and other sensitive vegetation could be quite narrow, in the order of c. 5-10m" (~16-33 feet).

Biological Control

Biological control can be defined as the use of natural enemies to reduce the damage caused by invasive plant populations. Biocontrol leaves behind no chemical residues that might have harmful impacts on humans or other organisms, and when successful, it can provide essentially permanent, widespread control with a very favorable cost-benefit ratio. Biological control is useful where: eradication is not possible, sites are too large to be sprayed with herbicides, and invasive plant species are so abundant that other methods would not be practical, or the biological control agent is effective on the target plant species and reduces or eliminates the need to use herbicides. The time frame for controlling invasive plants using biocontrols is very long, and agents would likely spread throughout the forest where food sources are available.

Stem weevil biocontrol agents have proven very successful for Dalmatian toadflax control on infested forest and adjacent landownership sites (Dawson 2007). Several biocontrol agents are available for yellow starthistle and diffuse knapweed and effectiveness appears to be higher when biocontrol agents work in concert. However, where fire has entered into yellow starthistle sites, biocontrol agents appear to be less effective, likely a result of biocontrol population dynamics, impacts from fire and available food source. Biocontrol agents for control of purple loosestrife have been released on the Idaho side of the Snake River, however, the fluctuating water levels have negatively affected the establishment of a productive biocontrol population and effectiveness is minimal (Dawson 2007).

Bio-control agents previously released on private lands and established on the Forest will continue to spread to other nearby invasive sites providing a potential long-term control treatment.

Cultural Treatments/Restoration

Cultural treatments proposed include seeding or planting competitive native vegetation, and fertilizing and mulching. Cultural treatments help native plants and ecosystems become more competitive by: 1) improving the cover density of native plants through seeding and planting; and 2) improving health and site conditions for existing native plant populations through fertilization and mulching.

3.2.4 Impacts of Treatments to Native Vegetation including SOLI

Herbicide Effects on Pollinators and Colony Collapse Disorder

Limited research is available that addresses impacts from invasive plants on mutualistic relationships between plant pollinators and native plant communities. One study has indicated that exotic plants may compete better for native plant pollinators by producing more desirable nectar and therefore increasing fitness and reproductive ability of the non-native plant (Levine et al. 2004). Presently, little is known about native plant and native plant pollinators in general. Efforts are just beginning to study basic aspects of plant-pollinator interactions for optimal management decisions to be made for conservation of these interactions in natural systems (Kearns et al. 1998). It is estimated that there may be between 130,000 and 200,000 invertebrate and vertebrate species that regularly visit the flowers of higher plants, which depend on these animals to assure cross-pollination. The majority of flowering plants in the world (88 percent) are pollinated by beetles, followed by wasps (18 percent) and bees (16.6 percent) (Buchman and Nabhan 1996).

Treatments that reduce invasive plants positively impact the native plant community when the native plants are restored. Very little information is available on the effect of herbicides on native pollinators. Most information is related to impacts on the non-native honey bee. It is known that

pollinators can be directly affected by spray, or affected indirectly when plants needed as food for adults or larvae are eliminated by herbicides (Shepherd et al. 2003). The only known quantified effects are from direct spray. The herbicides approved for use in the Umatilla Forest Plan as amended by the R6 2005 ROD are not expected to have toxic effects when directly sprayed on honeybees at the typical Forest Service application rates.

However, glyphosate and triclopyr may have some toxic effects if applied at the maximum application rate proposed by the Forest Service (SERA 2003-glyphosate; SERA 2003- Triclopyr). Table 22 lists the potential herbicide doses for bees in a direct spray scenario.

Table 22. Toxicity levels for bees from exposure to typical herbicide application rates

Herbicide	Typical Application Rate	Potential Dose for Bee	Toxic Level for Bee
Chlorsulfuron	0.056 lb/ac	8.98 mg/kg	>25 mg/kg (LD50)
Clopyralid	0.350 lb/ac	56.10 mg/kg	909 mg/kg (no mortality)
Glyphosate	2.000 lb/ac	321.00 mg/kg	540 mg/kg (NOAEC)
Imazapic	0.130 lb/ac	16.00 mg/kg	387 mg/kg (no mortality)
Imazapyr	0.450 lb/ac	72.10 mg/kg	1000 mg/kg (no mortality)
Metsulfuron Methyl	0.030 lb/ac	4.81 mg/kg	270 mg/kg (NOEC)
Picloram	0.350 lb/ac	56.10 mg/kg	1000 mg/kg (no mortality)
Sethoxydim	0.300 lb/ac	60.10 mg/kg	107 mg/kg (NOAEL)
Sulfometuron Methyl	0.045 lb/ac	7.21 mg/kg	1,075 mg/kg (NOEC)
Triclopyr BEE	1.000 lb/ac	160.00 mg/kg	>1,075 mg/kg (LD50)
Triclopyr TEA	1.000 lb/ac	160.00 mg/kg	>1,075 mg/kg (LD50)
NP9E (main generic ingredient in most surfactants)	1.67 lbs/ac	268.00 mg/kg	unknown

Uncertainty exists regarding the effects of herbicides on non-target plant species and pollinators because native species are not the usual test species for EPA toxicity studies. The EPA performs studies predominantly on crop species. Boutin et al. (2004) concluded that it was likely that the current suite of tested species were not representative of the habitats found adjacent to agricultural treatment areas, and suggested the current suite of tested species might cause an unacceptable bias and underestimated risk. Because of the lack of studies available to fully assess the impacts to native pollinators, it is possible that some short-term impacts to pollinators in localized areas could occur from herbicide treatments. Long-term impacts would not be expected to occur because herbicide treatments are presently proposed on less than 1.6 percent of the forest landbase (0.03 percent annually) with the remaining forest lands serving as future native pollinator sources after invasive areas are restored or recovered to native vegetative states.

Pesticides are one of several factors thought to possibly contribute to catastrophic losses of honey bees ("colony collapse disorder" or CCD) reported since 2006. Since the proposed action intends to use herbicides, a class of pesticides, a discussion of the possible connection of herbicide use and CCD is warranted. However, herbicides have a low likelihood of being implicated in CCD. Other pesticides, like miticides, may contribute to conditions that favor CCD (CCD Steering Committee 2007).

None of the herbicides included in the proposed action or alternatives exceeded toxicity values for honey bees at typical application rates. At highest application rates, only glyphosate caused any mortality, and this necessitated a direct spray at the highest rate. Herbicides are not typically used

directly on the agricultural crops that honey bees pollinate because they would have a high likelihood of adversely affecting the agricultural crop (unlike on grass crops where selective herbicides are used on the crop directly). However, herbicides are used near these crops to control weeds.

Herbicides proposed for use in the proposed action or alternatives have very low probability to cause any affect to honey bees or contribute to CCD because: 1) treatments on the forest are often in remote locations far from commercial bee hives; 2) treatments in the vicinity of bee hives would only entail treatment of patches of invasive plants, not widespread application likely to expose honey bees; 3) these herbicides have low toxicity to honey bees; 4) consequence to bees from these herbicides only occurred for one herbicide at the highest application rate, which is not applied in a spray application (in practice, highest application rates of glyphosate are used in wicking, wiping, or injection applications which are unlikely to expose bees).

Currently, the pathogen Israeli acute paralysis virus and the parasite *Nosema ceranae* are the leading candidates for cause of CCD (Higes et al. 2009, Goodman 2009). Further information on colony collapse disorder is in the project record.

Herbicide Effects on Plant Diversity

Just as changes in plant diversity or species composition can occur due to invasive plants, changes can also occur due to treatments. Short-term changes in species dominance may lead to long-term shifts in plant community composition and structure. Repeated treatments over time could favor tolerant species, which in turn could shift pollinators available to a community. DiTomaso (2001) points out that continuous use of one or a combination of herbicides could select for tolerant plant species. For example, when broadleaf selective herbicides are used noxious or invasive annual grasses such as medusahead, cheatgrass or other grasses may become dominant. Additionally, population shifts through repeated use of a single herbicide may also reduce plant diversity and cause nutrient changes. For example, legume species are important components of rangelands, pastures, and wildlands, and are nearly as sensitive to clopyralid as yellow starthistle. Therefore, repeated clopyralid use over multiple years may have a long-term detrimental effect on legume populations.

Alternatively, repeated applications of Picloram and Clopyralid for control of spotted knapweed resulted in no impacts or changes in plant diversity in Montana (Rice 2000). Additionally, analyses based on 60 published studies of terrestrial plants and animals in temperate zone forests and agro-ecosystems indicate species richness and diversity of vascular plants was either unaffected or increased (particularly on herbaceous species) in response to glyphosate (Sullivan and Sullivan 2003).

The ecological consequences of biodiversity loss have aroused considerable interest and controversy during the past decade. Major advances have been made in describing the relationship between species diversity and ecosystem processes, identifying functionally important species, and revealing underlying mechanisms. There is, however, uncertainty as to how results obtained in recent experiments scale up to landscape and regional levels and generalize across ecosystem types and processes. Larger numbers of species are probably needed to reduce temporal variability in ecosystem processes in changing environments. A major future challenge is to determine how biodiversity dynamics, ecosystem processes, and abiotic factors interact (Loreau et al. 2001).

Alternative A – No Action

Direct and Indirect Effects

Native Vegetation

Current numbers of acres approved for herbicide use would remain the same, placing heavy reliance on manual and mechanical treatments for all presently identified sites and all future sites. The removal of invasive plants using manual or mechanical techniques could directly affect native plants and plant communities. Direct negative effects would be unintentional removal, mowing or trampling of flowers, fruits, or root systems of native plants, but should be minimal with properly trained crews. Vigor could be reduced in individuals due to repeated treatments, however; impacts would be short lived, not likely to last a complete growing season. The removal of individuals could also directly affect remaining native plant community components negatively by reducing native seed production (if methods such as mowing are used), creating soil disturbance, and opening the canopy (understory, shrub layer or overstory depending on the species). For instance, hand-pulling trials conducted on spotted knapweed in western Montana and on diffuse knapweed in west-central Montana resulted in an increase in bare ground from 2.7 percent to 13.7 percent during the first year after treatment (Brown et al. 2001). Although these hand-pulling trials were shown to reduce the potential for knapweed seed production by exhibiting 100 percent flower control and 56 percent plant control (Brown et al. 2001), follow-up investigations on resultant vegetation from resident seed banks after treatment were not reported.

Indirect effects from these changes include microsite shifts such as reduction in productivity, reduction in soil moisture, disruption of mycorrhizal connections and increase in surface temperatures. These indirect effects could allow invasive species to reinfest the bare ground because many invasive species are aggressive, opportunistic plants that can thrive in the harsher microsites described above. Invasive plant seed introduction could occur through various means of introduction (windblown seeds, human transport etc.).

Alternatively, native plant communities could be affected positively by providing the space for increased growth in community size. One possible scenario is that removal of invasives will encourage native seed dormant in the soil to germinate due to less competitive conditions.

Dremann and Shaw (2002) documented the success of converting live oak woodland from 99 percent exotic species cover to 85 percent native plant cover through a strategy of timed manual/mechanical removal that released the native seed bank. No reseeding was necessary. Overall effects can vary by species and level of past and present infestation.

No impacts are anticipated from the use of biocontrol agents (see impacts to native vegetation common to all alternatives)

Herbicide use under this alternative would likely cause mortality to some, non-target native plants. Only two herbicides are available under the no action alternative for use on seven percent of the currently mapped invasive species sites (less than 0.001% of the forest). These two herbicides do not provide the best options for the variety of invasive plant species and situations that are present within the Forest. For example, the two chemicals available for use (picloram and glyphosate) are not considered to be highly effective on houndstongue, and are considered by weed experts to be herbicides of last choice. For some areas this may require more initial herbicide volume or more repeated applications compared to the same sites treated under alternative B, C, or D that could use more specific herbicides to target invasive species. Additionally, under alternative A, approved

herbicide treatments rely heavily on picloram to treat a large proportion of sites. Picloram is considered a higher risk herbicide to the environment compared to the other herbicides because it is very mobile and persistent, and because of the levels of hexachlorobenzene (Bautista 2005). This persistent herbicide can readily move to non-target native plants through root translocation or runoff.

The threat of off-site damage to native plants and plant communities around sites presently approved for herbicide use is expected to be higher under the no action alternative compared to alternatives that use more selective herbicides. Overall effects to non-target vegetation from herbicide use would be substantially less compared to alternatives B, C or D, because less than 10 percent of the acreage approved for treatment under the proposed action alternatives is approved under the no action alternative. However, on sites approved for treatment under the no action alternative, greater negative effects would likely result with this alternative compared to herbicide treatment on the same sites under alternatives B, C or D. The two approved herbicides available under the no action alternative are general herbicides that would damage or kill more non-target plants sprayed compared to the more target-specific herbicides approved under the three action alternatives.

SOLI at highest risk (within 100 feet of invasive species)

In the no action alternative, five SOLI with a total of eight occurrences have been treated under the existing EA. Seven of the eight SOLI occurrences (*Botrychium lanceolatum*- three sites, *Botrychium pinnatum*- one site, *Carex cordillerana*- two sites, and *Eleocharis bolanderi*- one site) were previously approved for herbicide treatments. The remaining occurrence was approved for treatment using non-herbicide methods. The invasive species presently being treated chemically near these approved SOLI sites are diffuse knapweed, tansy ragwort and sulphur cinquefoil with either picloram or Glyphosate and possibly dicamba in the past. The remaining seven species and 31 occurrences would only be protected from invasive species using manual or mechanical methods in the future. Table 20 lists the sensitive species, the number of occurrences on the Forest at risk, the invasive species documented nearby and if these specific sites have received invasive plant treatments under the existing EA.

SOLI species near invasive species being treated by manual or mechanical methods could be unintentionally damaged by removal or trampling of flowers, fruit, or root systems. Damage would likely be repeated because these treatments require repetition over many years. Impacts are likely to individual plants but minimal impacts to SOLI populations are expected because crews would be trained to identify and avoid SOLI species. Hand pulling would avoid impacts to individuals. Grubbing invasive plants could cause damage to nearby individual SOLIs by severing roots or corms but they would likely resput if corms are not severely damaged.

Risk to SOLI from herbicide use has previously been evaluated in existing analysis (USDA 1995) and no impacts were anticipated from treatments with existing PDFs. Even with herbicide treatments, monitoring indicates that the five sites treated with herbicide still have invasive species present. This could be attributed to the lower effectiveness of the herbicides used. Even though the herbicide did not impact the SOLI populations and their habitats are expected to continue to be at risk of invasive plant infestation under this alternative.

Lichens, bryophytes, and fungi

Impacts of invasive species to lichens, bryophytes, and fungi is not widely documented in the literature, likely due to taxonomic problems, lack of experts, the small size and intermixing of taxa in the field and the life history and variation of species. It is, however, widely recognized that alteration or loss of habitat resulting from invasive species infestations likely would affect these species. Unknown effects from herbicide treatments are possible. Most of the nonvascular SOLI exist in

habitats that don't occur in the disturbed areas often associated with invasive species. Sites presently approved for herbicide use have been evaluated by the forest botanist or proposed to be surveyed prior to treatment if potential habitat of these species occurs. It is likely that if invasive species continue to spread across the forest as predicted with this alternative, habitats for these species would likely be more negatively impacted compared to the treatments proposed in alternatives B, C and D.

All other SOLI

The risks to all other SOLI within the forest are similar to risks to native vegetation and habitats in which they thrive. The reduced effectiveness of current treatment options, combined with inability to effectively treat any newly established invasive species near SOLI could threaten these species and their occurrence in the future. Most SOLI are not commonly located in frequently disturbed areas which is commonly where invasive species establish. However, since alternative A would be less effective at controlling invasives plants, potential spread of invasives into SOLI habitats and associated threats to SOLI population viability would be considerably higher with this alternative compared to the other three alternatives.

Impacts to pollinators

Some impacts to pollinators could occur with the use of the highest level of glyphosate with this alternative (SERA 2003-glyphosate). There is, however, minimal impact expected to native plant pollinators under no action because only 0.001 percent of the Forest is anticipated to be treated with herbicides, and likely only a portion of that percent would be treated with Glyphosate. If the highest allowable glyphosate application level was used some impacts to pollinators could occur with this alternative (SERA 2003-glyphosate).

A greater percentage of invasive treatments would be manual or mechanical. Little to no effects to pollinators are expected from manual or mechanical treatments in the long term. Some short-term could occur due to the reduction of flower heads used as food sources for pollinators. Overall, fewer effects would be expected to pollinators under this alternative compared to alternatives B, C, and D because fewer acres would be treated.

Summary of Effects to Plants for Alternative A-No Action Alternative

Alternative A is the least effective in treating invasive plants and therefore, poses the highest risk to native vegetation including SOLI.

Native vegetation will continue to be impacted by invasive plants - Native plants, and potentially SOLI, would continue to be displaced because this alternative allows less acres of treatment of invasive species and the treatment methods are less effective. A loss of native plant biodiversity, higher risks to SOLI and their habitats would likely result.

Less risk of damage to individual native plants due to less herbicide use - There would be less herbicide use and therefore, less risk of damage to individual non-target native plants. Picloram or glyphosate could be used to treat diffuse knapweed, common burdock, tansy ragwort and sulphur cinquefoil on only eight sites.

Alternative B – Proposed Action

Direct and Indirect Effects to Native Vegetation

Impacts from manual and mechanical treatments would be similar to those as described in alternative A. The removal of invasive plants using manual or mechanical techniques could directly affect native plants and plant communities. Direct negative effects would be unintentional removal,

mowing or trampling of flowers, fruits, or root systems of native plants, but should be minimal with properly trained crews. These effects could reduce native seed production, create soil disturbance, and open the canopy (understory, shrub layer or overstory depending on the species). However, under this alternative, manual and mechanical methods would typically follow herbicide treatments and seldom be used as the primary control method.

Future sites using the early detection rapid response process may be appropriate for foaming or solarization/mulching techniques for invasive plant control. Such sites would have to be very small patches because both of these methods of treatments are very expensive (TNC 2006). Impacts to non-target vegetation would be limited to small areas. Both of these treatments use heat (plastic mulch in solarization, and steam combined with biodegradable sugar producing foam) to kill target invasives and therefore kill all plants in the treated area. Such treatments would likely be used where there are special resource concerns or where other methods are ineffective.

These sites would likely have higher levels of prioritization and monitoring and receive immediate revegetation and restoration. Only short-term effects in very limited areas are expected with these treatments.

EDRR sites may also be appropriate for the use of fertilizer/soil amendments and competitive planting as a method of controlling invasive weeds. Some short-term, minor effects to community diversity may occur from the establishment of native species that thrive in the modified condition as established by the addition of soil amendments or seeding. No long-term impacts are expected because passive restoration techniques are designed to promote the establishment of desirable plant communities (USDA 2005).

Approximately 1.6 percent of the 1.45 million acres of the Umatilla National Forest are infested. Proposed annual herbicide treatments are estimated to average approximately 0.03 percent of the Forest area (4,000 acres) or 40,000 acres over the life of the project. Over time herbicide use would be expected to decline as known sites are effectively controlled and EDRR methodologies eradicate new sites.

This alternative has the greatest potential to negatively affect non-target plants. Because it would treat many more acres using herbicides than alternative A it would cause mortality to more non-target plants. Because alternative B proposes use of broadcast herbicide spraying in riparian areas it would likely have more negative effects to non-target riparian vegetation than alternative C. Because alternative B proposes aerial application of herbicides, it would likely have more negative effects on non-target plants due to chemical drift than alternative D. However, these effects are considered short-term and minor because the regional prevention and restoration standards adopted by the Forest Plan, the common control measures and project design features (PDFs) are considered adequate to protect native plant populations.

The action alternatives (B, C, and D) allow the use of several new herbicides, some of which are associated with hazards to non-target vegetation (R6 2005 FEIS p. 4-27- 4-33) as described above. Alternatively, some of these herbicides are more specific to certain plant families which would reduce impacts to native vegetation compared to the two chemicals available in the no action alternative. In turn, the reduced impacts to non-target species would aid the recovery of affected native plant communities. For instance alternative A only allows use of picloram and glyphosate. However, metsulfuron methyl and chlorsulfuron are recommended for treating houndstongue compared to other herbicides, clopyralid and chlorsulfuron controls tansy ragwort more effectively than picloram and glyphosate, and imazapic and sulfometuron methyl/chlorsulfuron, sulfometuron methyl and sethoxydim controls medusa head more effectively than glyphosate. Infestations of

houndstongue, tansy ragwort and medusa head are 6,071; 945, and 1,498 acres respectively. Being more effective means reducing the number of applications and volume of herbicide required compared to alternative A. Risks to non-target vegetation are further reduced by careful implementation of PDFs and common control measure notes and supplemental information provided by local experts. Although some short-term negative effects to native vegetation likely will occur, this alternative would be more effective at accomplishing the projects purpose and need of containing, controlling and eradicating invasive plant infestations. Long-term, alternative B would be more effective at allowing native vegetation and plant communities to recover compared to alternative A.

The 675 acres of aerial application sites proposed are primarily for treatment of yellow starthistle and diffuse knapweed. The geology underlying this site is primarily basalt and the associated soil is generally a loam. Clopyralid and picloram are the selective herbicides most effective for these species. Clopyralid would be sprayed because the area contains some conifers and clopyralid does not affect these species.

The largest area is approximately 630 acres with slopes ranging from 6 to 56 percent (GIS). This site is next to private land (138 acres) that would be sprayed at the same time. This large site has a higher risk for wind movement of herbicide affected soil due to the nonselective nature of the herbicides, and the aerial application method. However, most of the treatment areas are in open forest of mixed ponderosa pine or grasses. Clopyralid would not affect these species; so much of the treatment areas would retain some vegetative covering to protect the soil.

All aerial applications of herbicides will comply with EPA label restrictions and advisories; adhere to all Forest Plan standards as amended by the R6 2005 ROD, and implement buffer distances described in project design features for the protection of SOLI and riparian areas. Buffer widths were determined by monitoring results and modeling herbicide drift (AGDISP 2007) using worst case scenario application situations. Factors such as release height, wind speed/direction, droplet size, ground terrain, weather conditions, and nozzle type/orientation/droplet size were model input factors.

Previous aerial herbicide applications in the area indicate sensitive areas were fully protected using a 300-foot buffer (no aerial deposition) in a study using three commonly used helicopters, with various nozzle types applying picloram at a rate of 2 gallons/acre (USDA 2006c).

Additionally, helicopter application of clopyralid and picloram to control yellow starthistle in Hells Canyon area in Idaho reported greater than 90 percent control and no apparent damage to the native grasslands following treatment (TNC 2006). This application method was reported to be very accurate and negligible drift was observed (Talsma 2006). Some temporary set-back of some arrowleaf balsamroot (*Balsamorhiza sagittata*) was observed, however, most plants recovered. Additional aerial drift tests conducted near sensitive areas (stream side and threatened plant species) in northern Idaho indicated that these areas were fully protected with 50- to 100-foot buffers (Huibregtse 2007).

Drift modeling indicated some herbicide could reach non-target plants up to 300 feet from the aerial spray swath. No SOLI are within 300 feet of aerial spray sites.

In summary, there would likely be more risk from herbicide impacts to non-target native vegetation because more acres and sites would be treated compared to alternative A. The annual forest-wide risk to non-target effects from herbicide use between the no-action and the proposed action is less than 0.008 percent and 0.3 percent acres respectively.

Although more acres may be impacted by alternative B, in the long-term native plant community health will improve because existing and potential future invasive plant sites will be more effectively treated.

SOLI at highest risk (within 100 feet of an invasive species)

Table 23 lists all SOLI site locations within 100 feet of an identified invasive species and the proposed (1st and 2nd choice) treatments for each individual site. For the federally listed species *S. spaldingii* invasive species sites within 1000 feet are listed. Risks to SOLI from each individual herbicide proposed for use are listed in appendix B. For completed analysis of impacts to federally listed *S. spaldingii* see the Botany Report and Biological Assessment for Invasive Plants.

Effects from manual and mechanical methods as primary methods of treatment or as a follow-up treatment after herbicide treatment are expected to be the same as SOLI listed to in the no action alternative. Since no cultural methods are proposed close to any SOLI, no impacts are anticipated and, if used in the future, treatments would be directed by the forest botanist.

Risks to SOLI presently determined to be at highest risk from herbicide treatments would be minimized through the application of site specific PDFs. Therefore, no impacts are expected from alternative B, except for the *Botrychium* species. Though *Botrychium* species depends on symbiotic relationships with soil fungi; the symbiotic and/or other unidentified interrelated multiple relationships are unclear. Triclopyr inhibits growth of some species of mycorrhizal fungi (Cox, 2000). Although triclopyr is not the preferred herbicide for treatment of invasive species identified near the *Botrychium* species, very little is known about impacts of other herbicides to soil fungi and microorganisms (USDA 2005). Therefore approved herbicides could potentially alter the relationship between these two species and associated soil fungi. Five sites proposed for chemical treatment are within 100 feet of a documented *Botrychium* species. Monitoring, required in the PDFs, would track direct impacts and, adjust buffers and treatment options to protect from potential future impacts. Therefore only short-term impacts would be expected from unknown herbicide impacts to inter-related symbiotic or mutualistic relationships. Information derived from monitoring results could be used to further protect any future *Botrychium* sites that could become at risk from invasive weeds.

Table 23. Determination statements for each sensitive species occurrence within 100 feet of documented invasive species and impacts from alternatives

Site no.	SOLI	Invasive species nearby	Alt A	Alt. B	Alt. C	Alt. D	Proposed Treatment for Alternatives B, C, and D 1st choice, other methods also available
0614000011	<i>Astragalus arthurii</i>	diffuse knapweed scotch thistle	MIH	NI	NI	NI	chem.
6140000073	<i>Astragalus arthurii</i>	yellow starthistle diffuse knapweed	MIH	Ni	NI	NI	biocontrol
0614000200	<i>Botrychium</i> species <i>B. lanceolatum</i> , <i>B. minganense</i> , <i>B. montanum</i> , <i>B. pedunculatum</i> , <i>B. pinnatum</i>	spotted knapweed	MIH	MIH	MIH	MIH	chem.-riparian

Site no.	SOLI1	Invasive species nearby	Alt A	Alt. B	Alt. C	Alt. D	Proposed Treatment for Alternatives B, C, and D 1st choice, other methods also available
0614000210	<i>Botrychium</i> species <i>B. lanceolatum</i> , <i>B. minganense</i> , <i>B. pinnatum</i>	diffuse knapweed	MIH	MIH	MIH	MIH	chem.
0614000212	<i>Botrychium lanceolatum</i>	Canada thistle	MIH	NI	NI	NI	biocontrol
0614000242	<i>Botrychium</i> species <i>B. lanceolatum</i> <i>B. minganense</i> ,	diffuse knapweed tansy ragwort	MIH	NI	NI	NI	biocontrol
0614000780	<i>Botrychium</i> species <i>B. lanceolatum</i> , <i>B. minganense</i> , <i>B. pinnatum</i>	spotted knapweed	MIH	NI	NI	NI	biocontrol
0614000884	<i>B. lanceolatum</i>	diffuse knapweed	MIH	MIH	MIH	MIH	chem
0614000235	<i>Botrychium minganense</i>	diffuse knapweed tansy ragwort	MIH	NI	NI	NI	biocontrol
0614000198	<i>Botrychium pinnatum</i>	diffuse knapweed	MIH	MIH	MIH	MIH	chem.
0614000199	<i>Botrychium pinnatum</i>	tansy ragwort	MIH	NI	NI	NI	biocontrol
0614000837	<i>Botrychium pinnatum</i>	Canada thistle	MIH	MIH	MIH	MIH	chem.
0614000228	<i>Carex cordillerana</i>	common burdock	MIH	NI	MIH	NI	chem.-riparian
0614000759	<i>Carex cordillerana</i>	yellow starthistle	MIH	NI	NI	NI	biocontrol
0614000841	<i>Carex cordillerana</i>	diffuse knapweed sulphur cinquefoil	MIH	NI	MIH	NI	chem.-riparian
0614000856	<i>Carex cordillerana</i>	diffuse knapweed sulphur cinquefoil	MIH	NI	MIH	NI	chem.-riparian
0614000876	<i>Carex cordillerana</i>	common burdock	MIH	NI	MIH	NI	chem.-riparian
0614000071	<i>Carex hystericina</i>	scotch thistle	MIH	NI	MIH	NI	chem.-riparian
0614000022	<i>Calochortus macrocarpus</i> var. <i>maculosus</i>	yellow starthistle scotch thistle	MIH	NI	MIH	NI	chem.-riparian
0614000058	<i>Calochortus macrocarpus</i> var. <i>maculosus</i>	yellow starthistle scotchthistle	MIH	NI	MIH	NI	chem.-riparian
0614000074	<i>Calochortus macrocarpus</i> var. <i>maculosus</i>	yellow starthistle scotch thistle	MIH	NI	MIH	NI	chem.-riaprian
0614000075	<i>Calochortus macrocarpus</i> var. <i>maculosus</i>	yellow starthistle diffuse knapweed	MIH	NI	NI	NI	biocontrol

Site no.	SOLI1	Invasive species nearby	Alt A	Alt. B	Alt. C	Alt. D	Proposed Treatment for Alternatives B, C, and D 1st choice, other methods also available
0614000183	<i>Calochortus macrocarpus</i> var. <i>maculosus</i>	diffuse knapweed	MIIH	NI	MIIH	NI	chem.-riparian
0614000186	<i>Calochortus macrocarpus</i> var. <i>maculosus</i>	diffuse knapweed	MIIH	NI	MIIH	NI	chem.-riparian
0614000187	<i>Calochortus macrocarpus</i> var. <i>maculosus</i>	tansy ragwort	MIIH	NI	NI	NI	biocontrol
0614000878	<i>Eleocharis bolanderi</i>	houndstongue	MIIH	NI	NI	NI	chem.
0614000881	<i>Eleocharis bolanderi</i>	spotted knapweed diffuse knapweed	MIIH	NI	NI	NI	chem.
0614000882	<i>Eleocharis bolanderi</i>	spotted knapweed	MIIH	NI	NI	NI	chem.
0614000883	<i>Eleocharis bolanderi</i>	houndstongue	MIIH	NI	NI	NI	chem.
0614000757	<i>Leptodactylon pungens</i> ssp. <i>hazeliae</i>	diffuse knapweed	MIIH	NI	NI	NI	chem.
061400076	<i>Silene spaldingii</i>	Yellow starthistle, scotch thistle	LAA	NLAA	NLAA	NLAA	chem.
0614000105	<i>Trifolium douglasii</i>	diffuse knapweed	MIIH	NI	NI	NI	chem.
0614000314	<i>Trifolium douglasii</i>	diffuse knapweed houndstongue	MIIH	NI	NI	NI	chem.
0614000330	<i>Trifolium douglasii</i>	St. john's wort	MIIH	NI	MIIH	NI	chem.-riparian
0614000761	<i>Trifolium douglasii</i>	diffuse knapweed	MIIH	NI	NI	NI	chem.
35 Weed sites	13 species 44 occurrences						

NI = No impact, MIIH= May Impact Individuals or Habitat, But Will Not Likely Contribute to a Trend towards Federal Listing or Loss of Viability for the Population or Species

Determinations were derived from the combination of treatment effectiveness, risks from herbicides, and species habitat requirements. All PDFs would be implemented.

Lichens, bryophytes, and fungi

Impacts of invasive species to lichens, bryophytes, and fungi is not widely documented in the literature, likely due to taxonomic identification problems, lack of experts, the small size, the life history and variation observed within individual species. Additionally, impacts from herbicides on these taxa have not been widely studied.

As previously stated, triclopyr inhibits the growth of mycorrhizal fungi, beneficial fungi that increases the ability of plants to uptake nutrients (Cox 2000). Glyphosate and triclopyr applications in the field and laboratory have also reported reduced diversity and negative impacts to bryophytes and lichens (Newmaster et al. 1999); in some studies, herbicide applications have shown little effect on other species of bryophytes and lichens in field and laboratory conditions (Atkinson et al. 1980;

Balcerkiewicz and Rusińska 1987, Bond 1976, Mabb 1989, Pihakaski and Pihahaski 1980, Ronoprawiro 1975, Rudolph and Samland 1985, Stjernquist 1981). Supportive field trials are few. Physiological research is also needed to explain whether herbicides directly alter the physiology of bryophytes and lichens or simply affect their water relations due to loss of associated microhabitats. Bryophytes listed in Table 19 may be impacted by herbicide treatments, but impacts are uncertain and hard to predict. It is expected that the implementation of PDFs that outline effectiveness monitoring will provide much needed information and adjust buffers to protect these species if negative impacts are observed. Short-term impacts could be expected. Long-term positive effects to habitats are expected because effective treatment of existing and future invasive plants would restore, protect and maintain habitats these species require.

Impacts to pollinators

Effects would be similar to No Action. Triclopyr would be used on a small number of sites and could potentially affect pollinators. Effects to pollinators due to herbicide treatments may occur at some invasive plant sites that are larger than five acres (35 % of sites), highly infested and proposed for broadcast treatment. In the worst case scenario, including all of these sites, 0.003 percent of the forest area where native plant pollinators occur may be impacted. Impacts to specific sites would be short-term and the ability of native pollinators to migrate into potentially impacted areas from other nearby areas is highly probable.

Little to no effect to pollinators is expected from manual or mechanical treatments in the long term. Some short-term (year of treatment) effects could occur due to the reduction of flower heads used as food sources for pollinators.

All other SOLI

The risks to all other SOLI within the forest are similar to risks to native vegetation. Most SOLI are commonly located in undisturbed areas and not in disturbed areas where invasive species are commonly established. Many other SOLI exist on the Forest, and are not presently considered to be at highest risk from invasive species infestation. Invasive sites with high potential for spread that are near, but more than 100 feet from identified SOLI, would likely receive high priority for treatment to fully protect SOLI and their habitats. PDFs requiring surveys of potential habitats, and incorporation of all PDFs should protect SOLI discovered in the future. Increased levels of treatment effectiveness combined with EDRR strategies will further protect future SOLI sites and habitats that might otherwise be impacted from invasive species establishment.

Summary of Effects to Plants for Alternative B—Proposed Action

Currently inventoried invasive sites will be treated as prioritized by each district and as funding allows. Over time currently impacted native plant communities and habitats will likely recover with implementation of PDFs, prevention and restoration standards and EDRR strategies.

Risks to SOLI within 100 feet of an invasive site would be minimized through the application of site specific PDF - No impacts to SOLI (at highest risk) or their associated habitats is expected except for *Botrychium* species and *Cypripedium fasciculatum* where project activities may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability for the population or species. This conclusion of risk was based on specific herbicide characteristics and best available information related to individual SOLI habitat requirements.

Risks to all other SOLI forest wide would be reduced - More effective invasive plant treatment and herbicide options would be available (compared to alternative A) thereby reducing the present

risk of invasive spread into other SOLI areas. Additionally, EDRR strategies in conjunction with PDFs provide for adequate protection of SOLI sites if invasive plant species pose a risk in the future.

Impacts to bryophytes and lichens and fungi are not presently known - Project design features would require surveys for these species as well as post treatment monitoring and adaptive management that could adjust buffers, if needed, to further protect these species from unknown effects.

Risks to pollinators may increase - Glyphosate and triclopyr may have some toxic effects if applied at the maximum application rate proposed by the Forest Service (SERA 2003-glyphosate; SERA 2003-triclopyr).

Alternative C – No Broadcast Application of Herbicides in Riparian Areas

This alternative is very similar to alternative B except broadcast methods (hand broadcast and boom mounted sprayers on vehicles) would not be allowed in riparian areas. This alternative addresses concerns about risk of herbicide delivery to water and potential impacts to fish. Based on GIS mapping and stream buffers an estimated 3,022 acres would not be broadcast treated.

Direct and Indirect Effects

Native Vegetation and SOLI at highest risk (within 100 feet of an invasive species)

This alternative reduces the potential for non-target plant impacts by reducing the risks of drift from broadcast applications. However, spot treating individual invasive plants would likely be less effective and more costly than broadcast treatments, and repeated treatments within the same site may be required for species with a long-lived seed bank.

Broadcast treatments spray herbicides over a wide swath of vegetation and bare soil if present, and can be effective at killing emerging invasive seedlings due to the persistent nature in the soil of some herbicides.

Lichens, bryophytes, and fungi

As stated previously, impacts from invasive species and from herbicides to lichens, bryophytes, and fungi are not widely documented. This alternative would reduce the impacts associated with drift and broadcast application in riparian areas. It is possible that this could be of importance since many of these species thrive in these wetter environments; however, at this point in time it is difficult to predict. Future surveys, monitoring and adaptive management techniques outlined in PDFs will provide additional information.

All other SOLI

Impacts to all other SOLI are similar to those discussed in the proposed action. There could be a slight increase in risk to SOLI in the future because broadcast methods could not be used nearby (within 300 feet) to more effectively treat a newly established invasive species. It is expected that EDRR strategies would reduce and eliminate the potential of this risk. Little to no measureable impacts to habitat would be expected should chemical use be needed.

Impacts to pollinators

Impacts to pollinators are expected to be similar to those described in the proposed action; however, the already low potential for direct spray to pollinators (from drift) in the riparian areas where broadcast treatments are prohibited would be eliminated.

Alternative D – No Aerial Herbicide Application

This alternative is similar to alternative B except it does not allow aerial herbicide application on currently proposed (675 acres) sites. This alternative addresses concerns about risk of herbicide drift, impacts to non-target plants, herbicide delivery to water and potential impacts to fish.

Table 24. Proposed aerial sites on the Umatilla National Forest - All sites are located on the Pomeroy Ranger District

Site no.	Invasive species	Proposed treatment	Acres
06140400051	yellow starthistle	chemical	3
06140400059	diffuse knapweed	chemical	211
06140400061	diffuse knapweed	chemical	3
06140400063	yellow starthistle	chemical	8
06140400067	diffuse knapweed	chemical	2
06140400082	diffuse knapweed	chemical	1
06140400086	diffuse knapweed	chemical	7
06140400188	diffuse knapweed	chemical	3
06140400191	yellow starthistle	chemical	134
06140400287	yellow starthistle	chemical	286
06140400292	diffuse knapweed	chemical	4
06140400495	spotted and diffuse knapweed	chemical	5
06140400498	yellow starthistle and diffuse knapweed	chemical	3
06140400499	yellow starthistle	chemical	6
Total			675

Direct and Indirect Effects

Native Vegetation

This alternative reduces the potential for impacts to non-target plants because it reduces the risks of drift associated with aerial broadcast applications. Currently, 675 acres are proposed for aerial herbicide application in alternative B. Sites proposed for aerial herbicide application often have very limited access; costs for ground based methods of treatment in these areas are high, and worker safety is a concern due to steep slopes. Where worker safety is not a concern, the potential for treatment using backpack sprayers is still a viable alternative, but may have a lower priority because of time and cost constraints. Since such sites may not be as effectively treated as they could be using aerial application methods, the potential for weeds spreading in remote areas is greater, and greater long-term impacts to native vegetation are probable.

SOLI at highest risk (within 100 feet of an invasive species)

Presently there are no SOLI located near proposed aerial sites, therefore no impacts are expected. Follow PDFs for newly identified invasive species.

Lichens, bryophytes, and fungi

As stated previously, impacts from invasive species and from herbicides to lichens, bryophytes, and fungi are not widely documented. This alternative would reduce the impacts associated with drift and aerial broadcast application. At this point in time, due to lack of scientific studies effects are difficult to predict.

Impacts to pollinators:

Impacts to pollinators are expected to be similar to those described in the proposed action; however, the potential for herbicide contact to pollinators from drift during aerial broadcast treatments would be eliminated.

Cumulative Effects for Botany

Coordinated treatment of invasive plants with adjacent landowners to restore native vegetation (see PDF B.1 in section 2.2.3) is essential to effectively controlling weeds on both sides of the boundary.

Drift associated with herbicide treatments from or onto adjacent lands is possible with all alternatives, including no action. Glyphosate was the most widely used herbicide in 2007 in Oregon; since glyphosate is non-selective; drift could impact individual non-target plants up to 100 feet away from broadcast treatment sites (figure 11).

Release of biological control agents on National Forest System lands and adjacent lands by the Oregon and Washington Departments of Agriculture, as analyzed by Animal Plant Health Inspection Service (APHIS), will continue under all alternatives, and contributes to reducing the spread of invasive plants. It is recognized that biocontrol agents will likely cross land ownership boundaries. Biocontrol agents could occasionally affect non-target plants; but adverse effects would be minor compared to benefits of reducing the spread of weeds. There could also be some damage to individual non-target plants from manual and mechanical treatments. The temporary and incidental effects are considered minor because affected plants would likely re-sprout. The benefit of invasive plant removal or reduced seed production due to treatment is considered a greater benefit to non-target plants than the minor damage that could occur to non-target individuals.

Repeated treatments are likely to occur over time in all alternatives. Herbicide persistence would be managed through the PDFs that limit rates of certain herbicides in certain types of soils and limitations on repeated entries where appropriate.

The cumulative effects of all the alternatives are similar. These effects include temporary (one season) loss of individual non-target native and desirable non-native plants. Treatments would be a very small percentage of the Forest's total area. In the long-term, vegetation management will favor re-establishment of native plant communities across ownership boundaries, especially where coordinated treatments have occurred. The annual forestwide risk to non-target botanical species effects from herbicide use between the no-action and the proposed action is less than 0.008 percent and 0.3 percent acres respectively. Although more acres may be impacted by alternative B, in the long-term native plant community health will improve because existing and potential future invasive plant sites will be more effectively treated.

The effectiveness of the proposed invasive plants treatment project would be increased if coordination with adjacent landowners treats invasive infestation across land ownerships. Coordination would also tend to prevent unwanted effects such as duplication of treatment along a property boundary. The cumulative effects analysis assumes that this cooperative, coordinated effort continues for the life of this project. In addition, the cumulative effects analysis assumes that the release of biological control agents on National Forest System lands and adjacent lands by the Oregon and Washington Departments of Agriculture, as analyzed by Animal Plant Health Inspection Service (APHIS), will continue to reduce the invasive plant infestations in Oregon and Washington and also decrease the spread of invasive plants. In addition, post-wildland fire recovery efforts may include invasive plant treatment.

The potential negative effects of past, present and foreseeable future treatments are minor and short-term, especially compared to the benefits of reducing the negative influence invasive plants have on non-target plant communities. The overall positive effect of killing target invasive infestations is a far greater long-term benefit to non-target plant communities, including SOLI, than the temporary damage that may occur to individual non-target plants.

3.3 Terrestrial Wildlife

Changes between the DEIS and FEIS for Section 3.3

The status of some species indicated here has been changed from when the DEIS was published. Those changes have been recognized in this FEIS. The bald eagle was delisted and is now identified as a Sensitive Species; Rocky Mountain bighorn sheep is identified as removed from the Sensitive Species list; but information about the sheep remains, and the gray wolf is recognized as now having a presence on the Forest.

Section 3.3.1 adds a table displaying issues identified by the public and measuring factors for potential effects by alternative.

Section 3.3.2 adds road density information for wolves

3.3.1 Introduction

Invasive plant species have become established and continue to spread, causing a loss of wildlife habitat and posing a risk of injury to wildlife, so the Umatilla National Forest has proposed to conduct invasive plant treatment projects within its administrative boundaries. Methods used to treat invasive plants also have the potential to adversely affect individual animals as well as wildlife habitat. This section will summarize the effects on wildlife from invasive plants and the methods used to control invasive plants. The issues displayed below relate to potential effects of treatment on terrestrial wildlife species from herbicide treatments proposed. Table 25 summarizes the issue and measuring factors for comparison of alternatives based on the analysis in this section.

Table 25. Issue and measuring factor for potential effects of herbicide treatment on terrestrial wildlife by alternative

Issue Component	Unit of Measurement	(No Action) Alternative A	(Proposed Action) Alternative B	Alternative C	Alternative D
4 - There is a concern that herbicide exposure, particularly when applied through aerial or broadcast spraying, may harm terrestrial wildlife species.	Character of PDFs that apply to wildlife	Herbicide exposure limited because herbicide treatment limited by only being used if non-herbicide treatments are ineffective; PDFs not specifically applied to this	PDF Group J minimizes disturbance and wildlife exposure to herbicides	In addition to alternative B, herbicide exposure further minimized by eliminating broadcast applications methods in riparian areas	In addition to alternative B, herbicide exposure further minimized by eliminating aerial application of herbicides and the potential for associated drift

Issue Component	Unit of Measurement	(No Action) Alternative A	(Proposed Action) Alternative B	Alternative C	Alternative D
		alternative			
	Acres of broadcast spraying	1,774	17,478	14,456	18,153
	Acres of Aerial Spraying	0	675	675	0

3.3.2 Affected Environment

Invasive Plants and Wildlife Resources

Invasive plants have adversely impacted habitat for native wildlife (Washington Dept. of Fish and Wildlife 2003). Any species of wildlife that depends upon native understory vegetation for food, shelter, or breeding, is or can be adversely affected by invasive plants. Species restricted to very specific habitats, for example pond-dwelling amphibians, are more susceptible to adverse effects of invasive plants.

Although it is rare, some wildlife species can utilize invasive plants for food or cover. For example, American goldfinch (*Carduelis tristis*), and red-winged blackbird (*Agelaius phoeniceus*) utilize purple loosestrife (Kiviat 1996; Thompson, Stuckey, and Thompson 1987), and native bighorn sheep will utilize cheatgrass (Csuti et al. 2001). It has been reported that elk, deer and rodents eat rosettes and seed heads of spotted knapweed. Doves, hummingbirds, honeybees, and the endangered southwestern willow flycatcher (*Empidonax trailii extimus*) are known to use saltcedar (Barrows 1996). These are not preferred plants for any of these species. The few uses that an invasive plant may provide do not outweigh the adverse impacts to an entire ecosystem (Zavaleta 2000).

Displacement of native plant communities by non-native plants results in alterations to the structure and function of ecosystems and constitutes a principle mechanism for loss of biodiversity at regional and global scales (Lacey and Olsen 1991; Risser 1988 as cited in Johnson et al. 1994). Mills et al. (1989) and Germaine et al. (1998) found that native bird species diversity and density, were positively correlated with the volume of native vegetation, but were negatively correlated or uncorrelated with the volume of exotic vegetation. Invasive plants can adversely affect wildlife species by eliminating required habitat components, including surface water (Brotherson and Field 1987; Dudley 2000; Horton 1977), reducing available forage quantity or quality (Bedunah and Carpenter 1989; Rice et al. 1997; Trammell and Butler 1996); reducing preferred cover (Rawinski and Malecki 1984; Thompson et al. 1987); drastically altering habitat composition due to altered fire cycles (D'Antonio and Vitousek 1992; Mack 1981; Randall 1996; Whisenant 1990); and physical injury, such as that caused by long spines or "foxtails" (Archer 2001). In the case of common burdock (*Arctium minus*), the prickly burs can trap bats and hummingbirds and cause direct mortality to individuals (Raloff 1998; and documented in photos by Clay Grove, USFS, and Rosa Wilson, NPS). Invasive plants that grow large and densely (e.g., giant reed, Himalayan blackberry) can act as physical barriers to water sources and essential habitat (Bautista S., personal observation).

Invasive plants can act as a population sink by attracting a species and then exposing them to increased mortality or failed reproduction (Chew 1981). For example, Schmidt and Whelan (1999)

reported that native birds increased their use of exotic *Lonicera* and *Rhamnus* shrubs over native trees, even though nests built in the exotic shrubs experienced significantly higher mortality rates.

Some invasive plants (such as knapweed) contain chemical compounds that make the plant unpalatable to grazing animals. Chemical compounds in these invasive plants disrupt microbial activity in the rumen, or cause discomfort after being ingested, resulting in a reduced or avoided consumption of the invasive plant (Olson 1999).

Habitats that become dominated by invasive plants are often not used, or used much less, by native and rare wildlife species. Washington Department of Fish and Wildlife (2003) identified noxious weeds, such as yellow starthistle and knapweed, as threats to upland game bird habitat. Some hunters and wildlife managers are concerned that invasive plants are degrading the quality of remaining habitat for deer and elk and are adversely affecting the animal's distribution and hunting opportunities. Trammell and Butler (1995) found that deer, elk, and bison avoided sites infested with leafy spurge (*Euphorbia esula*). Tamarisk stands have fewer and less diverse populations of mammals, reptiles, and amphibians (Jakle and Gatz 1985; Olson 1999). Invasion by purple loosestrife makes habitat unsuitable for numerous birds, reptiles and mammals (Kiviat 1996; Lor 1999; Rawinski 1982; Thompson, Stuckey, and Thompson 1987; Weiher and Neely 1997; Weiher et al. 1996).

Of the federally listed species that occur on Umatilla National Forest System land, none are known to be adversely affected by invasive plants within the Project Area.

In summary, invasive plants are known or suspected of causing the following effects to wildlife:

- Embedded seeds in animal body parts (e.g. foxtails), or entrapment (e.g. common burdock) leading to injury or death
- Scratches leading to infection
- Alteration of habitat structure leading to habitat loss or increased chance of predation
- Change to effective population through nutritional deficiencies or direct physical mortality
- Poisoning due to direct or indirect ingestion of toxic compounds found on or in invasive plants
- Altered food web, perhaps due to altered nutrient cycling
- Source-sink population demography, with more demographic sinks than sources
- Lack of proper forage quantity or nutritional value at critical life periods

Threatened, Endangered, Sensitive (TES) Species

Since the time the DEIS was circulated, there have been changes to the TES lists. These changes are ongoing and will be considered during implementation. Regional policy is that these changes need not be considered in ongoing environmental analysis. In some cases (for instance bald eagle and wolf) the species has been federally delisted; however these species remain on the Forest Service sensitive list.

Listed species and one candidate species found, or with potential habitat in the Project Area are included in Table 26. A brief overview of the bald eagle, Canada lynx, and gray wolf regarding their presence in the Project Area is discussed below. The Columbia spotted frog (*Rana luteiventris*) is a FWS candidate species and on the Regional Forester's Sensitive Species List.

All species life history, threats, and generally recognized species protection measures are discussed in the sections of the Terrestrial Wildlife Specialist Report/Biological Assessment prepared for this

project. The complete report is available upon request from the Umatilla National Forest Supervisor's Office in Pendleton, Oregon. Additional detailed accounts can be found in the Biological Assessment prepared for the Regional Invasive Plant Program (USDA Forest Service 2005).

The FWS maintains a list of "candidate" species. Candidate species are those taxa which the FWS has sufficient information on biological vulnerability and threats to support issuance of a proposal to list, but issuance of a proposed rule is currently precluded by higher priority listing actions (U.S. Fish and Wildlife Service 1996).

Table 26. Federally listed or candidate species known to occur on the Umatilla NF

Species	Scientific Name	Status	Critical Habitat	Presence
Canada lynx	<i>Lynx canadensis</i>	Threatened	None	No
Gray wolf	<i>Canis lupus</i>	Endangered	None	Yes (2008)
Columbia spotted frog ¹¹	<i>Rana luteiventris</i>	Candidate	None	Yes

Canada Lynx

Lynx occur in mesic coniferous forest that have cold, snowy winters and provide a prey base of snowshoe hare (*Lepus americanus*) (Ruediger et al. 2000). Both snow conditions and vegetation types are important factors in defining lynx habitat. Crusting or compaction of snow may reduce the competitive advantage that lynx have in deep, soft snow. Primary vegetation that contributes to lynx habitat is subalpine fir types where lodgepole pine is a major seral species, generally between 4,100-6,600 feet (Ruediger et al. 2000, Ruggiero et al. 1999, and Verts and Carraway 1998). Moist grand fir and Douglas-fir types intermixed with subalpine types constitute secondary vegetation that may also serve as foraging habitat when characterized by a dense, multi-layered understory that maximizes hare browse at ground level and at varying snow depths (Ruediger et al. 2000 and Ruggiero et al. 1999). Hares comprise 33-100 percent of the lynx' diet and a hare density of greater than or equal to 0.5 hares/hectare is likely required for lynx persistence (Ruggiero et al. 2000). Riparian areas, aspen stands, and high-elevation willow communities are also important lynx prey habitats.

Large, coarse woody debris is a common element of natal den sites. Hollow logs and root wads provide protection and thermal cover for kittens.

Denning habitat must be in or adjacent to foraging habitat to be functional (Ruediger et al. 2000). Lynx seem to prefer to move through continuous forest, and frequently use ridges, saddles, and riparian areas. Home range sizes for lynx can be variable, but it appears that at least 6,400 acres of primary vegetation should be present to support survival and reproduction.

Canada lynx are thought to occur in Oregon as dispersers that have never maintained resident populations. They are considered an infrequent and casual visitor by the state of Oregon (Ruediger et al. 2000, pp. 4-7). The Umatilla NF has not had a verified lynx observation, therefore the Forest is considered "unoccupied" habitat. To be considered "occupied" habitat, the Forest would have to have at least two verified lynx observations or records within the past five years, or evidence of lynx reproduction.

¹¹ Columbia spotted frog is also a R6 Sensitive Species and will be discussed further in that section below.

Winter track surveys for lynx and wolverine were conducted by the Forest from 1991-1994 and no confirmed lynx tracks were found. Hair snares were used to survey for lynx, according to the National Lynx Survey, during the summers of 1999-2001. There were no lynx detections confirmed from the survey effort. It is unknown whether lynx are currently present on the Forest, but there are no verified records of lynx, and there is no evidence of occupation or reproduction that would indicate colonization or sustained use by lynx.

Lynx habitat on the Umatilla National Forest was mapped using the vegetation and environmental conditions for the Northern Rocky Mountains Geographic area, and more specifically, the Blue Mountain Section, including northeast Oregon and southeast Washington. Primary vegetation was based on the direction provided in the Canada Lynx Conservation Assessment and Strategy (LCAS) (Ruediger et al. 2000), and follow-up guidance from the Forest Service Regional Office and the Lynx Biology Team. Sixth code Hydrologic Unit Codes (HUC), were used as the basis for delineating Lynx Habitat across the Forest. Potential lynx habitat generally occurs in an elongated cluster in the northern portion of the Umatilla National Forest with another habitat cluster in the Blue Mountains on the southern end. However, the Lynx Conservation Agreement (May 2006), states that the LCAS does not apply to forests that are considered as having unoccupied habitat. Table 27 describes the size and type of potential lynx habitat as defined in the LCAS and acres of known invasive plant sites that exists within the Forest.

Table 27. Descriptions of Potential Lynx Habitat

Potential Lynx Denning	Potential Lynx Forage	Currently Unsuitable	Total Potential Lynx Habitat	Acres of Invasive Plants Within Potential Habitat
81,485	154,761	121,716	357,962	3,486 (<1%)

Gray Wolf

Habitat preference for the gray wolf appears to be more prey dependent than cover dependent. The wolf is more of a habitat generalist inhabiting a variety of plant communities, typically containing a mix of forested and open areas with a variety of topographic features including grasslands, sagebrush steppe, and coniferous, mixed, and alpine forests (NatureServe 2006, Verts and Carraway 1998, and Witmer et al. 1998).

Wolves prefer fairly large tracts of roadless country; generally avoiding areas with an open road density greater than one mile per square mile (Mech 1989, Witmer et al. 1998). The basic social unit in wolf populations is the pack. A pack can consist of 2 to 20 wolves (average of 10).

Wolves prey primarily on large ungulates such as elk and deer (NatureServe Explorer 2006, Verts and Carraway 1998, and Witmer et al. 1998). Their alternate prey base typically consists of smaller mammals and birds, such as, beaver, ground squirrels, rabbits, and grouse (NatureServe Explorer 2006 and Witmer et al. 1998). It is not uncommon to observe wolves mousing in grassy meadows much like coyotes and red fox. Individuals may take livestock as secondary prey when ungulates are less vulnerable or available (Witmer et al. 1998).

Gray wolves have extensive home ranges but specific habitat requirements for denning, rearing young, and foraging. Dens are usually located on moderately steep slopes with southerly aspects within close proximity to surface water. Rendezvous sites, used for resting and gathering, are complexes of meadows that have adjacent hillside timber with nearby surface water (Kaminski and

Hansen 1984). Both denning and rendezvous sites are often characterized by having nearby forested cover, remote from human disturbance (Mech 1989, NatureServe Explorer 2006). Wolves are strongly territorial; defending an area of 75-150 square miles, and are threatened by negative interactions with humans. Oregon Department of Fish and Wildlife confirmed evidence of one breeding pair of wolves with two pups (discovered in 2008) ¹² on the Forest inhabiting wilderness and areas adjacent to wilderness. Several inventoried roadless areas and wilderness areas offer secluded places that would be logical for wolves to inhabit. Wolf sighting information seems to indicate there are also transient or lone individuals that are not part of a resident pack using the Umatilla National Forest. Gathering information about wolves on the Umatilla National Forest is ongoing.

Forest Service Sensitive Species

This section of chapter 3 discusses the Affected Environment of Sensitive Species documented (shown by a D in the Occurrence column of Table 28) as a component of the Umatilla National Forest.

The sensitive species list was updated in January 2008, however the Regional Forester did not require the lists be updated in planning for projects initiated previously to that time (such as this invasive plant treatment project). Changes in the species lists will be considered during implementation and documented as required in FSH 1909.15.

Table 28. Suspected (S) or Documented (D) Wildlife of the Umatilla NF on the Regional Forester's Sensitive Species List (July 2004)

Common Name	Scientific Name	Occurrence
Mammals		
California wolverine	<i>Gulo gulo</i>	D
Rocky Mountain Bighorn Sheep ¹³	<i>Ovis canadensis canadensis</i>	D
Birds		
American peregrine falcon	<i>Falco peregrinus anatum</i>	S
Green-tailed Towhee (WA only)	<i>Pipilo chlorurus</i>	D
Upland sandpiper	<i>Bartramia longicauda</i>	S
Gray flycatcher	<i>Empidonax wrightii</i>	S
Bald eagle	<i>Haliaeetus leucocephalus</i>	D
Amphibians		
Northern Leopard frog	<i>Rana pipiens</i>	S
Columbia spotted frog	<i>Rana luteiventris</i>	D
Reptiles		
Painted Turtle	<i>Chrysemys picta</i>	S
Striped Whipsnake (WA only)	<i>Masticophis taeniatus</i>	S
D = Documented – in the context of the Forest Service sensitive species program, an organism that has been verified to occur in or reside on an administrative unit. S = Suspected – in the context of the Forest Service sensitive species program, an organism that is thought to occur, or that may have suitable habitat, on Forest Service land or a particular administrative unit, but presence or occupation has not been verified.		

¹² This discovery was made after the Umatilla NF Invasive Plants Treatment Project DEIS was published

¹³ Rocky Mountain Bighorn Sheep has been taken off of the sensitive species list since the Draft EIS was issued, but is retained here for information purposes.

California Wolverine

Wolverine range in the contiguous United States is thought to include Idaho, Montana, Oregon, Washington, Wyoming and possibly California. Wolverines inhabit dense coniferous forests and use open sub-alpine forests up to and beyond timberline. Typically, they use high elevation alpine wilderness areas in the summer and montane forest habitats in the winter (Copeland, 1996). In California and southern Oregon and throughout the Cascades, the wolverine inhabits alpine, boreal forest and mixed vegetation (Grinnell et al. 1937; Schempf and White 1977). They are associated with rocky outcrops, steep mountainous areas and transition zones between primary cover types. Forested riparian zones at upper elevations are likely to be important forage habitats for these furbearers and provide relatively safe travel corridors that allow for animals to move within and between watersheds. They most commonly use areas with a high diversity of microhabitats and high prey populations.

Natal denning habitat includes open rocky slopes (talus or boulders) surrounded or adjacent to high elevation forested habitat that maintains a snow depth greater than 3 feet into March and April (Forest Service 1994). Wolverines are known to regularly avoid human generated disturbance, and are sensitive to any disturbance; they will move natal den-sites several miles if disturbance is in the area of their den.

The wolverine is an opportunistic scavenger, with large mammal carrion the primary food source year-round. Prey items also include small and medium-sized mammals, birds and their eggs, insects, fish, roots, berries, and carrion. While foraging, they generally avoid large open areas and tend to stay within forested habitat at the mid and high elevations (greater than 4,000 feet) and typically travel 18-24 miles to forage/hunt (USDA Forest Service 1994).

Prior to 1973, wolverines were classified as furbearers in Oregon. They are considered rare throughout all of Oregon, Washington, Idaho, and California, but recent sightings, tracks, and a road kill document their continued presence at low densities (Csuti et al. 2001). Records for eastern Oregon include a partial skeleton and tufts of fur found near Canyon Mountain, Grant County (1992), tracks and a possible den site discovered in the Strawberry Mountain Wilderness (1997), and tracks that were noted in the Monument Rock Wilderness (1997).

There are historical sighting records of wolverines on the Umatilla National Forest but there has been no physical evidence of their occurrence found on the Forest. Formal winter track surveys for wolverine were conducted during the winters of 1991 through 1994. Those surveys found no verified tracks. There are no known den sites on the Forest. The Umatilla lacks much acreage above 7,000 feet, which is generally where wolverine prefer to den.

The most likely places wolverines would be found are the wilderness areas since wolverines prefer remote and high elevation areas for denning. The Umatilla NF has three wilderness areas totaling approximately 304,925 acres, and there are approximately 251 acres within those three wildernesses known to have invasive plants. Therefore, far less than one percent of these three wilderness areas have invasive plants. In addition, no acres above 7,040 feet have invasive plants. What this means is that potential wolverine den sites would not be disturbed by invasive plant treatments because there are no invasive plants known to exist above 7,040 feet in elevation. In addition, since less than one percent of the wilderness areas contain invasive plants the likelihood of disturbance or impacts to wolverine or their habitat is highly unlikely. Although wilderness areas appear to be the most likely places to find wolverine den sites, they could in fact be foraging just about anywhere on the Forest since they have such large home ranges and are capable of traveling long distances in a day.

Rocky Mountain Bighorn Sheep

The Rocky Mountain bighorn sheep was removed from the R6 Sensitive Species list; but it is retained here for information purposes.

Bighorn sheep generally inhabit open areas of rocky slopes, ridges, rim rocks, cliffs, and canyon walls with adjacent grasslands or meadows, and few trees (Verts and Carraway 1998). Dense forest communities are avoided. Their primary diet consists of bunchgrass, but also includes significant amounts of forbs and shrubs during the growing seasons. In the spring they will also utilize cheatgrass, which is an invasive annual plant. The distribution of escape terrain regulates the extent to which other habitat components are used. Most bighorn sheep use forage areas within 0.5 mile of escape terrain and generally not seen farther than 1.0 mile.

Summer range varies from subalpine meadows above 7,500 feet to canyon grasslands at 1,000 feet. Winter range is usually below 6,000 feet. Some herds are yearlong residents on a given area, with little or no spatial separation of summer and winter ranges (Drewek 1970). Other herds migrate several miles between summer and winter range and occupy areas that include a variety of elevations and environmental conditions (Geist 1971). Both summer and winter range must provide freedom from disturbance and a proper juxtaposition of forage, escape terrain, and water.

Terrain for lambing is rugged, precipitous and remote (Van Dyke et al. 1983). Such terrain provides pregnant ewes security and isolation during the lambing season. Ewes select rugged cliffs of at least five acres for lambing. Ewe-lamb groups prefer more rugged topography than ram groups (Valdez and Krausman 1999) and are more restricted in use of their range. Ram groups will range farther from escape terrain than ewe groups.

The Forest has both Rocky Mountain and California bighorn sheep. Rocky Mountain bighorn sheep includes all the herds except the Potamus herd, which is the only herd that is California bighorn sheep.

Bighorn sheep can be found in the vicinity of the Grande Ronde, Wenaha (north end) and North Fork of the John Day (south end) rivers and the Tucannon Wilderness. They were recently introduced (2002) into the Heppner/Ukiah area, and although the populations are small, they appear to be stable. Bighorn sheep habitat on the Forest is not typical in that the Forest does not have a lot of high elevation habitat so these animals utilize lower elevation habitat year-around. Table 29 in this section contains the five areas bighorn sheep are found on the Forest and the number of acres within these areas where invasive plants are found. Invasive plants currently impact a small portion of bighorn sheep habitat; however, if left unchecked impacts will eventually become greater.

Table 29. Bighorn sheep locations and the approximate number of acres of invasive plants

Bighorn Sheep Location	Approximate Acres Within The Area	Acres with Invasive Plants	Percent of Bighorn Sheep Area with Invasive Plants
Asotin	21,745	613	2.8%
Cottonwood Creek/Lost Prairie/Mountain View	19,384	191	< 1%
Potamus	17,922	197	1.0%
Tucannon River/Wooten	7,434	146	1.9%
Wenaha	67,709	203	< 1%
Wenaha/Haas/Cottonwood	20,054	490	2.4%

Green-tailed Towhee

The green-tailed towhee is a bird of the western portion of the lower 48 states. Its northern limit is in the Blue Mountains of Washington, just over the Oregon state line. From there it breeds south to southern California and east to Wyoming and eastern New Mexico. It is migratory, spending winters in the southwestern U.S. and Mexico (Csuti et al. 2001).

The green-tailed towhee prefers vigorous shrub stands with high shrub species diversity. It occupies the undergrowth of sagebrush, bitterbrush, manzanita, mountain mahogany, and buckbrush in open ponderosa pine woodlands. During the breeding season, this species is generally found in brushy areas on the mountain slopes, where scattered trees such as juniper or aspen intermingled with significant stands of shrubs, particularly mountain mahogany or snowbrush (Marshall et al. 2003), sometimes as high as 6,000-7,000 feet. It breeds in higher-elevation coniferous woodlands in some parts of Oregon. While in the more arid portions of eastern Oregon, it occurs only in riparian woodlands and sagebrush thickets on mountain slopes (Csuti et al. 2001).

Little is known about the food habits of green-tailed towhees. Like other towhees, it scratches litter on the ground, presumably looking for seeds and insects.

It probably takes a variety of forb and shrub seeds, with more insects added to the diet in the breeding season. It will take some berries from shrubs when they are available (Csuti et al. 2001).

Forest records show a very limited number of sightings of green-tailed towhee on the Pomeroy and Walla Walla Ranger District. These sightings were on south, southwest, or west facing slopes with greater than 30 percent dry bunch grass interspersed with woody shrubs. NatureServe Explorer (2006) shows the green-tailed towhee as 'apparently secure' in Oregon and 'imperiled' in Washington, but this may be simply because southeast Washington is at the furthest northern part of their range and not much is known about them in this area. Mapping potential breeding and foraging green-tailed towhee habitat included: all dry shrubland habitat, ponderosa pine forest and juniper woodlands with less than 30 percent canopy closure, and south, southwest and west slopes. Using this broad scale analysis, there is approximately 71,394 acres of potential green-tailed towhee habitat on the Forest. Approximately 1,424 acres or two percent of those acres have known invasive plants. Approximately 43 percent of those acres are adjacent to roads (549 acres) or trails (63 acres).

Bald Eagle

The bald eagle ranges throughout much of North America, nesting on both coasts and north into Alaska, and wintering as far south as Baja California. The largest breeding populations in the contiguous United States occur in the Pacific Northwest states, the Great Lakes states, Chesapeake Bay, and Florida. Oregon and Washington are important for wintering bald eagles, however the Umatilla National Forest provides only limited wintering habitat for migratory eagles as well as residents.

Bald eagle populations have made substantial recoveries in recent years. Formerly listed as endangered in 1978, the bald eagle was down-listed to threatened status in the lower-48 states in 1995. In March 1999, FWS proposed to delist the bald eagle throughout its entire range (Federal Register 1999). In June 2007 the bald eagle was officially delisted as a threatened or endangered species and no longer falls under the protection of the ESA. The bald eagle is however, protected under the Bald Eagle and Golden Protection Act of 1940 and the Migratory Bird Treaty Act of 1918(as amended).

Bald eagle numbers vary by season and include breeding, migration and wintering populations. The breeding season begins in late February or March, with juveniles fledging between mid-July and early September. They generally leave the nest area between late August and late September. Migration generally peaks during March-April in the spring, and October-November in the fall.

Bald eagles first breed at five to six years of age. Egg-laying can start as early as February and continue until April, and both sexes incubate one to three eggs for 31 to 35 days. Eggs hatch from March to May, and the nestling period lasts 11 to 14 weeks. Some breeding birds remain near nesting territories throughout the winter months (USDI 1986).

Nesting territories are normally associated with lakes, reservoirs, rivers, or large streams (U.S. Fish and Wildlife Service, 1986). In the Pacific Northwest recovery area (for more information see the Bald Eagle Recovery Plan, U.S. Fish and Wildlife Service, 1986), preferred nesting habitat for bald eagles is predominately uneven-aged, mature coniferous (ponderosa pine, Douglas-fir) stands or large black cottonwood trees along a riparian corridor (NatureServe 2006 and USDI 1986). Eagles usually nest in mature conifers with gnarled limbs that provide ideal platforms for nests. Trees selected for nesting are characteristically one of the largest in the stand or at least codominant with the overstory. Nest trees usually provide an unobstructed view of the associated water body and are often prominently located on the topography. They also tend to be found in relatively remote areas that are free of disturbance. Snags, trees with exposed lateral limbs, or trees with dead tops are often present in nesting territories and are used for perching or as points of access to and from the nest. The size and shape of a defended breeding territory varies widely (1.6 to 13 square miles) depending upon the terrain, vegetation, food availability, and population density of an area (USDI 1986). Adults tend to use the same breeding areas year after year, and often the same nest, though a breeding area may include one or more alternative nests (U.S. Fish and Wildlife Service 1986).

The most common food sources for bald eagle in this region are fish, waterfowl, rabbits, and various types of carrion (NatureServe Explorer 2006 and USDI 1986). The main food source for bald eagles during the breeding season is fish; therefore, habitat of most importance during this period consists of areas near large bodies of water and major river systems (U.S. Fish and Wildlife Service 1995).

During the critical incubation (March) and brooding (late April/early May) phases, human disturbance can result in nest failure with the risk reduced as the nesting cycle progresses towards fledgling at the end of July. Some habituation of eagles to human activity has been observed, varying according to type and proximity to the bald eagle. Individual birds vary widely in their response to human disturbance (USDI 1986).

The Umatilla National Forest has one known bald eagle nest site, which was discovered in 1994. The Dry Creek bald eagle nest is located on the Heppner Ranger District, west of Dry Creek and is approximately three air miles north of the North Fork of the John Day River. The nest has had variable success over the years in fledging young, but the majority of the time has successfully fledged 1 to 2 young each year. The nest site is surveyed each spring to determine nest success. A site-specific management plan was developed and reviewed by the FWS and Frank Isaacs (bald eagle specialist from Oregon State University) for the Dry Creek bald eagle nest site in 1999. The plan developed both a Bald Eagle Consideration Area (BECA) boundary and a Bald Eagle Management Area (BEMA) boundary. The BECA includes both private and Bureau of Land Management (BLM) land, while the BEMA is entirely within National Forest System lands. It is presumed that the eagles occupying this nest stay in the area year-round.

The nest is on a north-facing slope in a canyon that contains mixed conifer with dry/juniper/pine on the south-facing slope. Several age classes of trees exist within the area, including several older,

large diameter trees. An unimproved dirt road runs up the canyon bottom near the nest. The area is grazed by livestock early in the season (early spring and summer). Motorized travel is limited and is mostly used for livestock operations. The BEMA is within critical elk winter range. The road in close proximity to the nest is within a seasonal road closure for elk, which happens to coincide with when the birds nest. The eagles have become accustomed to some degree to human disturbance. There are no identified invasive plants sites within the BEMA, however there are several small sites on National Forest System lands within the BECA. They are well over a mile from the nest and are currently not large enough to impact eagle prey foraging habitat.

At this time the Forest has no established winter roost sights; however bald eagles do roost on the Forest during winter months. Winter bird count surveys occur along the North Fork of the John Day River and the Umatilla River each year. Bald eagle numbers appear to be fairly small and both the roost and perch sites seem to vary somewhat from year to year. The majority of the bald eagle migration and winter sightings are in areas along the Mecham and Umatilla creeks as well as the Grande Ronde and Tucannon Rivers. Currently, there are no invasive plants adversely affecting bald eagles on the Forest.

Columbia Spotted Frog

Columbia spotted frogs range from southeastern Alaska to central Nevada, east to Saskatchewan, Montana, western Wyoming, and north central Utah. The Great Basin Distinct Population Segment (DPS) of the Columbia spotted frog is a federal candidate for listing. This DPS is found in Oregon, Idaho, and Nevada. The Columbia spotted frog is considered a Forest Service sensitive species and has been documented on the Malheur, Ochoco, Umatilla, and Wallowa-Whitman National Forests. This species was once considered to be included in *Rana pretiosa*, with the Oregon spotted frog

The spotted frog frequents waters and associated vegetated (grassy) shorelines of ponds, springs, marshes, and slow-flowing streams and appears to prefer waters with a bottom layer of dead and decaying vegetation (NatureServe Explore 2006, Hayes et al. 1997, Csuti et al. 2001). They occur along the grass and sedge margins of streams, lakes, ponds, springs, and marshes. They typically occur between 150 and 8,000 feet in elevation (Corkran and Thoms 2006). The Columbia spotted frog exhibits strong fidelity to breeding sites and often deposits eggs in the same locations in successive years. They deposit egg masses in still, shallow waters atop submergent herbaceous vegetation or among clumps of herbaceous wetland plants. Breeding habitats include a variety of relatively exposed, shallow-water (less than 60 centimeters), emergent wetlands such as sedge fens, riverine over-bank pools, beaver ponds, and the wetland fringes of ponds and small lakes. Vegetation in the breeding pools generally is dominated by herbaceous species such as grasses, sedges and rushes. After breeding, adults often disperse into adjacent wetland, riverine and lacustrine habitats. Tadpoles live in the warmest parts of ponds (Corkran and Thoms 2006). Froglets and adults live in well-vegetated ponds, marshes or slow, weedy streams that meander through meadows (Corkran and Thoms 2006). Springs may be used as over-wintering sites for local populations of spotted frogs (Hayes et al. 1997).

Larvae have a diet of algae, plant material, and other organic debris. Adults eat insects (ants, beetles, mosquito larvae, and grasshoppers), spiders, mollusks, tadpoles, crayfish, and slugs (NatureServe Explore 2006, Hayes et al. 1997, Csuti et al. 2001). Columbia spotted frogs eat arthropods, earthworms and other invertebrate prey.

Predators of the species include mink, river otter, raccoon, herons, bitterns, corvids, garter snakes, dragonfly larvae, and predacious diving beetles (McCallister and Leonard 1997).

Environmental stressors such as pesticides, herbicides, fertilizers, and heavy metals may slow reactions or cause behavioral changes that make spotted frog tadpoles more vulnerable to predation (Lefcort et al. 1998, Rosenshield et al. 1999, Marco et al. 1999, Bridges 1999, Bridges and Semlitsch 2000). Threats to the species include mining, livestock grazing, road construction, agriculture, and direct predation by bullfrogs and non-native fishes (USDI 1998).

Columbia spotted frogs occur in a number of locations (at least 15 sites) on the Umatilla National Forest. This species is often found in natural ponds, rock pits, old mining ponds, livestock ponds, and slow moving streams that retain water year-round. More have been found on the south end of the Forest than the north. Most spotted frog sites found on the Forest are in created habitat such as mining ponds and rock pits. Several of the known or potential spotted frog sites have invasive plants.

The Umatilla National Forest does not have GIS coverage for manmade and natural ponds, lakes, reservoirs, wet meadows, springs and stockponds; however, it does have GIS coverages for lakeshores and springs. Although lakeshores and springs contain only a portion of the potential Columbia spotted frog habitat available in the Project Area, it does show some of the potential habitat available and a portion of the potential habitat which contains invasive plants. This gives a sense of what proportion of the other waterbodies mentioned above may contain invasive plants.

There are eight waterbodies and 397 springs defined in the Umatilla GIS coverages. The potential habitat model for spotted frog used springs buffered by 300 feet and lakeshores 300 feet to the outside and 25 feet to the inside. Using these parameters there are approximately 2,775 acres of spotted frog habitat on the Forest, of which 133 acres contain invasive plant species.

Management Indicator Species

Management Indicator Species (MIS) are selected species whose welfare is believed to be an indicator of the welfare of other species using the same habitat, or a species whose condition can be used to assess the impacts of management actions on a particular area (Thomas 1979). Table 30 includes those wildlife species that were identified as MIS for the Umatilla National Forest (USDA 1990).

Table 30. Management Indicator Species and Their Associated Habitat for the Umatilla NF

Species	Habitat Types
Rocky Mountain elk	General forest habitat and winter ranges
Pileated Woodpecker	Dead/down tree habitat (mixed conifer) in mature and old growth stands
Northern three-toed woodpecker	Dead/down tree habitat (lodgepole) in mature and old growth stands
Pine Marten	Mature and old growth stands at high elevations
Primary cavity excavators	Dead/down tree (snag) habitat

Rocky Mountain elk

Rocky Mountain elk was selected as an indicator species in the Forest Plan to represent general forest habitat and winter ranges. Concern over this species arises from its status as an important game species. Habitat quality for elk is evaluated in terms of forage, cover (satisfactory and marginal), elk screening, and open road density. The quality of elk habitat is influenced by the presence of humans, which causes animal stress and hunting vulnerability. This is primarily associated with motorized use of open roads and the availability of vegetation (live and dead) to

screen elk. Elk have been found to select habitats preferentially based on increasing distance from open roads (Rowland et al. 2000). Vulnerability and hunting mortality have been found to be higher in forested stands with greater road densities and less vegetation to provide screening (Weber et al. 2000).

Elk habitat on the Forest was mapped as part of a cooperative effort sponsored by the Rocky Mountain Elk foundation using a 1:250,000 scale map. This mid-scale mapping is used for a “big picture” perspective of habitat use. When this map is overlain with the Forest mapped invasive species layer, it shows approximately 364,188 acres of elk winter range on the Forest. Approximately 8,967 acres (two percent) of the elk winter range is currently known to contain invasive plant species.

Of the elk winter range that contains invasive plants, approximately 39 percent is adjacent to roads and trails (approximately 37 percent is along roads only).

Elk summer range (approximately 1,252,527 acres) includes most of the Forest except for small portions of the Walla Walla and Pomeroy Districts. Approximately 22,736 acres (1.8 percent) of elk summer range is infested with invasive plants. Approximately 48 percent of the summer range infested with invasive plants is adjacent to roads and trails (45 percent along roads only). About three percent of the total mapped elk calving areas are impacted by invasive plants. Of that three percent, 64 percent is adjacent to roads and trails. Invasive plants within 100 feet of a road or trail are considered to be adjacent. What this analysis shows is that a fairly high proportion of the invasive plants within elk habitat are adjacent to roads and trails.

Pileated woodpecker

Pileated woodpecker was selected as an indicator species in the Forest Plan to represent dead and down tree habitat in mature and old growth mixed conifer stands. The pileated woodpecker is the largest woodpecker species in the western United States and nests in cavities of large trees or snags. It is an occupant of mature forests, relying on dead and decaying trees for foraging and nesting. Pileated woodpeckers can act as a keystone habitat modifier by excavating large numbers of cavities that are depended upon by several other species, and by influencing ecosystem processes such as decay and nutrient cycling (Aubry and Raley 2002). The pileated woodpecker is fairly common throughout the Umatilla National Forest in mature and late-successional mixed conifer forest. Pileated woodpeckers rely on large areas of unburned, mature and old-growth forests for their foraging resources, because they forage primarily on ants (*Hymenoptera* and *Formicidae*) within softened wood (Bull and Holthausen 1992).

Parameters used for mapping potential habitat for pileated woodpecker included late forest structure in mixed conifer stands consisting of ponderosa pine, western larch, grand fir and Douglas-fir, which had greater than or equal to 50 percent canopy closure and trees and snags that were at least 15 inches diameter breast height. Using this analysis there are approximately 191,171 acres of potential pileated woodpecker habitat within the project area. There are approximately 3,719 acres (2 percent) of known invasive plant species infestations within this potential pileated woodpecker habitat.

Since pileated woodpeckers utilize down logs and snags and forage on beetles and ants buried inside decaying wood, their habitat is not impacted by invasive plant infestations but infestations may occur in proximity to pileated woodpecker habitat. Fifty-two percent (1,949 acres) of those acres are adjacent to roads and trails.

Northern Three-toed Woodpecker

The northern three-toed woodpecker was selected as an indicator species in the Forest Plan to represent dead and down tree habitat in mature and old growth lodgepole pine stands. The northern three-toed woodpecker preferred habitat (foraging and nesting) includes late successional, cold/moist forest types (lodgepole/mixed conifer) with high standing-wood density, generally in higher-elevations above 4,500 feet (Marshall et al. 2003, Csuti et al. 2001).

This woodpecker feeds mostly on wood-boring larvae of moths and beetles, which it captures by probing dead or decaying wood. It also gleans some insects (ants, caterpillars), and eats fruits, mast, and cambium (Csuti et al. 2001). The loss of mature lodgepole pine forest habitat, essential to this naturally rare species, could lead to its decline.

Pine marten

The pine marten (aka American marten) was selected as an indicator species in the Forest Plan to represent complex mature and old growth stands. Preferred habitat for the marten consists of higher elevation (greater than 4000 feet) stands of dense conifer and large down-wood, often associated with streams. Pine martens occur in dense forests containing snags and down logs, which provide suitable denning sites. The pine marten is most closely associated with heavily forested east and north-facing slopes that contain numerous windfalls (Maser 1998). Martens spend a great deal of time in trees and can even leap from branch to branch between trees. They tend to avoid areas that lack overhead protection and the young are born in nests within hollow trees, stumps, or logs. They eat a variety of small mammals, particularly squirrels, as well as voles, mice, pika, and rabbits. Martens do not tolerate concentrated human use or habitat modification (Maser et al. 1981). The historical and current density and distribution of marten in the Forest is unknown, but they are thought to occur in low numbers.

Multi-storied, mature and old forest stands with trees and snags 15 inches in diameter at breast height or larger, and at 4,000 feet in elevation or above were used to determine broad-scale potential marten habitat. No acres of juniper woodland, hot-dry ponderosa pine or whitebark pine habitat was calculated into the marten habitat. This analysis does not include the marten preference for close proximity to riparian habitat so it is more inclusive. Using these factors to determine potential marten habitat; the Project Area contains approximately 78,595 acres of habitat. Approximately 1,662 acres (2 percent) contain known invasive plant sites. Approximately 2 percent of those sites are adjacent to roads (729 acres) and trails (67 acres). It is not entirely clear why two percent of potential marten habitat shows up with invasive plants, since they tend to use areas with dense canopy cover, which is not where invasive plants are generally found. It could be that much of the area is adjacent to roads where invasive plants are often found, the stands are adjacent to cut-over areas that contain invasive plant infestations, or there was a slight mapping error.

Cavity Excavators

A large number of species rely on cavities in trees for shelter and nesting. Primary cavity excavators include 16 species of birds with the potential for habitat to occur in the Umatilla National Forest.

These species include Lewis' woodpecker, Williamson's sapsucker, red-naped sapsucker, downy woodpecker, hairy woodpecker, white-headed woodpecker, three-toed woodpecker, black-backed woodpecker, northern flicker, pleated woodpecker, black-capped chickadee, mountain chickadee, chestnut-backed chickadee, red-breasted nuthatch, white-breasted nuthatch, and pygmy nuthatch (Johnson and O'Neil 2001, and Thomas 1979). Primary cavity excavators create holes for nesting or roosting in live, dead or decaying trees.

Secondary cavity users such as owls, bluebirds, and flying squirrels may use cavities created by primary cavity users for denning, roosting, and/or nesting. By addressing available habitat for primary cavity excavators, it is expected that habitat for secondary cavity users will be provided (USDA 1990). Habitat for primary cavity excavators includes dead trees in various size and decay classes with coniferous and hardwood vegetation and a variety of structural stages (Wahl et al. 2005, Johnson and O'Neil 2001, and Thomas 1979). This group of primary cavity excavators is considered one management indicator in the Forest Plan and represents a vast array of vertebrate species that depend upon dead trees and down logs for reproduction and/or foraging (USDA 1990).

Species of Interest

Landbirds (migratory birds)

Landbirds which include neotropical migratory birds that have been defined as those species that regularly breed in continental North America and winter south of the Tropic of Cancer, typically in Central and South America and the Caribbean. Landbirds are defined as all birds except loons, grebes, seabirds, waterfowl, long-legged waders, shorebirds, gulls, terns, alcids, cranes, and rails. One hundred sixty two species of landbirds breed in Oregon and Washington including common passerine songbirds, hawks, and owls (Andelman & Stock 1994).

Landbirds occur in a wide variety of habitat types including early- and late-seral forests (Finch & Stangel 1993). In the relatively arid western United States, however, densities of neotropical migrants are highest in riparian areas, with coniferous forests being the second-most used habitat by this assemblage of species (Saab and Rich 1997).

Species Discussion

Focal Species Analyzed

The Conservation Strategy for Landbirds in the Northern Rocky Mountains of Eastern Oregon and Washington (Altman 2000) set up biological objectives and management actions. The Plan says, "Simply stated, biological objectives are "what we think the birds need. They are not regulatory nor do they represent the policies of any agency or organization." The list of management level focal species was used to select species to analyze which represent key species of birds that could indicate any adverse affects to landbirds from the proposed invasive plant treatments.

Large-scale declines in open park-like dry forests with large trees and snags have led to population declines of the white-headed woodpecker, flammulated owl, white-breasted nuthatch, pygmy nuthatch, Williamson's sapsucker, and Lewis' woodpecker.

These bird species have likely suffered some of the greatest population declines and range retractions (Altman 2000).

Local overstory nesting species and foliage or crown feeders may include the pine siskin, golden-crowned kinglet, mountain chickadee, hermit thrush, ruby-crowned kinglet, yellow-rumped warbler, and western tanager.

The Conservation Strategy for Landbirds (Altman 2000) identifies three priority habitat types: Dry Forest, Mesic Mixed Conifer, and Riparian Woodland and Shrub. Several "unique" habitats are also important. The Project Area contains all three forest types over large areas.

Dry Forest habitat type is characterized as coniferous forest composed exclusively of ponderosa pine, or dry stands co-dominated by ponderosa pine and Douglas-fir or grand fir. It is generally at lower elevations and mostly on xeric, upland sites with shallow soils.

Focal species include: white-headed woodpecker (large patches of old forest with large trees and snags), flammulated owl (old forest with interspersed grassy openings and dense thickets), chipping sparrow (open understory with regenerating pines, and Lewis' woodpecker (patches of burned old forest). Dry forest type comprises about 51 percent of the forested area within the Umatilla Forest.

Mesic Mixed Conifer habitats are primarily Douglas-fir and grand fir sites that are generally higher elevation, wetter, on northerly aspects, and in draws where soils are mesic.

Focal species include Vaux's swift (large snags), Townsend's warbler (overstory canopy closure), varied thrush (structurally diverse, multi-layers), MacGillivray's warbler (dense shrub layer in forest openings or understory), and olive-sided flycatcher (edges and openings created by wildfire). Mesic mixed conifer (moist upland forest) occurs on about 33 percent of the forested habitat within the Umatilla Forest.

Riparian woodland and shrub habitats are typified by the presence of hardwood tree and shrub species, along with associated wetland herbaceous species. Water is an important component of these habitats, whether it is in the form of standing wetlands, springs, seeps, or flowing water (streams). Riparian vegetation is particularly important to Neotropical migratory songbirds (Sallabanks et al. 2001). Although these habitats generally comprise only a small portion of the landscape, they usually have a disproportionately high level of avian diversity and density when compared to surrounding upland habitats.

In addition, the Conservation Strategy identifies aspen as a unique habitat important to landbirds. In the Blue Mountains, aspen trees are nearly always associated with riparian areas or ephemeral draws, so they are included in this section.

Focal species include: Lewis' woodpecker (large snags), red-eyed vireo (canopy foliage and structure), veery (understory foliage and structure), and willow flycatcher (willow/alder shrub patches) and red-naped sapsucker (aspen). Riparian woodland and shrub habitat occurs on less than one percent of the Forest.

Focal species for Unique Habitats include: hermit thrush (subalpine forest), upland sandpiper (montane meadows), vesper sparrow (steppe shrubland), gray-crowned rosy finch (alpine), and red napped sapsucker (aspen). The Forest has only a small amount of any of these habitat types.

Table 31. Unique Habitat/Focal Species on the Forest

Unique Habitat	Habitat Attribute	Focal Species	Approximate Percent of Forest Acres
Subalpine Forest	Patches	Hermit thrush	Less than 1
Montane Meadows	Mesic and dry conditions	Upland sandpiper	1.4
Steppe Shrublands	Patches	Vesper sparrow	3
Aspen	Large trees/snags with regeneration	Red-naped sapsucker	Less than 1
Alpine	Patches	Gray-crowned rosy finch	Less than 1

3.3.3 Alternatives Analyzed

Effects Analysis & Methodology for Analysis

Excerpts from the Invasive Plants FEIS (USDA Forest Service, 2005a) are used throughout this discussion. The effects analysis of individual herbicides and surfactants are used here. Facts, figures, herbicides, and species analysis are modified to reflect the site-specific analysis effort on the Forest.

The following terminology and introduction from the Invasive Plants FEIS (USDA Forest Service, 2005a) are repeated here for easy reference, and are pertinent to discussion of effects on wildlife on the Forest (R6 FEIS Pages 4-42 to 4-44).

- **NOAEL (No observed adverse effect level):** An exposure level at which there is no statistically or biologically significant increases in the frequency or severity of adverse effects between the exposed population and its appropriate control. Some effects may be produced at this level, but they are not considered as adverse, or as precursors to adverse effects. In an experiment with several NOAELs, the regulatory focus is primarily on the highest one, leading to the common usage of the term NOAEL as the highest exposure without adverse effects.
- **LOAEL (Lowest Observed Adverse Effect Level):** The lowest dose associated with an adverse effect.
- **Toxicity index:** The benchmark dose used in analysis to determine a potential adverse effect when it is exceeded. Usually a NOAEL, but when data are lacking other values may be used.

When considering the effects of herbicides on wildlife species, it is important to remember these herbicides are designed to affect plants at relatively low rates, while much higher rates would be required to kill animals. Plants have metabolic systems that do not exist in animals. It is these metabolic systems at which the herbicides are targeted. Michael (2002) explained it well when he said, “All chemicals, natural or man-made, are toxic at some level of exposure. The difference between acute and chronic toxicity versus the no observed effect level (NOEL) is primarily a function of the amount of exposure in a unit of time and the mode of action of the chemical.

For example, vitamin D is essential to good health and mammals consume it on a daily basis. However, it could be very toxic, in fact more toxic than most of the herbicides used in forest management” (Michael 2002).

Results of numerous field studies indicate the likelihood for direct adverse effects to wildlife from herbicide use is low (e.g., Marshall & Vandruff, 2002; Dabbert et al., 1997; Fagerstone et al., 1977; Rice et al., 1997; Sullivan et al., 1998a, Cole et al., 1997; Cole et al., 1998; Johnson and Hansen, 1969; Nolte and Fulbright, 1997; McMurray et al., 1993a; McMurray et al., 1993b). However, the R6 2005 FEIS discloses that some herbicide use in projects similar to this one demonstrated potential to exceed a level of concern for free-ranging wildlife. Certain herbicides have the potential, for example, to affect the vital organs of some wildlife species, change body weight, reduce the number of healthy offspring, increase susceptibility to predation, or cause direct mortality. Individual birds and mammals may ingest vegetation or insects that have been sprayed with some herbicides and potentially experience these types of effects (ibid).

Herbicides may also cause some malformations or mortality to amphibians that have been exposed to herbicides or surfactants in water (Relyea 2005). In addition, herbicides contain impurities and additives, and produce metabolites that could be toxic to wildlife (ibid).

A metabolite of triclopyr, 3, 5,6-trichloro-2-pyridinol (TCP), is toxic to aquatic animals. The impurity hexachlorobenzene, found in picloram and clopyralid, is carcinogenic. Surfactants added to herbicides could substantially increase toxicity to aquatic species, like amphibians. These substances were evaluated in the relevant risk assessments and, with the exception of surfactants, were found not to contribute substantially to toxic exposures or increase cancer risk (SERA, 2003a, 2003b, 2003c, 2004b).

The R6 2005 FEIS disclosed that birds or mammals that eat grass or insects are most susceptible to harm from herbicides. Birds or mammals that eat vegetation (primarily grass) that has been sprayed with herbicide have relatively greater risk for adverse effects because herbicide residue is higher on grass than it is on other herbaceous vegetation or seeds (Kenaga 1973; Fletcher et al. 1994; Pfleeger et al. 1996). Because of their small size and relatively larger surface area, herbicide residues on insects may also be higher (Kenaga 1973). Some birds and mammals that eat grass include elk, rabbits and hares, chukar, California quail, and geese. Some bird species (like quail) are primarily herbivorous as adults but require insects as a primary food source as chicks. Insect-eating mammals include bats and shrews. Insect-eating birds include a huge number of species, such as bluebirds, flycatchers, swallows, wrens, and others.

NPE surfactants added to herbicides also have the potential to result in harmful doses to birds and mammals that eat vegetation or insects that have been sprayed (Bakke 2002).

Analytical Methods

The analytical methods used in determining toxicity of herbicides and surfactants on wildlife species including PETS, management indicator species and landbirds were described in appendix C, printed in the DEIS and available on request or online at <http://www.fs.fed.us/R6/uma/projects>

The number of acres of wildlife habitat benefited by removal of invasive species to restore native vegetation and rate of treatment is determined by the acres treated and the rate of treatment determined by the effectiveness of the treatment method.

The number of special status species potentially exposed to herbicides following implementation of the PDF is determined by Geographic Information System (GIS) analysis of the number of acres of herbicide treatment that dissect or traverse habitat that is potentially suitable. These acres are discussed in the wildlife effects section.

The number of special status species potentially impacted by manual, or mechanical, treatments following implementation of the PDF is determined by Geographic Information System (GIS) analysis of the number of acres of non-herbicide treatment that dissect or traverse habitat that is potentially suitable. These acres are discussed in the wildlife effects section.

3.3.4 Environmental Consequences

General Effects of Invasive Plant Treatments

Effects of invasive plant treatment methods to wildlife were evaluated and discussed in detail in the R6 2005 FEIS (USDA Forest Service 2005a), the corresponding Biological Assessment (USDA Forest Service 2005b), project files, and FS/SERA risk assessments (SERA 2001, 2003a-d, 2004a-e). These documents indicate that the most plausible adverse effect to wildlife from invasive plant treatments is from disturbance caused by manual and mechanical treatments.

Wildlife species may be adversely affected by invasive plant treatment methods. All treatment methods have the potential to disturb, temporarily displace, or directly harm various wildlife species. Successful control of invasive plant infestations provides long-term benefits by restoring native habitat. Treatment of larger infestations may create more disturbances for longer periods than small infestations, but the specific amount and duration is largely dependent upon specific treatment methods. Several techniques can create bare ground, which may reduce cover and expose certain species to increased predation. Large tracts of bare ground can alter migration and dispersal of some species (Semlitsch 2000). The probability of these effects depends on the size and distribution of bare ground created.

The effects of the invasive plant treatment are also relative to the size and locations of existing and future invasive plant infestations. Treatments of infestations along disturbed roadsides are not likely to substantially affect terrestrial wildlife populations since this vegetation type does not provide essential habitat for native wildlife species, and it consists of long, narrow areas spread over large distances. Adverse effects to individuals using the roadside vegetation at the time of treatment could occur.

Treatments of moderate infestations may pose the greatest risk to native wildlife. In moderately infested areas, enough native habitats may remain to support some native wildlife, and the infestation may be large enough to require more intensive and extensive treatment techniques. Very large infestations and monocultures of invasive plants do not support native wildlife populations and the presence of native wildlife in these areas is greatly reduced in comparison to native habitat (see Duncan and Clark 2005).

There are two primary effects likely for most species from invasive plant treatments; disturbance and trampling from machinery or people treating invasive plants, and risk from herbicide contact for species in which data is not sufficient to allow quantitative estimates of risk. There is no risk to species' habitat because invasive plant treatments do not remove suitable habitat for any species, and the majority of the treatments will occur along highly disturbed roadsides which do not provide suitable habitat in most cases.

Some species in the Project Area may have suitable habitat along roads, although in small amounts relative to the amount of suitable habitat that is not within a road corridor.

Invasive Plants Treatment Methods Effects to Wildlife

Manual

Manual treatments can result in trampling of non-target plants (habitat) and animals and create bare ground. The degree of threat and effect from manual treatments depends on the number of workers present and the size of the area being treated.

Because manual techniques are slower than mechanical or chemical methods, the duration of disturbance, caused by the presence of people, may be longer in the treatment area. The slower pace of work allows animals in the area to leave and reduces the risk of direct harm from trampling. Bare ground is likely to be patchy in distribution with this method and less likely to interfere with animal movement or dispersal.

Mechanical

Some mechanical treatments may crush small mammals, reptiles, amphibians, or eggs of ground-nesting birds. Small species that lack rapid mobility (e.g. turtles and toads) are vulnerable to crushing or injury from people or equipment.

Hand-held mechanical equipment, like chainsaws and string trimmers, can be used very selectively on target plants and may be less likely than larger equipment to directly harm wildlife. Use of vehicle-mounted mechanical equipment (mowers, or hammer flails, etc.) is much less selective and more likely to directly harm small wildlife species. Vehicle-mounted equipment is most often applied to monocultures of invasive plants on gentle slopes or road verges, and even though those areas do not provide preferred or suitable habitat for most native wildlife, adverse effects from disturbance or crushing are still possible. Mechanical treatments may produce more bare ground, reducing cover, exposing more soil to erosion, potentially disrupting dispersal or foraging patterns of small animals, and possibly exposing some to increased predation as a result of decreased cover. Mechanical methods generate more noise than other treatments, except for aerial applications, and have a higher likelihood of disturbing species that are secretive or sensitive to noise.

For several species loud and sudden noises above background or ambient levels (those above 92 dB) can cause disturbance that might flush a bird off the nest or abort a feeding attempt. Based on interviews with State and County weed control operators, the vehicles used to spray roadside vegetation with herbicides do not make noise as loud as logging trucks or large delivery trucks and are therefore within the background noise level for open roads. Other mechanical devices proposed for use on invasive plants include brushing machines, mowers, chainsaws, and string trimmers. These tools have the potential to create noise above background levels that may disturb certain wildlife species. Bald eagles could be disturbed by these same tools, as well as human presence, however eagles are quite variable in their responses to activity and noise in the vicinity of their nests or roosts.

Biological

Biological control methods will not directly affect native wildlife species; however, recent studies have found that native rodents may take advantage of the food source provided by biological control agents (Pearson et al. 2000).

Biological control methods that reduce invasive plant populations, increase native plant populations, and provide a supplemental food source are indirectly beneficial to wildlife. Any biological control agents that affect native plant species could adversely affect wildlife; however these biological control agents would not be used as per standard 18.

Site Restoration/ Revegetation

Reseeding or revegetation to increase competition with invasive plants can cause short-term disturbance to wildlife similar to manual or mechanical treatments, depending on specific methods used. If native or non-native, non-invasive forage species are used in restoration or competitive plantings, increased food and native habitat could benefit wildlife.

Restoration activities have the potential to restore important wildlife habitat faster than natural or passive revegetation.

Herbicide

The herbicides proposed for use in this document were determined to have minimal impacts to wildlife species in the analysis conducted for the R6 2005 FEIS. Risk from herbicide exposure was

determined using data and methods outlined in the SERA risk assessments (2001, 2003, 2004). Tables 5 and 6 in appendix P of the R6 2005 FEIS, and the Wildlife Biological Assessment (USDA 2005c pp. 24 – 27) list the toxicity indices used as the thresholds for potential adverse effects to mammals and birds (respectively) from each herbicide. A quantitative estimate of dose using a “worst case” scenario was compared to these toxicity indices. If a dose exceeded a toxicity index, then it was determined to have a potential for adverse effect.

Under “worst case” scenarios, mammals and birds that eat insects or grass that have been contaminated by herbicides are at most risk of adverse effects for some herbicides and NPE surfactants. Amphibians also appear to be at higher risk of adverse effects due to their permeable skin and aquatic or semi-aquatic life history. In most cases, there is insufficient data available on toxicity thresholds to allow a quantitative estimate of risk to an amphibian using a “worst case” scenario.

For this EIS, no aerial, broadcast or spot application will exceed the typical application rate, so highest application rate scenarios are not discussed here. For typical application rates and exposures to birds and mammals, only triclopyr and NPE surfactants produced doses that exceeded toxicity indices. Results of triclopyr exposures do not take into account the strict limitations on use required by a Forest Plan Standard, which makes the exposure scenarios implausible. NPE surfactant exceeded the toxicity index for direct spray of a small mammal, large mammal and large bird that consumed contaminated vegetation (acute), and a small mammal and small bird that consume contaminated insects. There is insufficient data to assess risk of chronic exposures for a large grass-eating bird or insect-eating birds and mammals.

Data is very limited or lacking on potential adverse effects of herbicides to reptiles and amphibians. There is some data to suggest that amphibians may be as sensitive to herbicides as fish (Berrill et al. 1994; Berrill et al. 1997; Perkins et al. 2000), so for this analysis, herbicides that pose potential risk to federally listed fish (as determined by the quantitative estimates from exposure scenarios) will also be considered to pose a risk to amphibians. Glyphosate, picloram, and sethoxydim were identified as posing potential risks to fish in the aquatic species BA (USDA Forest Service 2005c). Triclopyr used in a broadcast spray scenario may pose a risk to fish and amphibians, but a Standard in the Forest Plan restricts triclopyr to selective application methods only, almost eliminating the opportunity for exposure.

The exposure scenarios do not account for factors such as timing and method of application, animal behavior and feeding strategies, seasonal presence or absence within a treatment area, or implementation of project design features and therefore exaggerate risk when compared to actual applications proposed in this EIS.

Early Detection Rapid Response (EDRR)

EDRR is designed to be aggressive in the control of invasive plants. This is necessary to ensure success in managing and controlling the spread of these highly competitive and easily established plants.

The management direction included in all alternatives as well as the environmental conditions and animal behavior would tend to minimize actual impacts for EDRR. At the project scale, choices would be made to avoid situations that could cause harm to wildlife. For example, certain herbicides would be avoided in specific areas or times of the year where/when grass-eaters or amphibians may be at risk, or more specific application methods could be used. In addition the PDFs would be used under each action alternative. Alternative A (no action) does not incorporate EDRR. Actual adverse

effects are therefore not likely to occur. Any short-term adverse effects would be largely offset by the long-term benefits of protecting wildlife habitat from loss due to invasive plants.

Incomplete and Unavailable Information

The data available for mammals are derived from numerous studies conducted to meet registration requirements, and primarily on laboratory animals that serve as surrogates. Data for mammals are available for more types of toxicity tests and often on a wider variety of species than are available for birds.

Availability of information on the direct toxicological effects of the 10 herbicides approved for use in Region 6 on wild mammals varies by herbicide. Glyphosate has been widely studied, including field applications. Little or no data on wildlife may exist for other herbicides because they have been tested on only a limited number of species under conditions that may not well represent populations of free-ranging animals (SERA 2001b, 2003a, 2003b, 2003c, 2004a, 2004b, 2004c, 2004d, 2004e, 2004f).

Toxicity data available for birds are derived from studies conducted to meet registration requirements, and primarily on domestic birds that serve as surrogates. There are typically fewer types of toxicity studies conducted on birds using a more restricted variety of species than are conducted for mammals.

Almost all laboratory data is collected on mallards and northern bobwhite. How the sensitivities of different bird species to herbicides may vary from that reported for mallard and bobwhite is not known.

Effects Common to All Alternatives

The treatment of invasive plants has short-term impacts by reducing cover, but restoring native vegetation would have long-term benefits by providing food and cover. Birds or mammals that eat vegetation (primarily grass) that has been sprayed with herbicide have relatively greater risk for adverse effects because herbicide residue is higher on grass than it is on other herbaceous vegetation or seeds (Kenaga 1973; Fletcher et al. 1994; Pfleeger et al. 1996). Broadcast treatments would impact larger areas than spot treatments, however; disturbance would occur once a year and normally would last for less than a few hours. Species such as turkeys, grouse, quail, and waterfowl all consume grass as part of their diet. Other birds would eat grass seeds especially. The end result of all of the alternatives is some degree of improvement in the quality of habitat, while having a short-term negative effect on individual birds. One example from this project would be the treatment of knapweed. Knapweed seed is not consumed by birds and provides very poor nest cover. By reducing the presence of knapweed and allowing native grasses and forbs that do provide food and cover there is a positive effect from the treatment.

The effects of herbicides, from all methods of intake and to all species on the landscape, are limited. The studies that were analyzed for the R6 2005 FEIS indicated that there was a low toxicity of herbicides to birds, but because of the large gaps in data it must be stated that some effects to birds from herbicides are unknown. The data that is available would indicate that the risk is low.

Bald eagles are sensitive to disturbance from noise during the breeding season; however, at this time, no treatment areas are close enough to bald eagle nests to cause concern. The PDFs for bald eagles would effectively minimize the potential for disturbance to this species during the EDRR process, so there is no meaningful measure that can be used to compare alternatives.

For some species with limited toxicity data (amphibians, snakes), their habitat, life history, or required PDFs would make herbicide exposure a negligible risk. In addition, their locations are not mapped sufficiently to enumerate overlap with treatment areas, and their movements would make mapped occurrences less meaningful. For other species (amphibians and painted turtle), there remains some risk from herbicide exposure even when PDFs are followed. For the painted turtle, there is no toxicity data upon which to base an assessment of risk, however; at this time no painted turtles are known to exist on the Forest. For amphibians, there is some toxicity data, and some information indicating that toxicity data on fish may provide a reasonable surrogate (see R6 2005 FEIS, appendix P, p. 28). Amphibians have permeable skin and complex metamorphoses, so they could be sensitive to herbicide exposures. The aquatic PDFs required in all alternatives would reduce, but not eliminate, risk to aquatic amphibians and the painted turtle from herbicide entering the water. The majority of the known locations for spotted frogs (leopard frogs and painted turtles are only suspected) are not within any proposed treatment areas.

Mechanical and manual invasive plants treatment techniques pose a risk of trampling, introduction of sediment to aquatic habitat, or disturbance from noise.

For sedentary or slow moving species like turtles and terrestrial amphibians, trampling would cause direct and immediate mortality. Aquatic amphibians are very sensitive to the introduction of sediment into their habitat.

The overall likelihood of adverse effects from invasive plant treatments is low. Sensitive species like terrestrial amphibians are often underground or other insulating structures during the dry summer months when most invasive plant treatments would occur. They would therefore not be susceptible to trampling or herbicide exposure. PDFs reduce, but do not eliminate, risk to terrestrial amphibians. This low level potential effect makes it difficult to compare effects between alternatives in meaningful ways.

The distinction between alternatives could be compared to the difference between low potential for adverse effect and very low potential for adverse effect.

Also, because reducing herbicide use often means increasing manual or mechanical methods, the risk from herbicide exposure is traded for the risk from trampling or disturbance.

General Overview of Herbicide Analysis by Species

The analysis is based on exposure scenario results from the SERA risk assessments for mammals, birds, and honeybees using the typical application rate. The effects analyses are those effects that could be expected to exceed toxicity index based on the information outlined in appendix P of the R6 2005 FEIS.

The anticipated effects are extrapolated results based on the scenarios used for particular taxonomic groups and may be different from actual toxicity of a particular species. Worst-case for both acute and chronic exposures are combined if it is anticipated that both scenarios would apply to the species analyzed. For species that are mobile and have large home ranges only the acute scenarios are applied, because these species would not be in an area long enough to receive chronic exposure to the herbicides. Effects determinations for the purpose of NEPA analysis are made on the effects to individuals and populations for Threatened and Endangered species, but only on the population basis for migratory birds, sensitive, and MIS.

Basic assumptions for wildlife species analysis:

- Aquatic organisms such as frogs would have the same sensitivity to herbicides as fish (R6 2005 FEIS).
- Small insectivorous birds that defend territories may feed in the same area and could be subject to chronic exposures from some methods of applications. Exposures to herbicides is possible by the five Partners in Flight watch listed insectivorous migratory birds; however, exposure would likely be low since these species forage higher in the canopy and forage mostly on insects above the spray zone. These species may occasionally eat species from the ground or that fly into the canopy but this incidence of exposure would be low. Other land birds may forage lower and could be subjected to higher levels of exposure.
- Mustelids (wolverine) travel widely and would not be in the same area long enough to be subjected to chronic exposures.
- Peregrine falcons forage over a large territory and would not be subjected to chronic exposures.
- Aquatic birds that forage on fish or macro invertebrates would not find a concentration of herbicides in the water high enough to be exposed at levels that could get toxic (R6 2005 FEIS).
- Woodpeckers would rarely be exposed to herbicides because of their feeding methods. Their food sources are protected since the beetles and ants that the woodpeckers feed on are generally buried inside of decaying wood. The food source of these of these birds is not likely to be contaminated by spraying herbicides.
- Elk (and deer) would occasionally feed in the same area for multiple days which could lead to chronic exposures.

3.3.5 Effects to Threatened, Endangered, and Sensitive (TES) Species

Effects to Canada Lynx

As stated earlier, the Umatilla National Forest is categorized as “peripheral area” based on the Draft Lynx Recovery Outline (2005) for lynx habitat. Although historically lynx occupied Oregon, self maintaining populations of lynx in Oregon are not known to have existed historically. There is no documentation of lynx reproducing in the state of Oregon. The Forest has not had a verified lynx observation since 1999, therefore the Forest is considered “unoccupied” habitat by the USDI Fish and Wildlife Service (FWS) (letter August 2006). Since lynx are not considered present in the area and it is highly unlikely that lynx will ever occupy the Forest there will be **no effects to lynx** from any of the alternatives considered in this document. As shown in the existing condition portion of this document, one LAU has invasive plants within approximately 3 percent of the LAU, two with 2 percent and six with less than 1 percent. Invasive plants do not constitute lynx habitat so treatment of invasive plants would not affect habitat. Short-term disturbance could affect prey habitat but the long-term benefits to prey habitat from invasive plant treatments outweigh the short-term impacts.

Effects to Gray Wolf

Effects Common to All Alternatives

Oregon Department of Fish and Wildlife discovered the presence of one breeding pair of wolves with two pups in the Umatilla National Forest in 2008¹⁴. Investigations of wolf sightings are ongoing. The actions discussed below would have the same common impacts on wolves and/or their habitat for each of the alternatives considered.

¹⁴ This discovery was made after the Umatilla National Forest Invasive Plants Treatment Project DEIS was published.

Treatment and Restoration

Methods used to treat invasive plants or restore habitat though not likely, may affect the gray wolf. The general effects of each non-herbicidal method to wildlife are discussed previously in this chapter. The potential effects from herbicides are also summarized previously in this chapter, and discussed in detail in appendix C (printed in the DEIS and available upon request or on line at <http://www.fs.fed.us/R6/uma/projects>) and in appendix P of the R6 2005 FEIS. All treatment methods that result in improved habitat for elk, deer or other prey species will provide a long-term benefit to wolves.

Manual and Mechanical Methods

Direct effects from invasive plant treatment include disturbance caused by noise, aircraft, people and vehicles, which are activities common to manual and mechanical methods. These activities could potentially disturb gray wolves. However, invasive plant projects involve very short-term disturbance with few people and might only be repeated once in the same growing season.

Although wolves will travel over large distances, they are most likely to occur in wilderness and roadless areas, away from human disturbance. These areas have minimal invasive plant infestations so the likelihood of disturbance would likely be nominal. The life history traits of the species, current literature, existing guidelines, and expert opinion of biologists familiar with the species (Gaines, pers. comm.; Naney, pers. comm.) indicate that the level of disturbance expected from any invasive plant project is not likely to adversely disturb the gray wolf. In addition the project design feature that addresses activities in close proximity to known denning or rendezvous sites will limit disturbance.

Biological Control

Biological control methods have been utilized on the Umatilla National Forest, and on other National Forests where wolves currently exist. There is no indication that any biological controls adversely affect the forage of elk or other prey items for the gray wolf. Biological controls cannot affect gray wolves directly, because they only act on invasive plants.

Herbicides

Exposure scenarios used to analyze potential effects from herbicides are discussed in “Summary of Herbicide Effects to Wildlife” appendix C (printed in the DEIS and available upon request or on line at <http://www.fs.fed.us/R6/uma/projects>) and in appendix P of the R6 2005 FEIS. The potential effects are not likely to occur under actual field conditions because the worst-case scenarios do not account for plausibility of exposure, differences in application methods and timing, seasonal presence, species behavior, current protection measures in place, the current distribution of the species, or the standards adopted by the Umatilla Forest Plan (R6 2005 ROD). In addition, although wolves will travel over large distances, they are most likely to occur in wilderness and roadless areas, away from human disturbance. These areas have minimal invasive plant infestations so the likelihood of herbicide use where they exist would likely be nominal.

Gray wolves prey upon large mammals and will also eat carrion. It is extremely unlikely that a gray wolf would enter into an invasive plant treatment area, because they tend to be transient and generally avoid areas where there has been recent human activity. Wolves are even more unlikely to be exposed to herbicide because any appreciable exposure would require wolves to feed upon the exact individual of prey that had been feeding exclusively within the treatment area, or had been directly sprayed. Even if an elk or deer had foraged in the treatment area, or been directly sprayed, a single wolf would have to consume the entire deer or elk before the herbicide was eliminated from

the herbivore's body. Again, an extremely unlikely scenario, since most of any herbicide dose for the herbicides contained in the proposed action is eliminated within 24-48 hours.

Small mammals are not the typical prey item for wolves. Nonetheless, the scenario in which a medium-sized canid eats small mammals that have been directly sprayed was used to evaluate a general risk to carnivores from herbicide use. This scenario, while not very plausible, would constitute the worst-case scenario of herbicide exposure for a gray wolf.

The following interpretations of the exposure scenario results are made with the reservation that toxicity data was generated from laboratory animals that may not accurately represent potential effects to free-ranging wildlife.

At typical and highest application rates, the estimated doses from the exposure scenario are all less than the reported NOAELs for all herbicides except chronic doses of triclopyr.

There is no data available to estimate an actual chronic dose in this scenario, so the chronic estimate is obtained by comparing the acute dose to the chronic toxicity index. This comparison will over-estimate the dose and risk to the carnivore. At the typical application rate, the estimated acute dose to a carnivore consuming contaminated small mammals is 2.1 mg/kg (project file worksheets USDA Forest Service 2005b). The chronic NOAEL for effects to kidneys in dogs is 0.5 mg/kg/day.

For triclopyr, the worst-case analysis uses a very conservative toxicity value. Toxicity of triclopyr acid and triclopyr BEE does not differ for mammals. The EPA has used two different values for a reference dose on the effects of triclopyr to mammals. The FS/SERA risk assessment (2003 Triclopyr) relies on a chronic toxicity index (NOEL of 5 mg/kg/day) from a rat reproduction study. In this analysis, a lower value from a 1-year feeding study of dogs is used (chronic NOEL of 0.5 mg/kg/day; Quast et al., 1976, cited in SERA, 2003 Triclopyr). Dogs were not considered by EPA to be a good model for human health effects, because they do not excrete weak acids as well as other animals (see Timchalk and Nolan 1997; Timchalk et al. 1997). Canids are, however, relevant for concerns about effects to wildlife in general and gray wolves specifically. It may be argued that the use of the 0.5 mg/kg/day value for the toxicity index in this analysis is overly cautious, because it represents competition for excretion rather than a toxic effect (Timchalk et al., 1997). However, it meets the criteria for providing a worst-case analysis based on available toxicity data for potential effects to wildlife, and is therefore consistent with the criteria for choice of other indices used in this analysis.

The use of triclopyr for invasive plant treatment is restricted in the proposed action by Standard #16, which states, "The use of triclopyr is limited to selective application techniques only (e.g. spot spraying, wiping, basal bark, cut stump injection)." The above exposure scenarios calculate doses based on a broadcast spray-method application that would directly spray an entire day's diet of small mammals. The direct spray of many small mammals could not occur with triclopyr applied to non-desirable vegetation in a selective manner. Therefore, with Standard 16 in place, adverse effects to gray wolves from the use of triclopyr will not occur.

It is unlikely a wolf would be in areas with extensive acres of invasive plants, since invasive plants are not generally utilized by their prey species and are usually in more open or populated areas. It is unlikely a wolf would be directly sprayed through aerial application since the wolf would run from a low flying plane or helicopter or at least hide under some type of cover. The smallest area proposed for aerial spraying is less than one acre in size and the largest is approximately 286 acres. Oregon Department of Fish and Wildlife confirmed evidence of one breeding pair of wolves with two pups

(discovered in 2008).¹⁵ Wolf sightings are being investigated regularly so if wolves are located in the project area, their presence will be taken into account prior to aerial spraying. If it is determined that aerial spraying a particular area could negatively impact an individual or pack, the spraying would be postponed until they were outside the Project Area. As the PDF(J2b) requires, treatments within 0.50 mile or .50 mile line of sight occupied rendezvous sites would be timed to occur outside the season of occupancy unless treatment activity is within acceptable ambient noise levels and human presence in the area would not cause wolves to abandon the site (as determined by a local specialist). The restriction in the vicinity of active rendezvous sites is not backed up by scientific data but is intended to reduce impacts to wolves. Occupancy of both denning and rendezvous sites (i.e. whether it is active or not) will be determined each year prior to treatments. Consultation with FWS would be reinitiated (unless determined otherwise by FWS) if/when wolves are discovered in the vicinity of treatment sites.

Early Detection and Rapid Response

If new invasive plant treatment sites are discovered in close proximity to a wolf den or rendezvous site, PDFs J-2a and J-2b limit impacts to the wolf and its habitat for all the action alternatives. The short-term impacts of the treatments would be largely offset by the long-term benefit of protecting habitat for wolf prey species from loss due to invasive plants.

Summary of Herbicide Effects to Gray Wolf

Indirect effects to gray wolf would consist of changes to the habitat of their prey. Invasive plant treatments will not remove or degrade prey habitat since invasive plants do not provide adequate forage for elk and other prey, although certain invasive species may be utilized during some parts of the year. Successful control of invasive plant infestations provides long-term benefits to gray wolf by restoring native habitat and forage for their prey and preventing future degradation of habitat. Indirect effects of herbicide are not likely because the herbicides in the alternatives considered do not bioaccumulate and any exposure for gray wolf is highly unlikely. In addition, PDFs (J-2a and J-2b) would be in place to limit disturbance to denning and rendezvous sites (See chapter 2 of the EIS).

Determination of Effects to Gray Wolf

Invasive plant treatment projects conducted according to the standards in the proposed action, **may affect, but is not likely to adversely affect** the gray wolf. This determination is based on:

- The Region 6 Invasive Plants FEIS prevention standards will help to protect the foraging habitat of their prey from invasive plants
- Distribution of gray wolves within the infested areas would likely be very limited, and sporadic, so the opportunity for wolves to be in or near treatment areas is also very limited
- Disturbance from projects could occur, but is unlikely. In addition, the PDF for wolves would further limit possible disturbance
- Disturbance from invasive plant treatment projects is low level, short duration, and infrequent
- Doses of any herbicides in the proposed action that would cause potential adverse effects are not plausible

¹⁵ This discovery was made after the Umatilla NF Invasive Plants Treatment Project DEIS was published

3.3.6 Effects to Sensitive Species

Effects to California Wolverine

Effects Common to All Alternatives

Wolverines probably occur in remote wilderness areas of the Umatilla National Forest. Currently approximately 251 acres of the 304,925 acres of wilderness contain known invasive plants. The short duration, low intensity invasive plant treatments are not likely to disturb wolverines since such a small percentage of treatment areas are located in potential wolverine habitat. There is a minor potential for short-term disturbance, which is an indirect effect, from implementing any of the action alternatives. The herbicide effects analysis above shows no toxic effects (direct effect) determined from herbicide use on wolverines. There are no anticipated direct and only short duration, low intensity indirect effects from manual or mechanical treatments because their location is not in the proximity of possible denning areas or likely foraging habitat. In addition wolverine travel widely and would not be in the same area long enough to be subjected to chronic exposures.

Treatment and Restoration

Potential effects of invasive plants treatment methods on wolverine are associated with disturbance that may occur during the denning season. Direct effects from invasive plants treatment methods include disturbance caused by noise, people and vehicles. However, since wolverine den in the high country and no invasive plants have been located in potential den site habitat, it is unlikely they would be disturbed. If a wolverine were to be foraging in the immediate vicinity of a treatment, they would likely be temporarily displaced. They tend to travel widely and be opportunistic hunters so being temporarily displaced would have a minimal impact. Wolverines appear to be most vulnerable to disturbance during the winter months. Invasive plant treatments would not occur during winter.

Manual and Mechanical Methods

Methods used to treat invasive plants or restore prey habitat may have a limited affect on wolverine. The general effects of each non-herbicidal method (disturbance) to wildlife are discussed previously in this chapter and PDFs were developed specifically to limit disturbance in wilderness areas, which due to their remoteness are places wolverine likely use. Motorized treatments and aerial spraying are not permitted in the wilderness. Wilderness areas also tend not to have many invasive plants since they lack roads or much active resource management. All treatment methods that result in improved habitat for potential wolverine prey species will provide a long-term benefit.

Biological Control

There is no indication that any biological controls would adversely affect the cover or forage of prey for the wolverine. Biological controls cannot affect wolverine directly, because they only act on invasive plants.

Herbicides

The potential effects from herbicides are summarized previously in this chapter, and discussed in detail in appendix C (printed in the DEIS and available upon request or on line at <http://www.fs.fed.us/R6/uma/projects>). As stated previously, the most likely places wolverines would be found on the Forest are the wilderness areas since wolverine prefer remote and high elevation areas for denning.

Of the 304,925 acres of wilderness approximately 251 acres have known infestations of invasive plants. In addition, no areas above 7,000 feet in elevation have invasive plants. The higher elevation

areas are where wolverine would most likely den. Although wilderness areas appear to be the most likely places to find wolverine, they could be found just about anywhere on the Forest since they have such large home ranges and are capable of traveling long distances in a day. Wolverines eat a wide variety of foods; however they are opportunistic scavengers with large mammal carrion tending to be their primary food source year-round. While foraging, they generally avoid large open areas and tend to stay within forested habitat at the mid and high elevations. Unless directly along roads; the forested areas of the Forest tend not to have many invasive plants. If wolverines consume prey that has ingested herbicide, the herbicides approved for use are not retained in the body.

There will be no aerial spraying in the wilderness areas and since aerial spraying will not occur in areas with canopy closure over 30 percent, it is highly unlikely aerial or broadcast spraying will impact wolverine habitat.

Infrequent and short-term disturbance from treatment projects could affect wolverines during breeding season or if they happen to be in the area at the time of treatment. However, this type of disturbance is unlikely. Worst-case exposure exceeds the toxicity index from ingesting prey that has been sprayed with triclopyr. However, the worst-case herbicide exposure is highly unlikely for the reason mentioned above in herbicide portion of the Invasive Plant Treatment Method Effects to Wildlife section (pages 45-46). Broadcast spraying in wilderness would only be applied using tanks mounted on horses. No aerial spraying would occur in the wilderness or in areas that have over 30 percent canopy closure, which are the type of areas one would expect to find wolverine. For more detail on effects to medium sized carnivores see Herbicide Effects to Wildlife (appendix C printed in the DEIS and available upon request or on line at <http://www.fs.fed.us/R6/uma/projects>). Invasive plants may degrade habitat for some prey species of wolverine, such as elk and deer. The possible short-term disturbance to an individual wolverine caused by invasive plant treatments are worth the long-term benefits to wolverine and their prey by protecting their habitat from loss due to invasive plants.

Early Detection Rapid Response

Since wolverine prefer remote areas that are far from human activity, it is unlikely that they would spend time in the vicinity of invasive plants. Their prey would generally not be in areas with concentrations of invasive plants. It is unlikely invasive plant sites will be discovered in close proximity to a wolverine den since no invasive plants have been located above 7,040 feet in elevation. The no action alternative (alternative A), does not include EDRR and has no sites located in potential denning habitat. The short-term impacts of the treatments would not outweigh the long-term benefit of retaining habitat for wolverine prey species. Effects, if any, are expected to be negligible.

Differences between Alternatives

The effects of each of the alternatives would be similar. Alternative A has no treatments proposed in the wilderness; alternative B would treat the same number of acres as alternative C and D. Aerial spraying would not occur within the wilderness in any alternative and since that is where wolverine would most likely be found the impacts between the action alternatives would be similar. Alternative C would have no broadcast spraying within riparian areas, but infestations would still be treated. The no action alternative would be the least affective of the alternatives considered in protecting wolverine prey foraging habitat because it would treat the least number of acres and does not incorporate EDRR to help reduce the spread of invasive plants in the future.

Each alternative has the potential for short-term disturbance to wolverine due to treatments but the long-term benefit of treatments proposed in the action alternatives outweighs the possible short-term impacts.

Summary of Effects to Wolverine

There has been no recent sign of wolverine existence on the Forest. If wolverine were to be present, they would likely occur in remote areas of the Umatilla National Forest. Currently approximately 251 acres of the 304,925 acres of wilderness contain known invasive plants. The short duration, low intensity invasive plant treatments are unlikely to disturb wolverines since such a small percentage of treatment areas are located in likely wolverine habitat. If wolverines consume prey that has ingested herbicide approved for use, it would not be retained in the body. Herbicide persistence is managed through PDFs to avoid chemical loading in the soil over time at any one site.

Therefore invasive plant treatments **“may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species”** of California wolverine as a result of any of the alternatives considered in this EIS.

Effects to Bighorn Sheep

Effects Common to All Alternatives

Currently approximately 1,636 acres of the 136,401 acres of the bighorn sheep areas contain known invasive plants. Approximately 44 percent of the bighorn sheep habitat with invasive plants is adjacent to roads. The short duration, low intensity invasive plant treatments are unlikely to disturb bighorn sheep since such a small percentage of treatment areas are located in bighorn sheep habitat.

There is a minor potential for short-term disturbance, which is an indirect effect, from treatments proposed by the action alternatives considered. Triclopyr and NPE surfactant are the chemicals where exposure scenario results in a dose that exceeds the toxicity index using the highest application rate and upper residue rates. However, a PDF states that the lowest effective label rates would be used. No broadcast applications of herbicide or surfactant will exceed typical label rates and NPE surfactant would not be broadcast at a rate greater than 0.5 pounds of active ingredient per acre. Triclopyr would only be spot sprayed within riparian areas, which contains over one half of the bighorn sheep habitat with invasive plants, and although it may be used, it will not be used at the highest application rate on any sites within bighorn sheep habitat. Triclopyr is not approved for the no action alternative. The short-term disturbance due to the treatments is worth the long-term benefit to bighorn sheep foraging habitat.

Treatment and Restoration

Methods used to treat invasive plants or restore habitat may affect the bighorn sheep. The general effects of each non-herbicidal method to wildlife are discussed previously in this chapter. The potential effects from herbicides are also summarized previously in this chapter, and discussed in detail in appendix C (printed in the DEIS and available upon request or on line at <http://www.fs.fed.us/R6/uma/projects>) and in appendix P of the R6 2005 FEIS. All treatment methods that result in improved foraging habitat for bighorn sheep will provide a long-term benefit.

Manual and Mechanical Methods

Potential effects of invasive plant treatment methods on bighorn sheep are associated with disturbance. Direct effects from invasive plant treatment include disturbance caused by noise, people and vehicles. Effects from mechanical methods (e.g. tractors, chainsaws, or string trimmers) are not

likely to occur in primary habitat since bighorn tend to utilize steep slopes and only about 1.2 percent of bighorn sheep areas currently contain invasive plants. Even if there are short-term impacts, all treatment methods that result in improved habitat for bighorn sheep and their potential forage will provide a long-term benefit.

Biological Control

There is no indication that any biological controls would adversely affect the cover or forage for bighorn sheep. Biological controls cannot affect bighorn sheep directly, because they only act on invasive plants.

Herbicides

Approximately 1.2 percent of the bighorn sheep habitat currently contains known sites with invasive plant species. Much of the bighorn sheep summer range is in the higher elevation habitat which currently has less invasive plant sites. Winter range is usually below 6,000 feet in elevation and is currently where the known infestations are located, so invasive plant treatments in the winter range is not likely to impact the bighorn sheep since treatments are done mainly during the summer months. Cheatgrass which is considered an invasive plant and is utilized by bighorn sheep is not targeted for treatment.

Triclopyr and NPE surfactant are the chemicals where exposure scenario results in a dose that exceeds the toxicity index using the highest application rate and upper residue rates. However, high rates will not be used as per the PDFs. Triclopyr would be spot sprayed within riparian areas, which contains over one half of the bighorn sheep habitat with invasive plants. Standard 16 restricts broadcast use of triclopyr, which eliminates plausible exposure scenarios.

In addition, although it may be used, triclopyr would not be used at the highest application rate on any sites within bighorn sheep habitat. Triclopyr is not approved for use in the no action alternative.

Currently less than 20 acres of the Asotin bighorn sheep unit is the only area within bighorn sheep habitat that is proposed for aerial spraying. This is the only aerial spray unit within bighorn sheep habitat. It is improbable that the sheep would be in the area at the time since it is winter range, and the noise from the helicopter would cause them to move if they happened to be there. Aerial spraying should have similar impacts on bighorn sheep as broadcast spraying. PDFs would be in place to reduce impacts from aerial spraying. If bighorn are in the area, disturbance from the noise and people would be short-term. It is likely that the sheep would leave areas of noise and human disturbance. If a bighorn sheep were to ingest the treated vegetation, which is highly unlikely since the area would contain unpalatable forage, it is highly unlikely an individual would choose to consume 100 percent contaminated grass for one day since the aerial spray would be 20 acres of the approximately 21,745 acres the herd occupies. Bighorn sheep tend to graze over large areas in a day.

Early Detection Rapid Response

EDRR is designed to be aggressive in the control of invasive plants. This is necessary to ensure success in managing and controlling the spread of these competitive and easily established plants. Allowing the treatment of newly found sites adds additional risk factors to bighorn sheep just by adding additional exposure areas. The risk factors do not change because the PDFs would apply to reduce the effects to little or no impacts to wildlife species.

The management direction included in all action alternatives, as well as the environmental conditions and bighorn sheep behavior, would tend to minimize actual impacts from EDNR. Specific herbicides will be avoided in specific areas or times of the year where/when bighorn sheep may be at risk. In

addition the PDFs would be applied in each action alternative. Aerial spraying is not included in EDRR. Alternative A (no action) does not incorporate EDRR. Any short-term adverse effects would be largely offset by the long-term benefits to bighorn sheep from protecting their habitat from loss due to invasive plants. Negative effects, if any, are expected to be negligible.

Differences between Alternatives

The no action alternative would be the least effective of the alternatives considered in protecting bighorn sheep foraging habitat because it would treat the least number of acres and does not incorporate EDRR to help reduce the spread of invasive plants in the future.

The three action alternatives tend to have about the same impacts on bighorn sheep because they treat the same number of acres of habitat. A wider variety of chemicals may be used in the action alternatives than in alternative A. Alternative C would not allow broadcast herbicide treatment in the riparian areas but the areas would still be treated possibly using spot spraying or stem injection for example. It is possible under alternative C, that bighorns would be disturbed or temporarily displaced for a longer period of time, because these methods of treatments are selective and take longer to complete.

The scenario would be the same for alternative D; the areas would be treated though the process would be more time consuming, slower to get implemented and expensive. Currently less than 20 acres are proposed for aerial spraying in the Asotin bighorn sheep area for alternatives B and C; and under EDRR aerial spray would not be used.

PDFs and standards would be in place to minimize the impacts of aerial spraying. Noise and disturbance could impact the bighorn sheep, depending on the location of the animals at the time of treatment. The disturbance would take place whether the site is spot, broadcast or aerially treated. However, with any of the treatments, disturbance would be limited to the time it takes to apply the herbicides and leave the area.

It is unlikely bighorn sheep would be directly sprayed during aerial spraying since they would tend to run from the noise of the helicopter. Twenty acres of the 21,745 acres of bighorn sheep habitat are proposed for aerial treatment.

Alternative B would be most efficient because it allows all available treatment methods to be considered for use, which when applied should cause less disturbance to bighorn sheep than alternative C or D.

Summary of Effects to Bighorn Sheep and Determination of Effects

It is unlikely bighorn sheep will be in the vicinity of treatment areas at the time of treatment since they tend to go to higher elevations during the period of time most treatments will take place. In addition since less than 2 percent of their herd location areas contain invasive plants and they are not known to consume invasive plants. Disturbance from noise, people and mechanical equipment is the most probable impact to bighorn sheep and that would be minimal and short in duration.

Triclopyr and NPE surfactant result in a dose that exceeds the toxicity index using the highest application rate and upper residue rates. The PDFs prevent Triclopyr from being sprayed at the highest application rate. The lowest effective label rates would be used. No broadcast applications of herbicide or surfactant will exceed typical label rates and NPE surfactant would not be broadcast at a rate greater than 0.5 pounds of active ingredient per acre. Triclopyr will not be broadcast sprayed within riparian areas, which contains over one half of the bighorn sheep habitat with invasive plants.

Standard 16 restricts broadcast use of triclopyr, which eliminates plausible exposure scenarios. The limited spatial extent of infestation, which is limited primarily to disturbed roadsides, and the limits placed on herbicide applications will reduce exposure of bighorn sheep to herbicides.

Therefore invasive plant treatments **“may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species”** of bighorn sheep as a result of any of the alternatives considered in this EIS.

Effects to Green-tailed Towhee

Effects Common to All Alternatives

Due to the low likelihood of green-tailed towhees being present in the treatment sites, actual risk to the birds is very low. Potential effects of invasive plant treatment methods on green-tailed towhee are limited and mainly associated with disturbance that may occur during the nesting season. Direct effects from invasive plant treatment include disturbance caused by noise, people and vehicles. Green-tailed towhees are known to build their nests on the ground or low in a bush so there is the possibility of the nest being trampled or crushed, birds being flushed from the nest or being directly sprayed. However, of the potential 71,394 acres of habitat for the towhee, only about 2 percent has invasive plants. If a green-tailed towhee were to be in the immediate vicinity of a treatment, they could be temporarily displaced.

Treatment and Restoration

Potential effects of invasive plant treatment methods on green-tailed towhee are mainly associated with disturbance that may occur during the nesting season. Direct effects from invasive plant treatment include disturbance caused by noise, people and vehicles. Green-tailed towhees are known to build their nests on the ground or low in a bush so there is the possibility of the nest being trampled or crushed, birds being flushed from the nest or being directly sprayed. However, of the potential 71,394 acres of habitat for the towhee, only about 2 percent has invasive plants, and of that 43 percent is adjacent to roads. If a green-tailed towhee were to be in the immediate vicinity of a treatment, they would likely be temporarily displaced. Restoration work could cause similar temporary disturbance as well.

Manual and Mechanical Methods

Methods used to treat invasive plants or restore forage and prey habitat may affect green-tailed towhee. The most obvious impacts from manual and mechanical treatment would be the potential to crush or trample nests, disturbance from machinery noise and people. The general effects of each non-herbicidal method to wildlife are discussed previously in this chapter and PDFs were developed specifically to limit disturbance (E2, F1, F2, F4, F5, F6). The potential effects from herbicides are summarized previously in this chapter, and discussed in detail in appendix C (printed in the DEIS and available upon request or on line at <http://www.fs.fed.us/R6/uma/projects>) and in appendix P of the R6 2005 FEIS.

All treatment methods that result in improved habitat for green-tailed towhee and their potential forage and prey species will provide a long-term benefit.

Biological Control

There is no indication that any biological controls would adversely affect the cover or forage for the green-tailed towhee. Biological controls cannot affect green-tailed towhee directly, because they only act on invasive plants.

Herbicides

Risk of effects from herbicide exposure is evaluated using the insectivorous bird scenario. A quantitative estimate of dose was calculated for a small bird feeding on insects (or any other small item) contaminated by direct spray of herbicide. The bird is assumed to feed exclusively on contaminated insects for the entire day's diet. There is no chronic dose estimate because there is no data on long-term herbicide residue on insects. The herbicide triclopyr cannot be broadcast sprayed and it is unlikely that an entire day's diet of insects could be contaminated by spot spray or hand/selective applications, so quantitative estimates are not made for triclopyr. Also, triclopyr is used on invasive woody vegetation, like blackberries and Scotch broom, neither of which are present in this species habitat and if they were, green-tailed towhee would be unlikely to forage for insects exclusively on or near these plants. Exposures of concern for triclopyr are not expected.

At typical application rates, no herbicide exceeded a dose of concern for insectivorous birds. In this document no herbicide is approved for use at their highest application rate so it will not be discussed. However, NPE-based surfactants exceeded the dose of concern for insectivorous birds at typical application rates.

Contamination from NPE-based surfactants of an entire day's diet of invertebrates seems unlikely for the following reasons: 1) green-tailed towhees are not known to forage within areas dominated by invasive plants, and, 2) the presence and movement of applicators is likely to scare off some invertebrates.

The food habits of green-tailed towhees are poorly studied, although it eats insects it also scratches litter on the ground, presumably looking for seeds and insects. It probably takes a variety of forb and shrub seeds. It will also take some berries from shrubs when they are available so a worst-case scenario was used that estimated herbicide exposure for a bird eating contaminated vegetation. One paper (APERC 2000, cited in Bakke 2003) stated that no behavioral changes or mortality to quail occurred when they were fed up to 5,000 ppm of NPE for five days. The authors concluded that the LC50 for quail was greater than 5,000 ppm, which is at the higher range or well above the reported range of LC50 values for mammals. However, with only one study on birds available, data is insufficient to state whether or not birds are less susceptible to NPE than are mammals.

Using the limited data available, including toxicity thresholds from mammal data, it appears that some adverse effects from consuming contaminated vegetation are plausible from NPE surfactants.

Chronic exposures were also evaluated for herbicides. There are no long-term residue rates on vegetation for NPE, nor any exposure data on birds, so a quantitative estimate for chronic exposures is not available for NPE. There are no long-term residue rates for herbicides on insects, so quantitative estimates are not available for small birds consuming contaminated insects. Green-tailed towhees do not feed extensively on invasive plant species or contaminated insects, if at all, and they are highly unlikely to feed exclusively within treated patches for an extended amount of time.

No herbicides in the exposure scenario analysis produced exposures that exceeded the toxicity thresholds for birds when sprayed at typical application rates. Triclopyr cannot be broadcast sprayed due to a standard in the Forest LRMP, so exposures of concern are not likely.

About 43 percent (of the 2 percent of potential habitat with invasive plants) of treatments within or adjacent to potential suitable habitat for green-tailed towhee occurs along road shoulders and trails. It is highly unlikely this is preferred habitat for the green-tailed towhee. Proposed roadside treatments involve spraying the patch of invasive plants with truck-mounted nozzles or with hand-held sprayers.

Currently, there are approximately 55 acres within potential green-tailed towhee habitat that is proposed for aerial spraying. The likelihood of the birds actually being in that area at the time of aerial spraying is very low due to the extremely limited number of green-tailed towhees documented for the Pomeroy Ranger District and the sightings were not in close proximity to where the aerial spraying is proposed. Green-tailed towhees nest under brush so it is unlikely they would be directly sprayed. If by chance they were foraging, the sound of the helicopter would likely cause them to take cover so they would not be directly sprayed. The aerial units in potential green-tailed towhee habitat are small acreages. The 55 potential habitat acres proposed for aerial spraying are not all in one unit of potential habitat. It is unlikely an individual bird would eat only contaminated seed or insects in a treated area since much of the seed or insects would not have been contaminated by the treatment. However, if birds were in the area during aerial spraying the same possible impacts as described above in the exposure discussion would be applicable.

Early Detection Rapid Response

The effects discussed above will be the same with EDRR. The no action alternative (alternative A), does not include EDRR. The short-term impacts of the treatments would be largely offset by the long-term benefit of retaining habitat for green-tailed towhee prey species. Effects, if any, are expected to be negligible since very few green-tailed towhees have been detected on the Forest.

Differences between Alternatives

There is very little difference between alternatives for the green-tailed towhee. Alternative A would treat less acres and does not include EDRR so would be the least effective of any of the alternatives considered. Alternative B, the preferred alternative is the least restrictive alternative although it has standards and PDFs in place that minimize impacts to wildlife. It treats the same number of acres as alternatives C and D, however does it more efficiently. Approximately 55 acres of potential green-tailed towhee habitat would likely be aerial sprayed under alternative B and C. The impacts of aerial spraying would be similar to those described above for herbicide effects. Alternative C currently has close to 400 acres in riparian habitat that would not be broadcast sprayed, however it would be treated so the impacts would still be the same as discussed above. Disturbance within the riparian treatment areas with alternative C would likely be of longer duration than under alternatives B and D. The short-term impacts of treatment are outweighed by the long term beneficial impacts to habitat for the green-tailed towhee.

Summary of Effects and Determination of Effects to Green-tailed towhee

The plant material cup nests of the green-tailed towhee are susceptible to crushing or trampling by people or vehicles. If they were nesting in areas where invasive plant treatments occurred, eggs or nestlings could be trampled, regardless of the treatment technique used, except for aerial spraying. Data is not sufficient to distinguish in a meaningful way the magnitude or duration of disturbance or trampling between alternatives. Due to the low likelihood of green-tailed towhees being present in the treatment sites, actual risk to the birds is very low.

Using broad-scale analysis approximately 2 percent (1,424 acres) of potentially 71,394 acres contain invasive plants. Green-tailed towhees eat insects so the risk from herbicide and NPE-based surfactants is as discussed above under effects from herbicides. At typical application rates, no herbicide exceeded a dose of concern for insectivorous birds. The herbicide triclopyr cannot be broadcast sprayed and it is unlikely that an entire day's diet of insects could be contaminated by spot spray or hand/selective applications, so quantitative estimates are not made for triclopyr. Adverse effects cannot be ruled out for glyphosate at high application rates or NPE at typical and high rates. However, high application rates would not be used due to the PDF in place.

Data is insufficient to distinguish between alternatives the likelihood or magnitude of this potential effect. Due to the low likelihood of green-tailed towhee being present in the treatment sites, actual risk to the birds is low.

This analysis shows that under any of the alternatives, though the chances are small, invasive plant treatment methods **“may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species”** to green-tailed towhee.

Effects to Bald Eagle

Effects Common to All Alternatives

At this time invasive plant infestations are not known to exist within one half mile of the one known bald eagle nest on the Umatilla National Forest. However, new bald eagle nests and roost sites could be discovered during the life of this document so project design features have been incorporated to limit impacts to bald eagles should nest or roost sites be found in close proximity to invasive plants.

No effect to the bald eagles would occur from ingesting or contacting herbicides. The effects analysis showed no anticipated toxic effects. Even if they fed, for a lifetime, upon fresh-water fish that had been contaminated by an accidental spill of herbicide, they would not receive a dose that exceeds any known NOAEL. The concentrations of herbicides from invasive plant treatment would not be elevated to a point where there would be any observable effect to eagles. For bald eagles, which feed upon fish, adverse effects from herbicide or NPE surfactant exposure are not plausible because the estimated dose for herbicide or NPE does not exceed a threshold of concern for potential effects (i.e. the toxicity index).

The project design features (J-1a and J-1b) listed for bald eagles apply to all action alternatives. Because the project design features are required, and because they are effective at eliminating adverse effects from disturbance to these species, none of the action alternatives will result in adverse effects from disturbance, which supports direction from Standards 19 and 20.

Therefore, no invasive plant treatments in any alternative would result in adverse effects to bald eagles.

Manual and Mechanical Methods

Potential effects of invasive plant treatment methods on bald eagles are associated with disturbance that may occur during the nesting season. Direct effects from invasive plant treatments include disturbance caused by noise, people and vehicles. Human and vehicle presence can disturb bald eagles during the breeding season, causing the birds to leave nests, or stay away from the nest long enough to have detrimental effects to eggs or young (USDI 1986). Effects from mechanical methods (e.g. tractors, chainsaws, string trimmers, etc.) may be more likely to occur, and occur at greater distances from the project site, because machinery creates louder noise. The PDF in place for Bald Eagle should eliminate the disturbance from mechanical treatment methods.

The critical period in Oregon and Washington when human activities could disturb occupied nests extends from January 1 to August 31 (Anthony and Isaacs 1989). Bald eagles are sensitive to human disturbance during this time, particularly within sight distance of nest sites.

Disturbance near winter roost sites is not likely to occur because invasive plant treatments generally do not occur during the winter.

Most invasive plant treatments could avoid conducting the project in proximity to an occupied nest during these time-frames, but some projects may occur during the nesting season that may adversely affect bald eagles. If a bald eagle nest was located near invasive plants, it still may be prudent to treat the invasive plants, due to the detrimental affects to habitat if these plants were to be left untreated.

Projects conducted at anytime that are more than a quarter mile from a nest, or a half mile line of sight distance from a nest, and do not result in the modification of use areas or the eagles' food resource, and noise is below ambient levels, should have no effect on bald eagles (FWS 2003). Activities that occur within a quarter mile or half mile line of sight from eagle use areas and produce noise above ambient levels, and do not result in degradation of use areas or the eagles' food resource, but implement a Limited Operating Period (LOP) (October 31 to March 31 for winter roosting and foraging; and January 1 to August 15 for nesting and rearing), are not likely to adversely affect bald eagle. The duration of the disturbance would likely be less than a day in any given year.

Invasive plant treatments will not result in the removal of bald eagle nests or roost trees, or suitable habitat, because invasive plants do not provide habitat. Invasive plants could occur within suitable habitat, however.

Treatment and Restoration

Methods used to treat invasive plants or restore habitat may affect the bald eagle. The general effects of each method (alternate from herbicide methods) to wildlife are discussed previously in this chapter and PDFs were developed specifically to limit disturbance/effects to bald eagles. The potential effects from herbicides are summarized previously in this chapter, and discussed in detail in appendix C (printed in the DEIS and available upon request or on line at <http://www.fs.fed.us/R6/uma/projects>) and in appendix P of the R6 2005 FEIS. All treatment methods that result in improved habitat for potential bald eagle prey species will provide a long-term benefit.

Biological Control

There is no indication that any biological controls would adversely affect the cover or forage of prey for the bald eagles. Biological controls cannot affect bald eagles directly, because they only act on invasive plants.

Herbicides

Exposure scenarios used to analyze potential effects from herbicides are discussed in R6 2005 FEIS (appendix P, p. 24-27). None of the herbicides proposed for use in this EIS or NPE surfactants applied at typical application rates pose a risk to bald eagles.

Bald eagles are not likely to be directly sprayed, or encounter vegetation that has been directly sprayed, because no aerial application is proposed on the ranger district where the known nest site is located. No ground applications of herbicide would reach the upper canopies of mature trees where bald eagles nest. In addition, the bald eagle PDFs (J-1a and J-1b) place seasonal treatment restrictions around occupied nests if new nest locations are discovered to minimize disturbance. The potential for the herbicides to adversely affect bald eagles was determined using quantitative estimates of exposure from worst-case scenarios.

The dose estimates for fish-eating birds were calculated using herbicide or NPE concentrations in fish that have been contaminated by an accidental spill of 200 gallons into a small pond. Assumptions used include no dissipation of herbicide, bioconcentration is equilibrium with water, contaminant level in whole fish is used, and upper estimate assumes 15 percent of body weight

eaten/day. For chronic exposures the scenario used was where the bird consumes fish from water contaminated by an accidental spill over a lifetime. All estimated doses used in effects analysis were the upper levels reported in the Forest Service/SERA risk assessments.

The following interpretations of the exposure scenario results are made with the reservation that toxicity data was generated from laboratory animals which may not accurately represent potential effects to free-ranging wildlife.

The results of these exposure scenarios indicate that no herbicide or NPE surfactant proposed for use poses any plausible risk to birds from eating contaminated fish. All expected doses to fish-eating birds for all herbicides and NPE are well below any known NOAEL (See appendix C, printed in the DEIS and available upon request or on line at <http://www.fs.fed.us/R6/uma/projects>, and appendix P of the R6 2005 FEIS).

The weight of evidence suggests that adverse effects to bald eagles from NPE or the herbicides included in the action alternatives are not plausible. Each of the action alternatives would treat the same number of acres within the BECA. No aerial applications are currently proposed in the vicinity of the bald eagle nest.

Early Detection Rapid Response

If new invasive plant treatment sites are discovered in close proximity to a bald eagle nest, the PDF is in place to limit impacts to the bald eagle and its habitat for all action alternatives. Alternative A (no action) does not include EDRR using integrated weed management, although manual methods without herbicide may be used.

Summary of Effects to Bald Eagle

Disturbance by humans and vehicles during project implementation is the primary adverse effect that is plausible for bald eagles. There are no bald eagle nest locations within more than a mile of proposed treatment areas. The project design features (J-1a and J-1b) required for bald eagles, which imposes a seasonal restriction on activities near or within line-of-sight of nesting or roosting eagles, will eliminate adverse effects (per Standards 19 and 20) from disturbance to any future nests that may occur, and also applies to EDRR should new infestations of invasive plants occur near existing nests.

Conducting invasive plant treatments **may affect, but is not likely to adversely affect** the bald eagle. This conclusion is based on:

- The Project Design Feature required for application in areas within 0.25 miles of a bald eagle nest, or within 0.50 mile line-of-sight of a bald eagle nest will minimize adverse effects from disturbance.

Adverse effects to bald eagles from herbicide exposure are not plausible because:

Studies have shown that even if a bald eagle fed, for a lifetime, upon fresh-water fish that had been contaminated by an accidental spill of herbicide, they would not receive a dose that exceeds any known NOAEL.

Effects to Columbia Spotted Frog

Effects Common to All Alternatives

Columbia spotted frog are known to have a fairly large distribution within the Project Area. Since alternative A did not identify sites near known frog habitat, and the spotted and leopard frog PDF will be in place under all of the action alternatives, the chance of negative impacts to amphibians is considerably lessened. The PDF would avoid broadcast spraying of herbicides, and avoid spot spraying of glyphosate with POEA surfactant, sulfometuron methyl, and NPE-based surfactants, within 100 feet of occupied or suitable spotted or leopard frog habitat. The PDF also requires the coordination of the treatment methods, timing, and location with the local Biologist. Sites may require surveys prior to application.

Treatment and Restoration

Potential effects of invasive plant treatment and restoration methods on spotted frogs are mainly associated with disturbance, effects to their skin and absorption through the skin, and the potential effects of specific herbicides on their prey. Direct effects from invasive plant treatment include disturbance caused by noise, people and vehicles. Since no emergent vegetation is proposed for treatment under this plan, it is unlikely this species will be in the immediate vicinity of treatment; however they could be temporarily displaced by workers in the area.

Manual and Mechanical Methods

Adult frogs, eggs, and larvae are not likely to be disturbed by invasive plant treatments during the breeding season because they are restricted to aquatic habitat. After breeding however, adults will disperse into adjacent wetland and riparian habitats. Adults and juveniles would be susceptible to trampling from invasive plant treatment activities in wetland and riparian habitat utilized by frogs. The probability that this would actually occur is low because the frogs are less likely to inhabit areas infested with invasive plants and they tend to jump back into the water whenever they detect disturbance close by. Disturbance in close proximity to amphibians would likely be for a longer duration with alternative C since the plants would be treated individually rather than by broadcast treatment in the riparian areas. However, potential short-term disturbance would occur with all alternatives. All treatment methods that result in improved habitat for amphibians and their prey will provide a long-term benefit.

Biological Control

There is no indication that any biological controls would adversely affect the cover or forage for frogs. Biological controls cannot affect amphibians directly, because they only act on invasive plants.

Herbicides

Data on herbicide effects to amphibians is limited. Appendix P of the R6 2005 FEIS summarized available data on the effects of herbicides to amphibians and this discussion is incorporated by reference. Several studies have found that amphibians are less sensitive, or about as sensitive, as fish to some herbicides (Berrill et al. 1994; Berrill et al. 1997; Johnson 1995; Mayer and Ellersieck 1986; Perkins et al. 2000). As stated previously, where data was lacking, toxicity data on fish was used as a surrogate for toxicity to amphibians, based on studies comparing data available for both groups of species (Berrill et al. 1994; Berrill et al. 1997; Perkins et al. 2000). For glyphosate and sulfometuron methyl there was sufficient data to do a quantitative evaluation of exposure and risk.

Results of the analysis indicate that the following herbicides pose a low risk of mortality to amphibians: chlorsulfuron, clopyralid, imazapic, imazapyr, metsulfuron methyl, and picloram. Data

is insufficient to evaluate risk of sub-lethal effects. The Poast® formulation of sethoxydim is much more toxic to aquatic species than is technical grade sethoxydim. However, use of Poast® is unlikely to result in concentrations in the water that would result in toxic effects to aquatic species (SERA 2001). There is a substantial limitation to this risk characterization because there are no chronic toxicity studies on aquatic animals available for either sethoxydim or Poast®.

Formulations of glyphosate that contain POEA surfactant are much more toxic to aquatic organisms than aquatic-labeled formulations, which do not contain POEA. The concentration in water for a “worst case scenario” was compared to toxicity data on both versions of glyphosate. At typical application rate, concentrations in the water for acute and chronic exposures were well below any reported LC50 for either version of glyphosate, with the exception of one study by Smith (2001). The Smith study is not consistent with other reported studies on glyphosate and so was not used to establish the threshold of concern for aquatic species in the Glyphosate Risk Assessment (SERA 2003 Glyphosate).

At high application rate, concentrations of glyphosate with POEA surfactant exceeded lethal levels and mortality to amphibians could occur. The version of glyphosate without POEA (i.e. the aquatic-labeled formulations) did not exceed lethal doses.

Sufficient data are available for toxicity of sulfometuron methyl to allow quantitative estimates of exposure and risk. Data is limited to that generated by studies on *Xenopus*, but other studies have indicated that *Xenopus* are a sensitive indicator for effects to amphibians (Mann and Bidwell 2000, Perkins et al. 2000). Results from the “worst case scenario” for aquatic species indication that all estimated exposures were far below acute and chronic “no-observable-effect-concentration” (NOEC) values.

Triclopyr comes in two forms; triclopyr BEE and triclopyr TEA. Triclopyr BEE is much more toxic to aquatic organisms than is triclopyr TEA. Triclopyr cannot be broadcast sprayed, regardless of alternative, because the restriction is a standard in the LRMP. At typical application rates, neither version is likely to result in adverse effects to amphibians, using a sub-lethal effect for tadpole responsiveness as a threshold of concern.

At higher application rates, tadpole responsiveness could be reduced. These concentrations are not likely to occur from applications in the proposed action due to the restriction on broadcast spraying.

Triclopyr also has an environmental metabolite known as TCP (3, 5, 6-trichloro-2-pyridinol). TCP is about as acutely toxic to aquatic species as triclopyr BEE (SERA 2003 Triclopyr). Adverse effects to aquatic species (based on data from fish) from TCP are likely only if triclopyr is applied at the highest application rates. These rates are highly unlikely to be realized given the prohibition on broadcast spraying of triclopyr.

In summary, adverse effects to amphibians are only likely from glyphosate with POEA and triclopyr applied at high rates, both of which are actions prevented by the PDFs in place for this project.

NP and NPE have been studied for effects to aquatic organisms. NP is more toxic than NP9E, by one to three orders of magnitude (USDA FS, 2003). The toxicities of the intermediate breakdown products, NPEC and others are intermediate between NP and NPE. In the aquatic environment, the breakdown products NP1EC and NP2EC are likely to be present also. These two metabolites are known to affect vitellogenin (a precursor for egg yolk) production in male fish, but NP, which is a more potent estrogenic compound, did not cause vitellogenin increases in male *Xenopus laevis*, or leopard frogs (Selcer et al. 2001; cited in USDA Forest Service 2003).

Mann and Bidwell (2000, 2001) tested several Australian frogs and *Xenopus* for effects to NP8E. They found that *Xenopus* was the most sensitive to toxic effects, with an LC50 of 3.9 ppm (3.9 mg/L). Similar to studies with herbicides, the LC50 values for the frogs are comparable to those for fish (USDA FS 2003). NP8E inhibited growth at concentrations as low as 1 ppm (Mann and Bidwell 2000, 2001). Mild narcosis of tadpoles can occur at EC50 values as low as 2.3 ppm, and reduced dissolved oxygen content in the water lowered the EC50 values by about half as compared to normal oxygen levels. The tadpoles recovered from the narcosis. Malformations in *Xenopus* occurred at EC50 values between 2.8 and 4.6 mg/L.

NP may cause tail resorption with a 14-day NOEC of 25 ppb for *Xenopus laevis* (Fort and Stover, 1997; cited in USDA FS, 2003). NP also increased the percentage of female *Xenopus* developing from tadpoles exposed to 22 ppb for 12 weeks, but did not produce this effect at 2.2 ppb.

During operational use of NPE surfactant, ambient levels of NP9E (including a small percentage of NP, NP1EC, and NP2EC) could average 12.5 ppb (range 3.1 to 31.2 ppb). This is well below the levels reported to cause concerns discussed above. The duration of these exposures from Forest Service use would generally be much shorter than those used in laboratory experiments, due to transport by flowing streams, dilution, and environmental degradation. These levels are not likely to adversely affect amphibians found in the Pacific Northwest for normal operations (Bakke 2003). However, overspray or accidental spills could produce concentrations of NP9E that could adversely affect amphibians, particularly in small stagnant ponds.

Early Detection Rapid Response

The impacts of EDRR for these frogs would be the same as those discussed above. The no action alternative (alternative A), does not include EDRR. The short-term impacts of the treatments would be outweighed by the long-term benefit of retaining habitat for Columbia spotted frogs.

Differences between Alternatives

Alternative A (No Action): Invasive plants sites are not delineated in spotted frog habitat under this alternative. The existing infestations in spotted frog habitat are not part of the current projects included in the no action alternative. Existing spotted frog populations would not be affected by manual, mechanical, or herbicide treatments. Alternative A is the least effective for improving habitat for frog species since it does not allow for treatment in frog areas, and does not incorporate EDRR.

Alternative B (Proposed Action): No emergent vegetation would be treated under any of the action alternatives considered in this EIS, which reduces the amount of herbicide that could come in contact with water. Glyphosate isopropylamine (IPA), RoundUp™ and POEA surfactant used in RoundUp™ have been specifically tested for ability to cause malformations in the frog embryo teratogenesis assay using *Xenopus* (Perkins et al. 2000). *Xenopus* is a highly sensitive assay species for determining the teratogenicity of chemicals (Mann and Bidwell 2000, Perkins et al. 2000).

No increases in malformations were noted at levels that were not also lethal to the embryos. The 96-hour LC50 for glyphosate IPA was 7297 mg a.e./L. Formulations containing surfactant are known to have much higher toxicity to amphibians than glyphosate. RoundUp™ formulation containing POEA surfactant was 700 times more toxic than glyphosate IPA (See appendix C printed in the DEIS and available upon request or on line at <http://www.fs.fed.us/R6/uma/projects>). The Forest Service does not use the formulation used in the Smith study; however, potential effects to spotted frogs from glyphosate cannot be ruled out. To further minimize frog exposure a PDF was developed that prohibits broadcast spraying of herbicides, as well as spot spraying of glyphosate with POEA

surfactant, sulfometuron methyl, and NPE-based surfactants within 100 feet of occupied or suitable spotted or leopard frog habitat (J-4a).

In addition, treatment methods, timing, and location would be coordinated with local Biologists. With all of this protection in place, it is very unlikely that glyphosate will enter the water adjacent to treatment areas.

Adults could also be dermally exposed to glyphosate if they were to move through treated vegetation; however invasive plants have not been identified at any of the known spotted frog sites. It is, therefore, unlikely that frogs would be exposed to herbicides in this way.

Broadcast application of triclopyr, including aquatic triclopyr TEA, is prohibited. Some exposure could occur with spot applications which triclopyr TEA up to 15 feet of perennial streams, lakes and ponds. Spot or hand applications of Triclopyr BEE are prohibited within 150 feet of streams, lakes and ponds. Exposure from spot or hand applications would be much less than that modeled in the “worst case scenario.” There would be no aerial spraying within amphibian habitat.

Alternative C: The use of triclopyr is the same as alternative B. No adverse effects to spotted frogs would occur from triclopyr or TCP exposure. No herbicide at all is permitted within intermittent stream channels or within 10 feet of perennial streams, lakes, or ponds. This would reduce, but may not eliminate, exposure to glyphosate or other herbicides. Because glyphosate is strongly adsorbed to soil, runoff or percolation of glyphosate through the buffer and into water is unlikely. Eggs and tadpoles are unlikely to be exposed to glyphosate. Spotted or leopard frogs may be exposed to other herbicides, but available data suggests that adverse effects are unlikely. Adults could still be dermally exposed to glyphosate as they move outside the buffers through treated vegetation. There is insufficient data to quantify dose received from dermal exposure to contaminated vegetation. It is assumed there is the potential that this type of exposure could result in adverse effects.

Alternative D: There would be no aerial spraying within close proximity to amphibian habitat under any of the alternatives since PDFs would be adhered to under all alternatives so alternative D would have the same effects as alternative B for spotted frogs.

Summary of Effects to the Columbia Spotted Frog and the Determination of Effects

Adult frogs, eggs, and larvae are not likely to be disturbed by invasive plant treatments during the breeding season because they are restricted to aquatic habitat. After breeding however, adults will disperse into adjacent wetland and riparian habitats. Adults and juveniles would be susceptible to trampling from invasive plant treatment activities in wetland and riparian habitat utilized by frogs. The probability that this would actually occur is low because the frogs are less likely to inhabit areas infested with invasive plants.

This potential effect would occur in all alternatives, but might be more likely in alternative C due to increased use of manual and mechanical techniques. All treatment methods that result in improved habitat for frogs and their prey will provide a long-term benefit.

No emergent vegetation would be treated under any of the action alternatives considered in this EIS, which reduces the amount of herbicide that could come in contact with water. Glyphosate isopropylamine (IPA), RoundUp™ and POEA surfactant used in RoundUp™ have been specifically tested for ability to cause malformations in the frog embryo teratogenesis assay using *Xenopus* (Perkins et al. 2000). *Xenopus* is a highly sensitive assay species for determining the teratogenicity of chemicals (Mann and Bidwell 2000, Perkins et al. 2000). No increases in malformations were noted

at levels that were not also lethal to the embryos. The 96-hour LC50 for glyphosate IPA was 7297 mg a.e./L.

Formulations containing surfactant are known to have much higher toxicity to amphibians than glyphosate. RoundUp™ formulation containing POEA surfactant was 700 times more toxic than glyphosate IPA (See appendix C – Herbicide Effects to Wildlife printed in the DEIS and available upon request or on line at <http://www.fs.fed.us/R6/uma/projects>). The Forest Service does not use the formulation used in the Smith study; however, potential effects to spotted frogs from glyphosate cannot be ruled out. To further minimize frog exposure a PDF was developed that prohibits broadcast spraying of herbicides, as well as spot spraying of glyphosate with POEA surfactant, sulfometuron methyl, and NPE-based surfactants within 100 feet of occupied or suitable spotted or leopard frog habitat. In addition, treatment methods, timing, and location would be coordinated with local Biologists. With all of this protection in place, it is very unlikely that glyphosate will enter the water adjacent to treatment areas.

Adults could also be dermally exposed to glyphosate if they were to move through treated vegetation; however invasive plants have not been identified at any of the known spotted frog sites. It is, therefore, unlikely that frogs would be exposed to herbicides in this way.

Buffers established for use of triclopyr (see Aquatic Species section) would be effective at avoiding adverse effects from exposure to triclopyr BEE and others. The restriction on broadcast spray of any triclopyr would also greatly reduce potential adverse effects from triclopyr TEA and TCP. Some exposure could occur with spot and selective applications; these exposures would likely be much less than that modeled in the “worst case scenario.”

No herbicide is permitted within intermittent stream channels or within 10 feet of perennial streams, lakes, or ponds. This would reduce, but may not eliminate, exposure to glyphosate or other herbicides. Because glyphosate is strongly adsorbed to soil, runoff or percolation of glyphosate through the buffer and into water is unlikely. Eggs and tadpoles are unlikely to be exposed to glyphosate. Spotted frogs may be exposed to other herbicides, but available data suggests that adverse effects are unlikely.

The analysis shows that under any of the alternatives, though the probability is low, treatments could impact spotted frogs.

Therefore, the invasive plant treatments **“may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species”** for spotted frogs.

3.3.7 Effects to Management Indicator Species

The purpose of this section is to evaluate and disclose the impacts of the Umatilla National Forest Invasive Plants Treatment Project on the Umatilla Management Indicator Species (MIS) identified in the Forest Land and Resource Management Plan (USDA Forest Service 1990). This documents the effects of project alternatives on the habitat of selected MIS.

Effects to MIS from herbicide exposure were evaluated by placing the species into groups based on taxa type, body size, and diet. Exposure scenarios for various groupings were used to quantitatively estimate dose and characterize risk. Scenarios are discussed in detail in appendix P of the R6 2005 FEIS and this information is incorporated by reference. The following scenarios were used for the following species:

- Large mammal consuming contaminated vegetation: elk
- Carnivore consuming contaminated small mammal: American (pine) marten
- Effects to pileated woodpeckers, three-toed woodpecker, and primary cavity excavator are included below

Effects to Rocky Mountain Elk

Concern over elk (and deer) arises from its status as an important game species. The grazing and browsing habits of elk (and deer) make it possible for them to consume vegetation that has been sprayed with herbicide. Quantitative estimates of risk using “worst-case” scenarios found that none of the herbicides considered for use, at typical application rates, would result in a dose that exceeds the toxicity indices in either acute or chronic scenarios. The dose for NPE surfactant exceeds the toxicity index only in an acute scenario. Elk (or deer) would have to consume an entire day’s diet of contaminated grass in order to receive this dose. Broadcast spraying is proposed over areas in which deer or elk could forage. Spot spraying, roadside boom and aerial spraying of invasive plants are not likely to expose deer or elk to harmful levels of herbicide or NPE because they are unlikely to forage exclusively on treated invasive plants, which are not their preferred forage. Also, the patchy nature of the applications makes it unlikely that the elk (or deer) would forage exclusively on the scattered treated patches.

Treatment of invasive plants in meadows and along roadsides in meadow habitat could beneficially affect elk (and deer) by preserving native forage species and maintaining the long-term suitability of the habitat. Invasive plants can reduce the ability of an area to support elk (and deer) (Rice et al. 1997). The effects to elk and deer are almost identical, since their habitat requirements and forage are so similar. Even if a few individuals were adversely impacted by herbicides or disturbance caused by people, vehicles and mechanical treatments, there would be no substantial change in the population levels for elk (or deer) due to invasive plant treatments. Elk and deer populations on the Forest are in not in danger.

Elk (and deer) have been analyzed for direct effects of the herbicides and it was determined that based on the method of application that there would be little to no effect on the species.

The fact that game animals do forage in the areas that would be sprayed, there is a potential that a hunter could harvest an animal that has been foraging on herbicide treated areas. Since these herbicides do not bio-accumulate in the fat of animals, there would be no increase in the toxic effect to someone eating the animal. The amount of herbicides that might be ingested by the animal is anticipated to be low, and depending on the size of the animal, the amount ingested by a person would be even lower. Although there is no research data that was reviewed to confirm the effect of eating meat from an animal that has been foraging on herbicide sprayed vegetation, it is expected that there would be no observable or detectable effects on people who eat meat from an animal harvested that has ingested herbicides sprayed at the recommended rates and by the methods prescribed by this document. Since, many of these same herbicides have been sprayed in much larger quantities on private lands, especially on commercial agriculture lands, and there have not been recorded cases of humans developing problems following the consumption of game animals foraging on these lands, it is assumed that there would be no health issues on this project. See Section 3.7 – Effects of Herbicide Use on Workers and the Public- for more information. Rice (2000) demonstrated that the appropriate use of herbicides can provide clear benefits in the restoration of native plant communities and the enhancement of wildlife values in areas that had been degraded by spotted knapweed.

Effects Common to All Alternatives

Invasive plants probably affect elk (and deer) more than any other species analyzed in the MIS section. Invasive plants out compete and replace native forage plants for these ungulates. Eradicating, controlling and/or containing invasive plants would improve elk (and deer) habitat. This factor outweighs any detrimental effects of herbicide ingestion and disturbance.

Of the herbicides analyzed, triclopyr has a toxic effect on ungulates when ingested over a number of days (chronic exposure). At times, elk (and deer) could continue to return to a patch of vegetation that they prefer over other plants and continue to forage in that area. Due to this site selection behavior they are prone to chronic exposures. As a result, the R6 2005 ROD contains a standard that restricts the use of triclopyr and does not allow broadcast boom or aerial spraying of this herbicide. However, if there are a substantial amount of invasive species in an area (which are not preferred forage) elk (and deer) are not likely to continue to forage in such an area.

Mammals that eat vegetation (primarily grass) that has been sprayed with herbicide have relatively greater risk for adverse effects because herbicide residue is higher on grass than it is on other herbaceous vegetation or seeds (Kenaga, 1973; Fletcher et. al., 1994; Pfleege et. al., 1996). Elk (and deer) eat grasses so they are more susceptible to toxic effects than carnivores.

Alternative A – No Action

Under the existing 1995 Umatilla National Forest 1995 EA for invasive plant treatment, the use of triclopyr is not available. This is the only herbicide that the effects analysis (appendix C) shows as a potentially toxic herbicide for elk. The only herbicides available in the no action alternative are glyphosate and picloram. As discussed before, this alternative is the least effective at containing, preserving or restoring invasive plant sites since it has only a limited number of sites identified for treatment and does not incorporate EDRR.

Alternative B, C and D

There is at least some elk (and deer) forage on every acre of the proposed treatment areas. Potentially elk (and/or deer) could be affected by the treatment of invasive plants. As a result, potentially 25,000 acres of habitat could be improved by the removal of invasive plants, but also could expose elk (and deer) to herbicides. Acres treated with triclopyr could potentially have toxic effects for individual elk. This effect is offset by the fact that the chemical would only be used as a spot spray. The amount of forage plants that would be sprayed would be reduced substantially. This should eliminate the potential for toxic effects from acute and chronic exposure since elk (or deer) rarely forage on the invasive plants targeted for treatment.

All the acres aerial sprayed under alternative B have the potential to expose elk (and deer) to herbicides by being sprayed directly and exposure through walking in areas that have been sprayed. Currently 675 acres are proposed for aerial treatments; and there would be no additional aerial treatments under EDRR. The 675 acres is not in one large unit. There are 14 aerial treatment sites proposed that range in size from approximately .90 acres to 286 acres. Elk would likely run from the low flying helicopter or plane and so would not expected to be directly sprayed by herbicide.

The assumptions for toxicity are similar for each alternative. This would not affect the population of elk (or deer). There have been no reports of deer or elk suffering from exposure to any herbicides used on farms or commercial tree plantations where herbicide use is more prevalent.

Alternative C could cause more disturbances to elk than alternative B because it doesn't allow broadcast spraying in riparian areas so application of herbicides may take longer on certain sites.

Alternative D would be very similar in effects to elk (and deer) as both alternative B and C, except there would be no aerial spraying of herbicides. The 675 acres proposed for aerial treatment in alternative B and C would be treated if safety concerns and/or cost did not eliminate sites from treatment.

Effects to Pileated Woodpecker, Three-toed Woodpecker and Cavity Excavators

These species were grouped together because for the most part they share similar habitats and the effects from treatments would be similar. The pileated woodpecker is a Forest Management Indicator Species. Concern over pileated woodpeckers arises from their association with mature forest habitat, a habitat type that has been affected by logging throughout the woodpeckers range. Breeding bird survey data collected between 1966 and 1991 shows no significant change in the population in the western United States (Bull and Holthausen 1992).

Species that forage and nest in trees are not likely to be exposed because aerial applications are limited to sites with less than 30 percent canopy cover.

The aerially sprayed trees would intercept the herbicide, which would protect the cavity excavators from being directly contaminated. Lewis' woodpecker and northern flicker are the only cavity excavators that may feed on the ground or low shrubs for a substantial portion of their diet. They may encounter contaminated insects. No herbicides except triclopyr (which can't be broadcast sprayed) are a concern at typical application rates. NPE may exceed toxicity index at typical and highest application rates given the worst case scenario of feeding exclusively on contaminated insects. Given the varied diet and movement of these birds, they are unlikely to forage exclusively within one patch of treated invasive plants and actual doses exceeding levels of concern are unlikely.

Invasive plant treatments are not expected to affect the pileated woodpecker, the three-toed or cavity excavators. These birds nest in cavities in trees, usually dead trunks or dead limbs, and forage largely on trees and perhaps some shrubs, making it unlikely for them to be exposed to herbicides or affected by manual or mechanical treatments. Invasive plant treatments will not reduce the availability of dead trees, down logs or appropriate cavity sites. Since these woodpeckers utilize down logs and snags and forage on beetles and ants buried inside decaying wood, their habitat is not impacted by invasive plant infestations but infestations may occur in proximity to their habitat. The differences between alternatives do not result in any differences in effects to the pileated woodpecker, three-toed woodpecker or cavity excavators. There is no impact to these species for all action alternatives.

Alternative A – No Action

None of the treatments that occur under the existing 1995 Management of Noxious Weeds decision impact pileated habitat, three-toed woodpecker or primary cavity excavator's forage, or nesting. There are no effects to these birds from this alternative.

Alternatives B, C, & D – Action Alternatives

None of the proposed treatments would affect pileated woodpecker habitat, three-toed woodpecker or primary cavity excavator's forage or nesting habitat. The insects that pileated woodpeckers forage on live inside dead wood and snags: these insects have almost no chance of contacting herbicides at the treatment sites. The herbicide effects analysis showed no toxic effects to these species (appendix C). Very few acres would be treated in pileated woodpecker habitat, three-toed woodpecker or primary cavity excavator's forage or nesting habitat. Any treatment sites would not be in areas slated for aerial treatment since the forest canopy would be too dense for aerial spray. Treatments in riparian areas would generally be on more open sites and therefore not in typical habitat for these

species. No habitat would be affected by manual or mechanical treatments. The EDRR would not increase or decrease this risk.

Effects to American Marten

The American marten is a Forest Management Indicator Species. Concern for this species arises out of their association with mature and old-growth forest. Since this species is not restricted to riparian areas there is no appreciable difference between alternatives. There will be no aerial spraying within areas of dense tree cover so there will not be any difference between alternatives B and D.

No herbicide or NPE exceeded a level of concern for carnivores eating contaminated small mammals. Invasive plant infestations are unlikely to occur in marten habitat except along disturbed roadsides, so disturbance to martens from treatment is not likely to occur.

Even if pine martens consumed for an entire day nothing but prey that had been directly sprayed, they would not receive a dose that exceeded the toxicity indices for any herbicides or NPE (R6 2005 FEIS, appendix B). Because there is a lack of plausible effects from any treatments, there is no difference in effects regardless of alternative chosen.

Alternative A– No Action

Martens could occur in some of the areas treated under the 1995 decision that implements the Umatilla National Forest EA for the Management of Noxious Weeds.. These animals would potentially travel through areas treated, but avoid openings.

They do, however, travel across roads and small forest openings at times, so they could go through a treatment area. Exposure would be short and acute. Their home range makes chronic exposure unlikely. The effects analysis for herbicides showed no risk of exposure. No habitat would be altered by this alternative. None of the treatment methods would have any effect on martens. The effect determination for this alternative is No Effect to martens or their habitat.

Alternatives B, C and D

Martens do occur throughout the proposed treatment areas at the higher elevations. The analysis for these alternatives is the same as alternative A. Martens would travel through the treatment areas but there is no risk from any of the treatments methods. There are no toxic effects from herbicides, and no habitat altered. **The effect determination for martens and their habitat is No Effect. This includes EDRR as well as all treatment methods.**

3.3.8 Effects to Other Species of Interest

Landbirds

Effects Common to All Alternatives

The treatment of invasive plants has short-term impacts by reducing cover, but restoring native vegetation would have long-term benefits (See Section 3.2– Botany). Birds or mammals that eat vegetation (primarily grass) that has been sprayed with herbicide have relatively greater risk for adverse effects because herbicide residue is higher on grass than it is on other herbaceous vegetation or seeds (Kenaga 1973; Fletcher et. al. 1994; Pflieger et. al. 1996). Turkeys, grouse, quail, and waterfowl would all consume grass as part of their diet. Other birds would eat grass seeds especially. The end result of all of the alternatives is some degree of improvement in the quality of habitat, while having a potential short-term negative effect on individual birds. One example from this

project would be the treatment of knapweed. Knapweed seed is not consumed by birds and provides very poor nest cover. By reducing the presence of knapweed and allowing native grasses and forbs that do provide food and cover there is a positive effect to the treatment.

The effects of herbicides, from all methods of intake and to all species on the landscape, are limited. The studies that were analyzed for the adopted 2005 Pacific Northwest Region Invasive Plant Program decision indicated that there was a low toxicity of herbicides to birds.

But because of the large gaps in data it must be stated that some effects to birds from herbicides are unknown. The data that are available would indicate however that the risk is low.

Alternative A – No Action

The herbicide effects analysis from appendix C (printed in DEIS and available on request or on line at <http://www.fs.fed.us/R6/uma/projects>) and in the R6 2005 FEIS appendix P) shows no effect to the species analyzed from herbicides except triclopyr and NPE surfactant for blue grouse. These two herbicides are not allowed under the 1995 decision that implements the Umatilla National Forest EA for the Management of Noxious Weeds, so there could be no effect to these two species. The treatment areas are limited and should not result in a large exposure to blue grouse or other landbirds that are not analyzed.

Alternatives B, C and D

All of the treatment methods used to treat invasive plants have some short-term negative effect on early successional bird species use. All methods if implemented in the spring and early summer could impact nesting success of birds, especially ground nesting birds. All of these methods (herbicide, manual, and mechanical) could possibly flush birds from their nest. When flushed from a nest many birds return with no harm to the young or eggs, but some species are highly sensitive to disturbance and would abandon the nest.

These alternatives include the use of triclopyr. Since this herbicide is only approved for spot spraying, the risk of exposure is reduced substantially. It is not likely that blue grouse or other ground feeding birds would receive chronic dosages that would become toxic.

EDRR would expose landbirds to a possible additional disturbance and possible exposure to herbicides. In the short-term, this may cause some reduced reproduction from a reduction in ground cover for nesting but in the long-term their habitat would be restored or maintained and this is a greater benefit than the possible negative side effects.

Alternatives C and D could both result in more disturbance to landbirds than alternative B since both would require more ground work involving people and machines which can crush eggs, flush birds etc. However, the short-term negative impacts are outweighed by the long-term benefits to habitat.

Focal Species

The following species are listed in the Conservation Strategy for Landbirds and were used for analysis purposes and represent a variety of habitats and feeding strategies; hermit thrush (subalpine forest), upland sandpiper (montane meadows), vesper sparrow (steppe shrubland), gray-crowned rosy finch (alpine), and red napped sapsucker (aspen).

The herbicide effects analysis showed no toxic effects from the proposed treatment methods to these birds. Appendix P of the R6 2005 FEIS found that small insectivorous birds could be affected by herbicides if exposed to chronic levels of certain herbicides, such as sethoxydim, which could reach

“three times greater than the chronic LOAEL for birds so suppressed reproduction of insectivorous birds are expected from chronic dietary exposures.” When the focal species were analyzed, it did not appear likely that most of them would be exposed chronically due to feeding strategies of these birds. Except for the vesper sparrow the rest of the focal bird species do not occupy habitat where invasive plants are likely to be found. The potential effects to vesper sparrows would be similar to those described for the green-tailed towhee above. The invasive plant treatments are not expected to have an impact on any of the focal bird species.

Cumulative Effects to Wildlife

The proposed use of herbicides on and off National Forest System lands could result in additive doses of herbicides to wildlife species. For additive doses to occur, the two exposures would have to take place closely together in time, since the herbicides proposed for use are rapidly eliminated from wildlife and do not significantly bioaccumulate (USDA 2005). The application rates and extent considered in this EIS are unlikely to result in additive doses beyond those evaluated for chronic and acute exposures in the USDA Forest Service risk assessments, which formed the basis for the effects analysis in the R6 2005 FEIS. The R6 2005 FEIS disclosed some plausible risks to wildlife from proposed herbicide use. These risks have been minimized by project design features for the three action alternatives.

Early detection rapid response is part of all action alternatives, and is considered in the direct, indirect and cumulative effects analysis. Effects of treatments each year under early detection-rapid response, by definition, would not exceed those predicted for the most ambitious conceivable treatment scenario. New detections have no more likelihood to accumulate with effects from past, present, or foreseeable future projects than do current infestations. This is because project design features minimize potential for adverse effects.

Effects to most wildlife species have been minimized or eliminated; however there remains a theoretical, but unlikely risk from invasive plant treatments to wolverine, elk and deer, and birds. This project, along with winter recreation and hiking as well as proposed improvements for these activities increase human activity in potential wolverine habitat, and could add to the effect of disturbance. Any increase in human activity in areas where wolverines exist could be a cumulative effect on this species. However, at this time wolverines have not been detected on the Forest, invasive plants are not common in wolverine habitat, and invasive plant treatments are limited in time and space. Therefore, it is extremely unlikely for any cumulative effect to wolverine from disturbance to occur. No herbicides are likely to adversely affect wolverine and so cumulative effects from exposure will not occur.

It is not known how many acres of invasive plant herbicide treatment would occur near the borders of the Forest where this project could affect elk (and deer) that move across the boundary to forage. Theoretically, deer or elk could be exposed to herbicide-treated vegetation across multiple project sites and ownerships. However, there is unlikely to be any effect from this situation because, 1) deer or elk do not normally consume only invasive plant species in the course of a day or over several days and that is what would have to occur to receive a toxic dose, 2) the dose of concern is only possible if three or four of the herbicides are applied at the highest application rate, 3) there is much more untreated and desirable forage available than there would be treated invasive plants, and 4) herbicides proposed for use are rapidly eliminated from animal bodies. For aerial treatment site(s), native forage could be treated and then consumed. But aerial treatment is proposed to be conducted with clopyralid, which would not cause a dose of concern even if it was consumed all day or over 90 days. The low toxicity of the herbicides applied, along with their rapid elimination from mammal

bodies indicates that effects from multiple treatment areas are highly unlikely and therefore there is no basis to indicate that any cumulative effects would occur

Birds could potentially be exposed to herbicides on private, state, or National Forest System lands, and fly to another area where pesticides are being used. It is not possible to predict the amount of times this would actually happen, and it is also impossible to predict the effect of two different chemicals interacting synergistically to cause a toxic effect. For example: If a bird were to fly from an agricultural field where there was use of pesticides, and then arrive on the National Forest and ingest herbicides, it is feasible that there may possibly be a combined effect that could harm the bird.

Similarly to the discussion above, in order for birds to receive a dose of concern they need to consume contaminated food almost exclusively for their entire day's diet, or over a 90 day period. If birds foraged exclusively on treated food, with the exception of triclopyr, only a few of the herbicides proposed; applied at the highest application rates, have the potential to create a dose of concern. For the proposed aerial application areas, more native forage could be contaminated, but clopyralid does not create a dose of concern even if contaminated food is consumed exclusively for a day. It is highly unlikely for the scenario resulting in a dose of concern to occur, so the potential for any effect is extremely low. The probability for any cumulative effect occurring to birds is so low it is immeasurable.

For any mobile wildlife species, there is a possibility that the animal could be exposed to multiple pesticides if they foraged in one treatment area on other land ownership, and then moved to the Forest and were exposed to herbicides again. There are insufficient data available to predict the potential effects from this scenario; however, given the low toxicity of the herbicides proposed for use on the Forest, toxicity is likely to be additive rather than synergistic. Based on available data, it appears very unlikely that this scenario would result in adverse cumulative effects to wildlife, but this potential cannot be eliminated.

3.4 Soil and Water

Changes between the DEIS and FEIS for Section 3.4

This section has been rewritten for clarity in some areas based on public comment and internal review

Section 3.4 Soil and Water adds verbiage for groundwater based on public comment. Additional information on potential areas where there may be conflicts between herbicide proposed and soil type has been added. The 303(d) list for water quality impaired streams was updated (table 32). Cumulative Effects descriptions are now in one section for soil and the same for water instead of reiterated under each alternative.

3.4.1 Introduction

The effect of invasive plant treatments on soil and water is a primary public issue. Specifically, there is concern for potential adverse effects of herbicide treatment on soils, riparian areas, water quality and aquatic ecosystems.

While other types of treatments are analyzed, the primary focus of this section is the effect of herbicide treatments on soil and water resources. Project design features (PDFs) were developed to minimize the effects of invasive plant treatments on these resources.

Special consideration was given to areas that have high leaching potential and high potential rainfall runoff such as clay soils. Appendix D lists the inventoried invasive plant sites located on well drained soils, clays, and shallow water tables.

Project Area

The Project Area for direct and indirect effects is the Umatilla National Forest and lands administered by the Forest, approximately 1.4 million acres in Oregon and Washington. Cumulative effects analysis is based on 5th field watersheds. Approximately 30 percent of the land within these watersheds is National Forest System lands administered by the Umatilla National Forest.

Methodology for Analysis

This analysis is tiered to the R6 2005 FEIS. A primary focus of the site-specific analysis was developing project design features to insure compliance with standards introduced into each Forest Plan in Region 6, as well as Umatilla National Forest Plan standards and guidelines. Properties of herbicides from SERA risk assessments were used to develop criteria to minimize effects from treatment, as well as properties of soils in relation to herbicides, proximity of treatment sites to streams, stream/road connectivity and acres of proposed treatment for each 5th field watershed. Acres treated by non-herbicide and herbicide methods were compared within each alternative. The number of acres of aerial treatment, broadcast treatment (both boom and hand broadcast) versus hand and spot treatment within aquatic influence zone of each 5th field watershed was compared by alternative.

The Forest Service has a contract with Syracuse Environmental Research Associates, Inc. (SERA) to conduct human health and ecological risk assessments for herbicides that may be proposed for use on National Forest System lands. The information contained in this report, and in the EIS, relies on these risk assessments. Herbicide effects to stream aquatic resources was analyzed in risk assessments for each of the 10 herbicides included in the proposed action. The risk assessments considered worst-case scenarios including accidental exposures and application at maximum reported rates.

The R6 2005 FEIS added a margin of safety to the SERA Risk Assessments by lowering acceptable thresholds of herbicide exposure to account for increased protection needed for federally listed species (EPA 2004). Although the risk assessments have limitations (see R6 2005 FEIS pages 3-95 through 3-97), they represent the best science available.

The GLEAMS model is a computer model used to simulate water quality events after herbicide application on an agricultural field. This model is well validated for agricultural use. As the GLEAMS model was originally an agriculture model, all parameters used are not compatible with site specific parameters for treatment areas on the Forest. Despite these limitations the model is the best available at this time. The SERA Risk Assessment analysis takes the herbicide concentration provided by GLEAMS and uses them in a dilution model for a stream or pond to get the water contamination rates for specific scenarios. This was done to estimate the concentrations of herbicides that theoretically could be delivered to streams, based on general parameters in the R6 2005 FEIS.

The risk assessment model assumes broadcast treatment along a small perennial stream. The treatment area modeled is 50 feet wide and 1.6 miles long (10 acres). This would over estimate herbicide in streams on the Forest as no broadcast is proposed within 100 feet of a perennial or flowing intermittent stream or 50 feet of a dry intermittent stream (table 5, table 6).

Many treatment areas are larger than 10 acres. In steeper areas, the model may underestimate the herbicide delivery as it assumes a 10 percent slope, although much of the Forest has a steeper slope. The model also assumes even rainfall every ten days.

The spreadsheets developed for the SERA Risk Assessments were modified at the project scale for type of herbicide, herbicide application rates, soil texture and rainfall conditions found at treatment sites on Forest. These were run for the specific herbicides to be used at these sites to estimate the potential herbicide concentrations in streams and lakes after treatment. When specific treatment areas parameters were rerun in the worksheets for this project the upper limit of rain was set as high as 75 inches a year to model a '2 inches of precipitation in 24-hours' event. While no treatment area was over a threshold of concern for sensitive fish or human consumption, there were model parameters that do not accurately reflect parameters at treatment sites, adding uncertainty to modeled results.

For aerial application the model AGDISP was used to model drift from aerial application of herbicide for the maximum treatment scenario allowed under the PDFs of this project.

Past monitoring studies of herbicide use in forested areas were used to create PDFs, particularly stream buffers, near water resources to protect streams from adverse effects from treatments.

3.4.2 Affected Environment

Invasive Plants and Soil and Water Resources

Climate

The northern half of the Forest, generally consisting of the Pomeroy and Walla Walla Ranger Districts has a marine-influenced climate with average annual precipitation ranging from 30-65 inches. Winter conditions often include rain mixed with snow in mid elevations (2000-4500 feet) as a result of moist marine air intrusions. In contrast, the southern half of the Forest, the Heppner and North Fork John Day (NFJD) Ranger Districts has a more continental climate, with annual precipitation ranging from 20-55 inches, and colder winters dominated by snow. For all the Forest, the highest precipitation intensities occur during summer, localized, convective storms, and winter, regional, frontal storms, with varying precipitation accumulations.

Geology

For the northern half of the Forest basic geology is dominated by Columbia River basalt flows, which have been uplifted and dissected, forming gentle upland plateaus, narrow ridges, steep slopes and confined, narrow valleys. There are lake deposits interlaid between some of the basalt flows. Watersheds of the Lower Snake are deeply incised, and moderately dissected. There are both volcanic ash and loess deposits (airborne silts), and most have been reworked. The thickest deposits are found lower in the drainages.

The southern Forest geology is more complex and includes Columbia River basalts overlying older John Day volcanics and intrusive granitics. The southeast part of the Forest has the highest elevations (up to 8000'), with glaciated landforms, and areas of landslide deposits. Landforms are more complex with rolling mountain ridges, separated by steep canyons. Watersheds on the south half of the Forest are moderately incised, and moderately dissected. Volcanic ash deposits are common.

While mass wasting is rare on the Forest (USDA Forest Service 2004a), there are 3,747 acres of land within the Forest listed as unstable or slumps. The largest single block is about 340 acres. Of these areas, 54 acres are along gravel roads within areas proposed for treatment.

Soils

The surface texture of the soils in the northern half of the Forest are primarily silt loam and gravelly silt loam with volcanic ash dominating on the deep, footslope positions and more stable uplands. The shallower soils found on steeper shoulder and upper sideslope areas developed in the basalt and andesite rock, usually mixed with volcanic ash. They have gravelly loam and silt loam textures with some areas of silty clay loam in the more developed residuals soils. Loess subsoils also occur in similar locations as the volcanic ash, usually at depth below the volcanic ash or mixed into surface horizons of residual soils formed in basalt and andesite. These wind-blown deposits have favorable water-holding capacity, though not quite as good as ash soils, and favorable nutrient content when weathered. These soil properties, along with the marine-influenced climate, provide for the good growing conditions in the deep to moderately deep soils found on the plateaus and lower sideslopes and drainage ways.

The soil texture on the southern half of the Forest is similar to the northern Forest where the parent material is basalt or the soil contains ash. Soils that have developed on the older volcanics of the John Day formation tend to be finer textured and have higher clay content. These soils range from silty clay loam to clay loam with high gravel content (USDA Forest Service 2002).

In general, the ash-derived soils are less erodible and more productive than non-ash soils, since the ash soil layer is very porous with a high water infiltration rate, and can retain more water. Thus, there is less overland water flow to cause soil erosion. With a higher water holding capacity, the vegetation on ash soils re-establishes more quickly, thus minimizing the erosion potential. However, with ground disturbing activities, these ash cap soils may easily erode. Soil particles easily detach in these ashcap surface soils once groundcover is removed. Also, with no ground cover, these soils are more susceptible to soil displacement and mixing from management activities, especially when the surface soils are dry.

The greatest surface erosion problems occur in highly erodible terrain. This would include areas with soils derived from granitics and wind-deposited soil types (volcanic ash and loess) on steep slopes. Older volcanic material on the south end of the North Fork John Day district also tend to be more prone to road-related erosion problems (USDA Forest Service 2004a).

Soil Conditions within Treatment Areas

The majority of infested sites identified for treatment under this analysis are along roads, quarries, trails and recreation sites. These areas have highly disturbed soil conditions. This generally includes the loss or mixing of surface organics and mineral soil into subsurface mineral soil horizons as a result of displacement, and/or altered soil structure and porosity as a result of compaction of mineral soil. In general, conditions affecting vegetative growth such as available moisture holding capacities and soil porosity are likely to have been altered. As many invasive plants prefer disturbed sites, this creates conditions in which invasive species can out-compete native species.

Infested sites not along roads can include areas burned by fire and areas where streams have acted as a corridor for movement of plants downstream. Burned areas temporarily lack plant cover, generally include disturbances from heavy equipment creating fire breaks, and can have changed soil properties from soil heating. Where streams have acted as a corridor for movement of invasive plants downstream, soils are fairly undisturbed.

Effects of Invasive Plants on Soils

Invasive plants can affect soils by changing soil properties such as pH, nutrient cycling and microbe composition or activity. The alteration of nutrient availability below ground can shift conditions to favor invasive plants. The long-term effects of these changes are not known.

Soil Biology - Invasive plants may invade disturbed areas and lead to long-term changes in the plant/soil community. The ability of non-natives to move into a site may be from an absence of soil pathogens conditioned to the invading species (Callaway et al. 2004). Also, the presence of non-native plants can lead to changes in the mycorrhizal fungus community that native species depend on (ibid). These species mediated changes can alter the below ground nutrient regime to favor the invader (Huenneke 1990, Vinton and Burke 1995, Norton et al. 2004), and could increase the difficulty of re-establishing native vegetation after the invasive plants are removed.

Plant and soil communities are more resistant to invasive plants where water and nutrients are scarce (Bashkin et al. 2003, also see Herron et al 2001). Within dry shrubland and grassland systems where biotic crusts are abundant, cheatgrass growth can be limited (Gelbard and Belnap 2003). Gundale et al. (2008) showed how cheatgrass was more abundant where soil nitrogen and water availability was higher. Cheatgrass ringed ponderosa pine and Douglas-fir in an open woodland, but was sparse in the dry grassland interspaces. Similarly, more complete use of soil and water resources by plants and soil can lower invasive potential (Levine and D'Antonio 1999). Pokorney et al. (2005) refines this to state an invasive species can have less potential where plant communities have similar species.

In contrast, where soils are productive with large nutrient pools, invasive weeds are exceptional at exploiting resources. This is the case for “strong invaders” such spotted knapweed and cheatgrass (Ortega and Pearson 2005). Invasive plants directly limit or augment nutrient availability by out-competing native species for limited soil resources. Weeds have high nutrient uptake rates and can deplete soil nutrients to very low levels, especially in cases where weed species germinate prior to native species and exploit nutrient and water resources before native species are actively growing (Olson 1999). Once more, Bashkin et al. (2003) found that in the arid environment of Escalante National Park, invasion by weeds was tied to areas with high available nutrients nitrogen and phosphorus. Similar results were found with cheatgrass along tree fringes (Gundale et al. 2008).

Once established, weeds can influence the soil nutrient environment to favor their re-establishment. Cheatgrass, an annual grass, can alter nutrient cycles away from conditions to which native species have adapted (Norton et al. 2004). Specific changes to soil nutrient regimes are associated with large spotted knapweed infestations (Lejeune and Seastedt 2001).

Some invasive plants are allelopathic to other plants, and produce secondary compounds that can directly impact the soil microbial community (Bais et al. 2003). These changes will affect the soil food web and nutrient cycling, and may have impacts on the native plant community. Spotted knapweed displaces native vegetation by exuding the phytotoxin, catekin, from its roots (Bais et al. 2003). Similarly, Burke et al. (1998) showed the influence of different plant groups on available mineral nutrients. With weed invasions, a shift occurs from perennial grasses to forbs and/or annual grasses, with an accompanying shift in the timing and amount of nutrients (Burke et al. 1998, Hooper and Vitousek 1998).

Soil and Groundwater – The rate and volume of water infiltration can be reduced on weed infested sites due to reduced cover (DiTomaso 2000, Olson 1999). Significantly greater surface water runoff, indicating less infiltration, was measured from spotted knapweed dominated sites compared to adjacent native grass dominated sites (Lacey et al. 1989). These changes may occur as a site shifts

from bunchgrass dominated vegetation to individual stemmed forb vegetation as found with spotted knapweed (Lacey et al. 1989). Compaction present in many weed infested sites also reduces infiltration rates.

Vegetative Cover and Soil Erosion- Total vegetative cover can be reduced on weed infested sites where strong invaders out compete native vegetation. The presence of strong invaders such as spotted knapweed can lower the prevalence of native perennial forbs and grasses (Ortega and Pearson 2005). In heavily infested sites by single stemmed invasives, this shift in plant function al type leads to more exposed mineral soil on the surface with higher evaporation (Lacey et al. 1989, Burke et al. 1998, Olsen 1999).

Soil water stored deeper in the soil profile may also be depleted more rapidly on sites where vegetative cover provided by weeds is dense and associated transpiration rates are high (Olsen 1999).

Weed infested soil has been shown to be more susceptible to erosion than soil occupied by native grass species (Lacey et al. 1989). Soil erosion in a simulated rainfall test more than doubled in spotted knapweed-dominated rangeland areas when compared to natural bunchgrass/forb grasslands (Ibid).

The main difference between annual and perennial grasslands is the reduction in groundcover associated with single stemmed annual grasses, much like the transition from perennial bunchgrasses to more forbs. Vegetative groundcover protects soils from wind and water erosion along with raindrop splash effects (Elliot 1999). A certain level of bare soil exists in the moderate condition perennial bunchgrass communities since not all interspaces are vegetated. Also, remnant soil compaction from past cultivation and heavy grazing can reduce infiltration thereby increasing erosive overland runoff.

Existing Condition for Water Resources

Where fractured basalts are exposed they can have high permeability, which may serve to transfer contaminants from the surface to groundwater.

Water quality and riparian condition are the two elements of water potentially affected by invasive plant treatments. The 24,649 acres of invasive plants identified for treatment are scattered across the Forest in 34 of 39 5th field watersheds. Of these acres, 5560 (23%) are within PACFISH defined Riparian Habitat Conservation Areas (RHCAs) in 31 5th field watersheds.

Water Quality

Major river basins on the Forest include the Umatilla; the Upper and Lower Grande Ronde; Lower Snake; Walla Walla; and the North, Middle and Lower Forks of the John Day. Beneficial uses of these river basins include:

- OR: Public and private domestic, industrial, irrigation, livestock, aquatic life, wildlife, fishing, boating, recreation, aesthetic, navigation and hydropower.
- WA: Aquatic life (with specific use designations for water bodies), recreational, water supply, and miscellaneous uses (wildlife habitat, harvesting, commerce/navigation, boating, and aesthetics.

Beneficial uses of water are established by the Oregon State Department of Environmental Quality (Oregon Beneficial Uses by Basins) and the Washington Department of Ecology http://www.ecy.wa.gov/programs/wq/swqs/desig_uses.html.

Section 303d of the Clean Water Act requires that states develop a list of waterbodies that do not meet standards and submit the list for approval to the US Environmental Protection Agency (EPA). The Oregon list was updated in 2006 and the Washington list was updated in 2008. Water quality-limited streams and the parameters they are listed for are shown in table 32. Only those streams with existing mapped invasives are shown in the table; additional 303d listed streams are known on the Forest and information is available by contacting the Umatilla National Forest.

Temperature is the most widespread water quality impairment. High air temperatures coinciding with low rainfall and low stream flow during the summer months are key factors causing elevated stream water temperatures within the analysis area. South-facing aspects and lower elevations tend to create drier and hotter conditions, which serve to further elevate temperatures under these conditions.

Table 32 that follows displays the water quality impaired streams within listed invasive plant sites on the Forest.

Table 32 - Water quality impaired streams within listed invasive plant sites on the Umatilla National Forest

Waterbody	State	Acres of Invasive Plant Treatments within 100 feet of 303d listed stream	Paramter1	Paramter2
Big Wall Creek	Oregon	16	Temperature	
Camas Creek	Oregon	10	Temperature	
Grande Ronde River	Oregon	9	Temperature	Dissolved Oxygen
Granite Creek	Oregon	37	Temperature	
Indian Creek	Oregon	2	Temperature	
North Fork John Day River	Oregon	30	Temperature	
Willow Creek	Oregon	15	Temperature	
Umatilla River	Oregon	3	Iron	
ASOTIN CREEK, N.F.	Washington	31	Temperature	
CHARLEY CREEK	Washington	<1	Temperature	
CUMMINGS CREEK	Washington	2	Temperature	
LICK CREEK	Washington	15	Temperature	
PATAHA CREEK	Washington	1	Temperature	

*Acres of invasive plants proposed for treatment to contain, control or eradicate the target species.

By direction of the Clean Water Act, state agencies develop Total Maximum Daily Load (TMDL) plans where water quality is impaired, to improve water quality and support the beneficial uses of water. For water quality impaired streams on National Forest System lands, the USDA Forest Service provides information, analysis, and site-specific planning efforts to support state programs to protect and restore water quality. Two TMDLs have been completed for streams partially located on the Forest. The TMDLs were developed on a Sub-Basin level, not for individual streams. They are for the Umatilla Sub-Basin and the Upper Grande Ronde River and the Oregon portion of the Walla Walla Sub-Basin.

Goals for temperature and sediment reductions were developed in TMDL Management Plans (Oregon Department of Environmental Quality, approved 2001). The temperature analysis was based on a heat source model, and targets were developed for site potential vegetation and channel morphology. Forest Plan standards and guidelines including PACFISH were incorporated into an approved water quality management plan. Turbidity targets were based on studies of impacts to fish. Sediment loads were modeled using relationships between turbidity and total suspended sediment. Overall, Umatilla Forest watersheds have a negligible contribution to downstream sediment, and no load reductions were assigned to the Forest (USDA Forest Service 2001). However, management plans specify the importance of control of sediment during Forest management operations.

The State of Oregon completed the Upper Grande Ronde River Sub-Basin Total Maximum Daily Load TMDL and Water Quality Management Plan (WQMP) in December 1999. The document established water quality goals for the streams of the Upper Grande Ronde. The TMDL analysis assigned pollutant loads for water temperature and the WQMP established water quality goals to meet the TMDL, and remove streams from impairment listing (303d). No TMDL for sediment was developed in the Upper Grande Ronde Sub-basin. The state determined that, “the load allocations provided to address temperature, pH, and dissolved oxygen standard violations, coupled with ongoing efforts by the Forest Service to reduce loads from roads and other sources, will be adequate to address sedimentation and turbidity concerns in the Upper Grande Ronde Sub-Basin.” To insure that sediment standards are met, long-term monitoring has been implemented.

Geology and stream type play an important role in determining sediment sources, and the fate of sediment entering streams. On the Umatilla National Forest, the highest potential sediment source areas are the granitic rock types and landslide-prone terrain in the Upper North Fork John Day Subbasin. The majority of perennial and intermittent streams across the Forest, have moderate to high gradients, therefore they tend to transport rather than store sediment. In general, these stream types are not susceptible to fine sediment accumulations. Lower gradient (less than 2 %) response reaches occur in the main valleys of larger streams: Asotin Creek, Tucannon River, Touchet River, Walla Walla River, Umatilla River, Meacham Creek, and the upper North Fork John Day River and its major tributaries (Desolation, Granite, Camas, and Wall Creeks). Low gradient meadow systems in the higher elevations are also areas of sediment accumulation. Examples include: Brock-Jarboe Meadow, Granite Meadows, Desolation Meadows, and Kelly Prairie. Streamside developments (including roads, trails, dikes, and campgrounds) in larger stream systems restrict floodplain areas and promote channel incision (deepening). Accelerated streambank erosion resulting from down-cut channels is also a source of sediment to streams.

Bacteria may be a concern in localized areas with heavy recreation use and grazing. Heavy metals are a concern in areas with mining such as Clear Creek and Granite Watersheds. The ability of water to hold oxygen decreases with increased water temperature, altitude, or dissolved solids (TDS). Dissolved oxygen (DO), can be lowered by high stream temperatures, bacteria blooms and decaying vegetation in water, although no streams located on the Forest are listed for low dissolved oxygen.

Flows

There are approximately 7,683 miles of stream on the Umatilla. Of these, 2,963 miles (39%) are perennial and 4,720 miles (61%) are intermittent. In general, high flows in Blue Mountains watersheds result from two principle hydrologic processes; an occasional winter rain on snow event, which produces the largest flows, and spring snowmelt, which is an important annual occurrence. Lowest flows are in late summer and early fall when precipitation is low.

Channel Morphology and Riparian Condition

Riparian shrubs are lacking on many Forest streams. There has been over utilization of riparian vegetation in some areas by domestic livestock and wildlife. Large wood is lacking in many streams on the Umatilla, particularly where roads parallel streams. However, in recent years degraded riparian areas have been improved to provide for riparian-dependent resources. These improvements have resulted from better control and administration of livestock use in riparian areas, reduced timber harvest in forested riparian areas, and more roads being closed or obliterated (USDA Forest Service 2004a).

Native riparian vegetation plays a key role in forming aquatic habitat for fish and other aquatic species. Roots help stabilize stream banks, preventing accelerated bank erosion and providing for the formation of undercut banks, important cover for juvenile and adult fish. Riparian areas with native vegetation supply downed trees (large wood) to streams.

Riparian vegetation stabilizes stream banks, and serves as a filter to prevent the run-off of soil into streams. Riparian vegetation also provides large and small wood to streams, adding to habitat complexity and providing cover and food sourced for aquatic organisms. Aquatic ecosystems have evolved with certain vegetation types; invasive plants do not necessarily provide similar habitat.

Lakes, Wetlands and Floodplains

There are six reservoirs or lakes on the Forest. Wetlands occupy less than five percent of the Umatilla National Forest area and are generally associated with rivers and streams (USDA Forest Service 1990). Isolated wetlands occur on hillslopes in association with groundwater sources and atypical soil types (glaciated or landslide landforms).

Lakes, wetlands and floodplain areas are often popular for recreation, and so are at risk from invasive plants brought in by visitors. They are also at risk from invasive plants such as knotweed, which colonizes areas downstream of the original infestation along streams. Wetlands can be inundated with water year-round, and others are wet only seasonally. The areas that are wet only seasonally can be infested with upland invasive species, as well as invasive plants specifically adapted to wetlands.

Municipal Watersheds and Domestic Water Supplies

A municipal supply watershed is one that serves a public water system as defined in Public Law 93-523 (Safe Drinking Water Act) or as defined in State safe drinking water regulations. The municipal water supply in the Project Area is Mill Creek Watershed, which serves Walla Walla Washington. Biological controls are being used to treat the 153 acres of yellow starthistle mapped within the watershed at this time. No chemical treatments are proposed within the Mill Creek Watershed.

The city of Pendleton has water rights on the North Fork of the Umatilla River, and the Dale administrative site has a domestic water right on Desolation Creek. There are also wells and springs used for domestic water at campgrounds and private water rights on isolated springs on the Forest.

Roads

The R6 2005 FEIS describes roadside ditches as herbicide delivery mechanisms, potentially posing a high risk of herbicides reaching concentrations of concern for listed aquatic species (USDA Forest Service, 2004). Ditches may function as extensions of the stream network. Roadside ditches can act as delivery routes or ephemeral streams during high rainfalls, or as settling ponds following rainfall events.

According to the 2004 Umatilla Forest-Scale Roads Analysis Report, the entire road system is fundamentally hydrologically connected to the stream system because roads are part of watersheds; however, most of the Umatilla National Forest System roads comply with regional road standards in that drainage structures, which divert runoff away from streams, are in place. The Forest roads that remain hydrologically connected capture and release snow and rain, alter patterns and direction of runoff, erosion rates and processes, and can expand the channel network affecting routing of stream discharge. The most hydrologically connected roads cross streams or are located in floodplains and wetlands. For this project, roads within RHCAs are considered hydrologically connected to streams, and at risk for delivery of herbicides to streams. Of the 836.2 miles of road within invasive plant sites, 183 miles (21%) are within RHCAs.

Invasive Plants within RHCAs

Most of the invasive plants are not unique to riparian areas. Table 33 shows acres of invasive plants within RHCAs of both perennial and intermittent streams. All of the invasive plant species found within the RHCAs originate from disturbed sites. For example diffuse knapweed, which most often establishes on disturbed sites, is the most common species within the RHCAs of both perennial and intermittent streams. There are 9,968 acres of diffuse knapweed on the Forest with about 25 percent found within RHCAs. This species is commonly found in open disturbed areas along roads or in areas frequented by cattle. Hounds tongue and spotted knapweed are also found on these sites.

Table 33. Documented invasive plants acres within RHCAs

Primary invasive Plant	Acres within Perennial Stream RHCA	Acres within intermittent Stream RHCA	Total Acres	Percent Perennial	Percent Intermittent
russian knapweed	0.0	0.2	0.2	2.3	97.7
rush skeleton weed	0.3	0.0	0.3	88.9	11.1
musk thistle	0.9	1.1	2.0	45.1	54.9
scotch broom	0.0	2.2	2.3	1.3	98.7
medusahead	0.6	2.4	2.9	19.1	80.9
yellow toadflax	6.9	12.0	18.9	36.3	63.7
tansy ragwort	3.4	17.0	20.4	16.6	83.4
leafy spurge	12.5	13.8	26.4	47.5	52.5
dalmatian toadflax	7.2	21.2	28.4	25.4	74.6
whitetop	53.3	35.6	89.0	59.9	40.1
common burdock	69.8	56.3	126.1	55.3	44.7
yellow starthistle	39.7	133.2	172.9	23.0	77.0
sulfur cinquefoil	47.2	145.6	192.8	24.5	75.5
scotch thistle	93.8	110.4	204.2	45.9	54.1
canadian thistle	72.5	393.0	465.5	15.6	84.4
st. johns wort	124.4	453.6	577.9	21.5	78.5
spotted knapweed	283.1	397.6	680.7	41.6	58.4
hounds tongue	122.9	563.9	686.9	17.9	82.1
diffuse knapweed	760.9	1501.8	2262.7	33.6	66.4
	1699.4	3860.9	5560.5		

Totals are approximate

There are 24,649 acres within identified invasive plant sites on the Forest. Most watersheds have less than 1 percent of infested acres within their area. Meacham Creek is the only watershed with more than 2 percent of infested acres.

Temperature- Stable banks tend to provide more shade which helps reduce water temperature. While invasive plants may provide some shade they are replacing native forbs and grasses that are better bank stabilizers and promote narrower-deeper channels. Such channels have healthier temperature gradients than wide, shallow streams.

Sediment- One of the more prevalent species on the Forest and within RHCAs is knapweed. Diffuse and spotted knapweed is found along many streams in the Forest. Lacey et al. (1989) reported higher runoff and sediment yield on sites dominated by knapweed versus sites dominated by native grasses.

Channel Morphology and Riparian Condition - In the Forest there are approximately 5,560 acres of invasive plants within in RHCAs (See table 31 in Section 3.5.2). The largest amount of acres of invasive plants within RHCAs in a single 5th field watershed is 606 acres in Wall Creek. The smallest amount is one acre in the Lower North Fork John Day River.

- Native riparian vegetation plays a key role in forming aquatic habitat for fish and other aquatic species. Tree roots help stabilize stream banks, preventing accelerated bank erosion and providing for the formation of undercut banks, important cover for juvenile and adult fish. Riparian areas with native vegetation supply downed trees (large wood) to streams. In turn, downed trees in streams influence channel morphology characteristics such as longitudinal profile; pool size, depth, and frequency; channel pattern; and channel geometry. Turbulence created by large wood increases dissolved oxygen in the water needed by fish, invertebrates and other biota. Invasive plants could slow down or prevent the establishment of native trees, decreasing or delaying the future supply of large wood in stream channels (R6 2005 FEIS).

While invasive grasses and forbs would not directly replace riparian shrubs, in degraded areas where shrubs are no longer present, invasive plants can occupy sites and out-compete native vegetation, limiting opportunities for native shrubs to reoccupy the site.

Floodplains and Wetlands- The Umatilla National Forest Soil Resource Inventory (USDA Forest Service 1972) shows approximately 2,820 acres of invasive plants proposed for treatment on soils associated with riparian areas. Most are associated with stream channels or floodplains. About 780 acres of invasive plants have been identified for treatment within wet grasslands. No treatment would occur in water; but may take place if these areas become dry during the summer

3.4.3 Environmental Consequences

With the exception of aerial spraying herbicides, all alternatives, including the no action alternative, allow similar methods of treating invasive plants. Alternative B has the most aggressive management using herbicides. Alternative C omits broadcast spraying in the Riparian Habitat Conservation Areas (RHCAs). Alternative D omits aerial herbicide application. In addition, all the action alternatives include an early detection rapid response (EDRR) process to address new or unknown infestations over the next 10 to 15 years. Project design features such as riparian buffers, frequency of application limitations, and herbicide limitations specific to soil type, lower the risk of chemical contamination to RHCAs. These protective measures would work equally well for EDRR site that would be identified in the future. It is important to acknowledge that aerial and ground broadcast methods have higher risk for unknown variables such as wind drift and rainfall intensity. No herbicide application would occur within municipal watersheds or on domestic water supplies under any alternative. Water contamination risk from herbicide drift, runoff or leaching is low based on evaluation using

GLEAMS modeling and added herbicide restrictions. No long term impacts to soils are expected at the Forest scale, although some adverse effects from these actions are unavoidable. Adverse impacts include local effects on some groups of micro-organisms that may be temporarily sensitive to picloram (Tordon™), sulfometuron methyl (Oust™), and triclopyr (Garlon™, Access™).

The following sections discuss the general effects of manual, mechanical and herbicide treatments on soil and water resources. Specific differences in alternatives are detailed after the general discussion.

Soils

General Effects of Manual and Mechanical Treatment

Manual and mechanical treatments are proposed under all alternatives. The overall impacts of these activities are low. Manual methods would decrease ground cover, temporarily leading to incremental effects from erosion or slight decreases in soil moisture from groundcover reductions. Mechanical methods would not lead to adverse effects on soils since soil organic matter would be supplemented from cut vegetative material and off road vehicle use would be limited.

Mechanical treatment would include mowing or use of foaming or steaming machines on and off roads. Compaction of soil is avoided by restricting all vehicles to the road prism except for all terrain vehicles (ATVs). ATVs have low tire pressure and thus would not have measurable impacts on soils when used judiciously.

While the relative amounts of manual and mechanical treatments vary between the alternatives, the differences in terms of intensity or duration of effects from such treatments are not substantive. Other mechanical treatments, such as the use of motorized hand tools are expected to have effects similar to manual treatments.

General Effect of Biological Control

Biological control can be defined as the use of natural enemies to reduce the damage caused by invasive plant populations. The primary effect from biological controls is standing dead plants. Effects from biological control are difficult to estimate, though would likely be minimal.

General Effects of Cultural Treatments

No cultural treatment sites are presently identified within the treatment areas. Cultural treatments of newly found invasive species sites could include the addition of fertilizer/soil amendments, and/or competitive planting.

General Effects of Herbicides on Soils

The effect of chemical treatments may affect soils by having short term adverse impacts on certain soil microbes and indirectly from losses in vegetative cover. Most of the proposed chemicals are decayed primarily by soil microbes. Only Chlorsulfuron is mainly degraded through hydrolysis. In the short term, chemicals can adversely affect microbial growth for 1 day to 1 week depending on the chemical used. Results from field and laboratory testing are mixed since soil conditions are highly variable. In general, herbicides are decayed and therefore effects are reduced when microbial metabolic rates highest. These conditions are when adequate warmth, moisture and microbial substrate are abundant such as during spring.

The primary herbicide routes in soil are leaching, hydrolysis, adsorption/desorption onto soil particles, and biological degradation. Soil characteristics affect the herbicide residency time through

drainage and adsorptive capacities. Highly drained soils have greater propensity to transfer herbicides to groundwater stores.

Organic rich soils and finer texture soils have higher adsorption potential for holding herbicides. Herbicides will vary in the degradation potential based on their chemical structure and the biologic potential of the soil.

Overall, the proposed herbicide types and application rates are low enough to facilitate decay by soil microbes. The proposed herbicide usage would have a low risk for soils since the bulk of treatments focus on roads and rock quarries where soils are unproductive and soil communities are uniform. Adverse effects may occur where diverse native grasslands are treated with unselective herbicides and broadcast methods. These impacts are related to the short term loss of non-target broadleaf forbs that support diverse soil communities. Soil attributes at greatest risk from chemicals include damage to soil organisms and erosion from removal of ground cover. A more extensive discussion of the individual herbicide properties can be found in appendix D.

Of the proposed herbicides, coarse grained soils with well to excessively drained conditions pose a risk for leaching for picloram, clopyralid, and sulfometuron methyl. Application of chlorsulfuron poses risk for translocation by sheet wash and wind, which can spread the herbicide to nontarget soils and vegetation in addition to nearby waterways.

Herbicide Effects to Soil Organisms

Only native soils were considered for this analysis. Roadside chemical application was not considered since roadsides do not have the same drainage and adsorption characteristics as native soils. Offsite drainage from roadsides is avoided by limiting herbicide application near open water sources, connected drainages and riparian areas.

Clay soils are prominent in the western portion of the North Fork John Day district where chlorsulfuron was initially planned in the common control measures. Several sites targeting dalmatian toadflax and hounds tongue had chlorsulfuron removed due to soil concerns (see appendix D). Humarel series soils have the highest concern since the topsoil has fine clay loam texture that is subject to wind erosion. These soils are associated with pyroclastic volcanic geology and are found on mountain slopes. The northern portion of the Umatilla NF has some indication of fine texture clay soils that have risk for translocating chlorsulfuron. Sites targeting scotch thistle and Canadian thistle had chlorsulfuron identified in the common control measures.

Ninety percent of the sites with soil concerns were associated with application of picloram where soils have well drained conditions, typically from sandy loam textures or high rock contents. Sites of concern had soils belonging to the Fivebit and Analulu series soils. These soils are very common throughout the Umatilla National Forest. Fivebit series soils occur on mountain backslopes associated with rhyolitic tuff, andesite and basalt. Analulu series soils are associated with Montana sideslopes derived from argillite. Site specific conditions such as ridges and steep bedrock slopes have less risk since these conditions do not readily connect with groundwater. However, lower slope positions with thick colluviums have much higher risk for picloram leaching to groundwater.

Herbicide Effects to Soil Biology

The low application rates and type of herbicides proposed in general have a low impact on soil organisms. However, Picloram (Tordon) is known to affect soil organisms at the approved application rates (SERA 2004). At high rates, sulfometuron methyl (Oust™) and Triclopyr (Garlon™, Access™) can affect soil microbes. Sulfometuron methyl can inhibit soil microbial

growth. Triclopyr may adversely affect some fungi and algae. Effects are short term and transitory since effects decrease with time.

Functional groups of microbes that have similar metabolic pathways as the target weeds would be most sensitive to the herbicides. However, collective adverse effects of the proposed herbicides on soil microbes are hard to predict, given the diversity of the soil community and varying resistance to the particular herbicides. For example, some laboratory studies found glyphosate adversely impacted several types of microbes, although populations rebounded quickly (Tu et al. 2003). Similarly, Busse et al. (2001) found no long term impact on microbial communities when using glyphosate on ponderosa pine plantations.

Ultimately, soil microbes facilitate the degradation of the herbicides by using the herbicides as growth substrate, cometabolizing, polymerizing, accumulating or altering the chemical structure by influencing the pH of the soil environment (Bollag and Liu 1998). The residency times shown in table 9 are a gross collective function of average soil types, application timing and frequency, and finally the unique chemical structure. Of the herbicides, imazapyr has the longest half-life at 1 year, while Sethoxydim has a comparatively rapid half-life from 5 to 25 days. As stated above, favorable microbial growth conditions will speed herbicide degradation.

To protect soil organisms and therefore protect soil productivity, sulfometuron methyl would only be used once a year at any specific site to avoid accumulating herbicides in the soils. Picloram could only be used once every two years to protect soil productivity and avoid accumulation in the soils of this persistent herbicide (see Table 34).

The other herbicides have a small to no effect on soil microorganisms at normal application rates and could potentially be used three times on the same area in one year. More than likely, if an area was broadcast sprayed once, subsequent treatments would consist of spot spraying to treat missed areas, to treat areas where seeds have germinated since the last spraying, or to treat the small areas where invasives were damaged but are resprouting.

Soil and Groundwater

Factors that determine the fate of herbicides in soil include mobility and degradation. Herbicide degradation over time is a result of physical and chemical processes in soil and water. Herbicide fate in soil is determined by herbicide characteristics such as adsorption, solubility, degradation, and volatility. Soil characteristics such as organic matter, pH, temperature, moisture content, clay content, and microbial degradation can modify certain properties of herbicides such as mobility in soils and half-life (time it takes for half the amount of chemical present to breakdown). General characteristics for the proposed herbicides are displayed in Table 34. Many of the proposed herbicides are highly soluble in water (Table 34). In general, this is often taken as an indicator of the mobility of the chemical in soils. There are exceptions, however. Glyphosate, while having a high solubility, also binds tightly with soil particles, and because of this it has low mobility. Herbicides with high mobility potential and long half-lives have a greater potential for leaching into near surface ground water.

Table 34. Herbicide Properties

Herbicide	Toxicity to Soil Microbes	Potential Mobility¹	Water Solubility¹	Degradation path and half- life²	Activation Mechanism²
Chlorsulfuron	Low	High Very high in clay soils	Very High	Hydrolysis 40 days	Acetolactate synthesis inhibitor (Selective: controls broadleaves and some grasses)
Clopyralid	Low	Very high especially in sandy soils	High	Soil microbes 14 to 29 days	Plant growth regulator (Very selective to broadleaves; post emergent)
Glyphosate	Low	Low	Very High	Soil microbes 30 days	Inhibits 3 amino acids and protein synthesis (Non-selective; quickly absorbed by leaves with rapid movement through plant; no root absorption)
Imazapic	No info	Medium (Lower with increased organic Matter)	Very High	Soil microbes 113 days	acetolactate synthesis inhibitor (Uptake by roots & leaves; active in soil as pre-emergent)
Imazapyr	Slight at high application rates.	Medium (low Organic Matter and high pH raise mobility)	Very High	Soil microbes 25 to 180 days	acetolactate synthesis inhibitor (Uptake by roots & leaves; active in soil as pre-emergent)
Metsulfuron methyl	At high application rates short-term decrease for a few days but reversed quickly.	Very High	High	Slow microbial degradation at high pH, fast at low pH Up to 120 days	acetolactate synthesis inhibitor (Potent herbicide; uptake by roots & leaves)
Picloram	Toxic to some soil organisms, even at low levels.	Very High	Very High	Slow microbial 90 days	Plant growth regulator (Selective: rate and season dependant; pre-emergent and soil active)
Sethoxydim	Low	Medium (Organic Matter decreases)	Very High	Rapid microbial Up to 60 days	Inhibits acetyl co-enzyme (ACE) (Systemic that is absorbed rapidly by foliage and roots.
Sulfometuron methyl	Toxic to soil organisms. Soil residues may alter composition of soil microorganisms	High	Medium	Soil microbes 10 to 100 days	Acetolactate synthesis inhibitor (Non-selective pre and post emergent - uptake by roots & leaves. Potent herbicide)
Triclopyr	Inhibits algae at low rates Toxic to fungi at high rates.	Very High	Medium	Soil microbes 46 days	Plant growth regulator (Absorbed thru roots, foliage and green bark)

¹ Mobility and water solubility categories from Bautista and are general breakdowns not a definitive classification

² Deschutes Ochoco Invasive Plant EIS Soils Report, 2006

Vegetation Cover and Erosion

Herbicide treatments could also indirectly affect soil productivity in the short-term by changing the vegetative cover on the surface and the annual input of organic matter into the soil. These effects would occur on heavily infested sites with invasive plants that are moving toward monocultures, including those with hawkweed and whitetop.

Chemically treated plants would die and become incorporated into the soil as organic matter during the first years following treatment. Annual input in subsequent years would be contingent on the amount of re-growth of nontarget plants. If native populations were less than 30 percent vegetative canopy cover, native or naturalized species would be reseeded under all action alternatives. The 30 percent threshold canopy cover is based on recommendations from the Montana State Extension Service (Goodwin et al. 2002).

Herbicides would impact plant canopy cover greatest where broadcast spraying is planned. The overall risk for soil erosion is low, although erosion risk would increase on moderately steep slopes with fine textured soils. Erosion risk would be short-term, within 1 to 2 years. Monoculture stands of target weeds such as whitetop and meadow hawkweed would have the highest mortality rates and thus have the greatest bare soil available to erosive waterflows and wind. Other target weeds such as the knapweeds, medusahead, and starthistle may also have monoculture stands.

Summary of Soil Concerns with Specific Herbicides and Project Design Features

Clopyralid has high potential mobility in sandy soils. It is degraded by soil microbes not hydrolysis and therefore can be persistent in groundwater. PDF H-4 - To minimize movement of clopyralid through soils into groundwater, clopyralid would not be used on high-porosity soils (more than 20 percent coarse fragments or coarser texture than loamy sand).

Chlorsulfuron does not adhere to clay particles. PDF H-5 - chlorsulfuron would be avoided on soils with high clay content (finer than loam) to avoid herbicide movement.

Picloram and sulfometuron methyl persist longest in the soil and may also have adverse effects on soil organisms. Therefore, the PDFs H-6 and H-7 limit the frequency of use of these herbicides under all action alternatives, and prohibit their use on shallow or coarse soils to lower the risk of contact with groundwater. The proposed action avoids use of picloram sethoxydim, nonaquatic glyphosate and triclopyr bee on roads having high potential for herbicide delivery.

An analysis was done to identify sites where soil characteristics would not be appropriate for application of picloram, clopyralid and sulfometuron methyl, and chlorsulfuron herbicides (see PDFs H-4 to H-7). Sites were characterized with soil data from the recently completed portions of the Terrestrial Ecosystem Unit Inventory, as of June 2008.

Herbicides picloram and sulfometuron methyl were eliminated from treatment options where sites had a high risk for leaching. Clopyralid has slightly less risk for leaching, and thus was only eliminated where soils had extremely well drained conditions. Chlorsulfuron was eliminated for fine grained, clay soils, where runoff and wind translocation risk is high. Affected sites are listed in appendix D of this EIS.

Water

Streams are complex and dynamic systems that reflect the balance between stream flow, sediment input and substrate/bank composition. Riparian condition and water quality are the two elements potentially affected by invasive plant treatments.

General Effects of Manual and Mechanical Treatment

Mechanical treatments except for mowing would take place away from water. Mowing would occur only along established roads. Manual effects are generally cutting, digging or pulling weeds. If seeds are present the weeds are bagged and taken off site. Removal of soil cover would be very small under these circumstances. However there could be small localized areas of erosion and subsequent sediment input to the stream. These effects would be transitory and too small to measure.

Pulling weeds along stream banks could also destabilize the banks in highly localized areas. Fewer than 10 acres across several scattered sites are proposed for hand pulling. Localized effects would be expected, lasting only about one season until vegetation reestablished.

Manual and mechanical treatments within riparian areas could accelerate sediment delivery to streams through ground disturbance. However, most of the treatments areas are previously disturbed roadways and trails so additional ground disturbance would not be a significant change from the existing condition. Modification of surface ground cover can also change the timing of run-off. For all alternatives, treatment areas comprise a small portion of any watershed so no effects to stream flows are plausible.

General Effects of Herbicide Treatments

None of the alternatives have the potential to influence stream flow and channel morphology due to the small portion of any watershed that would be treated.

Treating invasive plants would improve riparian stability where invasive plants have colonized along stream channels and out-competed native species. All invasive plant treatments carry some risk that removing invasive plants could exacerbate stream instability; however the restoration plan accounts for these areas and prescribes mulching, seeding and planting as needed to revegetated riparian and other treated areas.

A primary issue is the potential for herbicides to enter streams and impact domestic water sources and/or aquatic organisms. This section describes how project design features minimize the possibility that herbicides would enter water and impact water quality.

Based on the R6 2005 FEIS, herbicides were grouped by their level of concern to aquatic resources. The herbicides of lower concern for aquatic resources are: clopyralid, imazapic, and metsulfuron methyl. The herbicides of moderate concern are chlorsulfuron, imazapyr, sulfometuron methyl. The herbicides of greatest concern are non-aqueous glyphosate, triclopyr, picloram, and sethoxydim. The aquatic formulations of glyphosate, triclopyr, and imazapyr may have more adverse effect effects to aquatic resources than the low concern herbicides but are licensed for use near or in water. Streamside buffers vary depending on the level of concern and label requirements.

Drift, Run-off and Leaching

The routes for herbicide to contaminate water are; direct application, drift into streams from spraying, runoff from a large rain storm soon after application, and leaching through soil into shallow ground water or into a stream. This section addresses each of these delivery routes.

Effects from drift, runoff and leaching were considered in the herbicide risk assessments, prepared for the R6 2005 FEIS, and assume broadcast treatments occur directly adjacent to streams. The Groundwater Loading Effects of Agricultural Management Systems (GLEAMS) model was used to estimate the amount of herbicide that may potentially reach a reference stream via runoff, drift and leaching in a 96 hour period, assuming broadcast treatments on a 50-foot strip along about 1.6 miles

of perennial stream. SERA risk assessments evaluated the hazards associated with each herbicide based on the concentrations of herbicide predicted by the GLEAMS model using these parameters. The GLEAMS model likely overestimates the herbicide concentrations that would plausibly enter streams from this project. This is because broadcast treatments are prohibited within 100 feet of all perennial streams and within 50 feet of intermittent streams under all action alternatives. To minimize adverse effects to streams, project design features (primarily stream buffers) were developed depending on the herbicide and the method of application.

Spot treatments using herbicides of higher concern to aquatic organisms along streams would be buffered. Hand and spot treatments are inherently far less likely to deliver herbicide to water because the herbicide is applied to individual plants, so drift, runoff and leaching are greatly minimized. Small amounts of some herbicides can translocate from the plant to the soil or an adjacent plant, but the concentrations of herbicide that may be delivered to streams from this mechanism is much less than GLEAMS predictions.

Berg (2004) compilation of monitoring studies on herbicide treatments with various buffer widths showed that any buffer helps lower the concentration of herbicide in streams adjacent to treatment areas. In California buffers between 25 and 200 feet generally had no detectable concentrations of herbicide in monitored streams with detection limits of 1-3 mg/m³.

In South Carolina, ground applications of the herbicides imazapyr, picloram and triclopyr had no detectable concentrations of herbicide in monitored streams with buffers of 30 meters (about 100 feet) (USDA HFQLG EIS, appendix B, 2003). No detection limits were given.

The USGS in partnership with the Oregon Department of Transportation studied runoff of herbicides along roads (Wood 2001). The study was conducted on runoff associated with several herbicides (including sulfometuron methyl and glyphosate) along a road in western Oregon simulating rainfall at 0.33 inches an hour at 1, 7 and 14 days after treatment. Samples were collected at the shoulder of the road and found concentrations of several hundred parts per billion (ppb) of sulfometuron-methyl and nearly 1,000 ppb of glyphosate that could potentially leave the road shoulder.

In the fall the road was again sprayed and the ditch line of the road was checked during natural rainstorms for three months. Sulfometuron-methyl was found in concentrations of 0.1 to 1 ppb along the shoulder and from 0.3 to 0.1 ppb in the ditch line, but was below detectable limits in the stream. Glyphosate was not found at the shoulder, ditch line or stream.

This study indicates that the greatest risk of herbicides moving off site is from large storms soon after herbicide application. In addition, this study also indicates that sulfometuron methyl may persist in the environment as it was detectable along the shoulder of the road (but not in the stream) the duration (three months) of the study.

Berg reported that herbicide applied in or along dry ephemeral or intermittent stream channels may enter streams through run-off if a large post-treatment rainstorm occurred soon after treatment. This risk is minimized if intermittent and ephemeral channels are buffered as would occur under the action alternatives (ibid.). If a large rainstorm occurs after herbicide application, sediment contaminated by herbicide could be carried into streams. As most herbicide application occurs in the late spring through the early fall, which is the driest time of the year, the probability of a large rainstorm soon after application of herbicides is low at any particular site.

Aerial Application

Wind drift is the mechanism most likely to carry herbicide to nontarget areas such as stream channels. This 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.

Spray drift can be reduced by increasing droplet size (table 35). Droplet size can be increased by: 1) reducing spray pressure; 2) increasing nozzle orifice size; 3) using special drift reduction nozzles; 4) additives that increase spray viscosity and; 5) using rearward nozzle 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. Project design features F-6 requires a coarse spray with a median diameter of 500-800 microns.

Table 35. Drift Distance versus Drop Diameter

Droplet Diameter (microns)	Type of Droplet	Time	Lateral Distance Traveled in 10 foot height & 3 mph wind speed
5	Fog	66 minutes	3 miles
20	Very Fine Spray	4.2 minutes	1,100 feet
100	Fine Spray	10 seconds	44 feet
240	Medium Spray	6 seconds	28 feet
400	Coarse Spray	2 seconds	8.5 feet
1,000	Fine Rain	1 second	4.7 feet

See Dexter (1993) ONLINE: www.ag.ndsu.edu/pubs/plantsci/weeds/a657w.htm#factors

Washington State Department of Ecology and Oregon Department of Forestry have monitored aerial application of herbicides in forest settings. The purpose of both studies was to look at the effectiveness of buffers protecting water quality in streams within herbicide treatment areas. The Washington study looked at many factors in addition to stream buffers that affected the concentration of herbicides in streams within treatment areas.

The Washington study collected herbicide samples at seven sites on small streams (Rashin and Graber 1993). Buffers were 50 feet on flowing streams and no buffers on small stream channels assumed to be dry. Peak herbicide concentrations ranged between 0.2 and 7.55 microgram per liter (ug/l). Maximum 24 hour averages were between 0.13 and 3.25 ug/l. Runoff samples collected at 4 sites 2 to 24 days after application had concentrations between 0.17 and 2.49 ug/l.

Oregon requires buffers of 60 feet on fish bearing streams or streams used for domestic water supplies. Two non-fish bearing streams also received 60 foot buffers (actual buffer ranged from 60 to 100 feet). For the Oregon study most of the samples (21 sites, and 105 post spray samples) had a detection limit of 1 ug/l. None of these samples had concentrations at detectable limits. Five sites (25 samples) had detection limits of 0.04 to 0.5 ug/l. Most samples were still below detectable limits, but 7 of the 25 samples tested between 0.9 and 0.56 ug/l (Dent and Robben 2000).

The Washington study attributed the majority of herbicide introduction in buffered streams to swath displacement, drift and secondary contribution from overspray of small stream channels mistakenly assumed to be dry. This study recommended buffers of between 15 to 25 meters for downwind applications and 75 to 90 meters for streams upwind applications.

All aerial applications of herbicides would comply with Environmental Protection Agency (EPA) label restrictions and state regulations. Using the recommendations above, PDFs were developed to minimize potential impacts to water (See chapter 2.2.3, PDFs F-8)

Accidental Spill

Concentrations of herbicides in the water as a result of an accidental spill depend on the rate of application and the stream ratio of surface area to volume. The persistence of the herbicide in water depends on the length of stream where the accidental spill took place, velocity of stream flow, and hydrologic characteristics of the stream channel. The concentration of herbicides would decrease rapidly down-stream because of dilution and interactions with physical and biological properties of the stream system (Norris et al.1991).

Potential for accidental spills is negligible and therefore not considered within the scope of the project. The project design features to reduce the potential for spills are practices that have been developed over time and proven effective. If an accident were to occur, these PDFs would minimize the magnitude and intensity of effects. An herbicide transportation and handling plan is a project requirement. This EIS addresses spill prevention and containment (See chapter 2.2.3).

Lakes, Wetlands and Floodplains

Herbicides affect lakes and wetlands differently than streams. Dilution by flow or tributary inflow is generally less effective in lakes.

Dilution is partially a function of lake size, but dilution could be rapid in small lakes with large water contributing areas. Decreases in herbicide concentration in lakes, ponds, and other lentic water bodies are largely a function of chemical and biological degradation processes or preferential adsorption of the herbicide into the lake sediments rather than from dilution. As no emergent treatments are proposed the primary pathways for herbicide to enter lakes would be from drift or runoff.

Some invasive plants may grow in wetlands or near lakes and reservoirs. To protect water quality, PDFs require that only spot or hand treatments occur within 100 feet of lakes or wetlands. A large rain event after treatment could carry herbicide into water resulting in minor amounts of herbicide contacting surface water. This amount would insignificant compared to concentrations modeled with GLEAMS and well under any threshold of concern.

To minimize risk to wetlands no more than 10 acres or half of a wetland would be treated in any 30-day period. The PDFs for wetlands limit the area treated at one time for two reasons:

- 1) They lower the amount of herbicide near the water body at one time and allow time for the herbicide to degrade. Many of the herbicides degrade quickly in soils high in organics or in water.
- 2) If only half an area is treated at a time it lowers the acreage affected by vegetation decay and leaves refugia for aquatic organisms in other areas around the lake, pond or wetland. No treatments are proposed to take place directly in water. Wetlands would only be treated if and when they dry out.

Small, unmapped ponds found during implementation planning would have the same PDFs on herbicide use within 100 feet of the pond.

Emergent Vegetation

There is no treatment of emergent vegetation proposed under any alternative.

Municipal Watersheds and Domestic Water Supplies

No herbicide application would occur within the municipal watershed under any alternative. The yellow star thistle would be treated with biocontrol under all action alternatives.

Other water supplies such as wells or springs at campgrounds would be buffered from herbicide application to protect water quality. *H-11- Herbicide use would not occur within 100 feet of wells or 200 feet of spring developments as required by Washington state's WAC 246-290-135. Oregon has no specific requirements.)*

Effects to Soil Resources by Alternative

Alternative A – No Action

Direct and Indirect Effects to Soils

Manual, Mechanical, Cultural and Biological treatments would continue under the existing NEPA decision from the 1995 *Umatilla National Forest Environmental Assessment for Managing Noxious Weeds*. Under this alternative less than seven percent of known sites would be treated with herbicide, leaving a heavy reliance on manual treatments. Alternative A would continue the use of glyphosate and picloram on up to 1,390 acres a year. There could be a short-term (1 to 2 years) reduction in soil cover for the areas treated. This localized reduction in cover would increase treated areas vulnerability to soil erosion. The effects would be minimal given the poor quality of groundcover provided by the invasive species proposed for treatment, the scattered nature of the treatments and the small amount of land treated, especially within Aquatic Influence Zones. These effects would last approximately one season until vegetation became re-established.

The no action alternative allows herbicide treatment only of invasive plant sites identified at the time of the project. Because newly discovered sites can only be treated manually or mechanically, it is expected that invasive plants would continue to spread. This would increase the number of acres negatively affected by invasive plants. These effects are described above in the Affected Environment section of this EIS.

Adverse impacts to soils may occur where some noxious weeds are left to populate. Alternative A has a much less aggressive strategy for addressing this weed spread. Specific changes to soil nutrient regimes are associated with large spotted knapweed infestations (Lejeune and Seastedt 2001), and allelopathic influences (Bais et al. 2003); in addition to changes in surface hydrology where the plant communities are moved from bunchgrass dominated to taproot forbs dominated (Lacey 1989). Similarly, the influx of cheat grass (*Bromes tectorum*) can alter soil dynamics with changes in structure, nutrient pulses and soil moisture status (Norton et al. 2004). These changes may be coincident with the long term shifts from perennial grasslands to annual grasslands as documented in California (D'Antonio and Vitousek 1992). Other noxious weed species may have similar impacts as demonstrated by Vinton and Burke (1995) where fertilization caused long time shifts to favor weedy forb species.

Adverse tradeoffs with alternative A, in this case the risk of no treatment, would be highest for *Centaurea spp* and others that can spread into relatively undisturbed grasslands (see Tyser and Key 1988). These tradeoffs are weighed by addressing spread rate versus the impact from treatment (D'Antonio et al. 2004); especially in regards to affecting nontarget plant species (see Ortega 2005b).

Dry grasslands and shrublands have the greatest risk for invasion (see section 3.2 Botany). Prior disturbance has offset soil community structure to favor fast growing species as demonstrated with

old field succession studies. Forest standards 12 and 13 (Umatilla LRMP as amended by the R6 2005 ROD) would be used to establish long-term strategies for controlling invasives where treatments are applied.

Alternative B – Proposed Action

Direct and Indirect Effects to Soils

Herbicide treatments are proposed for 20,691 of the total 24,649 acres inhabited by invasive plants. Approximately 4000 acres of treatment would be treated annually (budget allowing). Aerial and broadcast application methods have more potential than other application methods to contact soil, and affect soil organisms and/or productivity. Therefore, alternative B has the potential to affect soils and non-target vegetation, but overall it is still a very low risk to have significant effects to soils.

Herbicide application is favored in high traffic areas such as road corridors or where high disturbance occurs such as trailheads, stock yards or old agricultural areas. Approximately 11,753 acres is planned for herbicide treatment along travelways. Herbicide application is intended at regular intervals due to the sustained risk. In these highly disturbed areas, soil communities are largely uniform and function well under disturbed conditions; therefore, impacts are not anticipated.

Of the ten herbicides approved for use in Region 6, picloram and sulfometuron methyl pose risks to soil microorganisms and are most persistent in the soil. To protect soil organisms and therefore protect soil productivity, PDFs require sulfometuron methyl to only be used once a year and picloram once every two years. This will prevent accumulation of herbicides in the soils. The intent is to lower the noxious weed population where manual, mechanical or more selective herbicide methods could be used thereafter.

The other herbicides have small to no effect on soil microorganisms at normal application rates and could potentially be used three times on the same area in one year. More than likely, if an area was broadcast sprayed once, subsequent treatments would consist of spot spraying to treat missed areas, to treat areas where seeds have germinated since the last spraying, or to treat the small areas where invasives were damaged but are resprouting.

The project design features limit herbicide uses based on soil textures. For example, chlorsulfuron is not to be used on heavy clay soils (see PDFs in chapter 2). If herbicide treatment is necessary near streams or lakes when soils are wet, aquatic-labeled herbicides or those that pose low risk to aquatic organisms would be applied according to label directions and applicable PDFs.

Early Detection Rapid Response

Early detection rapid response (EDRR) is part of all the action alternatives. Under this approach new or currently unknown infestations may be treated using the range of methods analyzed in this EIS on sites similar to those presently proposed for treatment. PDFs would protect soil properties by constraining treatment methods according to site-specific conditions.

Alternative C – No Broadcast within Riparian Conservation Habitat Areas

Direct and Indirect Effects to Soils

The effects of this alternative are the same as for alternative B except within RHCA's. Where approximately 50 percent of the acres within the RHCA could be broadcast under alternative B, all 5,560 acres of potential herbicide treatment would be limited to hand or spot spray under alternative C.

Most of these treatment areas are along roads more than 100 feet from streams. The direct effect would be less potential for herbicide contact with soil. There would be less effect to non target plants that add soil cover. With no broadcast spray within the riparian area there would be less potential effect to soil organisms within these areas.

Alternative D – No Aerial Application

Direct and Indirect Effects to Soils

The effect of this alternative would be the same as for alternative B except for 675 acres proposed for aerial application. These areas would be treated by other methods. The R6 2005 FEIS considers aerial spraying a higher risk than other methods due to potential for drift to nontarget areas. As aerial spray is generally a broadcast method, more herbicide contacts soil than from spot treatments. This alternative is designed to use more targeted methods to treat these areas. More targeted methods mean less contact of herbicide to soil so less chance of effecting soil organisms in these areas. There would be less chance of damage to nontarget plants and soils, thus this alternative would have less potential to negatively affect soil biological communities and protective groundcover.

Soils Cumulative Effects

Treatment under no action would not plausibly contribute to significant cumulative effects on soils or water because potential direct and indirect effects from treatments are small in extent and intensity, and would be insignificant and temporary.

Under all action alternatives, soil productivity is maintained by the project design features that allow only one herbicide treatment a year of suflometuron methyl. Picloram would only be used once every two years to let this persistent herbicide degrade. These herbicides have half-lives of 90 days and 10-100 days depending on soil conditions.

While the proposed project has sufficient safeguards to protect soil microbes, this project along with other herbicide treatments occurring on adjacent lands has the potential of multiplying effects. For example, though picloram will not be aerially sprayed on Forest System lands, if an adjacent landowner was aerially spraying picloram and it drifted onto a National Forest site that was broadcast sprayed one month earlier, the cumulative effect could be significant to soil microbes. PDF B-1 (see Section 2.2.3) ensures that Forest staff coordinates with owners and managers of neighboring lands to avoid this occurrence.

Additional cumulative effects may occur where repeated herbicide applications change plant community structure. In Ortega's monitoring (2005b), repeated applications of picloram cumulatively led to an increase in cheatgrass even though knapweed cover decreased. The new Forest Plan standards 12 and 13 (R6 2005 FEIS) suggest a long-term strategy is used to evaluate these circumstances and restoration considered. Seeding with native and naturalized species may reduce the invasibility of treated sites. Biocontrol agents spreading from adjacent lands onto National Forest System lands would likely have the beneficial effects of reducing weeds. Invasive plants killed by such agents would also contribute organic matter to soils.

Effects to Water Resources by Alternative

Alternative A – No Action

Direct and Indirect Effects to Water Resources

Under this alternative no additional management of invasive plants would occur other than what is identified under the existing 1995 EA Decision for the Umatilla National Forest to Manage Noxious Weeds, except manual and mechanical treatments, which can occur anywhere. No aerial application of herbicides is allowed. Invasive plants would continue to grow on sites where their treatment is currently not authorized by a NEPA analysis. Invasive plants are often less effective for stream bank stabilization than deeper rooted native plant species. Most invasive plants also provide less stream-shading than native hardwoods and conifers.

No herbicide application takes place within 100 feet of water under this alternative. Under this alternative there is negligible chance of herbicide drift into streams. Only two herbicides are available for use under this alternative. Picloram is of high concern for aquatic resources but preferred in some situations because it is a selective herbicide which kills only certain plants and has a residual effect to repress reestablishment of target invasive species. Glyphosate is the other choice, and is nonspecific and kills all vegetation.

Alternative B – Proposed Action

Direct and Indirect Effects to Water Resources

Up to 5,560 acres of treatment, including chemical treatment could take place in RHCAs. Almost 50 percent could be broadcast sprayed and the other 50 percent treated by spot or hand methods. In reality, most of these areas have only discontinuous infestations of invasive plants, but, as acres of infestations change year to year; analysis is done as if all acres within a treatment area are infested.

None of the treatments are extensive enough under any alternative to effect peak flows, low flows or water yield. Methods used for treatment would have negligible effect on water infiltration into soil and associated surface runoff. No 5th field watershed has more than 2.5 percent proposed for treatment and most have less than one percent. This amount is much too small an area to show effects to flows from treatment.

Generally, small areas would be treated along streams. As most invasive plants provide little shade, removal of these plants is unlikely to have any measurable effect to stream temperature. As these methods target individual plants, the risk from spot or hand application of herbicides to native riparian vegetation is small. Increasing native forbs and grasses would improve bank stability and potential for narrower, deeper channels, potentially reducing water temperature over time. Where passive restoration occurred, native vegetation would slowly become reestablished. Where restoration was applied, re-establishment of native vegetation could occur more quickly; possibly within a couple of years.

Where manual methods remove invasive plants near streams there could be minor loss of ground cover and soil disturbance leading to erosion, and a minor localized increase in fine sediments particularly if vegetation is removed from stream banks. This increase would only last a season until vegetation became re-established and is not considered significant. Many treatment sites are small and would reseed naturally with existing native vegetation. Restoration would allow sites lacking a native vegetation seed source to re-vegetate to control erosion.

Project design features also minimize the chance of herbicides reaching streams or wetlands through drift, runoff, or leaching into soils. Buffer widths vary depending on herbicide aquatic risk ranking (established in the R6 2005 FEIS) and application method. PDFs and label requirements prohibit use of the more mobile herbicides on shallow soils. This would protect groundwater, particularly in areas where shallow soils cover fractured bedrock.

Glyphosate and imazapyr are the only herbicides used for spot spraying up to water's edge along perennial channels. Glyphosate is highly water soluble but because it adheres tightly to soils is unlikely to be carried into a stream unless the soil particle is carried into the stream. This is unlikely to happen during the late spring or summer when herbicides would be applied because there is less rain in the summer and more vegetation growth to hold soil particles in place. If glyphosate is carried into a stream by runoff it preferentially stays with the soil over partitioning into water. Imazapyr is only moderately water soluble and forest field studies have not found it very mobile in soils (appendix D).

Herbicides entering surface water through surface runoff are also expected to be minimal, since targeted spot spraying techniques would be used to apply herbicide within 100 feet of surface water. This would minimize the amount of herbicide reaching the ground surface as well as minimize the potential for herbicide drift. No herbicides considered high risk to aquatic resources would be broadcast within 100 feet of streams and none would be spot sprayed within 50 feet of streams (chapter 2, Tables 5, 6 and 7).

Some streams within road corridors have treatment areas that parallel both the road and the stream with many continuous acres of treatment within the aquatic influence zone. In reality these areas have invasive plants scattered among other vegetation along the stream. To model a worst case scenario a few of these areas were modeled for site specific soil types and rainfall with the SERA spreadsheet. For NF Astonin River and Little Phillips Creek clay soils were modeled due to the compacted road conditions near the streams within the treatment areas. In addition, the model was run for a hypothetical site with the highest rainfall on the Forest and a sandy soil, the soil most likely to allow runoff into the stream. Only aquatic glyphosate and aquatic imazapyr were modeled with the high rainfall and sandy soil as they are the only herbicides allowed for spot spray treatments below bankfull, and PDFs do not allow the use of clopyralid on sandy soils.

NF Asotin Creek has up to 81 acres of treatment of scotch thistle on 3.9 miles along the trail that follows the creek and tributaries within 100 feet of the stream channel. In reality the scotch thistle is probably patchy and covering less than 25 percent of the acres within the treatment area at this time. Modeling limitations include: modeling only the 50 feet closest to the channel and 1.6 miles of stream channel, and assumes broadcast spray, not spot spray. The broadcast spray would over estimate concentrations in the stream. PDF H-13 states that in aquatic settings, herbicide applications from water's edge to bank-full width will be limited to 2 acres within a 6th field HUC. Treatments above bankfull, within the aquatic influence zone (riparian area), would not exceed 10 acres along any 1.6 mile of stream length per 6th field HUC. This would keep treatment at this site within the modeled parameters.

Analysis of these sites indicates all HQ values were below 1; therefore, no herbicide concentrations in water reached a level of concern for sensitive fish (Table 42).

Domestic Water Supplies

Water sources, including those in campgrounds, recreational homes, and individual special use permit would be protected by PDF H-11, which requires that herbicide use would not occur within 100 feet of wells or 200 feet of spring developments.

Groundwater

To protect groundwater as well as surface water, PDFs that restrict the use of mobile herbicides on high porosity soils were developed. Aerial and broadcast treatments across intermittent streams, which can be recharge areas for groundwater, would not occur to lower the likely hood of herbicide moving into groundwater or surface water.

In general precipitation is low in the project area and herbicide application would occur during the dryer times of the year. Application during dryer times of the year reduces movement of herbicide through soils, allows the plant time to uptake the herbicide, and allows the herbicide in the soil time to degrade. Utilizing these natural conditions and applying the PDFs protects groundwater resources.

In this case the assumption is made that recharge areas are primarily along intermittent streams and below shallow soils, which are protected by PDFs. These PDFs ensure groundwater recharge zones are adequately protected.

Roads

There are 836.2 miles of road within treatment areas. Of these, 183 miles (21%) are within RHCAs and proposed for chemical treatments. Roads and their associated ditchlines are often connected to streams and during storm events can carry herbicide to streams; however, much of the Umatilla National Forest System roads comply with regional road standards in that drainage structures are in place that divert runoff away from streams. Still, some roads with connected ditchlines are within RHCAs. Under this alternative, broadcast application of herbicides (both boom and hand) are allowed within the outer part of the RHCA. To minimize risk to aquatic resources, PDF H-2 requires that no high risk herbicides would be broadcast within RHCAs. Therefore, for 183 miles of road identified within RHCAs, picloram, non-aquatic triclopyr (Garlon 4), non aquatic glyphosate, and sethoxydim would not be broadcast.

Though the probability of a large rain storm happening after application is low at any particular site, this additional protection measure would ensure that high risk herbicides are not delivered to streams in concentrations that exceed levels of concern.

Aerial Application

Aerial application of herbicide would occur on the Pomeroy District covering approximately 675 acres on 17 sites ranging in size from 1 to 290 acres. Most of the acres are in one area of 625 acres where both yellow starthistle and spotted knapweed are found. There are approximately 195 acres of grasslands with most of the area in open ponderosa pine forest. There are also small areas of lodgepole pine, grand fir and mixed forest types. The herbicide to be applied aerially would be clopyralid. Clopyralid is a selective herbicide that would preserve soil cover by not harming nontarget vegetation such as pines, firs and grasses.

There are another set of small sites totaling 62 acres. These sites are scattered along the Little Tucannon River. There are only three acres classified as grasslands with the rest of the cover a mixture similar to the larger site described above. Clopyralid would be used in these areas also.

Given the soil protection provided by non-target vegetation, erosion and associated sediment delivery to streams would be minor and short-term (1 to 2 years).

As drift is a concern with aerial application AGDISP was used to model drift from aerial application of herbicides. AGDISP was first developed by NASA, improved by the USDA Forest Service and implemented by the Spray Drift Task Force and the U.S. Environmental Protection Agency into a regulatory version (Teske et al.2003).

Site specific conditions for aerial application of the Umatilla National Forest were modeled. In general, for aerial application at these sites, the helicopter would be flown at 10 to 25 feet off the ground when spraying grasslands. However, there is a section of the treatment area with up to 30 percent tree cover. For safety reasons if this area is sprayed the pilot may need to fly higher when near trees. The higher release heights are more of a concern.

Spray application height, wind speed and droplet size are the three most significant factors impacting drift distance and the potential to affect non-target areas. To model worst case scenarios, cross wind speed and droplet size were kept at the highest wind speed allowed (8mph) and a coarse spray droplet size (500 μ m) commonly used for aerial application of herbicides and the smallest droplet size allowed in this project (PDF F-6). Three release heights were modeled for the largest aerial site.

The first run was for open grassland with a spray height of 25 feet and the following runs were with a spray height of 35 and 50 feet respectively with the other conditions remaining the same.

Conditions

- Eight mile an hour cross winds toward the stream
- Median droplet size is approximately 500 microns
- Release height 25, 35 and 50 feet off the ground

Results

As expected, drift became greater as the release height increased. At a 25-foot release height there was minimal drift. At a 35-foot release height the maximum deposition was displaced 25 feet downwind with a large amount of deposition up to 50 feet downwind.

At a 50-foot release height the maximum herbicide deposition was displaced approximately 50 feet downwind with a large amount of deposition up 150 feet downwind.

For example, for a small stream directly downwind of the spray area, 300 feet from the last swath, with no interception from vegetation (ground cover 1 foot tall) the concentration of clopyralid in the stream varied between 0.21 ppb for the conditions at 25 feet spray height and 6.15 ppb at a spray height of 50 feet. This is well under the 5000 ppb considered a concern for fish. However, the purpose of this project is to treat invasive terrestrial plants, not to treat streams or other sensitive areas and to minimize offsite deposition to sensitive areas such as streams or non-target vegetation, SOLIs or other sensitive areas under the worst case scenario conditions the following design criteria would be used to lower drift.

Two options could be used 1) Table 36 lists conditions where an increased buffer width is required. 2) Low drift technology (i.e. nozzle design) and/or additives that maximize deposition to the intended target and minimized drift into non-target and sensitive areas as directed in PDFs.

Either method would increase the effectiveness of the buffer for sensitive areas and streams. Drift cards would be used to track the effectiveness of the buffers.

Table 36. Additions to buffer widths under specified conditions

Buffer Widths	25 foot Release Height	35 foot Release Height	50 foot Release Height
Buffer width at 6-7 mph	Designated buffer	Add 1 swath widths to buffer	Add 2 swath widths to buffer
Buffer width at 7-8 mph	Designated buffer	Add 2 swath widths to buffer	Add 3 swath widths to buffer

Alternatively use low drift technology, i.e. nozzle design and/or additives that ensure little to no drift into stream buffers or sensitive areas as directed in PDFs.

Water contamination from aerial herbicide drift is a large concern. The following project design features are included to address this concern by minimizing risk for aerial herbicide drift and contamination to waterways:

- E-2 requires that aircraft fueling occurs outside RHCAs
- F-5 requires that herbicide applications occur when winds are between 2 and 8 miles per hour
- F-6 requires coarse droplet size to minimize drift
- F-8i requires that aerial units be ground checked and water features marked and buffered before application
- F-8 and Tables 5, 6, 7 require buffers of 300 feet on perennial or wet intermittent streams and wetlands, and 100-foot buffers are required on dry channels.
- F-8 Additional buffers or drift reduction methods are required in winds over 5 mph with flight heights over 30 feet as shown in table 36 above

Based on buffer effectiveness documented by Rashin and Graber (1993) and Dent and Robben (2000) concentrations of herbicides reaching streams are expected to be well below concentrations of concern to beneficial uses. Spray cards would be used to track the effectiveness of the stream buffers.

Lakes, Wetlands and Floodplains

There are approximately 19 acres of treatment proposed within 100 feet of lakes or reservoirs on the Forest. The main invasive plants to be treated are diffuse knapweed and Canadian thistle. Treatments are proposed near three waterbodies, generally at campgrounds.

Most of these treatment acres are at Jubilee Lake, which proposes approximately 17 acres of chemical treatment of Canadian thistle around the 92-acre lake. PDF H10 requires that no more than half the perimeter, or 50 percent of the vegetative cover, or 10 contiguous acres around a lake or pond would be treated with herbicides in any 30-day period. This PDF reduces exposure to herbicides for aquatic organisms by providing some untreated areas as refugia. Buffers minimize the potential for herbicides to move into surface water. Buffers displayed in chapter 2, Tables 5, 6 and 7, minimize the potential for herbicides to move into surface water as described above in the section on general effects of herbicides on water.

The most effective herbicides for Canadian thistle are clopyralid, picloram, chlorsulfuron and glyphosate (best in the fall). No broadcast applications would occur within 100 feet of the lake. Picloram and chlorsulfuron could only be spot sprayed to within 50 feet of the lake. Clopyralid (considered low aquatic risk) could be spot sprayed to within 15 feet of the high water mark of the lake. Aquatic glyphosate and aquatic imazapyr could be spot sprayed up to the edge of the water. Adverse effects to beneficial uses of the lake are unlikely with these specific protection measures in place.

While the PDFs make it highly unlikely that herbicide concentration in water would reach a level of concern, high rainfall soon after application could deliver herbicide to the lake. To model this scenario the SERA worksheet was rerun for specific rainfall and soils for this area for clopyralid (most likely to be used where allowed), and the two aquatic formulations available for spot spray closer to the lake. No concentrations of concern were reached for any herbicide. Use of PDFs further lowers potential for higher concentrations of herbicides near the lakes. Therefore treatments are unlikely to affect functioning of wetlands or waterbodies or to contribute to significant adverse effect of beneficial uses.

To control the infestation the treatments would continue over several years, with fewer acres needing treatment each year. Wetlands would be treated using non-herbicide methods where such treatments are likely to be effective.

Early Detection Rapid Response

Early detection rapid response (EDRR) is part of all the action alternatives. Under this approach new invasive species or currently unknown infestations may be treated using the range of ground based methods analyzed in this EIS, on sites similar to those presently proposed for treatment. PDFs limit types and methods of treatments and types of herbicides by aquatic risk within RHCAs and would minimize the risk of treating these new or undiscovered infestations.

Aerial application of herbicides would not be allowed in the EDRR process. If treatment sites or types of treatment were not within the range of the ground based treatments discussed above, then additional analysis would occur under another NEPA document. Two examples would be if there was a need to use different herbicides than the 10 discussed in this document, or a need to treat emergent vegetation.

The R6 2005 FEIS classified aerial spraying of herbicide a high risk treatment method. The risk is related to lack of control for applying herbicide. Unpredictable weather patterns can lead to adverse effects where herbicide is applied near buffered areas. Wind speeds and direction can change quickly leading to more drift to waterways and nontarget plant species and soil. Aerial spraying on steep forest sites may have increased risk drift from alternating wind currents in addition to higher risk for herbicide movement from overland flow. Furthermore, stream buffers may be difficult to maintain since stream channels can be hard to identify in some forest environments. Given these uncertainties, aerial spraying is a high risk tool for use under EDRR.

Clean Water Act Finding

No adverse impacts to water quality or beneficial uses are predicted from this project. While there is some potential for herbicide molecules to reach surface water and impact aquatic organisms, the extent of treatment is very low and the risks have been minimized or eliminated by buffers and PDFs (see Chapter 2 for PDFs). There would be no measurable changes to water resources from implementation of this alternative.

Alternative C – No Broadcast within Riparian Habitat Conservation Areas

Direct and Indirect Effects

The effects from treatments under this alternative are the same as for alternative B except for the 3,022 acres within the RHCAs available for broadcast of herbicides. Potentially these areas would be treated with mechanical or manual methods. As the main methods are mowing and cutting or pulling weeds, and the areas to be treated are between 100 and 300 feet from a stream, effects from treatment on streams would be negligible. If these acres were treated with herbicide then spot or hand methods

of application would be used under alternative C. Spot spraying is more targeted to specific plants; therefore, there would be less herbicide in contact with soil and available for runoff into streams. There would be less nontarget vegetation removed so more groundcover would be available in these areas lowering the potential for sediment delivery to streams.

Alternative D – No Aerial Application

Direct and Indirect Effects

The effects from treatment under this alternative are the same as for alternative B except for 675 acres proposed for aerial application. These acres would need to be treated by other methods. Under this alternative there would be lower risk of herbicide contaminating water due to drift.

Water Cumulative Effects

The amount of herbicide the Forest Service proposes to use for invasive plant management is a very small percentage of overall use. Thus, all alternatives, including no action, have low potential to adversely affect water quality or contribute to adverse effects at the 6th field watershed scale. Assuming project design features are implemented, the spatial extent of effects of herbicide use would mainly be limited to the site of application, and governed by the extent of the target species to be treated. Herbicide would only be applied where needed; non-target vegetation and bare ground would not be treated.

Aerial spraying has a wider area of potential influence (low amounts of herbicide may reach streams up to 300 feet away from drift); however aerial spraying is not proposed near any water bodies. Broadcast spraying is also considered high risk within 100 feet of live streams because of the potential for drift and run off. Spot spraying and hand treatments are not considered high risk because the applicator can narrowly focus the spray making the area of influence much smaller.

Chemical treatments are scattered across watersheds making it unlikely that herbicide concentrations would be additive with similar treatments at the 6th field watershed scale. Potential for cumulative effects is negligible due to implementation of project design features that limit direct and indirect effects, the scattered nature of treatments, and dilution over time and space by mixing and addition of inflow downstream. The amount of herbicide that may be delivered to a common point downstream is very small to non-existent. Previous NWQAP studies (see section 3.1.6) did not indicate cumulatively harmful levels of herbicides proposed for use in this project in the water bodies studied.

Table 37 shows the watersheds with the greatest acreage/percent of invasive treatments. Only a fraction of sites would be treated in any one year, and all treatments would be done according to project design features that minimize off-site movement of herbicides. Herbicide mobility, persistence, toxicity, and potential runoff, drift and leaching have all been addressed in the project design features. The low amount of herbicide as well as applying project design features signify no likelihood of water contaminants accumulating as a result of this project.

The project design features ensure that herbicides used near water are applied with a level of caution that ensures target species are treated and offsite movement of herbicides is managed and contained to a very small area. Where drift, run off, and/or leaching are possible, PDFs limit the type of herbicide that may be used, along with the application method and rate. Thus, herbicide use in this project would not contribute to cumulative adverse effects on water resources off National Forest System land. In addition, coordination of treatments across ownerships would ensure that limitations on extent of herbicide use within watersheds are not exceeded.

Table 37. Watersheds with the largest percent of proposed chemical treatments

6 th field Watershed Name	6 th field Watershed Acres	Proposed Treatment (All Action Alternatives)					
		Biocontrol	Chemical Acres	Manual Acres	Total Acres	Percent of Total Treatment	Percent of Chemical Treatment
Asotin Creek	208532	1	2104	0	2105	1.0	1.0
Looking Glass Creek	60527	264	889	0	1153	1.9	0.0
Meachem Creek	114158	1019	1798	2	2820	2.5	1.6
Wall Creek	128327	30	1723	2	1756	1.4	1.3

3.5 Aquatic Organisms and Habitat

Changes between the DEIS and the FEIS for Section 3.5

This section was rewritten in some areas for clarity based on public comment and internal review

Table 46. Effects Determination for Herbicide Treatments, Non-Herbicide Treatments, and EDRR – Table was updated to include critical habitat and determinations were changed.

Table 47. Potential Effects to Commercially Important Fish Species under the Proposed Action – Determinations were changed.

3.5.1 Introduction

Invasive plants are displacing native plants, and have the potential to destabilize streams, reducing the quality of fish and wildlife habitat and degrading natural areas in the Umatilla National Forest. Invasive plants found growing adjacent to or within aquatic influence areas can invade, occupy, and dominate riparian areas and indirectly impact aquatic ecosystems and fish habitat.

Invasive plants can change stand structure and alter future inputs of wood and leaves that provide the basic foundation of the aquatic ecosystem food webs. Native vegetation growth may change as a result of infestation, and the type and quality of litter fall, and quality of organic matter may decline, which can alter or degrade habitat for aquatic organisms.

Under the proposed action, infested areas would be treated with an initial prescription and retreated in subsequent years, if needed, until the site was restored with desirable vegetation. Herbicide treatments would be part of the initial prescription for most sites; however, use of herbicides would be expected to decline in subsequent entries as a result of effective treatment. Ongoing inventories would confirm the location of specific invasive plants and effectiveness of past treatments. Treatment prescriptions would be strict enough to ensure that adverse effects are minimized, while flexible enough to adapt to changing conditions over time. Future infestations will be treated using an Early Detection/Rapid Response protocol.

This FEIS has been prepared to consider the site-specific environmental consequences of treating invasive plants over the next 5 to 15 years (until invasive plant objectives are met or until changed conditions or new information warrants the need for a new decision). This EIS is tiered to a broader

scale analysis: *The Pacific Northwest Region Invasive Plant Program – Preventing and Managing Invasive Plants Final Environmental Impact Statement* and the accompanying Record of Decision (USDA Forest Service 2005a, 2005b).

The R6 2005 ROD added management direction relative to invasive plants to the Umatilla National Forest Plan. The management direction applied to the broader Forest invasive plant program, establishing goals, objectives and standards for public education and coordination, prevention of the spread of invasive plants during land uses and activities, reducing reliance on herbicides over time, and treatment and restoration.

Methodology for Analysis

This analysis is tiered to the R6 2005 FEIS and ROD. A primary focus of the site-specific analysis was development of project design features (PDFs) to insure compliance with standards adopted by R6 as well as Forest standards and guidelines. Information used to design criteria to minimize effects and the method of comparison of alternatives was the same as that used for water and soil (see Section 3.4.1 above).

Herbicide concentrations derived from SERA herbicide risk assessments were used with the GLEAMS worksheet as an indicator of potential herbicide delivery to water. The GLEAMS worksheet developed for the SERA risk assessments was run for site specific conditions (rainfall, soil type, and herbicide) on the Forest. GLEAMS is a model used as a tool to evaluate the impact of management decisions (such as herbicide use) on water quality. The model can be used to estimate herbicide exposure for aquatic species in worst-case scenarios.

As the GLEAMS model was originally an agriculture model, all parameters used are not compatible with treatments for the Forest. The model assumes broadcast treatment along a small perennial stream. The treatment is 50 feet wide and 1.6 miles long. This would overestimate herbicide in streams on the Forest as no broadcast is proposed within 100 feet of a perennial stream. In steeper areas the model may underestimate the herbicide delivery as it assumes a 10 percent slope, although much of the Forest has a higher slope. The model also assumes even rainfall every ten days, which is very different than the rainfall patterns for the Forest.

When specific treatment areas were modeled, the upper limit of rain was set as high as 75 inches to attempt to model a larger summer storm.

3.5.2 Affected Environment

5th Field Watersheds

Table 38 displays the relative distribution of the invasive plants proposed for treatment at the 5th field watershed scale. The Meachum Creek watershed has the greatest proportion of infested acres being proposed for treatment (about 2.5 percent is proposed for treatment). Information about the existing condition of the watersheds is in the action area descriptions below. Additional information about the existing condition of river basins and watersheds is in the Fisheries Specialist Report, along with the Biological Evaluation and Biological Assessment in the project file.

Table 38. Fifth Field Watersheds within Umatilla National Forest Proposed for Treatment

Fifth Field Watershed Name	HUC	Acres	Acres of Invasive Plants	Percent Watershed to Treat	Treated Acres in RHCAs*	TES Fish Present*
Asotin Creek	1706010302	208,532	2105	1.0%	380	SRS, SRC, BT,
Upper Grande Ronde River	1706010401	133,777	98	0.07%	0	NF
Meadow Creek	1706010402	116,100	44	0.04%	7	NF
Grande Ronde River/Five Points Creek	1706010404	87,630	78	0.008%	13	NF
Willow Creek	1706010408	53,565	162	0.3%	73	NF
Lookingglass Creek	1706010410	60,527	1153	1.9%	132	SRS, SRC, BT
Grande Ronde River/Cabin Creek	1706010411	108,389	1018	0.9%	447	SRS
Grande Ronde River/Grossman Creek	1706010601	114,787	1108	1.0%	129	SRS, SRC, BT
Wenaha River	1706010603	189,224	958	0.5%	155	SRS, SRC, BT
Lower Grande Ronde River	1706010607	160,794	370	0.2%	69	SRS, SRC
Pataha Creek	1706010705	118,434	176	0.1%	28	NF
Upper Tucannon River	1706010706	140,811	762	0.5%	199	SRS, SRC, BT
Upper Walla Walla River	1707010201	101,385	234	0.2%	22	MCS, BT
Mill Creek	1707010202	76,051	906	1.2%	141	MCS, BT
Upper Touchet River	1706010203	146,115	1128	0.8%	104	MCS, BT
Upper Umatilla River	1707010301	86,765	1410	1.6%	239	MCS, MCC, BT
Meacham Creek	1707010302	114,158	2820	2.5%	367	MCS, MCC, BT
Birch Creek	1707010306	182,206	505	0.3%	176	MCS
Upper Butter Creek	1707010309	206,658	199	0.1%	21	NF
Upper Willow Creek	1707010401	94,088	340	0.04%	176	NF
Rhea Creek	1707010403	145,967	2	0.001%	0	NF
Upper North Fork John Day River	1707020201	71,525	17	0.02%	9	MCS
Granite Creek	1707020202	94,513	277	0.3%	169	PL, WCT, MCS, MCC, BT

Fifth Field Watershed Name	HUC	Acres	Acres of Invasive Plants	Percent Watershed to Treat	Treated Acres in RHCAs*	TES Fish Present*
North Fork John Day River/Big Creek	170702 0203	105,88 1	344	0.3%	277	PL, MCS, MCC
Desolation Creek	170702 0204	69,675	126	0.2%	21	WCT, MCS, MCC, BT
Upper Camas Creek	170702 0205	104,62 3	539	0.5%	297	MCS, MCC, BT
Lower Camas Creek	170702 0206	157,01 5	815	0.5%	158	PL, MCS, MCC
North Fork John Day River/Potamus Creek	170702 0207	185,28 8	1772	1.0%	388	PL, MCS, RT, MCC
Wall Creek	170702 0208	128,32 7	1756	1.4%	606	MCS, RT
Lower North Fork John Day River	170702 0210	117,01 6	12	0.01%	1	NF
Camp Creek	170702 0302	125,94 0	1166	0.9%	344	NF
Lower Middle Fork John Day River	170702 0305	60,635	2	0.003%	0	NF
Lower John Day River/Kahler Creek	170702 0401	197,91 9	1676	0.8%	339	RT
Upper Rock Creek	170702 0411	177,12 1	567	0.3%	74	NF
Total			24,643**		5560	

*Riparian Habitat Conservation Areas (RHCA) are based on designated PACFISH buffers as delineated in GIS.

*SRC=Snake River Chinook, MCC=Middle Columbia Chinook, SRS=Snake River Steelhead, MCS=Middle Columbia Steelhead, BT= Bull Trout, RT=Redband Trout, WCT=Westslope Cutthroat Trout, MS=Margined Sculpin, PL=Pacific Lamprey, NF=No TES Fish Present

**24,643 acres is slightly different from 24,649 acres displayed elsewhere. This minor difference can be explained as rounding errors

Roads Having High Potential for Herbicide Delivery

Roads are the primary vector for invasive plants to enter the Forest. Native soil has been removed along roads, and fill and surfacing have been placed within the road prism. Ditches have been compacted, allowing them to deliver run-off to streams, which may include herbicides used in broadcast treatments along the roads. Road cutbanks can be a combination of disturbed soil and exposed bedrock.

The R6 2005 FEIS describes roadside ditches as an herbicide delivery mechanism; potentially posing a high risk of herbicides reaching concentrations of concern for listed aquatic species (see chapter 3.5). Ditches may function as an extension of the stream network. Roadside ditches can act as delivery routes or intermittent streams during high rainfalls, or as settling ponds following high rainfall events. Because the proposed action includes treatment of road prisms with herbicides, the

concern for herbicides being indirectly delivered to waterbodies containing fish via roadside ditchlines was addressed by identifying roads that have a high potential for herbicide delivery.

To reduce the potential for herbicides to come in contact with water via runoff at or near concentrations of concern, the following restrictions would apply to treatments along roads having high potential for herbicide delivery (See appendix E printed in the DEIS and available upon request or on line at <http://www.fs.fed.us/R6/uma/projects>):

- No broadcast spraying of any herbicide
- No use of picloram or non-aquatic triclopyr
- Only spot or hand select methods of aquatic labeled herbicides or low risk herbicides (as defined in this document) would be applied within 15 feet of wet roadside ditches
- Apply appropriate buffer widths to road sections that cross streams (See tables 5, 6, and 7)

According to the 2004 Umatilla Forest-Scale Roads Analysis Report, the entire road system is fundamentally hydrologically connected to the stream system because roads are part of watersheds. Roads capture and release snow and rain, alter patterns and direction of runoff, erosion rates and processes, and expand the channel network affecting routing of stream discharge. The most hydrologically connected roads cross streams or are located in floodplains and wetlands. For this project, roads considered most hydrologically connected were those located within 100 feet of Class 1 and 2 streams.

An estimated 28.65 miles of roads considered high risk for potential herbicide delivery are proposed for herbicide treatment (See table in appendix E printed in the DEIS and available upon request or on line at <http://www.fs.fed.us/R6/uma/projects>). Nearly all watersheds on UNF have roads that have a high risk of herbicide delivery; invasive plants are widely scattered along these roads. Roadside treatment areas include compacted ditch lines, disturbed soil and thin soils near exposed bedrock. Due to the extensive reworking of properties of soils along roads, the Soil Resource Inventory (SRI) may be misleading for roadside treatment areas. As roads and ditchlines are compacted, roadside soils are assumed to function with a high runoff rate. Therefore, those roads that have a high potential for herbicide delivery would not be treated by broadcast applications.

Threatened, Endangered and Sensitive Fish Species and Habitat

The Umatilla National Forest has three Federally Listed fish species and four fish species listed on the Region 6 Sensitive Species list (See table 39 and table 40). Steelhead and Chinook, are under the jurisdiction of National Marine Fisheries Service (NOAA Fisheries), and bull trout are under the jurisdiction of the US Fish and Wildlife Service.

Table 39. Threatened, Endangered and Proposed Fish Species and Critical Habitat on Umatilla National Forest

Species - DPS		Status	Listing Status	Critical Habitat
Steelhead (<i>Oncorhynchus mykiss</i>)	Snake River Basin	Threatened MIS	Listed on 8/18/97; (62 FR 43937) Status Reaffirmed 6/28/05; (70 FR 37160)	09/02/05 70 FR 52630
	Middle Columbia River	Threatened	Listed on 3/25/99; (64 FR 14517) Status Reaffirmed 6/28/05; (70 FR 37160)	09/02/05 70 FR 52630
Chinook Salmon (<i>Oncorhynchus tshawytscha</i>)	Snake River Spring/Summer Run	Threatened	Listed on 4/22/92; (57 FR 14653) Status Reaffirmed 6/28/05; (70 FR 37160)	10/25/99 64 FR 57399
	Snake River Fall Run	Threatened	Listed on 6/3/92; (57 FR 23458) Status Reaffirmed 6/28/05; (70 FR 37160)	12/28/93 58 FR 68543
Bull Trout (<i>Salvelinus confluentus</i>)	Columbia River	Threatened	Listed on 6/10/98; (63 FR 31647)	10/06/04 69 FR 59996

MIS = Management Indicator Species

Table 40. Sensitive Species on the Umatilla National Forest¹⁶

Species	Designation
Middle Columbia River Spring Run Chinook Salmon (<i>Oncorhynchus tshawytscha</i>)	Sensitive
Redband Trout (<i>Oncorhynchus mykiss gairdneri</i>)	Sensitive/MIS
Westslope Cutthroat Trout (<i>Oncorhynchus clarkii lewisi</i>)	Sensitive/MIS
Margined Sculpin (<i>Cottus marginatus</i>)	Sensitive

MIS = Management Indicator Species

For purposes of addressing federally listed fish species under the jurisdiction of National Marine Fisheries Service (NOAA Fisheries) within the context of their status and life history, only brief summaries from various sources are presented in this document. Additional information related to brief life history information and status of populations at the ESU or DPS scale can be found in the following sources:

- R6 2005 FEIS Fisheries Biological Assessment, Environmental Baseline
- NMFS Federal Register documents (<http://www.nwr.noaa.gov/ESA>)

¹⁶ The Regional Forester's sensitive species (RFSS) list was updated in 2008, however the RF stated: "Projects initiated prior to the date of this letter may use the updated RFSS list transmitted in this letter or the RFSS list that was in effect when the project was initiated." Changes to the sensitive species list will be reviewed during implementation and new sensitive species will be treated as aquatic SOLI for the purposes of implementation, however the analysis in this section was not updated to reflect new lists.

Snake River (SR) spring/summer run Chinook salmon (Threatened)

Critical Habitat

Critical habitat was designated for Snake River spring/summer chinook salmon on December 28, 1993 (58 FR 68543). Critical habitat is designated to include river and tributary reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams) to Snake River spring/summer chinook salmon in the Snake River basin. Migratory habitat in the Columbia River mainstem from the mouth to the Snake River confluence is also included. Essential habitat consists of four components: spawning and juvenile rearing, juvenile migration, areas for growth and development to adulthood, and adult migration corridors. Essential features of migration corridors are further defined as: substrate, water quality, water quantity, water velocity, cover/shelter, food (juveniles only), riparian vegetation, space, and safe passage conditions.

The main 5th field watersheds on Umatilla National Forest with designated critical habitat are the Lower Grande Ronde River, Asotin River and Upper Grande Ronde River watersheds.

Life History

The Snake River spring/summer chinook ESU includes current runs to the Tucannon River, the Grande Ronde River system, the Imnaha River and the Salmon River (Matthews and Waples 1991). Some or all of the fish returning to several of the hatchery programs are also listed, including those returning to the Tucannon River, Imnaha River, and Grande Ronde River hatcheries and to the Sawtooth, Pahsimeroi, and McCall hatcheries on the Salmon River.

Spring and summer chinook from the Snake River Basin exhibit stream-type life history characteristics (Healey, 1983). Most SR spring/summer chinook salmon enter individual subbasins from May through September. Eggs are deposited in late summer and early fall, incubate over the following winter and hatch in late winter/early spring of the following year. Juvenile SR spring/summer chinook salmon emerge from spawning gravels from February through June (Peery and Bjornn 1991). Typically, after rearing in their nursery streams for about 1 year, smolts begin migrating seaward in April and May (Bugert et al. 1990, Cannamela, 1992). Depending on the tributary and the specific habitat conditions, juveniles may migrate extensively from natal reaches into alternative summer rearing and/or overwintering areas. After reaching the mouth of the Columbia River, spring/summer chinook salmon probably inhabit nearshore areas before beginning their northeast Pacific Ocean migration. Snake River spring/summer chinook return from the ocean to spawn primarily as 4 and 5 year old fish, after 2 to 3 years in the ocean. A small fraction of the fish return as 3-year-old 'jacks', heavily predominated by males.

Many of the Snake River tributaries used by spring and summer chinook runs exhibit two major features: extensive meanders through high elevation meadowlands and relatively steep lower sections joining the drainages to the mainstem Salmon (Matthews and Waples 1991).

The combination of relatively high summer temperatures and the upland meadow habitat creates the potential for high juvenile salmonid productivity. Historically, the Salmon River system may have supported more than 40 percent of the total return of spring and summer chinook to the Columbia system (e.g., Fulton 1968).

Action Area Information

Lower Grande Ronde River Subbasin (approximately 25 percent is within the Umatilla National Forest, and another 25 percent is within the Wallowa-Whitman National Forest) has 14 major streams that contain more than five miles of anadromous fish habitat inside National Forest System

land, including Grande Ronde River, Wenaha River, Butte Creek, Crooked Creek, Joseph Creek, Elk Creek, Swamp Creek, Davis Creek, Cottonwood Creek, Peavine Creek, Mud Creek, McAllister Creek, Tope Creek, and Wildcat Creek. Wenaha River holds roughly 26 miles of anadromous fish habitat inside Umatilla National Forest System land. Lower Snake/Asotin Subbasin has two major streams that contain more than five miles of anadromous fish habitat inside the National Forest, including Snake River (WWNF) and Asotin River (UNF). Asotin River holds roughly 10 miles of anadromous fish habitat inside Umatilla National Forest System land.

Lower Snake/Tucannon Subbasin, approximately 10 percent of which is within Umatilla National Forest, has one major stream, Tucannon River, which holds roughly 13 miles of anadromous fish habitat inside the National Forest System land. Upper Grande Ronde River Subbasin approximately 10 percent of which is within the Umatilla National Forest, has 18 major streams that contain more than five miles of anadromous fish habitat inside National Forest System land, including Grande Ronde River, Meadow Creek, Burnt Corral Creek, McCoy Creek, Indian Creek, Dark Canyon, Spring Creek, Five Points Creek, Sheep Creek, Clear Creek, Beaver Creek, Limber Jim Creek, Lookingglass Creek, Little Lookingglass Creek, and Phillips Creek. Lookingglass Creek holds roughly 7 miles of anadromous fish habitat inside Umatilla National Forest System land.

Snake River (SR) fall-run Chinook salmon (Threatened)

Critical Habitat

Critical habitat was designated for Snake River fall chinook salmon on December 28, 1993, (58 FR 68543). Critical habitat for the listed ESU is designated to include river reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams) to Snake River fall chinook salmon in the Columbia River from its mouth upstream to the confluence of the Columbia and Snake Rivers; all Snake River reaches from the confluence of the Columbia River, upstream to Hells Canyon Dam; the Palouse River from its confluence with the Snake River upstream to Palouse Falls; the Clearwater River from its confluence with the Snake River upstream to its confluence with Lolo Creek; the North Fork Clearwater River from its confluence with the Clearwater River upstream to Dworshak Dam.

Essential habitat consists of four components: spawning and juvenile rearing, juvenile migration, areas for growth and development to adulthood, and adult migration corridors. Essential features of migration corridors are further defined as: substrate, water quality, water quantity, water velocity, cover/shelter, food (juveniles only), riparian vegetation, space, and safe passage conditions.

The main 5th field watersheds on Umatilla National Forest with designated critical habitat are the Lower Grande Ronde River and Asotin Creek watersheds.

Life History

Snake River fall chinook spawn above Lower Granite Dam in the mainstem Snake River, and in the lower reaches of major tributaries entering below Hells Canyon Dam. Adult fall chinook enter the Columbia River in July and August. The Snake River component of the fall chinook run migrates past the Lower Snake river mainstem dams in September and October. Spawning occurs from October through November. Juveniles emerge from the gravels in March and April of the following year. Downstream migration generally begins within several weeks of emergence (Becker, 1970, Allen and Meekin, 1973), and juveniles rear in backwaters and shallow water areas through mid-summer before smolting and migrating to the ocean—thus they exhibit an ocean-type juvenile history. Once in the ocean, they spend 1 to 4 years (though usually 3 years) before beginning their

spawning migration. Fall returns in the Snake River system are typically dominated by 4-year-old fish.

Fall chinook returns to the Snake River generally declined through the first half of this century (Irving and Bjornn 1991). In spite of the declines, the Snake River basin remained the largest single natural production area for fall chinook in the Columbia drainage into the early 1960s (Fulton 1968). Spawning and rearing habitat for Snake River fall chinook was significantly reduced by the construction of a series of Snake River mainstem dams. Historically, the primary spawning fall chinook spawning areas were located on the upper mainstem Snake River. Currently, natural spawning is limited to the area from the upper end of Lower Granite Reservoir to Hells Canyon dam and the lower reaches of the Imnaha, Grande Ronde, Clearwater and Tucannon Rivers.

Action Area Information

Lower Grande Ronde River Subbasin, approximately 25 percent of which is within Umatilla NF, has 10 major streams that contain more than five miles of anadromous fish habitat inside National Forest System land, including Grande Ronde River, Wenaha River, Butte Creek, Crooked Creek, Joseph Creek, Elk Creek, Davis Creek, Cottonwood Creek, Mud Creek and Wildcat Creek.

Wenaha River holds roughly 26 miles of anadromous fish habitat inside the Umatilla National Forest. Lower Snake/Asotin sub-basin includes the Asotin River, which has 10 miles of anadromous fish habitat inside Umatilla National Forest System land. Lower Snake/Tucannon Subbasin, approximately 10 percent of which is within the Umatilla National Forest, has one major stream, Tucannon River, which holds roughly 13 miles of anadromous fish habitat inside National Forest System land.

Middle Columbia River (MCR) steelhead (Threatened)

Critical Habitat

Critical habitat was designated for Middle Columbia River steelhead on September 2, 2005 (70 FR 52630). NMFS designates critical habitat based on physical and biological features that are essential to the listed species. Essential features of designated critical habitat are: (1) substrate, (2) water quality, (3) water quantity, (4) water temperature, (5) water velocity, (6) cover/shelter, (7) food for juveniles, (8) riparian vegetation, (9) space, and (10) safe passage conditions (50 CFR 226.212).

The three freshwater primary constituent elements of critical habitat are:

- 1) Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development;
- 2) Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks;
- 3) Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

Recent designated critical habitat on the Umatilla National Forest includes the stream channels in each designated reach, and a lateral extent as defined by the ordinary high water line (Sept. 2, 2005; 70 FR 52629). The primary constituent elements essential for conservation of listed ESUs are those sites and habitat components that support one or more fish life stages, including freshwater spawning sites, freshwater rearing sites, and freshwater migration corridors.

The main 5th field watersheds on Umatilla National Forest with designated critical habitat are the Upper Walla Walla River, Mill Creek, Upper Touchet River, Upper Umatilla River, Meacham Creek, Birch Creek, Upper North Fork John Day River, Granite Creek, North Fork John Day River/Big Creek, Desolation Creek, Upper Camas Creek, Lower Camas Creek, North Fork John Day River/Potamus Creek, Wall Creek and Lower North Fork John Day River watersheds.

Life History

Major drainages in this ESU are the Deschutes, John Day, Umatilla, Walla-Walla, Yakima, and Klickitat river systems. Almost all steelhead populations within this ESU are summer-run fish, the exceptions being winter-run components returning to the Klickitat and Fifteen Mile Creek watersheds. A balance between 1- and 2-year-old smolt emigrants characterizes most of the populations within this ESU. Adults return after 1 or 2 years at sea.

Most fish in this ESU smolt at two years and spend one to two years in salt water before re-entering fresh water, where they may remain up to a year before spawning. Age-2-ocean steelhead dominate the summer steelhead run in the Klickitat River, whereas most other rivers with summer steelhead produce about equal numbers of both age-1- and 2-ocean fish. Juvenile life stages (i.e., eggs, alevins, fry, and parr) inhabit freshwater/riverine areas throughout the range of the ESU. Parr usually undergo a smolt transformation as 2-year-olds, at which time they migrate to the ocean. Subadults and adults forage in coastal and offshore waters of the North Pacific prior to returning to spawn in their natal streams. A non-anadromous form of *O. mykiss* (redband trout) co-occurs with the anadromous form in this ESU, and juvenile life stages of the two forms can be very difficult to differentiate. In addition, hatchery steelhead are also distributed within the range of this ESU.

Recent estimates of the proportion of natural spawners of hatchery origin range from low (Yakima, Walla Walla, and John Day Rivers) to moderate (Umatilla and Deschutes Rivers). Most hatchery production in this ESU is derived primarily from within-basin stocks.

Action Area Information

Walla Walla Subbasin, approximately 10 percent of which is within Umatilla NF, has four major streams that contain more than five miles of anadromous fish habitat inside National Forest System land, including North Fork Walla Walla River, South Fork Walla Walla River, North Fork Touchet River, and Mill Creek. The South Fork Walla Walla River holds roughly 13 miles of anadromous fish habitat inside the National Forest.

Umatilla Subbasin, approximately 15 percent of which is within Umatilla National Forest, has six major streams that contain more than five miles of anadromous fish habitat inside National Forest System land, including North Fork Umatilla River, South Fork Umatilla River, Ryan Creek, Meacham Creek, North Fork Meacham Creek, and Pearson Creek. Meacham Creek holds roughly 15 miles of anadromous fish habitat inside National Forest System land.

North Fork John Day Subbasin, approximately 50 percent of which is within the Umatilla National Forest has 20 major streams that contain more than five miles of anadromous fish habitat inside National Forest System land, including North Fork John Day River, Big Wall Creek, Wilson Creek,

Ditch Creek, Mallory Creek, Potamus Creek, Camas Creek, Fivemile Creek, Hidaway Creek, Granite Creek, Clear Creek, Olive Creek, Lake Creek, Crane Creek, Desolation Creek, South Fork Desolation Creek, East Fork Meadow Brook Creek, Winom Creek, and Big Creek. North Fork John Day River holds roughly 33 miles of anadromous fish habitat inside the Umatilla National Forest.

Snake River Basin (SRB) Steelhead (Threatened)

Critical Habitat

Critical habitat was designated for Snake River steelhead on September 2, 2005 (70 FR 52630). NMFS designates critical habitat based on physical and biological features that are essential to the listed species. Essential features of designated critical habitat are: (1) substrate, (2) water quality, (3) water quantity, (4) water temperature, (5) water velocity, (6) cover/shelter, (7) food for juveniles, (8) riparian vegetation, (9) space, and (10) safe passage conditions (50 CFR 226.212). The three freshwater primary constituent elements of critical habitat are:

- 1) Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development;
- 2) Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks;
- 3) Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

Recent designated critical habitat on the Umatilla National Forest includes the stream channels in each designated reach, and a lateral extent as defined by the ordinary high water line (Sept. 2, 2005; 70 FR 52629). The primary constituent elements essential for conservation of listed ESUs are those sites and habitat components that support one or more fish life stages, including freshwater spawning sites, freshwater rearing sites, and freshwater migration corridors.

The main 5th field watersheds on Umatilla National Forest with designated critical habitat are the Asotin Creek, Upper Grande Ronde River, Meadow Creek, Grande Ronde River/Five Points Creek, Willow Creek, Lookingglass Creek, Grande Ronde River/Cabin Creek, Grande Ronde River/Grossman Creek, Wenaha River, Lower Grande Ronde River and Upper Tucannon River watersheds.

Life History

The Snake River historically supported more than 55 percent of total natural-origin production of steelhead in the Columbia River Basin. It now has approximately 63 percent of the basin's natural production potential (Mealy, 1997). The Snake River steelhead ESU is distributed throughout the Snake River drainage system, including tributaries in southwest Washington, eastern Oregon and north/central Idaho (NMFS, 1997a).

Snake River 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 habitat that is considerably warmer and drier (on an annual basis) than other steelhead ESUs. Snake River basin steelhead are generally classified as summer run, based on their adult run timing patterns. Summer steelhead enter the Columbia River from late June to October. After holding over the winter, summer steelhead spawn during the following spring (March to May). Managers classify up-river summer steelhead runs into two groups based primarily on ocean age and adult size upon return to the Columbia River. A-run steelhead are predominately age-1 ocean fish while B-run steelhead are larger, predominated by age-2 ocean fish.

With one exception (the Tucannon River production area), the tributary habitat used by Snake River steelhead ESU is above Lower Granite Dam. Major groupings of populations and/or subpopulations can be found in (1) the Grande Ronde River system; (2) the Imnaha River drainage; (3) the Clearwater River drainages; (4) the South Fork Salmon River; (5) the smaller mainstem tributaries before the confluence of the mainstem; (6) the Middle Fork salmon production areas, (7) the Lemhi and Pahsimeroi valley production areas and (8) upper Salmon River tributaries.

The A-run populations are found in the tributaries to the lower Clearwater River, the upper Salmon River and its tributaries, the lower Salmon River and its tributaries, the Grande Ronde River, Imnaha River, and possibly the Snake River's mainstem tributaries below Hells Canyon Dam. B-run steelhead occupy four major subbasins, including two on the Clearwater River (Lochsa and Selway) and two on the Salmon River (Middle Fork and South Fork); areas that are for the most part not occupied by A-run steelhead. Some natural B-run steelhead are also produced in parts of the mainstem Clearwater and its major tributaries. There are alternative escapement objectives of 10,000 (Columbia River Fisheries Management Plan) and 31,400 (Idaho) for B-run steelhead. B-run steelhead, therefore, represent at least 33 percent and as much as 60 percent of the production capacity of the ESU.

B-run steelhead are distinguished from the A-run component by their unique life history characteristics. B-run steelhead were traditionally distinguished as larger fish with a later run timing. The recent review by the U.S. v. Oregon Technical Advisory Committee (TAC), a group that monitors adult salmon and steelhead escapement in the Snake River Basin, indicated that different populations of steelhead do have different size structures, with populations dominated by larger fish (i.e., greater than 77.5 cm) occurring in the traditionally defined B-run basins. Larger fish occur in other populations throughout the basin, but at much lower rates. Evidence suggests that fish returning to the Middle Fork Salmon River and Little Salmon River have a more equal distribution of large and small fish. B-run steelhead also are generally older. A-run steelhead are predominately 1-ocean fish, whereas most B-run steelhead generally spend 2 or more years in the ocean before spawning. The differences in ocean age are primarily responsible for the differences in the size of A- and B-run steelhead. However, B-run steelhead are also thought to be larger at any given age than A-run fish. This may be due, at least in part, to the fact that B-run steelhead leave the ocean later in the year than A-run steelhead and thus have an extra month or more of ocean residence when growth rates are thought to be greatest.

Action Area Information

Lower Grande Ronde River sub-basin, approximately 25 percent of which is within the Umatilla National Forest, has 10 major streams that contain more than five miles of anadromous fish habitat inside National Forest System land, including Grande Ronde River, Wenaha River, Butte Creek, Crooked Creek, Elk Creek, Swamp Creek, Davis Creek, Cottonwood Creek, Mud Creek and Wildcat Creek. Wenaha River holds roughly 26 miles of anadromous fish habitat inside the Umatilla National Forest.

Lower Snake/Asotin Subbasin has one major stream that contains more than five miles of anadromous fish habitat inside the Umatilla National Forest. Asotin River holds 10 miles of anadromous habitat inside the National Forest System land. Lower Snake/Tucannon Subbasin, approximately 10 percent of which is within Umatilla National Forest, has one major stream, Tucannon River, which holds roughly 13 miles of anadromous fish habitat inside National Forest System land.

Upper Grande Ronde River Subbasin, approximately 10 percent of which is within the Umatilla National Forest, has 14 major streams that contain more than five miles of anadromous fish habitat inside National Forest System land, including Meadow Cr., Burnt Corral Cr., McCoy Cr., Indian Cr., Dark Canyon, Spring Creek, Five Points Creek, Sheep Creek, Clear Creek, Beaver Creek, Limber Jim Creek, Lookingglass Creek, Little Lookingglass Creek, and Phillips Creek. Lookingglass Creek holds roughly 7 miles of anadromous fish habitat inside the Umatilla National Forest.

Columbia River Bull Trout

This section is taken directly out of the R6 2005 FEIS Fish BA so as not to recreate information.

The FWS BOs for the FS LRMPs as amended by the NWFP and the FS LRMPs as amended by the PACFISH and INFISH provided a general description of the status of bull trout in the NWFP (USDI, 1998 and USDI, 2004). The draft Bull Trout Recovery Plan provides information on the distribution and abundance of bull trout in all Distinct Population Segments (DPS) in the conterminous United States, and offers the most recent status information for the species by recovery unit (USDI, 2002). Of the 23 recovery units for bull trout, 16 extend into NF lands. Chapters 2, 5 to 14, and 20 to 24 of the Draft Recovery Plans describe the current distribution and abundance of the recovery units considered in the BA. Reasons for decline for each recovery unit are identified within draft Bull Trout Recovery Plans.

Detailed accounts of life history, taxonomy and behavior can be found in the final rule listing the Columbia River and Klamath River populations of bull trout as threatened (USFWS, 1998b), and in the determination of threatened status for bull trout in the conterminous United States (USFWS, 1999a) for Coastal-Puget Sound, and the Status of Oregon's bull trout; distribution, life history, limiting factors, management considerations, and status (Buchanan et al., 1997).

The FWS has draft recovery plans for the Columbia River and Klamath River DPSs (USFWS 2002a) and the Coastal-Puget Sound DPS (USFWS 2004a). Through these efforts, the FWS has converted bull trout subpopulations into "core areas." Core areas represent a combination of habitat that provides all elements for the long-term security of bull trout and the presence of bull trout inhabiting core habitat.

Thus, core areas form the basis on which to gauge recovery within a recovery unit. Thus, a core area, by definition, is considered habitat occupied by bull trout and serves as a biologically discrete unit upon which to base bull trout recovery. Within core areas, groups of bull trout or local populations which spawn in various tributaries are generally characterized by relatively small amounts of genetic diversity within a tributary, but high levels of genetic divergence between tributaries (chapter 1, recovery plan). Individual local populations may come and go or expand and contract over time, but the focus of the draft recovery plan is maintaining all existing core areas.

Critical Habitat

Critical habitat was designated by the FWS for the Columbia River DPS bull trout on October 6, 2004 (69 FR 59996) (USFWS 2004b). Lands not designated as critical habitat for Columbia River

Basin bull trout include those that do not meet the requirement of needing special management or protection and are excluded due to the exercise of the Secretary of Interior's Authority under section 4(b)(2) of the ESA.

On September 21, 2004, the FWS designated 2,812 km (1,748 mi) of streams and 24,781 ha (61,235 ac) of lakes in Oregon, Idaho, and Washington as critical habitat for bull trout. Within the Columbia River Basin, 1,136 km (706 mi) of streams in Oregon and 1,186 km (737 mi) of streams in Washington were designated as critical habitat (USFWS 2004b).

The FWS determined that PACFISH, INFISH, the Interior Columbia Basin Ecosystem Management Project (ICBEMP) strategy, Aquatic Conservation Strategy (ACS) provide conservation, adequate protection and special management for the primary constituent elements (PCEs) essential for bull trout. Protection is at least comparable to designating critical habitat. As a result, those lands are not being designated critical habitat as they do not meet the statutory definition. In many specific ways these plans are superior to a designation in that they require enhancement and restoration of habitat, acts not required by the designation.

The FWS critical habitat designation identified those physical and biological features of the habitat that are essential to the conservation of the species and that may require special management consideration or protection. These physical and biological features include, but are not limited to:

- Space for individual and population growth
- Space for normal behavior; food, water, or other nutritional or physiological requirements
- Cover or shelter
- Sites for breeding, reproduction, or rearing of offspring
- Habitats that are protected from disturbance or are representative of the historic geographical and ecological distribution of a species

All areas proposed as critical habitat for bull trout are within the historic geographic range of the species and contain one or more of these physical or biological features essential to the conservation of the species. The FWS also included a list of known primary constituent elements with the critical habitat description. The primary constituent elements may include, but are not limited to, features such as spawning sites, feeding sites, and water quality or quantity. The FWS determined the primary constituent elements for bull trout from studies of their habitat requirements, life-history characteristics, and population biology, as outlined above. These primary constituent elements are:

- Permanent water having low levels of contaminants such that normal reproduction, growth and survival are not inhibited
- Water temperatures ranging from 2 to 15 °C (36 to 59 °F), with adequate thermal refugia available for temperatures at the upper end of this range. Specific temperatures within this range will vary depending on bull trout life history stage and form, geography, elevation, diurnal and seasonal variation, shade, such as that provided by riparian habitat, and local groundwater influence
- Complex stream channels with features such as woody debris, side channels, pools, and undercut banks to provide a variety of depths, velocities, and instream structures
- Substrates of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine substrate less than 0.63 cm (0.25) in diameter and minimal substrate embeddedness are characteristic of these conditions

- A natural hydrograph, including peak, high, low and base flows within historic ranges or, if regulated, a hydrograph that demonstrates the ability to support bull trout populations
- Springs, seeps, groundwater sources, and subsurface water connectivity to contribute to water quality and quantity
- Migratory corridors with minimal physical, biological, or chemical barriers between spawning, rearing, overwintering, and foraging habitats, including intermittent or seasonal barriers induced by high water temperatures or low flows
- An abundant food base including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish
- Few or no predatory, interbreeding, or competitive nonnative species present

Life History and Habitat Description

Biology

Bull trout exhibit both resident and migratory life-history strategies (Rieman and McIntyre 1993). Resident bull trout complete their entire life cycle in the tributary (or nearby) streams in which they spawn and rear. Migratory bull trout spawn in tributary streams where juvenile fish rear one to four years before migrating to either a lake (adfluvial form), river (fluvial form) (Fraley and Shepard 1989, Goetz 1989), or in certain coastal areas, to saltwater (anadromous) (Cavender 1978; McPhail and Baxter 1996; WDFW et al. 1997). Resident and migratory life-history forms may be found together but it is unknown if they represent a single population or separate populations (Rieman and McIntyre 1993). Either form may give rise to offspring exhibiting either resident or migratory behavior (Rieman and McIntyre 1993). The multiple life-history strategies found in bull trout populations represent important diversity (both spatial and genetic) that help protect these populations from environmental stochasticity.

The size and age of bull trout at maturity depends upon the life-history strategy and habitat limitations. Resident fish tend to be smaller than migratory fish at maturity and produce fewer eggs (Fraley and Shepard 1989; Goetz 1989). Resident adults usually range from 150 to 300 millimeters (6 to 12 inches) total length (TL). Migratory adults however, having lived for several years in larger rivers or lakes and feeding on other fish, grow to a much larger size and commonly reach 600 millimeters (24 inches) TL or more (Pratt 1985; Goetz 1989).

The largest verified bull trout was a 14.6-kilogram (32-pound) adfluvial fish caught in Lake Pend Oreille, Idaho, in 1949 (Simpson and Wallace 1982).

Size differs little between life-history forms during their first years of life in headwater streams, but diverges as migratory fish move into larger and more productive waters (Rieman and McIntyre 1993).

Ratliff (1992) reported that bull trout under 100 mm (4 inches) in length were generally only found in the vicinity of spawning areas, and that fish over 100 mm were found downstream in larger channels and reservoirs in the Metolius River Basin. Juvenile migrants in the Umatilla River were primarily 100-200 mm long (4 to 8 inches) in the spring and 200-300 mm long (8 to 12 inches) in October (Buchanan et al. 1997). The age at migration for juveniles is variable. Ratliff (1992) reported that most juveniles reached a size to migrate downstream at age 2, with some at ages 1 and 3 years. Pratt (1992) had similar findings for age-at-migration of juvenile bull trout from tributaries of the Flathead River. The seasonal timing of juvenile downstream migration appears similarly variable.

Bull trout normally reach sexual maturity in 4 to 7 years and may live longer than 12 years. The species is iteroparous (i.e., can spawn multiple times in their lifetime) and adults may spawn each year or in alternate years (Batt 1996). Repeat-spawning frequency and post-spawning mortality are not well documented (Leathe and Graham 1982; Fraley and Shepard 1989; Pratt 1992; Rieman and McIntyre 1996) but post-spawn survival rates are believed to be high.

Bull trout typically spawn from late August to November during periods of decreasing water temperatures (below 9 degrees Celsius/48 degrees Fahrenheit). Redds are often constructed in stream reaches fed by springs or near other sources of cold groundwater (Goetz 1989; Pratt 1992; Rieman and McIntyre 1996). Migratory bull trout frequently begin spawning migrations as early as April and have been known to move upstream as far as 250 kilometers (km) (155 miles) to spawning grounds in Montana (Fraley and Shepard 1989; Swanberg 1997). In Idaho, bull trout moved 109 km (67.5 miles) from Arrowrock Reservoir to spawning areas in the headwaters of the Boise River (Flatter 1998). In the Blackfoot River, Montana, bull trout began spring spawning migrations in response to increasing temperatures (Swanberg, 1997). Depending on water temperature, egg incubation is normally 100 to 145 days (Pratt 1992), and after hatching, juveniles remain in the substrate. Time from egg deposition to emergence of fry may surpass 220 days. Fry normally emerge from early April through May, depending on water temperatures and increasing stream flows (Pratt 1992; Ratliff and Howell 1992).

Bull trout are opportunistic feeders, with food habits primarily a function of size and life-history strategy. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macro-zooplankton, and small fish (Boag 1987; Goetz 1989; Donald and Alger 1993). Adult migratory bull trout feed on various fish species (Leathe and Graham 1982; Fraley and Shepard 1989; Brown 1992; Donald and Alger 1993). In coastal areas of western Washington, bull trout feed on Pacific herring (*Clupea pallasii*), Pacific sand lance (*Ammodytes hexapterus*), and surf smelt (*Hypomesus pretiosus*) in the ocean (WDFW et al. 1997).

Habitat Affinities

Bull trout have more specific habitat requirements than most other salmonids (Rieman and McIntyre 1993). Habitat components that influence the species' distribution and abundance include water temperature, cover, channel form and stability, valley form, spawning and rearing substrate, and availability of migratory corridors (Fraley and Shepard, 1989; Goetz 1989; Hoelscher and Bjornn 1989; Sedell and Everest 1991; Howell and Buchanan 1992; Pratt 1992; Rieman and McIntyre 1993, 1995; Rich 1996; Watson and Hillman 1997).

Watson and Hillman (1997) concluded that watersheds must have specific physical characteristics to provide the habitat requirements necessary for bull trout to successfully spawn and rear and that these specific characteristics are not necessarily present throughout these watersheds. Because bull trout exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993), individuals of this species should not be expected to simultaneously occupy all available habitats (Rieman et al. 1997).

Bull trout are found primarily in cold streams, although individual fish are found in larger, warmer river systems throughout the Columbia River Basin (Fraley and Shepard 1989; Rieman and McIntyre 1993, 1995; Buchanan et al. 1997; Rieman et al. 1997). Water temperature above 15 degrees Celsius (59 degrees Fahrenheit) is believed to limit bull trout distribution, a limitation that may partially explain the patchy distribution within a watershed (Fraley and Shepard 1989; Rieman and McIntyre 1995).

Spawning areas are often associated with cold-water springs, groundwater infiltration, and the streams with the coldest summer water temperatures in a given watershed (Pratt 1992; Rieman and McIntyre 1993; Rieman et al., 1997; Baxter et al., 1999). Water temperatures during spawning generally range from 5 to 9 degrees Celsius (41 to 48 degrees Fahrenheit) (Goetz 1989). The requirement for cold water during egg incubation has generally limited the spawning distribution of bull trout to high elevations in areas where the summer climate is warm. Rieman and McIntyre (1995) found in the Boise River Basin that no juvenile bull trout were present in streams below 1613 m (5000 feet). Similarly, in the Sprague River Basin of south-central Oregon, Ziller (1992) found in four streams with bull trout that “numbers of bull trout increased and numbers of other trout species decreased as elevation increased. In those streams, bull trout were only found at elevations above 1774 m [5500 feet].”

All life-history stages of bull trout are associated with complex forms of cover, including large woody debris, undercut banks, boulders, and pools (Fraley and Shepard 1989; Goetz 1989; Hoelscher and Bjornn 1989; Sedell and Everest 1991; Pratt 1992; Thomas 1992; Rich 1996; Sexauer and James 1997; Watson and Hillman 1997). Jakober (1995) observed bull trout overwintering in deep beaver ponds or pools containing large woody debris in the Bitterroot River drainage, Montana, and suggested that, because of the need to avoid anchor ice in order to survive, suitable winter habitat may be more restricted than summer habitat. Maintaining bull trout habitat requires stability of stream channels and of flow (Rieman and McIntyre 1993). Juvenile and adult bull trout frequently inhabit side channels, stream margins, and pools with suitable cover (Sexauer and James 1997). These areas are sensitive to activities that directly or indirectly affect stream channel stability and alter natural flow patterns. For example, altered stream flow in the fall may disrupt bull trout during the spawning period, and channel instability may decrease survival of eggs and young juveniles in the gravel from winter through spring (Fraley and Shepard 1989; Pratt 1992; Pratt and Huston 1993).

Preferred bull trout spawning habitat consists of low-gradient stream reaches with loose, clean gravel (Fraley and Shepard 1989). In the Swan River, Montana, abundance of bull trout redds was positively correlated with the extent of bounded alluvial valley reaches, which are likely areas of groundwater to surface water exchange (Baxter et al. 1999). Survival of bull trout embryos planted in stream areas of groundwater upwelling used by bull trout for spawning were significantly higher than embryos planted in areas of surface-water recharge not used by bull trout for spawning (Baxter and McPhail 1999). Pratt (1992) indicated that increases in fine sediment reduce egg survival and emergence.

Migratory corridors link seasonal habitats for all bull trout life-history forms. For example, in Montana, migratory bull trout make extensive migrations in the Flathead River system (Fraley and Shepard 1989), and resident bull trout in tributaries of the Bitterroot River move downstream to overwinter in tributary pools (Jakober 1995). The ability to migrate is important to the persistence of bull trout (Rieman and McIntyre 1993; M. Gilpin in litt. 1997; Rieman et al. 1997). Migrations facilitate gene flow among local populations when individuals from different local populations interbreed, or stray, to non-natal streams. Local bull trout populations that are extirpated by catastrophic events may also become re-established by migrants.

Action Area Information

Bull trout are found in the following **fifth field** and *sixth field* watersheds on the Umatilla National Forest:

- **Asotin Creek** (*North Fork Asotin Creek*)
- **Desolation Creek** (*North Fork Desolation Creek*)

- **Grande Ronde River/Grossman Creek** (*Elbow Creek, Grande Ronde River/Bear Creek*)
- **Granite Creek** (*Clear Creek*)
- **Lookingglass Creek** (*Little Lookingglass Creek, Upper Lookingglass Creek, Lower Lookingglass Creek*)
- **Meacham Creek** (*Boston Canyon, Camp Creek, North Fork Meacham Creek*),
- **Mill Creek** (*Upper Mill Creek*,
- **Upper Touchet River** (*Upper North Fork Touchet River*)
- **Upper Tucannon River** (*Cummings Creek, Little Tucannon River, Tucannon River Headwaters, Panjab Creek*)
- **Upper Umatilla River** (*Bear Creek, North Fork Umatilla River, Buck Creek, Ryan Creek, South Fork Umatilla River, Thomas Creek*)
- **Upper Walla Walla River** (*North Fork Walla Walla River, Upper South Fork Walla Walla River, Middle South Fork Walla Walla River*)
- **Wenaha River** (*Upper South Fork Wenaha River, Lower South Fork Wenaha River, Wenaha River/Rock Creek, Lower Butte Creek, Upper Butte Creek, Wenaha River/Cross Canyon, Upper Crooked Creek, Lower Crooked Creek, Lower Wenaha River, First Creek*)

Middle Columbia River Spring Run Chinook Salmon (Sensitive)

Middle Columbia River spring run Chinook salmon are stream-type salmon that spawn in the Klickitat, Deschutes, John Day, and Yakima Rivers.

Historically, spring-run populations from the Hood, Walla Walla, and Umatilla Rivers may have also belonged in this ESU, but these populations are now considered extinct. MCR spring run Chinook salmon immigrate to the ocean as yearlings apparently far off-shore, as they do not appear in appreciable numbers in any ocean fisheries. The majority of adults spawn as 4-year-olds, with the exception of fish returning to the upper tributaries of the Yakima River, which return predominantly at age 5. Populations are genetically distinguishable from other stream-type chinook salmon in the Columbia and Snake Rivers. Streams in this region drain desert areas east of the Cascades (Columbia Basin Ecoregion) and are ecologically differentiated from the colder, less productive, glacial streams of the upper Columbia River Spring-Run ESU and from the generally higher elevation streams of the Snake River.

Redband Trout (Sensitive)

Inland redband trout are the same species as steelhead (*O. mykiss*) and juveniles cannot be distinguished phenotypically. Isolated populations of *O. mykiss* above longstanding natural passage barriers (and barring hatchery introductions) may be reasonably assumed to be resident redbands.

Redband trout are sensitive to changes in water quality and habitat. Redband trout of interior Oregon basins are believed to be best adapted to cold (less than 21° C), clean water, but a few Great Basin populations possess a hereditary basis to function at high temperatures (Behnke 1992). Adult redband trout are generally associated with pool habitats, although various life stages require a wide array of habitats for rearing, hiding, feeding, and resting. Pool habitat is important refugia during low water periods.

Spawning success decreases as fine sediment increases. The quantity and quality of pool and interstitial habitat also decrease as fine sediment increases. Other important habitat features include healthy riparian vegetation, undercut banks, and LWD (large woody debris).

Spawning occurs during the spring, generally from March to June. Redds tend to be located where velocity, depth and bottom configuration induce water flow through the stream substrate, generally in gravels at the tailouts of pools. Water temperatures influence emergence of fry, which is typically from June through July.

Redband trout are widely distributed across Oregon east of the Cascade Mountains. According to the Umatilla Forest GIS data, redband trout are found within the Project Area in the North Fork John Day River/Potamus Creek, Wall Creek and Lower John Day River/Kahler Creek watersheds. They are also found in the Tucannon and Asotin watersheds (S. Reinecke Pers. Comm.).

Westslope Cutthroat Trout (Sensitive)

Westslope cutthroat trout inhabit small mountain streams, main rivers, and large natural lakes. They require cool, clean, well-oxygenated water and prefer large pools and slow velocity areas. Juveniles of migratory populations may spend 1-4 years in their natal streams, and then move (usually in spring or early summer, and/or in fall in some systems) to a main river or lake where they remain until they spawn (Spahr et al. 1991, McIntyre and Rieman 1995). Many fry disperse downstream after emergence (McIntyre and Rieman 1995). Juveniles tend to overwinter in interstitial spaces in the substrate. Larger individuals congregate in pools in winter.

Westslope cutthroat trout spawn in small tributary streams on clean gravel substrate where mean water depth is 17-20 cm and mean water velocity is 0.3-0.4 m/sec.

They tend to spawn in natal stream (see McIntyre and Rieman 1995). Adfluvial populations live in large lakes in the upper Columbia drainage and spawn in lake tributaries. Fluvial populations live and grow in rivers and spawn in tributaries. Resident populations complete the entire life history in tributaries. All three life-history forms may occur in a single basin (McIntyre and Rieman 1995). Migrants may spawn in the lower reaches of the same streams used by resident fishes. Maturing adfluvial fishes move into the vicinity of tributaries in fall and winter and remain there until they begin to migrate upstream in spring. Of migratory spawners, some remain in tributaries during summer months but most return to the main river or lake soon after spawning (Behnke 1992).

Westslope cutthroat trout are native to the upper Missouri River drainage in Montana, extreme northwestern Wyoming, and southern Alberta; the Salmon, Clearwater, and Spokane (including the Coeur d'Alene and St. Joe drainages) river drainages in Idaho; and the Clark Fork and Kootenai river drainages in Idaho, Montana, and British Columbia (Spahr et al. 1991); also westward to the Cascade Mountains as disjunct populations, for example, in the Lake Chelan drainage in Washington, the John Day River drainage in Oregon (where limited hybridization with redband trout apparently has occurred), and elsewhere in mid-Columbia tributaries (Behnke 1992), including the Methow, Entiat, and Wenatchee river Basins in Washington (McIntyre and Rieman 1995).

According to Umatilla Forest GIS data, westslope cutthroat trout occur within the Project Area in the Granite Creek and Desolation Creek subwatersheds.

Margined Sculpin (Sensitive)

Margined sculpin appear adaptable to a wide variety of currents and substrates (Lee et al. 1980). In areas where they are not competing with other species of sculpins, they are typically found in moderate to rapid current on rubble or gravel substrate. They probably spawn in the spring like most other sculpins.

Margined sculpin occurs in the Columbia River drainage from the Tucannon and Walla Walla River systems, Washington, to the Umatilla River system, Oregon. They are fairly common within that small range (Page and Burr 1991).

3.5.3 Environmental Consequences

This section discusses the general effects of herbicides used for invasive plant treatments to fish and other aquatic organisms as well as the specific effects of the no action and action alternatives. Much of the effects discussion is incorporated from Risk Assessments and the Fisheries BA completed for the R6 2005 FEIS and associated documents. A full discussion of the Herbicide Risk Assessments in regard to proposed treatments can be found in the Fisheries Report available in the Project Record. A discussion of toxicity indexes and hazard quotients of chemicals and surfactants is disclosed in appendix E (printed in the DEIS and available upon request or on line at <http://www.fs.fed.us/R6/uma/projects>).

General Effects of Herbicide Use for Invasive Plant Treatments

Fish and other aquatic organisms have the potential to be adversely affected by contact with concentrations of herbicide that exceed levels of concern in water. For example, herbicides applied near a stream could inadvertently contact aquatic invertebrates that rely on terrestrial plants to fulfill their life cycle and thus reduce the availability of food for fish. Herbicides can alter the structure and biological processes of both terrestrial and aquatic ecosystems; these effects of herbicides may have more profound influences on communities of fish and other aquatic organisms than direct lethal or sublethal toxic effects (Norris et al. 1991). Herbicides used for aquatic invasive plant control have been shown to affect aquatic ecosystem components, however concentration of herbicides coming in contact with water following land-based treatments are unlikely to be great enough to cause such changes (ibid). Since this project does not include treatment of emergent aquatic plants, effects from aquatic invasive plant control are not a concern.

Sublethal effects can include changes in behaviors or body functions that are not directly lethal to the aquatic species, but could have consequences to reproduction, juvenile to adult survival, or other important components to health and fitness of the species. Or, sublethal effects could result from effects to habitat or food supply.

Residues in food from direct spraying are not likely to occur since herbicides would not be applied to emergent aquatic vegetation. Drift from herbicides used on terrestrial vegetation may affect aquatic vegetation at low concentrations, however they show little tendency to bioaccumulate and are likely to be rapidly excreted by organisms as exposure decreases (Norris et al. 1991).

Therefore, while the herbicides considered for use in this project may kill individual aquatic plants, aquatic habitats and the food chain would not be adversely impacted because the amount of herbicide that could be delivered is relatively low in comparison with levels of concern from SERA Assessments and the duration to which any non-target organism (including aquatic plants) would be exposed is very short-lived and impacts to aquatic plants would be very localized.

The application rate and method, along with the behavior of the herbicide in the environment, influence the amount and length of time an herbicide persists in water, sediment, or food sources. Once in contact, the herbicide must be taken up by the organism and moved to the site of biochemical action where the chemical must be present in an active form at a concentration high enough to cause a biological effect (Norris et al. 1991).

Herbicides vary in their environmental activity and physical form. Some may be oil- or water-soluble molecules dissolved in liquids, or attached to granules for dry application to soil surface. Herbicides may move from their location of application through leaching (dissolved in water as it moves through soil), volatilization (moving through air as a dissolved gas), or adsorption (attached by molecular electrical charges to soil particles that are moved by wind or water).

In soil and water, herbicides may persist or decompose by sunlight, microorganisms, or other environmental factors. Soil properties, rainfall patterns, slope, and vegetative cover greatly influence the likelihood that an herbicide will move off-site, once applied.

The movement, persistence, and fate of an herbicide in the environment determine the likelihood and nature of the exposure fish and other aquatic organisms will receive. Stream and lake sediments may be contaminated with herbicides by deposition of soils carrying adsorbed herbicides from the land or by absorption of herbicides from the water (Norris et al. 1991). Persistence of the herbicide is the predominant factor affecting its presence in the soil.

In combination with other site and biological factors, these characteristics influence both the probability of meeting site-specific goals for invasive plant control, and the potential of impacting non-target components of the environment.

The effects from the use of any herbicide depends on the toxic properties (hazards) of that herbicide, the level of exposure to that herbicide at any given time, and the duration of that exposure. Risk to aquatic organisms can be reduced by choosing herbicides with lower potential for toxic effects when exposure may occur. Exposure of federally listed fish to herbicides can be greatly reduced or increased depending on site-specific implementation techniques and timing used in herbicide application projects. Exposure can be reduced by such methods as streamside buffer zones, timing applications to avoid sensitive seasons, varying application methods used, and combining herbicide treatments with non-herbicide treatments to reduce overall use. Project design features included in the proposed action are expected to minimize potential exposures to federally listed fish.

The hazards associated with each herbicide active and inert ingredients, impurity or metabolite were determined by a thorough review of available toxicological studies. For a background discussion of all toxicological tests and endpoints considered in Forest Service Risk Assessments, refer to SERA, 2001.

Herbicides are not pure compounds and they contain the active ingredient, impurities, adjuvants, inert ingredients, and may also contain surfactants. The effects of active ingredients to wildlife (includes fish) are discussed first, followed by a discussion of the effects of the surfactants.

Effects of Active Ingredients in Herbicide to Aquatic Organisms

The most sensitive effect from the most sensitive species tested was used to determine the toxicity indices for each herbicide. Quantitative estimates of dose from each exposure scenario were compared to the corresponding toxicity index to determine the potential for adverse effect. Doses below the toxicity indices resulted in discountable effects. Table 41 lists the toxicity indices for fish used for the R6 2005 FEIS BA. Values in bold are the values used to assess risk to fish from acute exposures. Indices represent the most sensitive endpoint from the most sensitive species for which adequate data are available. Numbers in bold indicate the toxicity index used in calculating the hazard quotient for exposures to listed fish. Generally, the lowest toxicity index available for the species most sensitive to effects was used. Measured chronic data (NOEC) was used when they were lower than 1/20th of an acute LC50 because they account for at least some sublethal effects, and doses that are protective in chronic exposures are more certain to be protective in acute exposures.

Table 41. Toxicity Indices for Listed Fish

Herbicide	Duration	Endpoint	Dose	Species	Effect Noted at LOAEL
Chlorsulfuron	Acute	NOEC	2 mg/L (1/20th of LC50)	Brown trout	LC50 at 40 mg/L
	Chronic	NOEC1	3.2 mg/L	Brown trout	rainbow trout length affected at 66mg/L
Clopyralid	Acute	NOEC	5 mg/L (1/20th of LC50)	Rainbow trout	LC50 at 103 mg/L
	Chronic				none available
Glyphosate (no surfactant)	Acute	NOEC	0.5 mg/L (1/20th/LC50)	Rainbow trout	LC50 at 10 mg/L
	Chronic	NOEC	2.57 mg/L2	Rainbow trout	Life-cycle study in minnows; LOAEL not given
Glyphosate with POEA surfactant	Acute	NOEC	0.065 mg/L (1/20th of LC50)	Rainbow trout	LC50 at 1.3 mg/L for fingerlings (surfactant formulation)
	Chronic	NOEC	0.36 mg/L	salmonids	estimated from full life-cycle study of minnows (surfactant formulation)
Imazapic	Acute	NOEC	100 mg/L	all fish	at 100 mg/L, no statistically sig. mortality
	Chronic	NOEC	100 mg/L	fathead minnow	No treatment related effects to hatch or growth
Imazapyr	Acute	NOEC	5 mg/L (1/20th LC50)	trout, catfish, bluegill	LC50 at 110-180 mg/L for North American species
	Chronic	NOEC	43.1 mg/L	Rainbow	"nearly significant" effects on early life stages at 92.4 mg/L
Metsulfuron methyl	Acute	NOEC	10 mg/L	Rainbow	lethargy, erratic swimming at 100 mg/L
	Chronic	NOEC	4.5 mg/L	Rainbow	standard length effects at 8 mg/L
Picloram	Acute	NOEC	0.04 mg/L (1/20th LC50)	Cutthroat trout	LC50 at 0.80 mg/L
	Chronic	NOEC	0.55 mg/L	Rainbow trout	body weight and length of fry reduced at 0.88 mg/L
Sethoxydim	Acute	NOEC	0.06 mg/L (1/20th LC50)	Rainbow trout	LC50 of Poast at 1.2 mg/L
	Chronic	NOEC			none available
Sulfometuron methyl	Acute	NOEC	7.3 mg/L	Fathead minnow	No signs of toxicity at highest doses tested
	Chronic	NOEC	1.17 mg/L	Fathead minnow	No effects on hatch, survival or growth at highest doses tested
Triclopyr acid	Acute	NOEC	0.26 mg/L (1/20th LC50)	Chum salmon	LC50 at 5.3 mg/L3
	Chronic	NOEC	104 mg/L	Fathead minnow	Reduced survival of embryo/larval stages at 140 mg/L
Triclopyr BEE	Acute		0.012 mg/L	Bluegill sunfish	LC50 at 0.25 mg/L

Herbicide	Duration	Endpoint	Dose	Species	Effect Noted at LOAEL
	Chronic ⁴	NOEC	104 mg/L	Fathead minnow	Reduced survival of embryo/larval stages at 140 mg/L
NPE Surfactants	Acute ⁵	NOEC	0.2 mg/L (1/20th LC50)	fathead minnow, rainbow trout	LC50 at 4.0 mg/L
	Chronic ⁶	NOEC	1.0 mg/L	trout	no LOEL given

1 Chronic value for brown trout (sensitive sp.) was estimated using relative potency in acute and chronic values for rainbow trout, and the acute value for brown trout.

2 Estimated from minnow chronic NOEC using the relative potency factor method (SERA Glyphosate 2003).

3 Using Wan et al. (1989) value for lethal dose

4 Chronic and subchronic data for triclopyr are limited to triclopyr TEA. No data is available for triclopyr BEE.

5 Exposure includes small percentage of NP and NP1-2E (Bakke, 2003).

6 Chronic exposures are from degradedates NP1EC and NP2EC, because NPE breaks down rapidly and NPECs are more persistent (Bakke, 2003).

NOEC = No Observable Effect Concentration

LOAEL – Lowest Observed Adverse Effect Level

Results of the exposure scenarios as applied to listed fish on the Umatilla National Forest are displayed below in Table 42. The R6 2005 FEIS Fish BA displayed the results by placing stars (*) and diamonds (♦) where there was an exceedence in the level of concern (LOC). For purposes of this BE the table of stars and diamonds has been modified to show the hazard quotients (HQ) value in order to exemplify the magnitude of difference between typical and high application rates, and aquatic and non-aquatic formulations. Where table cells display “--” and no number means that there was no exceedence in level of concern. The LOC exceedences occur when the HQ value exceeds 1. Exceedences in LOC indicate occasions where the expected exposure concentration (EEC) is greater than the no observable effect concentration (NOEC) value used for that aquatic species group, which may lead to an indirect effect to listed aquatic species if conditions were similar to what was modeled in the SERA risk assessments. To calculate a HQ, simply take the ratio of EEC/NOEC values. Toxicity indices used in the R6 2005 FEIS for aquatic organisms are NOEC values, refer to table above.

Two types of indirect effects are possible, those toxic to the listed aquatic species, and those mediated by toxic effects to an ecosystem component that is part of the Primary Constituent Elements (PCE) or associated essential habitat features.

Table 42. Hazard Quotient Values for Acute Exposure Estimates for Sensitive Aquatic Organisms from the R6 2005 FEIS Broadcast Spray Scenarios

Aquatic Species Group	Chlorsulfuron	Clopyralid	Glyphosate w/o surfactant*	Glyphosate with surfactant	Imazapic	Imazapyr*	Metsulfuron Methyl	Picloram	Sethoxydim	Sulfometuron Methyl	Triclopyr TEA*	Triclopyr BEE	NPE surfactant
Application Rate													
Fish High	--	--	6	43	--	--	--	5	3	--	15	125	--
Typical	--	--	2	12	--	--	--	2	2.5	--	1.5	13	--
Aquatic invertebrates High	--	--	--	2.5	--	--	--	--	--	--	--	1.8	--
Typical	--	--	--	--	--	--	--	--	--	--	--	--	--
Algae High	5	--	--	3.1	--	5	--	--	--	3	9.5	214	--
Typical	--	--	--	--	--	2	--	--	--	--	--	21	--
Aquatic macrophytes High	1064	--	--	--	1.4	8	9	2	--	36	9.5	214	--
Typical	234	--	--	--	--	3	2	--	--	4	--	21	--
'--' Predicted concentrations less than or equal to the estimated or measured 'no observable effect concentration' at both typical and high application rates. '*' Aquatic formulations analyzed in the R6 2005 FEIS.													

The exposure scenarios do not account for factors such as timing of application, animal behavior and feeding strategies, animal presence within a treatment area, or other relevant factors such as site-specific conditions. However, the SERA risk assessments do represent a worst-case scenario that is a good benchmark for assessing true concerns with actual application. Results of triclopyr exposures take into account the strict limitations on use identified in the forest plan standards, which makes the exposure scenarios implausible or impossible. Table 42 displays the results of exposure if all "worst-case" conditions reflected in the scenario occur, which is highly unlikely for Umatilla National Forest.

The Chronic and Acute Exposures section focuses on the probability and magnitude of acute exposures from herbicide treatments based on results from the SERA risk assessments (table 42 above).

Effects of Surfactants

Appendix 3c of the SERA 2003 risk assessment summarizes the available ecological information from all of the Material Safety Data Sheets (MSDS) for the formulations that are labeled for forestry applications. It is apparent that these formulations fall into relatively clear groups. The most toxic formulations appear to be Credit Systemic¹⁷, Credit, Glyfos, Glyphosate, glyphosate Original,

¹⁷ All of the formulations listed here are registered trademarks

Prosecutor Plus Tracker, Razor SPI, Razor, Roundup Original, Roundup Pro Concentrate, and Roundup UltraMax. It may be presumed that these formulations contain the most toxic surfactants. Other formulations such as Aqua Neat, Aquamaster, Debit TMF, Eagre, Foresters' Non-Selective Herbicide, Glyphosate VMF, and Roundup Custom are much less acutely toxic (See the BA for this EIS, which is available in the Project Record at the Umatilla National Forest in Pendleton, OR and appendix G for more details about surfactants).

For the SERA 2003 risk assessment, the uncertainties involving the presence or absence of a surfactant and the possibly differing effects of using various surfactants cannot be resolved with certainty. The Umatilla Forest Plan as amended by the R6 2005 ROD addresses this uncertainty through Standard #18.

Alternative A – No Action

Direct and Indirect Effects

Manual, mechanical, cultural and biological treatments would continue under an existing decision from the Umatilla National Forest 1995 EA for the Treatment of Noxious Weeds. Under this alternative less than seven percent of known sites would be treated with herbicide, leaving a heavy reliance on manual treatments, which in many cases is cost prohibitive. Repeated manual treatments may effectively control small, isolated populations of certain plants, however associated labor, time and cost may make manual treatments less practical and effective, especially when treating large infestations.

The decision made in the 95 EA allows use of glyphosate and picloram on up to 125 acres per year. Picloram is a high risk herbicide for aquatic resources but is preferred in many situations because it is a selective herbicide that represses reestablishment of target invasive species. Glyphosate is nonspecific and kills all vegetation.

According to the soil and water analysis for this EIS, there could be a short-term reduction in soil cover for the areas treated. This localized reduction in cover would increase treated areas vulnerability to soil erosion. The effects would be minimal given the small amount of land treated, especially within Aquatic Influence Zones, and the scattered nature of the treatments. These effects would last approximately one season until vegetation became re-established. Most invasive plants provide less stream-shading than native hardwoods and conifers and less bank stabilization than deeper rooted native vegetation.

Invasive plants would continue to grow on sites where treatment is currently not authorized by a NEPA analysis. There is no mechanism in alternative A that allows for early detection rapid response (EDRR). No broadcast application takes place within RHCAs under the no action alternative so there is little chance of herbicide drift into streams.

Cumulative Effects

This alternative is covered under the decision made for the 1995 EA. Treatments would occur on an extremely small percentage of any watersheds in the Project Area. Direct and indirect effects are so insignificant and temporary that treatment under no action could not plausibly contribute to significant cumulative effects.

Alternative B – Proposed Action

Direct and Indirect Effects

Non-herbicide Treatment Methods

All invasive plant treatments can result in some erosion, stream sedimentation, and disturbance to aquatic organisms if carried out over a large enough area. Sedimentation can cover eggs or spawning gravels, reduce prey availability, and harm fish gills. Soil can also become compacted and prevent the establishment of native vegetative cover. All invasive plant treatments can reduce insect biomass, which would result in a decrease in the supply of food for fish and other aquatic organism. Reductions in cover, shade, and sources of food from riparian vegetation could result from herbicide deposition in a streamside zone (Norris et al. 1991).

Riparian vegetation affects habitat structure in several important ways. Roots of riparian vegetation hold soil, which stabilizes banks, prevents addition of soil run-off to water bodies with subsequent increases in turbidity or filling substrate interstices, and helps to create overhanging banks. Riparian and emergent aquatic vegetation can provide hiding cover or refuge for fish and other aquatic organisms where native plants have been replaced.

Manual, Mechanical, Site Restoration and Revegetation Methods

Manual and mechanical treatments related to the proposed action are described as methods that may include brush cutters, or other machinery with various types of blades to remove plants. Manual methods include the use of hand-operated tools (e.g., axes, brush hooks, hoes, shovels, hand clippers) to dig up and remove noxious species (USDI 2003).

Direct and indirect effects of manual and mechanical treatments were analyzed in the R6 2005 FEIS (appendix J). Public scoping issues about these treatments were not raised. Manual treatments, such as lopping or shearing, cause an input of organic material (dead roots) into the soil. As the roots are broken down in the soil food web, nutrients will be released. Rainfall may cause these nutrients to be lost to surface runoff or to groundwater. Bare soils combined with high nutrient levels provide ideal conditions for the establishment of many invasive species. In lower intensity infestations, non-target vegetation could provide erosion control as well as a seed source for establishing native vegetation. In areas with larger amounts of bare soil, PDFs require restoration activities to reestablish native vegetation. The intent is to re-establish competitive local, native vegetation post-treatment in areas of bare ground.

The presence of people or crews with hand-held tools along streambanks could lead to localized, sediment/turbidity to fish habitat because of trampling, soil sloughing due to stepping on banks and removal of invasive plant roots. However, amounts of potential localized sediment/turbidity would be negligible because the invasive plant populations in RHCA's on the Umatilla National Forest are not extensive enough to result in significant sediment/turbidity and emergent vegetation will not be treated. Effective invasive plant treatment and restoration of treated sites would improve the function of riparian areas and lead to improved fish habitat conditions.

The proposed action would benefit aquatic ecosystems to the extent they effectively restore riparian habitats, especially habitats adjacent to fish bearing streams. The impacts of invasive plants on these habitats can last decades, while the impacts of treatment tend to be short term. Passive and active restoration would accelerate native vegetative recovery in treated sites.

Removal of plant roots along a streambank will cause some ground disturbance and may introduce some sediment to streams. For example, weed wrenching of scotch broom may loosen soil and cause minor amounts of erosion for approximately one season until vegetation was reestablished. These minor amounts of erosion would be negligible once contact with water is made. Under the proposed action, significant removal of riparian invasive species would not occur because of the proposed use of herbicides reducing the potential for significant soil disturbance.

Using mowing equipment on existing roads is not expected to impact soils. Soil compaction eliminates soil pores and so reduces water infiltration, aeration, and the ability of plants to root effectively. However, the limited amount of mechanical treatment proposed eliminates risk of extensive soil impacts.

While the relative amounts of manual and mechanical treatments vary, the differences in terms of effects from such treatments are negligible. Other mechanical treatments, such as the use of motorized hand tools, are expected to have effects similar to manual treatments.

Turbidity and Sediment

Manual, mechanical, and restoration treatment activities that incorporate substantial ground-disturbing activities in riparian areas may lead to increased erosion and stream sedimentation. Persistence of increased turbidity depends on the size of the suspended particle and velocity of the water. Impacts related to fine sediment depends on the amount of fine sediment introduced and the holding capacity of the surface water. Increased turbidity can reduce feeding ability or gill function in some fish species and fine sediments can cover eggs or spawning gravels. Effects to listed aquatic species will vary with the proximity of the species and their habitat to the treatment area, the sensitivity of the listed species to turbidity and fine sediment, and the size of the area treated.

Manual, mechanical, and restoration treatments include activities such as hand pulling, mowing, brushing, seeding, and planting. Manual treatments within 100 feet of streams with listed species would occur along the North Fork John Day River, Third Creek, Camas Creek and Alder Creek. The amount of sediment created by these non-herbicide treatments is anticipated to be insignificant because the methods of treatments do not include ground disturbing activities by heavy equipment. Ground disturbing activities by hand pulling and planting will cover a relatively small area and any sediment created at these sites would be quickly dispersed in the large volume of water. In addition, the only listed fish species at the location of treatment are bull trout and Middle Columbia steelhead, therefore Snake River steelhead, Snake River Chinook salmon, and Middle Columbia Chinook salmon would not be exposed to effects from treatments at these sites.

Temperature

Aquatic species have specific needs in terms of water temperature. Increasing water temperature may decrease the dissolved oxygen in water which may affect metabolism and food requirements. Many factors influence water temperature including shade, discharge, channel morphology, air temperature, topography, stream aspect, and interactions with ground water. Shade is the factor that has the potential to be impacted by non-herbicide treatments.

Manual, mechanical, and restoration treatments of some invasive plant species (such as knotweed) may decrease riparian vegetative shading in some areas, thereby increasing the amount of solar radiation striking the water. This may result in a warming effect but many other factors in addition to shade affect water temperature. A significant amount of vegetation would need to be removed to change water temperature in the stream, and shade would have to be provided only by the invasive plant removed.

The only known treatment sites that would remove invasive vegetation directly adjacent to water are the Camas Creek and Alder Creek sites. The amount of vegetation that will be removed at these sites is not enough to measurably impact stream temperature and therefore listed fish will not be exposed to the effects of increased stream temperature from treatments at this site.

Herbicide Treatments

Herbicide treatments proposed for use may result in some minor amounts of herbicide coming in contact with water where there may be fish present, however; the likelihood of the amount being at a level of concern is low. The project design features (PDFs) and buffers (See chapter 2.2.3 of the EIS) minimize or eliminate the potential for any herbicide to reach a threshold of concern for listed and sensitive fish species. The proposed action would not apply herbicides directly to any stream for purposes of treating aquatic weeds that are floating or submerged in any situation. There are no sites with emergent vegetation proposed for treatment; therefore the potential for high concentrations causing acute toxicity effects is extremely remote.

An accidental spill could result in concentrations of herbicides that could harm aquatic organisms. The proposed action includes project design features that would reduce the likelihood and impact of a spill. The proposed action allows only certified applicators that have gone through various courses and training to properly use herbicides in a safe manner.

The proposed action includes limitations on the type and application method of herbicides in Aquatic Influence Zones and along roads that have high potential for herbicide delivery to streams. The PDFs included in the proposed action apply to known sites and those detected in the future. In both cases, the limitations in the PDFs are expected to ensure that herbicide use will not exceed a level of concern for aquatic organisms tested by the SERA risk assessments.

Buffers act as a safety zone to limit the potential for herbicides coming in contact with water at concentrations of concern for aquatic resources through leaching, run-off, or drift. The buffers included in the proposed action become more restrictive within Aquatic Influence Zones, especially when water is present. PDFs and buffers were developed based on label advisories, SERA “worst case” risk assessments, previous Section 7 Consultation for the R6 2005 FEIS, Neil Berg’s 2004 study of broadcast drift and run off to streams, as well as monitoring data from other herbicide applications projects.

No broadcast applications of herbicides would occur within 100 feet of perennial and wet intermittent streams, lakes, or wetlands, or on roads that have a high potential for herbicide delivery. The majority of herbicides have 50-foot buffers for spot treatments, except for low risk and aquatic labeled herbicides. Spot applications of aquatic labeled formulations of glyphosate and imazapyr may be used up to the water’s edge or within 15 feet of isolated standing water present in roadside ditches that are outside the stream buffer. Spot applications of aquatic labeled triclopyr may not be used within 15 feet of perennial and wet intermittent streams or other waterbodies.

Spot applications of aquatic formulations of glyphosate and imazapyr are not likely to result in harmful amounts coming in contact with water and harming fish, invertebrates, and algae. Some aquatic plants would be damaged at the immediate spot spray locations. Glyphosate would not be applied directly to water for weed control, but if it does enter the water it is bound tightly to dissolved and suspended particles and to bottom sediments and becomes inactive.

The proposed action limits broadcast application of herbicide to the following situations:

- Outside established buffers for aquatic influence zones along perennial/intermittent streams and other waterbodies (buffers differ by chemical, based on risk factors)
- Outside established buffers when water is present within roadside ditches
- On roads that do not have a high potential for herbicide delivery (see PDF H4)

Analysis of the Effects

Herbicide applications may occur near streams utilized by ESA listed fish species found in the project area. Physiological responses from exposure to herbicides proposed for use are probably similar between bull trout, salmon and steelhead.

Herbicide characteristics and basic hazard identification to aquatic organisms for each herbicide proposed for use is discussed above. The herbicides with a greater likelihood of coming in contact with water are the aquatic formulations of glyphosate, imazapyr, and triclopyr. Therefore, the focus of the quantitative analysis included in this report is on the aquatic formulations. Quantitative analysis of the non-aquatic formulations is covered in the R6 2005 FEIS and is incorporated by reference.

Higher Risk Treatment Scenarios on the Umatilla National Forest

Higher risk treatment scenarios are defined as situations where herbicide exposure could exceed a level of concern for listed fish. Higher risk treatment scenarios also include aerial application of herbicide. Many treatment areas on UNF are within riparian areas and along roads with potential to deliver herbicide to streams. As discussed previously, broadcast treatments would not occur within 100 feet of a wet stream or 50 feet of a dry stream. The treatment methods and herbicides proposed for use within the Aquatic Influence Zone are far less likely to deliver herbicide at levels of concern than broadcasting. Results from the risk assessments far overestimate the amount of herbicide likely to enter surface waters for proposed treatments because actual treatments will not broadcast spray 10 acres immediately adjacent to streams and the proposed action contains PDFs that restrict application methods and rates near water. For more information about how risks are abated see table 6.

Analysis of Higher Risk Scenario 1

The following 6th-field watersheds contain at least ten acres of estimated treatment within the Aquatic Influence Zones. In all cases, the existing treatment sites were found to be small and scattered throughout the watersheds. The PDFs and buffers appear to sufficiently reduce risks to a low level, even if all these treatments were to occur simultaneously (unlikely). One of the 6th field watersheds listed below does not contain any federally listed fish, refer to table 10 in the BE for a complete listing of federally listed fish by 6th field watershed.

Lick Creek – Approximately 17 acres of treatment lie with the aquatic influence zone. One road within this watershed is associated with high risk for delivery of herbicide to streams, with specific PDFs applying. There are no federally listed fish in the Lick Creek 6th field watershed.

North Fork Asotin Creek – Approximately 62 acres of treatment lie within the aquatic influence zone. None of the roads in this watershed are associated with high risk for delivery of herbicides to streams. Federally listed fish include Snake River Steelhead, Snake River Chinook Salmon and Bull Trout.

Little Lookingglass Creek – Approximately 26 acres of treatment lie within the aquatic influence zone. Two roads within this watershed are associated with high risk for delivery of herbicides to streams, with specific PDFs applying. Federally listed fish include Snake River Steelhead and Bull Trout.

Phillips Creek - Approximately 150 acres of treatment lie within the aquatic influence zone. Many roads within this watershed are associated with high risk for delivery of herbicides to streams, with specific PDFs applying. Federally listed fish include Snake River Steelhead

Lower Crooked Creek - Approximately 45 acres of treatment lie within the aquatic influence zone. No roads within this watershed are associated with high risk for delivery of herbicides to streams. Federally listed fish include Bull Trout.

Lower Wenaha River - Approximately 15 acres of treatment lie within the aquatic influence zone. No roads within this watershed are associated with high risk for delivery of herbicides to streams. Federally listed fish include Snake River Steelhead, Snake River Chinook Salmon and Bull Trout.

Little Tucannon River - Approximately 35 acres of treatment lie within the aquatic influence zone. Three roads within this watershed are associated with high risk for delivery of herbicides to streams, with specific PDFs applying. Federally listed fish include Snake River Steelhead, Snake River Chinook Salmon and Bull Trout.

Thomas Creek - Approximately 29 acres of treatment lie within the aquatic influence zone. Many roads within this watershed are associated with high risk for delivery of herbicides to streams, with specific PDFs applying. Federally listed fish include Middle Columbia Steelhead, Middle Columbia Chinook Salmon and Bull Trout.

Butcher Creek - Approximately 66 acres of treatment lie within the aquatic influence zone. Many roads within this watershed are associated with high risk for delivery of herbicides to streams, with specific PDFs applying. Federally listed fish include Middle Columbia Steelhead.

Pearson Creek - Approximately 50 acres of treatment lie within the aquatic influence zone. Many roads within this watershed are associated with high risk for delivery of herbicides to streams, with specific PDFs applying. Federally listed fish include Middle Columbia Steelhead.

Texas Bar - Approximately 28 acres of treatment lie within the aquatic influence zone. Many roads within this watershed are associated with high risk for delivery of herbicides to streams, with specific PDFs applying. Federally listed fish include Middle Columbia Steelhead and Middle Columbia Chinook Salmon.

Bowman Creek - Approximately 39 acres of treatment lie within the aquatic influence zone. Many roads within this watershed are associated with high risk for delivery of herbicides to streams, with specific PDFs applying. Federally listed fish include Middle Columbia Steelhead.

Lane Creek - Approximately 14 acres of treatment lie within the aquatic influence zone. Many roads within this watershed are associated with high risk for delivery of herbicides to streams, with specific PDFs applying. Federally listed fish include Middle Columbia Steelhead and Middle Columbia Chinook Salmon.

East Fork Meadow Creek - Approximately 15 acres of treatment lie within the aquatic influence zone. Many roads within this watershed are associated with high risk for delivery of herbicides to streams, with specific PDFs applying. Federally listed fish include Middle Columbia Steelhead.

Meadow Brook - Approximately 12 acres of treatment lie within the aquatic influence zone. Many roads within this watershed are associated with high risk for delivery of herbicides to streams, with specific PDFs applying. Federally listed fish include Middle Columbia Steelhead.

Upper Ditch - Approximately 29 acres of treatment lie within the aquatic influence zone. Many roads within this watershed are associated with high risk for delivery of herbicides to streams, with specific PDFs applying. Federally listed fish include Middle Columbia Steelhead.

Upper Potamus - Approximately 14 acres of treatment lie within the aquatic influence zone. Two roads within this watershed are associated with high risk for delivery of herbicides to streams, with specific PDFs applying. Federally listed fish include Middle Columbia Steelhead.

Alder/Upper Skookum - Approximately 70 acres of treatment lie within the aquatic influence zone. Many roads within this watershed are associated with high risk for delivery of herbicides to streams, with specific PDFs applying. Federally listed fish include Middle Columbia Steelhead.

Middle Big Wall - Approximately 28 acres of treatment lie within the aquatic influence zone. Many roads within this watershed are associated with high risk for delivery of herbicides to streams, with specific PDFs applying. Federally listed fish include Middle Columbia Steelhead.

Swale Creek - Approximately 13 acres of treatment lie within the aquatic influence zone. Many roads within this watershed are associated with high risk for delivery of herbicides to streams, with specific PDFs applying. Federally listed fish include Middle Columbia Steelhead.

Upper Wilson - Approximately 21 acres of treatment lie within the aquatic influence zone. Many roads within this watershed are associated with high risk for delivery of herbicides to streams, with specific PDFs applying. Federally listed fish include Middle Columbia Steelhead.

Analysis of Higher Risk Scenario 2

Aerial application is proposed in three 6th field watersheds;

Little Tucannon River – Approximately 37 acres are estimated for treatment within this watershed, however none of these acres are within the aquatic influence zone. These acres are not concentrated within a single part of the watershed. Specific PDFs apply to aerial treatments, including no application with 300 feet of fish-bearing streams. This watershed includes Snake River steelhead, Snake River Chinook salmon and bull trout.

Middle North Fork Touchet River – Approximately 632 acres are estimated for treatment within this watershed, however none of these acres are within the aquatic influence zone. In fact, the treatment site is more than a mile from the nearest fish-bearing stream. Specific PDFs apply to aerial treatments, including no application with 300 feet of fish-bearing streams. There are no listed fish within this watershed.

Headwaters Tucannon River – Approximately 7 acres are estimated for treatment within this watershed, however, none of these acres are within the aquatic influence zone. In fact the treatment site is almost a mile from the nearest fish-bearing stream. Specific PDFs apply to aerial treatments, including no application with 300 feet of fish-bearing streams. This watershed includes Snake River steelhead, Snake River Chinook salmon and bull trout.

SERA Risk Assessment Worksheets

Some streams within road corridors have treatment areas that parallel both the road and the stream with many continuous acres proposed for treatment within the aquatic influence zone. In reality most of these areas have pockets of invasive plants within a much larger assembly of native vegetation along the stream. To model a worst case scenario a few of these areas were modeled for site specific soil types and rainfall with the GLEAMS spreadsheet. In addition, the model was run for the highest rainfall on the Forest with sandy soil, the soil most likely to allow runoff into the stream (table 43). Only aquatic glyphosate and aquatic imazapyr were modeled with the high rainfall and sandy soil as they are the only herbicides allowed for spot spray treatments below bankfull.

Table 43. Water contamination rates (mg/L per lb/acre), peak concentrations in water, and range of Hazard Quotients for worst case scenario on the Umatilla NF for aquatic glyphosate, aquatic imazapyr, and aquatic triclopyr at the typical application rate

Herbicide/ location	Annual Precipitation (inches)	Peak Water Contam. Rate (mg/L per lb/acre)	Range of Concentration in water (dose) (mg/L)	Toxicity Index for Listed Fish (mg/L)	Range of Hazard Quotients
Glyphosate (2 lbs/acre)					
NF Asotin River	20-24	0.001 to 0.011	0.002 to 0.022	0.5	0.0004 to 0.004
Little Phillips Creek	32-56	0.01 to 0.035	0.02 to 0.07	0.5	0.04 to 0.14
Dry, Intermittent Channel, Sandy Soil	25-75	0.0191 to 0.09854	0.03821 to 0.19854	0.5	0.0764 to 0.3942
Jubilee Lake	48-56	0.0031 to 0.00425	0.0062 to 0.0085	0.5	0.0726 to 0.211
Imazapyr (0.45 lbs/acre)					
NF Asotin River	20-24	0.0001 to 0.00042	0.000024 to 0.000019	0.135	0.0002 to 0.001
Little Phillips Creek	32-56	0.00021 to 0.00096	0.000095 to 0.00043	0.135	0.0007 to 0.003
Dry, Intermittent Channel, Sandy Soil	25-75	0.0000691 to 0.00035	0.0003.11 to 0.0001057	0.135	0.0002 to 0.0008
Jubilee Lake	48-56	0.000019 to 0.000021	0.0000086 to 0.0000095	0.135	0.000006 to 0.000007
Clpyralid (1 lbs/acre)					
NF Asotin River	20	0.0045 to 0.0093	0.0015 to 0.0303	5.15	0.0003 to 0.0006
Little Phillips Creek	32-56	0.008 to 0.011	0.0019 to 0.0039	5.15	0.0004 to 0.0007
Dry, Intermittent Channel, Sandy Soil	Not allowed According to PDFs and buffers				
Jubilee Lake	48-56	0.013 to 0.0204	0.0046 to 0.032	5.15	0.0004 to 0.0006

Sources: Precipitation records from USGS, local site knowledge; SERA 2003, 2004.

NF Asotin River has up to 81 acres of treatment of scotch thistle on 3.9 miles of the River and tributaries within 100 feet of the stream channel. Modeling limitations include: modeling only the 50 feet closest to the channel and 1.6 miles of stream channel, and assumes broadcast spray, not spot spray.

The results of this analysis indicate all HQ values were below one; therefore, no levels of concern were exceeded for sensitive fish. The R6 2005 FEIS notes that as HQ increases above one, the margins of safety decrease, compared to the most sensitive toxic effect shown in laboratory studies.

It is highly unlikely that the low values modeled in the worksheets would even be approached given that treatment methods within buffers established by PDFs for each herbicide/surfactant are limited to spot and hand/select methods. Hand selective treatment methods have a much less likelihood of herbicides coming in contact with water than spot spray (which far reduces exposure potential compared to broadcast treatment).

Aerial Herbicide Treatments

Aerial application is proposed for 675 acres on the Pomeroy District. The primary overstory in these areas is ponderosa pine with small numbers of lodgepole pine and grand fir, and grasslands. The herbicide most likely to be applied is clopyralid. It is a selective herbicide that would leave soil cover by not harming nontarget vegetation such as pines, firs and grasses. The dead plants would also be left on site contributing to ground cover. Erosion and associated sediment delivery to streams would be minimal and transitory.

Of more concern is water contamination from drift during aerial spray. Project design features were designed to control drift and overspray of headwater streams. PDF E-3 requires that fueling would not occur in RHCAs; F-5 requires that herbicide applications occur when winds are between 2 and 8 miles per hour; F-6 requires coarse droplet size to minimize drift; F-8i requires that aerial units be ground checked and water features marked and buffered before application. Buffers of 300 feet are required on perennial or wet intermittent streams and wetlands, and 100 feet buffers are required on dry channels. Based on buffer effectiveness documented by Rashin and Graber (1993) and Dent and Robben (2000) concentrations of herbicides reaching streams are expected to be well below concentrations of concern to beneficial uses.

Accidental Spill

Accidental spills are not considered within the scope of the project. Project design features would reduce the potential for spills to occur, and if an accident were to occur, minimizes the magnitude and intensity of impacts. An herbicide transportation and handling plan is a project requirement. This plan would address spill prevention and containment.

EDRR

Early detection rapid response (EDRR) allows for newly identified or currently unknown invasive plant infestations to be treated using the range of methods analyzed in the Umatilla Invasive Plant FEIS 2006, on sites similar to those presently proposed for treatment. PDFs would protect aquatic resources by constraining treatment methods according to site-specific conditions.

The analysis for treatments within the aquatic influence zone for EDRR is summarized below. Included is the basis for treatment caps with respect to EDRR.

Treatments above Bankfull

The basis of the analysis for treatments from bankfull to upland are the HQ's from the SERA risk assessment scenario worksheets and the assumptions of the worst-case scenario (10 contiguous acres of broadcast spray, adjacent to a 1.8 cfs stream, sparsely vegetated). Ten contiguous acres of treatment in a 6th field subwatershed are not likely to exceed the HQ's calculated for the NF Asotin River, Little Phillips Creek and Jubilee Lake sites. Ten acres of infestation spread out in patches (not contiguous) throughout a 6th field sub-watershed are also not likely to exceed the HQ's in the SERA risk assessment scenario because there is more water and less herbicide in each patch area than that estimated in the scenario. Based on knowledge of rainfall patterns, stream sizes, fish species present, it is reasonable to expect that treatments within the riparian/aquatic influence areas within a 6th field subwatershed would not exceed the HQ's estimated by the SERA risk assessment worksheet calculations. To provide a limit to the extent of treatment and herbicide exposure for projects implemented under EDRR where there are federally listed fish or designated critical habitat, no more than 10 acres per year within the riparian area of any 1.5 mile stream reach within a 6th field watershed would be treated at a single time.

Proximity, Probability, and Magnitude of Effects from Herbicide Use

By using the analysis above, the effects to each ESA listed fish species and habitat can be described by further analyzing factors of proximity, probability, magnitude, duration, nature, distribution, frequency, and timing of the proposed action. Habitat pathway indicators discussed in this analysis for herbicide use is "chemical contaminants" and "sediment/turbidity". The proposed action had no causal mechanisms to affect any other matrix indicators; therefore this analysis will address only those indicators mentioned above. This section complements the designated critical habitat analysis.

Chemical Contaminants Indicator

Baseline information for this indicator within the UNF is "properly functioning" for the majority of watersheds. Watersheds identified as "at unacceptable risk" for the chemical contaminants indicator are the Walla Walla and Umatilla River subbasins.

Walla Walla Subbasin – The Oregon Department of Environmental Quality's and the Washington Department of Ecology's 1996 303(d) lists of water quality-limited waterbodies (DEQ 1996, DOE 1996) were used as data sources for this indicator. DEQ does not list any stream in the Walla Walla River subbasin as being water quality-limited for chemical contamination or nutrients. The DOE lists Mill Creek for excess amounts of chlorine, nitrogen, and phosphorus, and lists the Walla Walla River for excess amounts of a variety of agricultural chemicals. The DOE does not specify any particular sections of the streams as containing these contaminants, but the nature of the pollutants suggests that they are present only in lower stream reaches in the subbasin. Forest Service water quality testing has not found these contaminants to be present on the Forest. For this reason, this indicator was judged to be properly functioning for the four subpopulation checklists, but was judged to be functioning at unacceptable risk for the combined checklist due to factors occurring after the streams leave Forest System land. However, it should be noted that these contaminants may not be at concentrations of concern during the winter months when steelhead and fall chinook would normally be using these lower stream reaches.

Umatilla River Subbasin - DEQ does not list any stream in the upper Umatilla River, Meacham Creek, or Pearson Creek as being water quality-limited for chemical contamination or nutrients. This indicator was judged to be properly functioning for steelhead. This parameter was judged to be not properly functioning for the subbasin as a whole due to elevated phosphorus levels in two stream reaches (DEQ 1996).

It is expected that the baseline condition will not change as a result of the proposed action. The discussions below complement the analysis for designated critical habitat.

Proximity of Streams to Treatment Areas

Many of the treatment areas are on or near roads that cross either perennial or intermittent streams on UNF. For the purpose of analyzing close proximity of treatment areas to listed fish, streams containing listed fish that flow through treatment areas were identified, and a width of 100ft from the stream up into the riparian area was used to identify treatment areas that may be located immediately adjacent to a stream (i.e., up to bankfull) with listed fish. A total of 158 treatment areas have been identified that include areas within 100 ft of streams with ESA fish (Table 44).

Many mainstem rivers, such as Grande Ronde River and Tucannon River serve as migration corridors to pacific salmon and bull trout. Tributaries to these mainstem rivers provide spawning and rearing habitat. For fall Chinook, juveniles will not typically be found in freshwater on UNF because they migrate to salt water immediately upon emergence. Most of the spawning and rearing for bull trout occurs in the headwaters, and typically in the lower reaches only adults can be found.

Herbicide application is expected to occur on the streambanks in close proximity to rearing and migration habitat within the rivers listed in table 44, however no treatments would occur below the ordinary high water mark. Spring chinook salmon may occasionally utilize some of these stream reaches for spawning. Steelhead and Chinook share a majority of the rivers, while other fish are limited on habitat based on their ability to access tributaries or quality of habitat available.

Table 44. Herbicide Treatment Areas on the UNF within 100 feet of Streams with Listed Fish

Fifth Field Watershed Name	Stream Name	Treatment Site Identification	Treatment Type	Listed Fish Species* present within Stream*
Asotin Creek	Charlie Creek	614045279	Herbicide	SRS
	North Fork Asotin Creek	614400194	Herbicide	SRS, SRC, BT
Lookingglass Creek	Little Lookingglass Creek	6140601365	Herbicide	SRS ,BT
	Mottet Creek	6140600747	Herbicide	SRS
		6140600054	Herbicide	SRS
Grande Ronde River/Cabin Creek	Phillips Creek	06140600577	Biocontrol	SRS
		06140600773	Herbicide	SRS
		06140600781	Herbicide	SRS
		06140601318	Biocontrol	SRS
		06140601319	Biocontrol	SRS
		06140601320	Herbicide	SRS
		06140601321	Herbicide	SRS
		06140601322	Herbicide	SRS
		06140601323	Biocontrol	SRS
		06140601534	Herbicide	SRS
	Little Phillips Creek	06140600393	Herbicide	SRS
Wenaha River	Third Creek	06140600141	Manual	BT
		06140600142	Herbicide	BT
		06140600138	Herbicide	BT
	Crooked Creek	06140600144	Herbicide	SRS, SRC, BT

Fifth Field Watershed Name	Stream Name	Treatment Site Identification	Treatment Type	Listed Fish Species* present within Stream*
		06140600146	Herbicide	SRS, SRC, BT
		06140600153	Herbicide	SRS, SRC, BT
		06140600155	Herbicide	SRS, SRC, BT
		06140600241	Herbicide	SRS, SRC, BT
		06140600242	Herbicide	SRS, SRC, BT
		06140600244	Herbicide	SRS, SRC, BT
		06140600263	Herbicide	SRS, SRC, BT
	Wenaha River	06140600157	Herbicide	SRS, SRC, BT
		06140600508	Herbicide	SRS, SRC, BT
		06140600268	Herbicide	SRS, SRC, BT
Lower Grande Ronde River	Menatchee Creek	06140600236	Herbicide	SRC
Upper Tucannon River	Unnamed Trib to Tucannon River	06140600236	Herbicide	SRS, BT
		06140600162	Herbicide	SRS, BT
	Little Tucannon River	06140600056	Herbicide	SRS, BT
		06140600057	Herbicide	SRS, BT
		06140600075	Herbicide	SRS, BT
	Tucannon River	06140600075	Herbicide	SRS, SRC, BT
		06140600083	Herbicide	SRS, SRC, BT
		06140600088	Herbicide	SRS, SRC, BT
		06140600099	Herbicide	SRS, SRC, BT
	Panjab Creek	06140600098	Herbicide	SRS, BT
Upper Walla Walla River	South Fork Walla Walla River	06140600229	Herbicide	MCS, BT
		06140600183	Herbicide	MCS, BT
Mill Creek	Low Creek	06140601356	Biocontrol	BT
	Tiger Creek	06140600261	Herbicide	MCS
		06140600271	Herbicide	MCS
Upper Touchet River	North Fork Touchet River	06140600176	Herbicide	MCS
Upper Umatilla River	North Fork Umatilla River	0614066928	Herbicide	MCS, MCC, BT
	Umatilla River	06140601361	Herbicide	MCS, MCC, BT
		06140601380	Herbicide	MCS, MCC, BT
	South Fork Umatilla River	06140600099	Herbicide	MCS, MCC, BT
		06140600166	Herbicide	MCS, MCC, BT
		06140601776	Herbicide	MCS, MCC, BT
Meacham Creek	Meacham Creek	06140600706	Herbicide	MCS, MCC, BT
Birch Creek	Pearson Creek	06140600221	Herbicide	MCS
		06140600305	Herbicide	MCS
		06140600308	Herbicide	MCS
		06140600309	Herbicide	MCS
Upper North Fork John Day River	Unnamed Trib to North Fork John Day River	06140600483	Herbicide	MCS
		06140600484	Biocontrol	MCS

Fifth Field Watershed Name	Stream Name	Treatment Site Identification	Treatment Type	Listed Fish Species* present within Stream*
Granite Creek	Granite Creek	06140500109	Herbicide	MCC, MCS
		06140500140	Herbicide	MCC, MCS
		06140500241	Herbicide	MCC, MCS
		06140500289	Herbicide	MCC, MCS
		06140500390	Herbicide	MCC, MCS
		06140500391	Herbicide	MCC, MCS
		06140500392	Herbicide	MCC, MCS
		06140500492	Herbicide	MCC, MCS
		06140500108	Herbicide	MCS
		06140500111	Herbicide	MCS
		06140500219	Herbicide	MCS
		06140500248	Herbicide	MCS
		06140500571	Herbicide	MCS
		06140500546	Herbicide	MCC, MCS
	Lick Creek	06140500155	Herbicide	MCS
		06140500195	Herbicide	MCS
	Squaw Creek	06140500559	Herbicide	MCS
	Ten Cent Creek	06140500492	Herbicide	MCS
	Unnamed Trib to Granite Creek	06140500047	Herbicide	MCS, MCC
		06140500048	Herbicide	MCS, MCC
		06140500337	Herbicide	MCS, MCC
North Fork John Day River/Big Creek	North Fork John Day River	06140500103	Herbicide	MCS, MCC
		06140500125	Herbicide	MCS, MCC
		06140500135	Herbicide	MCS, MCC
		06140500142	Herbicide	MCS, MCC
		06140500147	Herbicide	MCS, MCC
		06140500186	Herbicide	MCS, MCC
		06140500226	Herbicide	MCS, MCC
		06140500236	Herbicide	MCS, MCC
		06140500237	Herbicide	MCS, MCC
		06140500324	Herbicide	MCS, MCC
		06140500413	Herbicide	MCS, MCC
		06140500416	Herbicide	MCS, MCC
		06140500419	Herbicide	MCS, MCC
		06140500420	Herbicide	MCS, MCC
		06140500421	Herbicide	MCS, MCC
		06140500423	Herbicide	MCS, MCC
		06140500425	Herbicide	MCS, MCC
		06140500430	Herbicide	MCS, MCC
		06140500432	Herbicide	MCS, MCC
		06140500434	Herbicide	MCS, MCC
		06140500435	Herbicide	MCS, MCC
		06140500436	Herbicide	MCS, MCC
		06140500437	Herbicide	MCS, MCC
		06140500438	Herbicide	MCS, MCC
		06140500440	Herbicide	MCS, MCC
		06140500442	Herbicide	MCS, MCC
		06140500443	Herbicide	MCS, MCC
		06140500457	Herbicide	MCS, MCC

Fifth Field Watershed Name	Stream Name	Treatment Site Identification	Treatment Type	Listed Fish Species* present within Stream*
	Texas Bar Creek	06140500485	Herbicide	MCS, MCC
		06140500610	Herbicide	MCS, MCC
		06140500466	Herbicide	MCS
Desolation Creek	Desolation Creek	06140500038	Herbicide	MCS, MCC
		06140500045	Herbicide	MCS, MCC
		06140500451	Herbicide	MCS, MCC
		06140500591	Herbicide	MCS, MCC
		06140500594	Herbicide	MCS, MCC
Upper Camas Creek	Lane Creek	06140500225	Herbicide	MCS
	Bear Wallow Creek	06140500080	Herbicide	MCS
	Camas Creek	06140500012	Herbicide	MCS
		06140500576	Manual	MCS
	Bowman Creek	06140500280	Herbicide	MCS
	Hideaway Creek	06140500069	Herbicide	MCS, MCC
		06140500599	Herbicide	MCS, MCC
Lower Camas Creek	Fivemile Creek	06140500004	Herbicide	MCS
	Sugarbowl Creek	06140500004	Herbicide	MCS
North Fork John Day River/Potamus Creek	Ditch Creek	06140203122	Herbicide	
		06140203121	Herbicide	MCS
	Mallory Creek	06140203080	Herbicide	MCS
	Potamus Creek	0614026885	Herbicide	MCS
		0614026853	Herbicide	MCS
	Hinton Creek	06140500166	Herbicide	MCS
	West Fork Meadow Brook Creek	06140500060	Herbicide	MCS, MCC
		06140500215	Herbicide	MCS, MCC
		06140500298	Herbicide	MCS, MCC
	East Fork Meadow Brook Creek	06140500517	Herbicide	MCS
Wall Creek	Wilson Creek	06140200591	Herbicide	MCS
		06140201428	Herbicide	MCS
		06140203029	Herbicide	MCS
		06140203030	Herbicide	MCS
	Big Wall Creek	06140201068	Herbicide	MCS
		06140201427	Herbicide	MCS
		06140201430	Herbicide	MCS
		06140203023	Herbicide	MCS
		06140203027	Herbicide	MCS
		06140200717	Herbicide	MCS
	South Fork Big Wall Creek	06140203021	Herbicide	MCS
	Indian Creek	06140203059	Herbicide	MCS
	Little Wall Creek	06140201119	Herbicide	MCS
		06140201121	Herbicide	MCS
		06140203063	Herbicide	MCS
		06140200452	Herbicide	MCS
	Alder Creek	06140200229	Herbicide	MCS
		06140202953	Manual	MCS
	Unnamed Trib to Alder Creek	06140200176	Herbicide	MCS

Fifth Field Watershed Name	Stream Name	Treatment Site Identification	Treatment Type	Listed Fish Species* present within Stream*
	Swale Creek	06140200180	Herbicide	MCS
		06140200187	Herbicide	MCS
		06140203070	Herbicide	MCS

Probability of Herbicide Exposure (Increased Chemical Contaminants)

The probability that an ESA listed fish will be exposed to non aquatic formulations of herbicide is very low. The probability of being exposed to the aquatic formulation of triclopyr is also very low. However, there is a possibility of being exposed to aquatic formulations of glyphosate and imazapyr but the probability of being exposed at levels of concern is very low. Glyphosate and imazapyr have a low propensity for leaching, but can enter water by other means such as overspray, drift, or erosion of contaminated soil. This probability is discussed by potential exposure vector below:

Water contamination from hand/select methods: The probability of hand-select methods resulting in herbicides coming in contact with water is low.

The plant begins to take in the herbicide immediately after it is applied directly to a leaf or stem with the use of approved binding surfactants. Overland transport to the water column from stem injections is unlikely because the injected herbicide is contained within the plant stem. Transfer through the stem to the roots might allow some herbicide to enter the soil, but it is likely to adhere to soil particles or is degraded by soil microbes before leaching into the ground water. In addition, other general protection measures of the applicators themselves result in a very low risk of water contamination.

Water contamination from drift: The ability to contaminate water varies with the herbicide application method. For example, spot and hand application methods substantially reduce the potential for loss of non-target vegetation because there is little potential for drift. Drift is most associated with broadcast treatments and can be mitigated to some extent by the applicator. Droplet size is key to drift as larger droplets are heavier and therefore less affected by wind and evaporation.

Water contamination from contaminated soil: Riparian treatments are limited in spatial extent, and given the restrictions noted above, it is likely that much of the herbicide will have either adhered to the soil or broken down not being available for transport into the water. See previous sections for more information on herbicide properties. The probability of water contamination from contaminated soil is low.

Water contamination from an accidental spill: Concentrations of herbicides in the water as a result of an accidental spill depend on the rate of application and the streams' ratio of surface area to volume. The persistence of the herbicide in water depends on the length of stream where the accidental spill took place, velocity of stream flow, and hydrologic characteristics of the stream channel. The concentration of herbicides would decrease rapidly down-stream because of dilution and interactions with physical and biological properties of the stream system (Norris et al. 1991). Project design features would reduce the potential for spills to occur, and if an accident were to occur, minimize the magnitude and intensity of impacts. An herbicide transportation and handling plan addressing containment and spill prevention is a project requirement. All personnel applying the herbicides would be trained in both.

No spills have been reported for herbicide application using similar treatment methods in northwest Oregon and western Washington. No spills are documented on the Umatilla National Forest. Thus, the risk of accidental spill under the proposed action is extremely low.

Probability of exposure to aquatic organisms: The probability of localized effects to individual aquatic plants is low since no treatments are proposed within the bankfull channel. Spot applications of aquatic formulations of glyphosate and imazapyr on streamside vegetation are not likely to result in harmful amounts coming in contact with water and harming fish, invertebrates, and algae.

The use of glyphosate will not be applied directly to water for weed control, but if it does enter the water it is bound tightly to dissolved and suspended particles and to bottom sediments and becomes inactive. The probability of exposure to aquatic organisms is low.

Direct Mortality due to Trampling: The project does not propose treatments on emergent vegetation that would require applicators to enter the water, therefore the risk of disturbing spawning adults or stepping on redds is very low.

Magnitude of the Effect

The severity and intensity of herbicides coming in contact with streams containing ESA listed fish is variable due to different application techniques and specific herbicide properties. The severity and intensity of the effect will depend on the size of stream, type of waterbody, herbicide type and its properties. Any treatment of emergent vegetation proposed in the future would require additional NEPA analysis.

Hand/select Methods: The magnitude of hand-select methods resulting in water contamination is discountable because the application will be directed to a leaf or stem, and the herbicide and surfactant will quickly bind to the plant material. The magnitude is predicted to be extremely low from any droplets that come in contact with water.

Drift: Drift is the most likely vector for herbicides coming in contact with water from treatments within riparian areas. However, the magnitude of drift compared to an aerial application or broadcast application, such as what was analyzed above in the SERA risk assessment worksheets, immediately adjacent to a stream is extremely low. Label restrictions, restrictions on application rate, type of herbicide, application method restrictions, buffers, and the use of a surfactant all factor in to limiting the potential amount of drift. In addition, roads that have a high potential for herbicide delivery have been identified and have added restrictions, such as no broadcasting. The magnitude of drift is expected to be very low.

Contaminated soil: Riparian treatments are limited in spatial extent, and given the restrictions on methods and type of herbicide, it is likely that much of the herbicide will have either adhered to the soil or broken down not being available for transport into the water. The intent of the proposed action is to apply herbicide to a plant, not to the soil. Any amount of herbicide that would indirectly come in contact with the soil as a result of drift or droplets is expected to be insignificant; therefore the magnitude of contaminated soil would be low.

Accidental spill: The probability of an accidental spill for this project is low. If a spill were to occur, the magnitude is limited by project design features, where only daily use quantities of herbicides will be transported to the project site, transport via watercraft will require extra precautions, impervious material will be placed over mixing areas in such a manner as to contain any spills associated with mixing/refilling, and the requirement that a spill kit will be on site during all herbicide application

Aquatic Organisms: The potential to reach toxicity levels for each trophic level under spot and hand/select applications with glyphosate and imazapyr is low. Localized effects would not disrupt aquatic ecosystem function of the aquatic food web because spot applications of aquatic formulations of glyphosate and imazapyr are not likely to result in harmful amounts coming in contact with water and harming fish, invertebrates, and algae. However, some aquatic plants could be damaged if enough herbicide comes in contact with the aquatic plant. It is believed that the magnitude of effect to fish as a result of local aquatic plant mortality is extremely low because there will not be enough herbicide coming in contact with water to result in extensive aquatic plant mortality.

Trampling: The probability of stepping on a redd while wading across a stream to access either the opposite streambank is low. Should an individual wade across a stream and accidentally step on a redd, then there is the possibility of impacting individual eggs in the gravel. The magnitude of effect from accidentally stepping on a redd is limited to the amount of eggs in the gravel that are impacted from the actual weight of the person and disturbance to the redd itself (i.e., shifting of the gravel, etc), thus leading to a negative impact to individual egg(s). An egg can be dislodged and eaten by a predator, or smashed between gravel or amongst other eggs, which can impede successful development of eggs. Although there are few scenarios where workers would need to cross a live stream, each egg has the potential to contribute to the overall success of a returning population, therefore, the magnitude of effect from accidentally stepping on a redd is high. (Magnitude is high)

Distribution: Refer to Table 44 for a list of treatment sites within aquatic influence zones. Effects, if they occur, would be limited in scope and widely scattered due to the patchy nature of the infestations. The distribution of effects will be small and scattered throughout UNF.

Frequency: The proposed treatments would occur over the next 15 year period and the acreage treated is expected to decline as long as funding is available and patches are eradicated. The programmatic nature of the proposed action is the treatment of future unknown infestations. It is expected that the frequency of herbicide use will be low given that treatment of invasive plants is an activity composed of integrated methods (i.e., mix of non-herbicide and herbicide methods) to facilitate effectiveness.

Duration: Any herbicides coming in contact with water are expected to be short-term events that subside quickly due to the stream volumes moving through the area (pulse effect). Herbicide coming in contact with smaller streams containing extensive riparian infestations is a high risk because of the need for simultaneous treatment and lower volumes of water. Given the properties of glyphosate and imazapyr, it is unlikely that these two active ingredients would persist long enough in the environment to harm ESA fish. A simultaneous treatment is believed to be a short-term event whose effects subside immediately because of the herbicide properties and factors that push a concentration up would be off-set by those that push the concentration down.

Timing: Most of the treatments would likely occur in the summer when eggs of all the listed species would not be in the gravel and only rearing life stages are present. However, there is a potential for some treatments to occur in fall or spring when chinook salmon or steelhead may be spawning adjacent to treatment sites. There is also the potential for some treatments to occur in late summer or early fall when bull trout are spawning. Since no treatments are proposed below bankfull, there is a low probability of accidentally stepping on a redd and displacing spawning fish.

Summary of Effects to the Chemical Contamination Indicator

No emergent vegetation is proposed for treatment with this project. There is a possibility for herbicide to come in contact with water in proximity to ESA fish; however, the magnitude of the

effect from the amount of herbicide exposure to ESA fish is low. The magnitude of effect from disturbance to breeding/spawning and/or accidentally stepping on a redd is also low, again due to no emergent vegetation being proposed for treatment.

Restrictions on method, type, and location serve to limit the potential amount of herbicides that may come in contact with water where fish or other aquatic organisms are present, even if an unexpected storm occurred shortly after treatment. The amount of herbicide that would be available for runoff, leaching and/or drift is necessarily limited by restrictions on broadcast use. Spot and hand/select treatments do not have high potential to deliver herbicide because the treatments are directed at target vegetation and herbicide is quickly taken up by the plant.

The likelihood of meeting or exceeding levels of concern for fish is extremely low because herbicide use in the aquatic influence zone is limited to typical application rates, application methods are restricted to spot or hand/select, buffers on broadcast applications and other methods, project design features, and low potential for herbicides proposed for use near water to move through soils.

Sediment/turbidity

The presence of people or crews with spot spray or hand/select tools along streambanks could lead to localized, sediment/turbidity to fish habitat because of trampling, soil sloughing due to stepping on banks. However, amounts of potential localized sediment/turbidity would be negligible because the invasive plant populations on the Umatilla National Forest are not extensive enough to result in significant sediment/turbidity. Effective invasive plant treatment and restoration of treated sites would improve the function of riparian areas and lead to improved fish habitat conditions.

Under the proposed action, significant removal of riparian invasive species would not occur because of the proposed use of herbicides reducing the potential for significant soil disturbance. While the relative amounts of spot and hand/select methods vary, the differences in terms of effects from such treatments are negligible.

Proximity

The amount of sediment created by herbicide treatments is anticipated to be insignificant because the methods of treatments do not include ground disturbing activities by heavy equipment. There will be no ground disturbing activities associated with spot or hand/select methods.

Probability and Magnitude

There is a possibility that some minor bank erosion may occur in locations where invasive plants have taken over a streambank, especially in smaller streams. For example, killing knapweed with an herbicide would devegetate a portion of the streambank and result in a loss of roots that help to hold soil particles together. This may expose streambanks at higher flows and result in some erosion. The total spatial extent of heavy infestations along streambanks within the action area is low. The amount of sediment released into any particular stream reach would depend on how extensive a particular invasive plant patch is and how close the invasive plant is to the actual wetted perimeter of the channel. Exposed streambanks are expected to revegetate during the spring/summer following treatment. In addition, site restoration and revegetation methods preclude erosion as a result of herbicide treatment. It is expected that most patches would be relatively small and any erosion negligible.

The probability of sedimentation and turbidity as a result of herbicide treatments is extremely low; therefore the magnitude of effect to listed fish and/or critical habitat is low.

GLEAMS Model Estimates for Blue Mountains Ecotype

The R6 FEIS Fisheries BA considered whether ecosystem conditions associated with a variety of bioregions (ecotypes) might affect herbicide concentrations/hazards predicted using the GLEAMS model. The BA found that risk assessment modeling tends to estimate water contamination rates adequately for undisturbed forested vegetation types within the Blue Mountains ecotype (Umatilla National Forest fits this ecotype). Modeling an agricultural field would more adequately model the other vegetation types and would tend to underestimate water contamination rates in these circumstances. At higher stream flows (larger stream channels or wet season flow conditions), risk assessment model predictions tend to overestimate the herbicide concentration in most local streams.

The R6 FEIS Fisheries BA identified a potential increase in concern for fish exposure to picloram, glyphosate, and triclopyr on smaller streams. There was also an increase in concern for aquatic macrophytes with chlorsulfuron, glyphosate, imazapic, metsulfuron methyl, triclopyr and picloram; for invertebrates with glyphosate and triclopyr, and for aquatic plants with chlorsulfuron, glyphosate (with surfactant only), metsulfuron methyl, picloram and triclopyr.

The GLEAMS model likely overestimates the amount of herbicide that would enter water, even in small streams, because:

- Spot and selective methods would only be used within 100 feet of wet streams and 50 feet of dry streams. These methods substantially reduce potential for offsite impacts, drift, and other herbicide delivery mechanisms to water (runoff, leaching). Applicators can immediately respond to site conditions to ensure PDFs are followed as planned.
- The model does not account for vegetation uptake of herbicide (the entire label rate is assumed to be subject to run off). The herbicides allowed for use within the Aquatic Influence Zone are rapidly taken up by plants and/or bind to soil and would not be available for runoff soon after application.
- The Umatilla Forest Plan as amended by the R6 2005 ROD specifically limits triclopyr to spot and hand methods (no broadcast of triclopyr allowed as per standard 16) to avoid scenarios of concern related to triclopyr.
- PDFs do not allow broadcast on roads with high potential to deliver herbicide, which also significantly reduces the potential for herbicides to reach streams in concentrations predicted by the GLEAMS model scenarios.

Previous Monitoring Studies

Berg, N. (2004) compiled monitoring results for broadcast herbicide treatments given various buffers along waterbodies. The results showed that any buffer helps lower the concentration of herbicide in streams adjacent to treatment areas. In California, when buffers between 25 and 200 feet were used, herbicides were not detected in monitored streams (detection limits of 1 to 3 mg/m³) (ibid).

In South Carolina, buffers of 30 meters (comparable to 100 feet) during ground applications of the herbicides imazapyr, picloram and triclopyr resulted in no detectable concentrations of herbicide in monitored streams (USDA HFQLG EIS, appendix B, 2003). No detection limits were given.

Even smaller buffers have successfully protected water quality. For example, where imazapyr was aerially sprayed without a buffer, the stream concentration was 680 mg/ml. With a 15-meter buffer, the concentration was below detectable limits (Berg 2004). No detection limits were given.

Berg collected samples of several herbicides (including sulfometuron methyl and glyphosate) following roadside application one, seven and fourteen days after treatment. Rainfall of one-third inch occurred throughout the period.

Berg detected concentrations of sulfometuron-methyl and glyphosate along road shoulders through the period. In the fall the road was again sprayed, and the ditch line of the road was checked during rainstorms for three months. Sulfometuron-methyl was detected along the shoulder in the ditch line, but was below detectable limits in the nearby stream. Glyphosate was not found at the shoulder, ditch line or stream.

This study indicates that the greatest risk of herbicides moving off site is from large storms soon after herbicide application. In addition, this study also indicates that sulfometuron methyl may persist in the environment as it was detectable along the shoulder of the road (but not in the stream) the entire duration (three months) of the study.

Berg also reported that herbicide applied in or along dry ephemeral or intermittent stream channels may enter streams through run-off if a large post-treatment rainstorm occurred soon after treatment. This risk is minimized if intermittent and ephemeral channels are buffered (*ibid.*) as would occur under the proposed action. If a large rainstorm occurs sediment contaminated by herbicide could be carried into streams.

Project design features require no forecast rain for 24 hours after application to allow the herbicide to adhere to the plant, give time for the plant to uptake the herbicide and to minimize risk of herbicide being washed from the plant.

Dry sediment contaminated by herbicide could plausibly be carried by wind and enter a stream or water body. This is an unlikely scenario as most of the forest is heavily vegetated so there is less bare soil for movement by wind.

Designated Critical Habitat

Invasive plant treatment would have many beneficial effects on critical habitat for federally listed fish species. In the long-term, treatment of invasive weeds on the Umatilla National Forest would increase native vegetation growth and successional patterns leading to cover and food. Thus, it improves essential habitat features for federally listed fish species. Potential downstream effects to critical habitat for bull trout are not likely given the PDFs that limit the potential for herbicide concentrations coming in contact with water where fish are present. Information here complements the analysis provided for non-herbicide treatment methods.

In 1996, NMFS developed a methodology for making ESA determinations for individual or grouped activities at the watershed scale, termed the “Habitat Approach”. A Matrix of Pathways and Indicators (MPI) was recommended under the Habitat Approach to assist with analyzing effects to listed species. The MPI was used by the Umatilla National Forest in previous years to analyze project effects on listed fish species.

When using the MPI, project effects to the Pathways (significant pathways by which actions can have potential effects on anadromous salmonids and their habitats) and Indicators (numeric ratings or narrative descriptors for each Pathway) are used to determine whether proposed actions would damage habitat or retard the progress of habitat recovering towards properly functioning condition.

The Sept. 2, 2005 designated critical habitat Primary Constituent Elements (PCEs) pertinent for analysis on the Umatilla National Forest’s freshwater habitats include spawning sites, rearing sites,

and migration corridors. The Habitat Approach's Matrix of Pathways (MPI) has numerous habitat-associated Indicators that closely "cross-walk" with the PCEs of the Sept 2, 2005 designated critical habitat (table 45).

Table 45. MPI for Primary Constituent Elements Crosswalk

Primary Constituent Elements	Matrix of Pathways and Indicators
Spawning Habitat , as defined by water quality, water quantity, substrate	Water Quality: Temperature, Suspended Sediment, Substrate, Chemical Contaminants and Nutrients Flow/Hydrology: Change in Peak/Base flows Habitat Elements: Substrate/Embeddedness
Rearing as defined by adequate water quantity and floodplain connectivity	Channel Conditions and Dynamics: Floodplain connectivity Flow/Hydrology: Change in Peak/Base flow
Rearing as defined by adequate water quality and forage	Water Quality: Temperature, Substrate Habitat Elements: Large Woody Debris, Pool Frequency and Quality, Off-channel Habitat
Rearing as defined by adequate natural cover	Habitat Elements: Large Woody Debris, Pool Frequency and Quality, Large Pools, Off-channel Habitat
Migration as defined by habitat free of artificial obstructions, and adequate water quality, water quantity, and natural cover	Habitat Access: Physical Barriers Water Quality: Temperature Flow/Hydrology: Change in Peak/Base flow Habitat Elements: Large Woody Debris, Pool Frequency and Quality, Large Pools

The following is an analysis of the effects on Primary Constituent Elements of the Sept. 2, 2005 designated critical habitat, as determined via analysis of MPI indicators. Please refer to the hydrology analysis for effects on Riparian Condition and Water Quality, Lakes, Wetlands and Floodplains.

Habitat Indicator Effects

- **Pathway: Water Quality**
- **Indicator: Temperature**
- **PCE Crosswalk: Spawning, Rearing, Migration habitat PCEs**

Stream temperature is controlled by many variables at each site. These include topographic shading, stream orientation, channel morphology, discharge, air temperature, and interactions with ground water, none of which would be influenced by invasive plant treatments.

Treatment of invasive plants using integrated methods, specifically herbicides, along small streams may increase solar radiation at a localized level (i.e. on a small portion of a stream) if invasive plants are the only source of shade. Where invasive plants provide the only source of shade on small streams, removing 100 percent of the shade producing cover can change forest floor microclimates and water temperature at the localized level.

However, the precise effects to water temperature from treating invasive plants would depend on the size of the stream, how close to the stream a treatment site is, how much is treated along the stream, and what vegetation is currently available to shade the stream.

Removal of invasive plants from the banks of small, intermittent streams would not affect temperature because they are dry during the hottest time of the year, relative size of the infestation is small within context of the watershed, and more than likely there is overstory canopy present. Conditions would have to mimic post wildfire in order to impact stream temperatures.

On larger perennial streams, a significant amount of vegetation would need to be removed to change water temperature and shade would have to be provided only by the invasive plant removed – a

situation that is not likely on the Umatilla National Forest. One reason treatment of invasive plants is being proposed is to recover vegetation structure and, in time, provide more stream shade with the establishment of native coniferous and deciduous trees. The PDFs prohibit broadcast applications within 100 feet of wet perennial and intermittent waterbodies, and along roads that have a high likelihood of transporting herbicides to streams to prevent any potential adverse affects to stream channels or water quality conditions. This PDF will protect overhanging vegetation and smaller trees that are currently providing shade closest to the stream and other waterbodies. The treatment of invasive plants outside of the 100-foot buffer should have no affect on stream temperature because it is unlikely that vegetation growing 100 feet from the stream is providing enough shade to influence water temperature.

The US Environmental Protection Agency under the Clean Water Act (CWA) of 1972 requires States to set water quality standards to support the beneficial uses of water. The Act also requires states to identify the status of all waters and prioritize water bodies whose water quality is limited or impaired.

For water quality limited streams on National Forest System land, the Forest Service provides information, analysis, and site-specific planning efforts to support state processes to protect and restore water quality. The Umatilla Forest Plan as amended by the R6 2005 ROD includes standards and guidelines and other management measures designed to protect and improve water quality. This project adheres to all of the above protection measures and adds site specific design criteria to further protect water quality, meeting the requirements of the Clean Water Act.

There are eleven streams in the project area on the 303d list (See Table 32 in chapter 3.4.2 above). All are listed for temperature.

- **Pathway: Water Quality**
- **Indicator: Sediment/Turbidity**
- **PCE Crosswalk: Spawning habitat PCEs**

Herbicide treatment methods that would be utilized within the Aquatic Influence Zone include spot-spray and hand applications. These treatment methods are unlikely to produce sediment because very little ground disturbance would take place.

Manual and mechanical treatments are also unlikely to contribute sediment. Manual labor such as hand pulling may result in localized soil disturbance, but increases of sediment to streams would likely be undetectable. Not all vegetation in a treated area would be pulled or removed, so some ground cover plants would remain. Not all sediment from pulling weeds along roads would reach a stream because many relief culverts intercept ditch flow and drain it on to the forest floor away from streams. Handpulling is very labor intensive and costly. Thus, few acres per year could be treated using this technique across a watershed.

When compared to the total acres within a watershed, project-related soil disturbance from handpulling would be negligible.

Utilizing a combination of manual, mechanical and herbicide treatments, rather than manual alone, would limit the potential for excessive trampling of streambanks.

- **Pathway: Water Quality**
- **Indicator: Chemical Contaminants/Nutrients**
- **PCE Crosswalk: Spawning habitat PCEs**

The most likely routes for herbicide delivery to water are potential runoff from a large rain storm soon after application, especially from treated roadside ditches as well as drift from aerial spraying. Project design features were designed to control drift and overspray of headwater streams. PDF E-3 requires that fueling would not occur in RHCAs. F-5 requires that herbicide applications occur when winds are between 2 and 8 miles per hour. F-6 requires coarse droplet size to minimize drift. F-8i requires that aerial units be ground checked and water features marked and buffered before application. Buffers of 300 feet are required on perennial or wet intermittent streams and wetlands, and 100 feet buffers are required on dry channels. Based on buffer effectiveness documented by Rashin and Graber (1993) and Dent and Robben (2000) concentrations of herbicides reaching streams are expected to be well below concentrations of concern to beneficial uses.

Boom or hand broadcast treatments with Aquatic Influence Zones would be limited to herbicides posing low levels of concern for aquatic organisms. Herbicides considered high risk to aquatic organisms would not be applied using any method within 15 feet of ditches that feed streams, or 50 to 100 feet from intermittent streams, even when ditches or intermittent streams are dry. These buffers are considered adequate to minimize herbicide concentrations in water because, buffer studies in forested areas (Berg 2005) show that buffers greater than 25 feet commonly lower herbicide concentrations below any threshold of concern and often below detectable limits.

Glyphosate and imazapyr are the only herbicides used for spot spraying below bankfull along perennial channels. Glyphosate is highly water soluble, but because it adheres tightly to soils is unlikely to be carried into a stream unless the soil particle is carried into the stream. This is unlikely to happen during the late spring or summer when herbicides would be applied because there is less rain in the summer and more vegetation growth to hold soil particles in place. Imazapyr is only moderately water soluble and forest field studies have not found it very mobile in soils (Soil and Hydrology Analysis).

Herbicides entering surface water through surface runoff are also expected to be minimal, since targeted spot spraying techniques would be used to apply herbicide within 100 feet of surface water. This would minimize the amount of herbicide reaching the ground surface as well as minimize the potential for herbicide drift. No herbicides considered high risk to aquatic resources would be broadcast within 100 feet of streams and none would be spot sprayed within 50 feet of streams

- **Pathway: Channel Condition & Dynamics**
- **Indicator: Floodplain Connectivity**
- **PCE Crosswalk: Rearing habitat PCE**

Some invasive plant treatments can have positive effects on floodplains and streambanks when infestations of invasive plants on valley bottom areas are removed. Valley-bottom infestations often encroach on floodplains where road-related and recreational activities have led to the establishment of invasive plant populations.

Removal of such infestations is expected to benefit aquatic and terrestrial communities in the long term by increasing floodplain area available for nutrient, sediment and large wood storage, and flood flow refugia. There is no risk of negatively impacting channel condition and dynamics as a result of treating invasive plants.

- **Pathway: Habitat Access**
- **Indicator: Physical Barriers**
- **PCE Crosswalk: Migration habitat PCE**

Invasive plant treatments will not create physical barriers or otherwise degrade access to aquatic habitat.

- **Pathway: Habitat Elements**
- **Indicator: Substrate/Sediment**
- **PCE Crosswalk: Spawning, Rearing habitat PCEs**

Invasive plant treatments are not expected to affect substrate composition. All PDFs that minimize sediment would be implemented, such as no heavy equipment within riparian areas. These practices would reduce, but not eliminate sediment. Some sediment may enter stream channels as a result of extensive manual labor and could result in exposed soils. The amount of sediment that enters a stream is expected to be small, infrequent, of short duration, and at a localized level. Localized increases in fine sediment in gravels or along channel margins may be seen at the immediate treatment site. However, substrate quality would not decrease over time because treatment of invasive plants would not result in a chronic sediment source. Diffuse and spotted knapweeds are found along many streams in the Forest. Lacey et al. (1989) reported higher runoff and sediment yield on sites dominated by knapweed versus sites dominated by native grasses. Therefore reestablishment of native vegetation would provide long-term benefit to sediment levels in aquatic habitat.

- **Pathway: Habitat Elements**
- **Indicator: Large Woody Debris, and Pool Area, Quality and Frequency**
- **PCE Crosswalk: Spawning habitat PCE**

Treatment of invasive plants would not impact pool area, quality and frequency. Treatment of invasive plants in RHCAs would not impact current wood debris in streams. The PDF that establishes a 100 foot buffer for broadcast applications provides protection to the recruitment of conifer seedlings within riparian areas which will sustain channel and habitat features in the future. Controlling invasive plants would allow for reestablishment of native vegetation, allowing riparian stands over time to develop larger recruitment trees, increasing the size and quantity of inchannel debris. The use of spot-spray applications of aquatic glyphosate and aquatic imazapyr may result in some minor non-target vegetation impact because of drift. However, the amount necessary to drift into the entire riparian area and kill trees is not possible with spot-spray applications.

- **Pathway: Flow/Hydrology**
- **Indicator: Change in Peak/Base Flows**
- **PCE Crosswalk: Spawning, Rearing, Migration habitat PCEs**

None of the treatments are extensive enough under any alternative to effect peak flows, low flows or water yield. Methods used for treatment would have negligible effect on water infiltration into soil and associated surface runoff.

No 5th field watershed has more than 2.5 percent proposed for treatment and most have less than one percent. This amount is much too small an area to show effects to flows from treatment

Alternative C – No Broadcast within Riparian Habitat Conservation Areas (RHCAs)

Direct and Indirect Effects

The effects from treatments under this alternative are analogous to those of Alternative B except no broadcast would occur within RHCAs. Alternative B proposes 2,743 acres of broadcast within the

RHCAs. Potentially these areas would be treated with mechanical or manual methods under Alternative C.

Not broadcasting herbicides within RHCAs would reduce the potential for contamination of water; however, utilizing manual and mechanical methods within these treatment areas could increase risk of sediment delivery to streams. As the main methods are mowing and cutting or pulling weeds, and the areas to be treated are between 100 and 300 feet from a stream, effects from manual and mechanical treatment on streams would be negligible. These areas could also potentially be treated with herbicides using spot or hand methods of application. Spot spraying is more targeted to specific plants; therefore less non-target vegetation would be removed resulting in more groundcover. Retaining as much groundcover as possible would lower the potential for sediment delivery to streams. Spot spraying also reduces the amount of herbicide that comes in contact with soil resulting in less herbicide available for runoff into streams.

Alternative D – No Aerial Application of Herbicide

Direct and Indirect Effects

The effects from treatments under this alternative are analogous to those of alternative B except no aerial application of herbicides would occur. Alternative B proposes 675 acres of aerial application. These acres would need to be treated by other methods. Under this alternative there would be a lower risk of herbicide contaminating water due to drift, however many of these areas are in remote locations where manual and mechanical treatments would not be feasible due to cost or safety. In those areas no treatment would occur and invasive plants would be allowed to spread.

Effects Determinations

The effects determinations below are based on effects that have a reasonable probability of occurring due to invasive plant treatments within the action area, and conducted according to the Standards in the R6 FEIS and project design features in the action alternatives.

The potential for sublethal effects to fish from herbicide exposure was considered and addressed in the R6 2005 FEIS. Because there is insufficient data on the herbicides included in the action alternatives to conclude that there may or may not be sublethal effects, the 1/20th of the NOEC values were used in the SERA risk assessments to account for the potential of sub-lethal effects from those herbicides that could potentially reach streams with listed and sensitive fish. The lack of information on sub-lethal effects did not affect our ability to make determinations of effects to listed species because of the degree of risk for herbicides coming in contact with water at levels of concern.

Effects from the action alternatives are expected to vary because of proximity to water, species occurrence, life stage present, and herbicide properties. Some treatments completely outside of the aquatic influence zone with no mechanism for herbicide delivery fall under a “no effect” determination. However, spot treatments up to the water’s edge and along intermittent streams have the potential to deliver aquatic glyphosate and aquatic imazapyr to water.

These treatments have been designed to minimize introduction of herbicide into aquatic habitats as well as avoid substantial amounts of sedimentation. Toxic levels of herbicides are unlikely to enter streams or lakes due to the ability to alter application methods and distance from water, timing, active ingredients and formulations, and other project design features.

Effects to immediate streamside cover cannot be avoided and there may be small droplets of aquatic glyphosate and aquatic imazapyr coming in contact with water. For example, treatment of riparian species growing along the streambank (above ordinary high water) may result in insignificant amounts of aquatic glyphosate and aquatic imazapyr in water 24 hours after treatment. Any treatment method, could introduce minor amounts of sediment and/or herbicide into adjoining waters as result of spot/hand applications, manual/mechanical plant removal, stream bank trampling, and planting. Effects from these activities are expected to be minor but exceed the discountable threshold and are likely to adversely affect listed fish and their habitat.

The determinations in table 46 were updated during the ESA consultation process and updated since the release of the DEIS. The effects analysis has not substantially changed; the determination of Likely to Adversely Affect (LAA) allowed the agencies to proceed with formal consultation and for NMFS and USFWS to publish Biological Opinions including terms and conditions to minimize take.

Table 46. Effects Determination for Herbicide Treatments, Non-Herbicide Treatments, and EDRR

Species	Status	Determination
Snake River Basin Steelhead	Threatened	MA-LAA
Middle Columbia River Steelhead	Threatened	MA-LAA
Snake River Spring/Summer Run Chinook Salmon	Threatened	MA-LAA
Snake River Fall Run Chinook Salmon	Threatened	MA-LAA
Columbia River Bull Trout	Threatened	MA-LAA
Snake River Basin Steelhead Critical Habitat	Designated	MA-LAA
Middle Columbia River Steelhead Critical Habitat	Designated	MA-LAA
Snake River Spring/Summer Run Chinook Salmon Critical Habitat	Designated	MA-LAA
Snake River Fall Run Chinook Salmon Critical Habitat	Designated	MA-LAA
Columbia River Bull Trout Critical Habitat	Designated	MA-LAA
Middle Columbia River Spring Run Chinook Salmon	Sensitive	MII
Redband Trout	Sensitive	MII
Westslope Cutthroat Trout	Sensitive	MII
Margined Sculpin	Sensitive	MII

NE=No Effect; MA-NLAA = May Affect, Not Likely to Adversely Affect; MA-LAA = May Affect, Likely to Adversely Affect
 NI = No Impact; MII = May adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing; LRLV = likely to result in a loss of viability in the planning area, or in a trend toward federal listing.

Rationale for Determination

- Invasive plant treatments (herbicide and non-herbicide) and site preparation for revegetation can result in insignificant amounts of localized sediment due to trampling and removal of plant roots,
- Some herbicides could be introduced into the water indirectly from spot-spray and may impact aquatic plants at the immediate site.

- Within the aquatic influence zone, aquatic formulations of glyphosate or imazapyr would be spot sprayed on plants, and could be indirectly delivered to water. However, spot applications reduce the potential to reach any expected exposure concentration of concern.
- Invasive plant treatments could temporarily reduce streamside vegetation (albeit non-native and low quality) that provides cover for fish. Removal would be localized (plants surrounding target plant) and overhead story would still provide cover via shade and future input of woody material.
- Some treatments of streamside vegetation could involve workers walking in the water, however disturbance of redds or fish spawning would be minimized given the in-stream work periods. Risks to fry and juveniles, given their life history attribute and general avoidance of predators will be minimized.
- The potential for non-aquatic formulations of herbicide coming in contact with water is very low under the proposed action.
- Biological controls will not influence any of the pathways for effects to federally listed fish or their habitat.
- The potential for adverse effects from invasive plant treatments are expected to be uncommon and transitory because:
 - Project design features significantly reduce the potential for herbicides coming in contact with water where there are federally listed fish present; if any were to come in contact with water the amounts would be far below levels of concern and potentially not at detectable levels.
 - Water flow in streams quickly dilutes herbicide, reducing the potential for herbicide exposure.
 - Transitory water quality impact, if any, would be limited to the point of contact with water and not an entire stream reach.

The USFWS and NMFS have issued Biological Opinions that documents their findings that the proposed action would not jeopardize the existence of any listed aquatic species. The NMFS Biological Opinion modeled road ditch runoff. The average sulfometuron 24-hour post-application concentration reported by USGS (2001) was used to extrapolate likely concentrations and HQ values of the five herbicides chlorsulfuron, clopyralid, imazapyr, metsulfuron, and sethoxydim. The simulated 24-hour post application ditch runoff for glyphosate reported by NMFS was from those reported by the USGS (2001) study. This analysis by NMFS reports HQ levels for chlorsulfuron, metsulfuron, and sulfometuron a hundred to several thousand times greater than the HQ effects threshold of 1 for aquatic plants and algae.

The method used to generate these results likely far overestimate HQ levels because:

- PDFs do not allow herbicide application if rainfall is predicted within 24 hours.
- The USGS (2001) study utilized a pavement runoff simulator and most other ditch studies have been focused on paved highways. A majority of forest roads are made of native rock or cinder which would lessen initial runoff and would allow more contact of runoff with soil particles before reaching the ditch.
- The duration of exposure to fish and aquatic organism are not taken into account. The effects thresholds concentrations for fish and aquatic organisms have been derived in laboratory settings and use a 96 hour or similar long term exposure scenario. Exposure of fish and aquatic organisms to higher levels of herbicide may last from a few minutes to a few hours depending on the type of waterbody and the type and amount of mixing processes that are taking place.

- The herbicide concentration and HQ values are measured in the ditch and not in the stream where effects to fish and habitat would take place. The same USGS (2001) study calculated a range of theoretical herbicide concentrations in Bull Creek (1.2 cfs) one day and one week after application. The high end of the sulfometuron concentrations were 0.0005 mg/l and 0.0001 mg/l for one day and one week following application. The high end of the glyphosate concentrations were 0.0015 mg/l and 0.0002 mg/l for one day and one week following application. There sulfometuron concentrations slightly exceed effects threshold concentrations after one day but are under the effects threshold concentrations after one week. Glyphosate concentrations did not come close to exceeding effects threshold concentrations for any organism. These results more accurately depict concentrations that may be found in a small stream where effect to aquatic organisms could occur.
- The model does not take into account partitioning of herbicides to soils and organic matter. The USGS (2001) study states that after one week the decrease in the removal of herbicides was much greater than could be explained by degradation alone. Giudice et al. (2008) found the amount of organic carbon present helps reduce the amount of herbicide runoff in ditches.
- USGS (2001) measures ditch runoff from a simulation which does not take into account water entering the ditch from a greater area which would increase runoff volume and dilution of herbicides.
- The estimate of risk associated with use of glyphosate (Aquamaster™) overestimates exposure because the label rates appear to be in error in the BO (maximum application rate of 7 pounds per acre used when the actual maximum one time rate is about 3 pounds per acre).

Magnuson-Stevens Fishery Conservation and Management Act – Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance essential fish habitat (EFH) for those species regulated under a Federal fisheries management plan.

Essential Fish Habitat is defined in the Act as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” Essential Fish Habitat includes all freshwater streams accessible to anadromous fish (Chinook, coho, and pink salmon), marine waters, and inter-tidal habitats. The objective of this EFH assessment is to determine whether or not the proposed action “may adversely affect” designated EFH for relevant commercially, federally-managed fisheries species within the project area.

Section 305(b)(2) of the MSA requires all Federal agencies to consult with the Department of Commerce on all actions or proposed actions authorized, funded or undertaken by the agency that may adversely affect EFH. The proposed action includes freshwater habitat that has been designated as EFH for Chinook salmon. The biological assessment includes analysis of effects of the proposed action on EFH.

Identification of Essential Fish Habitat

Pursuant to the MSA the Pacific Fisheries Management Council (PFMC) has designated EFH for federally managed fisheries within the waters of Washington, Oregon, and California. Designated EFH for groundfish and coastal pelagic species encompasses all waters from the mean high water line, and upriver extent of saltwater intrusion in river mouths, along the coasts of Washington, Oregon and California, seaward to the boundary of the U.S. exclusive economic zone (370.4 km) (PFMC, 2004, 1998).

Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable artificial barriers (as identified by the PFMC, 2003), and longstanding, naturally-impassable barriers (i.e., natural waterfalls in existence for several hundred years) (PFMC, 2003). In estuarine and marine areas, designated salmon EFH extends from the nearshore and tidal submerged environments within state territorial waters out to the full extent of the exclusive economic zone (370.4 km) offshore of Washington, Oregon, and California north of Point Conception to the Canadian border (PFMC, 2003).

Detailed descriptions and identifications of EFH are contained in the fishery management plans for groundfish (PFMC 2004), coastal pelagic species (PFMC 1998), and Pacific salmon (PFMC, 2003).

The geographic extent of EFH on the Umatilla National Forest is specifically defined as all currently viable waters and most of the habitat historically accessible to Chinook salmon within the watersheds identified in table 38. Salmon EFH excludes areas upstream of longstanding naturally impassable barriers (i.e., natural waterfalls in existence for several hundred years). Salmon EFH includes aquatic areas above all artificial barriers.

Effects of the Proposed Action

The MSA defines adverse effects as any impact, which reduces the quality and/or quantity of Essential Fish Habitat. Non-herbicide treatment methods would have very localized effects to soil at the project scale. Herbicide treatment methods may result in insignificant amounts of herbicides coming in contact with water as a result of drift and runoff from roadside ditches. Effects from both non-herbicide and herbicide treatment methods would not impact those waters necessary for spawning, breeding, feeding, or growth to maturity because there is no treatment of emergent or submerged invasive plants and the predicted amount of herbicide coming in contact with water is well below levels of concern. As discussed above in the Effects Analysis section Chinook salmon would not be adversely affected because:

- The quantity of EFH will not be reduced
- The quality of EFH will be maintained and not degraded

As described in detail in the Effects Analysis section of this BE, the exclusion of heavy machinery from the proposed action will not result in impacts to sediment and cover. The use of non-herbicide methods as described in the proposed action is not expected to reduce the quality and/or quantity of EFH. The use of herbicide treatments as described in the proposed action and analyzed in this BE is not expected to reduce the quality and/or quantity of EFH.

As described in detail earlier in this chapter, relative to effects of listed species, the proposed activities may result in short-term adverse effects to a variety of stream habitat parameters. The assessment of potential adverse effects from elements of the action alternatives on EFH is based on information in the effects analysis section for listed fish. Since estuarine and ocean habitat are not expected to be affected by the proposed action, no effect to EFH for groundfish or coastal pelagic species are expected. Pacific salmon EFH would be impacted in the same manner as ESA Designated Critical Habitat. Most of these potential short-term adverse effects would be avoided through implementation of PDFs described in the BA as part of the proposed action. The most likely effects to habitat include:

- Short-term increases in turbidity pursuant to manual and mechanical treatment activities

- Decreased primary productivity, alterations in aquatic macrophyte community, and toxic effects to fish and aquatic invertebrates through herbicide introduction to streams.

Aquatic Organisms Cumulative Effects

None of the alternatives are likely to have significant effects to fish and their habitat. It is unlikely that effects from proposed treatments would approach a threshold of concern; therefore, the project would not contribute to significant cumulative effects on aquatic organisms.

The effects analysis used models of herbicide delivery to streams under a variety of site-specific conditions. Herbicide could also potentially be delivered to a nearby stream if the area treated had high clay content in the soil and a significant rain event occurred.

These models did not indicate there would be herbicides (or other ingredients such as surfactants) delivered to streams in concentrations over a threshold of concern to fish. Ten 6th field watersheds had at least 10 acres of estimated treatment within the Aquatic Influence Zones in the action alternatives. In all cases, the existing treatment sites were found to be small and scattered throughout the watersheds. The project design features and buffers appear to sufficiently reduce risks to a low level, even if all these treatments were to occur simultaneously (unlikely).

To provide a limit to the extent of treatment and herbicide exposure for projects implemented under EDRR where there are federally listed fish or designated critical habitat, no more than 10 acres per year within the riparian area of any 1.5 mile stream reach within a 6th field watershed would be treated at a single time. There is no indication that the amount of herbicide reaching streams would mix with pesticide use elsewhere and cause a cumulative impact.

The most important difference between the alternatives to aquatic organisms is the extent to which invasive plants are controlled within riparian areas. Riparian habitat restoration would have a small beneficial impact; however the acreage affected is not significant to fish at the 6th field watershed scale.

Conclusion

The proposed action is expected to adversely affect EFH for Pacific salmon species listed in table 47. These adverse effects, however, are expected to be short-term in nature and avoided or minimized to the extent practicable through application of PDFs. The long-term effects of the proposed activities are expected to be an improvement in essential fish habitat conditions in locations currently infested with invasive plants.

Table 47. Potential Effects to Commercially Important Fish Species under the Proposed Action

Species	Magnuson-Stevens EFH Determination
Snake River Spring/Summer Run Chinook Salmon	Adverse Effect
Snake River Fall Run Chinook Salmon	Adverse Effect

3.6 Recreation

3.6.1 Introduction

Invasive Plants and Recreation Resources

Recreational activities are influenced by, and have influence on, the rate and degree of invasive plant spread in campgrounds, trails, wilderness areas, and wild and scenic rivers of the Umatilla National Forest. Recreationists move in and out of these forest settings, inadvertently transporting seeds and propagating plant parts throughout the forest as well as across and between landscapes.

Heavy use areas such as trailheads, parking lots and riparian areas can be denuded of their native vegetation, creating prime environment for invasive plants to seed. The most likely vectors of invasive plant spread are roads, trails and riparian corridors (R6 2005 FEIS).

Invasive plants can detract from the desirability of using recreation sites and participating in certain recreational activities. For example, stiff plant stalks, thorns, sharp bristles, and allergies created by invasive plants can prevent humans from walking, sitting, setting up camp, and finding a place to fish or tie up a raft (ibid). Recreation use associated with hunting such as off-highway vehicle (OHV) use, dispersed camping, wilderness and back country access using pack stock all increase substantially the likelihood of spreading invasive plants.

This section will describe the affected environment and analyze the effects of the proposed project and alternatives on the recreation resource and congressionally designated areas. The analysis will evaluate the impacts of invasive plant treatment methods on recreation in the general forest, developed recreation sites, and trails. Congressionally designated areas include wild and scenic rivers and wilderness areas. The effects on the outstandingly remarkable values, water quality and free flowing characteristics of designated and eligible wild and scenic rivers and the effects on wilderness character will be evaluated. Invasive plant treatment methods are described in detail in chapter 2 of this document.

3.6.2 Affected Environment

Congressionally Designated Areas

Wilderness

Wilderness is to be managed according to the 1964 Wilderness Act, which directs agencies to protect wilderness character (1964 Wilderness Act, Section 2(a) and Section 4(b)). Four qualities, derived from the Definition of Wilderness (Section 2(c) of the 1964 Wilderness Act), define wilderness character:

- **Untrammeled** – wilderness is essentially unhindered and free from modern human control or manipulation
- **Natural** – wilderness ecological systems are essentially free from the effects of modern civilization
- **Undeveloped** – wilderness is essentially without permanent improvements or modern human occupation
- **Outstanding opportunities for solitude or a primitive and unconfined type of recreation** – wilderness provides opportunities for people to experience solitude or primitive and unconfined recreation, including the values of inspiration and physical and mental challenge (USDA 2005).

There are three designated wilderness areas on the Umatilla National Forest; the Wenaha-Tucannon, the North Fork Umatilla, and the North Fork John Day. Invasive plants have been identified in all three. Invasive plants within wilderness are typically found at trailheads, along trails, riparian areas, and near popular dispersed camping sites. Invasive plant infestations within wilderness areas are minor compared to the general forest acres. Infestations outside wilderness boundaries have the potential to spread into wilderness areas and threaten wilderness values.

Invasive plants have adverse effects on wilderness character as they can disrupt natural processes. Invasive plants may alter natural plant communities, interact in unknown ways with native wildlife species, and alter ecological processes such as plant community dynamics and disturbance processes such as fire. This potential change in ecological condition can threaten the natural integrity of the wilderness and the values for which it was designated. The presence of invasive weeds is typically a result of human use.

Weed infestations are typically associated with human activities such as grazing, pack stock use, trails; activities that create disturbed conditions that allow weeds to establish.

The 1964 Wilderness Act presents managers with direction that creates a dilemma regarding what to do about invasive plants. Section 2 (a) of the Act provides direction to preserve natural conditions in wilderness. Section 2 (c) of the Act defines wilderness as an area where earth and its community of life are “untrammeled”. Untrammeled is interpreted to mean uncontrolled, unconfined, not restrained by people; protected from human control or at least intentional manipulation. The dilemma that this direction creates regarding what to do about invasive plants is that managers must choose either to preserve natural conditions by actively manipulating wilderness to reduce or eliminate invasive plants, or to keep wilderness free from intentional human manipulation, but lose natural conditions due to the changes caused by invasive plants. This analysis will describe effects of invasive plant treatments and the effects of invasive plants on wilderness character.

The R6 2005 FEIS identified wilderness as an area of special concern and it is in the highest priority treatment category. The accompanying Record of Decision (R6 2005 ROD) approved herbicide use as a potential tool in designated wilderness throughout the region.

The ROD also amended all forest plans in the region; requiring use of certified weed-free feed for all pack and saddle stock used on National Forest System lands. As of January 2007, certified weed-free feed or pelletized feed is required in all wilderness and wilderness trailheads on National Forest System lands in the Pacific Northwest Region. This will help prevent further introduction of invasive weeds into the wilderness through stock feed. This requirement is being phased in to allow recreationists time to adjust to the change and due to lack of available weed-free hay certification programs in Washington and a limited program in Oregon.

Wenaha-Tucannon Wilderness

The primary recreation activity within the Wenaha-Tucannon Wilderness has traditionally been elk hunting with a large number of hunters packing in on horses each fall. Overall use is considered light to moderate with the majority of use occurring during hunting season.

Recently, however, there has been an increase in anglers and backpackers during the summer and early fall months.

There are approximately 158 acres of invasive weed infestations identified within the Wenaha-Tucannon Wilderness. The largest concentrations are located near the Three Forks Trailhead and

along the Three Forks and the Crooked Creek Trails. These trails are popular with horseback riders and people packing in for big game hunting.

North Fork Umatilla River Wilderness

The North Fork Umatilla River Wilderness is the smallest wilderness on the Forest, and currently there are only 17 acres of invasive plant sites identified. There are extensive infestations identified and mapped along roads outside the wilderness boundary. Minor infestations are located at access points such as Umatilla Forks Campground, Buck Creek, and Corporation Organizational Camp. These infestations have potential to spread and threaten wilderness values.

North Fork John Day Wilderness

The North Fork John Day Wilderness is comprised of four separate units, three on the North Umatilla National Forest, and one on the Wallowa-Whitman National Forest. Use of this wilderness is typically light and increases during the big game hunting seasons.

There are approximately 22 acres of invasive plant infestations identified within the North Fork John Day Wilderness, Umatilla National Forest. There are minor infestations that have been identified and mapped along roads outside the wilderness boundary. The most significant infestations are along FR 1035 which accesses Granite Creek Trail. and FR 5506 which accesses Oriental Creek Campground and the trailhead for Big Creek, Corral Creek and North Fork John Day River Trails.

Table 48. Wilderness Areas and Acres of Invasive Plants

Wilderness Name and Acres		Acres Invasive Plants
Wenaha-Tucannon	177,432	158
North fork Umatilla	20,435	17
North Fork John Day	107,058	22
Total Acres	304,925	197

Wild and Scenic Rivers

The Wild and Scenic Rivers Act was enacted to preserve in a free-flowing condition, rivers which possessed outstandingly remarkable values such as scenic, recreational, geologic, fish and wildlife, historic or cultural. Congress declared that it was important to manage certain rivers in their free flowing condition, and to manage them and their immediate environment to protect those qualities for the benefit and enjoyment of present and future generations.

In the planning process for the Umatilla National Forest, the Forest Service also identified rivers that are eligible for designation as wild and scenic rivers.

Designated and eligible rivers are assigned a classification of wild, scenic, or recreational.

Characteristics of these classifications are:

- **Wild** - Rivers or sections of rivers that are free of impoundments, generally inaccessible except by trail (no roads), with watersheds or shorelines essentially primitive, with little or no evidence of human activity and having unpolluted waters.

- **Scenic** - Rivers, or sections of rivers, that are free of impoundments, having shorelines or watersheds largely primitive and shorelines largely undeveloped, but accessible in places by roads.
- **Recreational** – Rivers or sections of rivers that are readily accessible by road or railroad, may have some development along the shoreline, and may have had some impoundment or diversion in the past.

Forest Service Manual 2354.42 provides direction for resource protection and management activities in WSR corridors. FSM 2354.42(l) Forest Pest Management states “Control forest pests in a manner compatible with the intent of the Act and management objectives of contiguous National Forest System lands.” Invasive plants can alter the ecology and recreation setting within WSR corridors, impacting the outstandingly remarkable values for which it was designated.

Segments of the Grande Ronde, the North Fork John Day and the Wenaha Rivers have been designated as part of the National Wild and Scenic River System (WSR). Desolation Creek, Granite Creek, North Fork Asotin Creek and the Tucannon River are identified as eligible WSRs. The river management corridor typically extends one quarter mile from the riverbank on each side of the designated segment. Invasive plant species have been found in all three river corridors. The presence of invasive species along the river corridor can detract from the aesthetic and recreational opportunities and impact the values for which the river has been designated. Acres in WSR corridors that occur in wilderness would be subject to laws, standards and project design features pertaining to wilderness. The following table summarizes each river and the outstandingly remarkable values for which it was designated.

Table 49. Wild and Scenic Rivers on the Umatilla National Forest and their Outstandingly Remarkable Values

River Name	Wild (mi.)	Scenic (mi.)	Recreation (mi.)	Outstandingly Remarkable Values
Grande Ronde River	17.4		1.5	Scenery, Recreation, Fisheries, Wildlife
Wenaha River	18.7	2.7	0.2	Scenery, Fisheries, Geology
North Fork John Day River	27.8	10.5	15.8	Scenery, Recreation, Fisheries, Wildlife, Cultural Resources
Desolation Creek (Eligible)		21.5		Recreation, Botanical/Ecological
Granite Creek (Eligible)		7.9		Fisheries
North Fork Asotin Creek (Eligible)		18.0		Fisheries
Tucannon River (Eligible)	9.1	4.6	8.6	Recreation, Fisheries, Cultural/Historic, Botanical/Ecological

Grande Ronde WSR

The Grande Ronde River receives moderate to heavy use by rafters and kayakers during spring and summer seasons with the heaviest use occurring on weekends and holidays. The wild segment of the river that occurs on National Forest System lands has limited vehicle access. The put-in and take out sites are located on, and managed by, the Bureau of Land Management and state agencies.

Dispersed camping occurs along the river on National Forest System lands in conjunction with multi-day raft trips.

There are 28 acres of invasive plants identified within the WSR corridor, the majority of which is leafy spurge within the riparian area. The infestations are typically small sites, less than two acres each. The sites are located along the entire length of the wild segment of the river. There are no invasive plants identified in the recreation segment of the river.

North Fork John Day (NFJD) WSR

The NFJD River has Wild, Scenic and Recreation designations on the Umatilla National Forest. The Wild segment is within the North Fork John Day Wilderness. Use along this segment is typically by foot or horseback along the NFJD River Trail. The Scenic section follows Forest Road 5506 from the Big Creek trailhead to Texas Bar. The Recreation section follows Forest Highway 55 from Texas Bar past Tollbridge Campground. Use along both these segments consists of dispersed camping along the road and river during summer, with use increasing during big game hunting season. There is some float use on the river during early spring run-off, with use declining after mid June.

There are approximately 179 acres of invasive plants identified along the NFJD WSR. The majority of invasive plant acres are within Recreation and Scenic designations. The invasive plants are predominantly associated with the road right of way within the managed river corridor. Thirty acres identified in the Wild segment of the river are primarily along 1.5 miles of the NFJD River Trail, closest to the wilderness trailhead at the end of FR 5506. The remaining five acres are scattered small sites along the NFJD River Trail and Crane Creek Trail.

Wenaha WSR

The Wenaha WSR receives light use due to its remote character. The Wild segment is located in the Wenaha-Tucannon Wilderness and is accessible by pack stock or foot along the Wenaha River Trail.

There are approximately 20 acres of invasive plants along the Wenaha WSR; 15 acres within the Wild segment associated with the Wenaha River Trail and the Cross Canyon Trails, and five acres within the Recreation segment that is part of a larger area outside of the forest boundary on Bureau of Land Management and state lands.

Desolation Creek - WSR Eligible

Desolation Creek is proposed as a recreation river along its entire length. The area provides dispersed camping opportunities, hiking and big game hunting.

There are approximately 27 acres of invasive plants identified along this creek. They are primarily associated with the road corridors of Forest Highway 34 and 10. There are also infestations near Tollbridge Campground at the confluence with the North Fork John Day River.

Granite Creek - WSR Eligible

Granite Creek is proposed as a recreation river. This creek is considered high quality spawning grounds for Chinook salmon. The Granite Creek Trail is a popular access to the North Fork John Day Wilderness Area.

There are approximately 108 acres of invasive plants along this creek. They are primarily associated with the FR 1035 road corridor and Granite Creek Trail.

North Fork Asotin Creek - WSR Eligible

The North Fork Asotin Creek is proposed as a scenic river. It contains native Chinook, bull trout and steelhead. NF Asotin Creek Trail follows the length of the creek. Use on the trail includes motorcycle, mountain bike, foot and horse use.

There are approximately 159 acres of invasive plants identified along its banks. The majority of the invasive plants are along the NF Asotin Creek Trail from the forest boundary to the junction with Pinkam Trail.

Tucannon River - WSR Eligible

The Tucannon River has segments proposed as wild, scenic and recreation. The river is popular for camping, sight-seeing, fishing and wildlife viewing.

There are approximately 116 acres of invasive plants identified primarily along the scenic segment. The majority of invasive plants are associated with the FR 4712 road corridor.

Table 50. Wild and Scenic Rivers, Designation, and Acres of Invasive Plants

Wild and Scenic River Name and Designation		Acres of Invasive Plants
Grande Ronde	Recreation	0
	Wild	28
Grande Ronde Total		28
NFJD	Recreation	45
	Scenic	98
	Wild	35
NFJD Total		179
Wenaha	Recreation	5
	Wild	15
Wenaha Total		20
Desolation Creek (Eligible)	Recreation	27
Granite Creek (Eligible)	Recreation	108
North Fork Asotin Creek (Eligible)	Scenic	159
Tucannon River (Eligible)	Scenic	116
Grand Totals		637

Developed Recreation Sites

The Umatilla National Forest has 32 developed recreation facilities that have invasive plants within the managed use area of the site. These sites include campgrounds, trailheads, winter sports areas, cabin rentals, interpretive sites and organizational camps. Many of the invasive plant sites are small, less than one acre. Fairview Campground and Woodward Campground have the largest area to be treated at 10.3 and 18.9 acres, respectively.

There are 17.2 acres of invasive plant infestations associated with winter sports and snow play areas (toboggan, and sledding area). Weeds associated with these areas are typically located near parking lots or along access roads. There are no recreation facilities associated with the winter sports areas

during the snow-free season. Use of these areas during snow-free seasons, as dispersed sites, is incidental.

The following table shows developed recreation sites by ranger district, site name and acres of invasive plants.

Table 51. Ranger District, Developed Recreation Site Name, and Acres of Invasive Plants

Ranger District and Site Name		Acres of Invasive Plants
Heppner	Bull Prairie Campground	6.2
	Fairview Campground	10.3
	Penland Lake Campground	0.2
	Coalmine Hill Campground	0.1
	Ditch Creek Guard Station Rental	0.5
Heppner Totals		17.3
Pomeroy	Alder Thicket Campground	2.6
	Pataha Campground	0.1
	Meadow Creek Trailhead	0.9
	Panjab Trailhead	2.8
	Tucannon Trailhead	0.6
	Rose Spring Winter Sports Area	2.5
Pomeroy Totals		9.5
North Fork John Day	Bear Wallow Campground	2.2
	Big Creek Meadows Campground and Trailhead	0.2
	Driftwood Campground	2.3
	Gold Dredge Campground	2.7
	Oriental Campground & Trail Head	1.1
	Tollbridge Campground	0.3
NFJD Totals		8.8

Ranger District and Site Name		Acres of Invasive Plants
Walla Walla	Jubilee Lake Campground	4.6
	Target Meadows Campground	2.4
	Umatilla Forks Campground	1.6
	Woodland Campground	1.6
	Woodward Campground	18.9
	Fry Meadows Guard Station Rental	0.2
	Burnt Cabin Trailhead	0.5
	Whitman Route Interpretive Site	4.3
	Corporation Organizational Camp	1.9
	Buck Creek Organizational Camp	0.1
	Andies Prairie Snow Play Area	4.3
	Bone Springs Winter Sports Area	3.7
	Spout Springs Ski Area	5.8
	Ruckle Junction Winter Sports Area	0.1
	Woodland Snow Play Area	0.8
Walla Walla Totals		50.8
Grand Total		86.4

Trails

Non-motorized and motorized trails are considered high spread potential sites for invasive plants. Trail corridors are defined as the area 100 feet on either side of the trail tread. Invasive plant acres that are in trail corridors within wilderness areas or WSR are included in wilderness or WSR acres. All other invasive plant acres that occur outside the trail corridor are included in the general forest area.

Non-Motorized

There are approximately 613 miles of non-motorized trails on the forest. Non-motorized trail types include pack and saddle trails, hiking trails and cross-country ski trails. Pack and saddle trails and the feed, straw and disturbance associated with such use can facilitate the establishment and spread of

invasive plants. There are approximately 404 acres of invasive plant infestations within non-motorized trail corridors outside of wilderness areas and WSR corridors.

Motorized

Motorized trails include off-highway vehicles (OHV) motorcycle and snowmobile trails. OHV trails and “cross country” use can create the conditions that are favorable for invasive plant establishment and subsequent spread by vehicle use (Lacey et al. 1997).

Snowmobile trails are typically on roads that are not plowed during winter seasons. Invasive plant acres along snowmobile trails are included in the general forest area as roads.

There are approximately 50 acres of invasive plant infestation within motorized trail corridors. The following table summarizes the acres of invasive plants by trail type. Acres along trails within wilderness areas and wild and scenic river corridors are not included in these totals.

Table 52. Trail Types and Acres of Invasive Plants

Trail Type	Acres of Invasive Plants
OHV/Motorcycle	50
Hiking/Pedestrian	23
Pack and Saddle	211
Cross Country Ski	170
Total	454

General Forest Area

The general forest area, for the sake of this writing, is considered all areas not within a developed recreation site boundary, designated wilderness, wild and scenic river corridor, or trail corridors. The majority of invasive plant sites within the general forest area occur along roads. Roads are considered to be high spread potential areas.

There are currently 6,846 miles of forest roads that are determined to be needed for long-term motor vehicle use on the Umatilla National Forest. The Forest has jurisdiction for 4,957 miles while approximately 1,889 miles have county, state, BLM, or private jurisdiction (USDA 2004). Recreational access to the forest is the predominant use of the transportation system. Driving for pleasure is a primary use of the forest (USDA 2003).

Dispersed recreation sites are typically along roads and have developed due to repeated use by recreationists. These site types are not usually inventoried, signed, or have any other use controls associated with them other than access. Repeated use by recreationists can create the conditions that favor invasive plant establishment and spread.

Overall incidence of summer dispersed camping is moderate, and is associated with OHV riding and river use. Dispersed camping during the hunting season would be considered high with camps occurring along many roads. Many hunter campsites have been used by the same hunting group year after year.

Approximately 23,272 acres of invasive plants have been identified in the general forest area. The general forest acres are derived from the total acres of invasive plants identified (24,236 acres) minus the acres within the boundaries of congressionally designated areas, trail corridors and developed recreation sites. The following table summarizes acres of invasive plants by recreation type.

Table 53. Recreation Areas, General Forest and Acres of Invasive Plants

Recreation Area	Acres of Invasive Plants
Wilderness	197
WSR	227
Developed Recreation	86
Trails	454
General Forest Area	23,272
Grand Totals	24,236

3.6.3 Environmental Consequences

Effects on Recreation for the No Action Alternative

The 3,154 acres of invasive plants approved for treatment under existing decision documents (USDA 1995) have proven ineffective in controlling the spread of invasive plants (see Botany Report). Though new infestations of invasive plants can be treated using mechanical and manual methods they have proven to be ineffective at controlling the Forestwide spread of invasive plants.

Effects on Recreation Common to all Action Alternatives

Direct Effects

Visitors may notice invasive plant treatments when traveling through the forest by car, OHV, foot, pack stock or water craft. The size of the invasive plant site being treated and the type of treatment being used would determine how noticeable the treatment is.

Chemical application methods vary from individual plant application to broadcast spraying. Wicking and stem injection treat individual plants and only target plants would be affected. Spot spraying would target individual plants but overspray may affect adjacent vegetation. Broadcast spraying would treat an area and all plants within the site may be affected depending on the herbicide. Broadcast application could include hand spreading and spraying from vehicle mounted tanks. Individual plant application would use less chemical agent overall.

Visitors that are concerned about exposure to herbicides may be more accepting of individual plant application methods, especially in high use areas and gathering areas for berries and mushrooms.

Chemical treatments may leave dead vegetation that would be noticeable for several days to several weeks. Individual plant treatments would be less noticeable than broadcast treatments overall. These effects would be of short duration, typically one growing season.

Physical treatments include manual and hand mechanical treatments. Manual treatments may show signs of disturbed earth from digging or grubbing out root systems. Hand mechanical treatments may leave evidence of cut vegetation due to mowing, weed whipping and roadside brushing. These effects are commonly seen by the visitor on and off the forest and are not expected to detract from

their overall recreation experience in the general forest areas. These effects would be of short duration, typically one growing season.

Biocontrol measures would not be noticeable to the casual forest visitor. It is a long term method of treatment that does not eradicate the invasive plant, but instead keeps the population in check so that native species can compete.

Eradicating invasive plants can make areas more desirable for recreation. Invasive plants that have characteristics such as thorns, bristles, stiff plant stalks and chemical irritants would be treated, making areas more inviting to recreationists. Recreationists may appreciate a more natural landscape with intact native vegetation.

Early Detection/Rapid Response (EDRR) is a treatment strategy that allows managers to rapidly respond to new or expanding invasive plant sites. Effects to recreation would be similar to those described above and within the categories described below.

Indirect Effects

All sites and areas that are treated with herbicides would be posted to inform forest visitors what herbicide was used, when it was applied and how long the herbicide would persist in the area before breaking down. Visitors would be able to make informed decisions concerning their comfort level with recreating in an area where herbicides have been recently applied.

People may decide not to recreate in areas where herbicides have been applied. The greatest impact to visitors would be if they were not aware that herbicides had been applied in their destination recreation area. Standard 23 of the Umatilla Forest Plan as amended by the R6 2005 ROD provides for public notification through various media but it is impossible to contact all potential visitors prior to them arriving on the forest. Posting signs at key access points would alert visitors to the presence of herbicides; however notification upon arrival may disrupt a visitor's plans and activities. Similar recreational opportunities exist across the forest so a visitor may, if desired, be able to find a substitute place to recreate. This may provide an opportunity for forest visitors to explore new areas.

Effects on Congressionally Designated Areas

Alternative A - No Action Alternative

Under this alternative, approximately eight acres within wilderness that is currently approved for treatment would continue to receive treatments. Invasive plants have spread substantially beyond these sites. Without treatment of new invasive plant sites, populations that have become established within wilderness would continue to spread. By not aggressively treating weeds, wilderness character would remain "untrammeled" and free from human manipulation; however, the spread of invasive plants may change the character of the ecosystem such that they threaten the apparent naturalness and natural integrity of the wilderness.

Approximately 0.4 acres within WSR corridors would continue to be treated under this alternative. Invasive plants have spread beyond these sites. Invasive plants can detract from the outstandingly remarkable values for which the WSR's were designated. These include scenery, recreation, fisheries, wildlife, botanical, ecological, cultural and geological values. Refer to their respective reports for detailed descriptions of impacts invasive plants have on these resources.

Effects Common to all Action Alternatives

Wilderness

To best preserve the wilderness resource, alternatives will be evaluated for their potential effects on the four qualities of wilderness character previously mentioned: Untrammeled, natural, undeveloped, and outstanding opportunities for solitude or a primitive and unconfined type of recreation. The untrammeled quality is the extent to which wilderness ecosystems remain free from modern human manipulation. Natural integrity is the extent to which long-term ecological processes are intact and operating. The undeveloped quality is a measure of how natural the environment appears and how free it is from any structures or developments. The outstanding opportunities for solitude or a primitive and unconfined type of recreation are subjective values defined as isolation from the sights, sounds and presence of others, and the developments and activities of people. Primitive recreation opportunities are those that allow the recreationists to use backcountry skills, knowledge and abilities that do not rely on developed facilities, mechanical transport or motorized equipment.

Invasive Plant Treatment and Transport Methods in Wilderness

Approximately 197 acres of invasive plants are identified within wilderness areas. These acres are located along trails that access the wilderness areas. Treatment methods that may be utilized include non-mechanical hand treatments such as hand-pulling or use of hand tools for cutting, digging and grubbing. Herbicide treatments may use application methods such as wicking, stem injection, spray bottle, hand pressurized pumps, and propellant based systems such as those that use pressurized carbon dioxide.

Battery or solar powered pumps are considered motorized equipment. These devices are used to apply herbicides from horseback mounted spray systems. Solar panels and/or batteries to operate pumps may be evident on pack stock. These types of pumps are quiet and would not impact opportunities for solitude or a primitive and unconfined type of recreation in wilderness.

Approved herbicide application methods described above are considered acceptable herbicide application methods within wilderness without further analysis of the Wilderness Act's prohibitions on use of motorized equipment.

Gas-powered, motorized pumps and aerial application of herbicides are not proposed as application methods in wilderness under any of the proposed alternatives including for EDRR.

Use of herbicides as a treatment method is estimated to be 80 percent effective in reducing invasive plants with one treatment application (see Botany Report).

Treatment is most effective when herbicides are applied during the active growing season of the plant, typically May through July. Areas would be treated one to two times per year during the growing season to effectively eliminate the invasive species at that site. Where continued disturbance occurs such as at trailheads and popular campsites annual treatments may be necessary to prevent the re-establishment of invasive plants and subsequent spread.

Visitors may feel their wilderness experience is degraded if they happen to visit a treatment site during treatment due to encounters with weed treatment crews. While important to those visitors it affects, it is a short-term impact, lasting one to several days at each site per year, depending on its size. Effects on visitor's wilderness experience can be minimized through public notification and treating areas during low visitor use periods.

Use of wilderness on the Umatilla National Forest is typically low during the summer and it increases during the fall big game hunting season. Invasive plant treatments typically occur during the summer growing season. Some visitors may appreciate encountering people working with pack stock in the wilderness.

“Packing in” is a traditional skill that many people associate with wilderness.

Proposed methods to transport people and supplies into wilderness areas to carry out invasive plant treatments include non-mechanized methods considered acceptable within wilderness including backpack and pack stock use. Since these types of transport methods are nonmechanized, they do not require additional analysis of the Wilderness Act’s prohibitions on use of mechanical transport.

Use of helicopters or other mechanized methods to transport supplies and people to carry out invasive plant treatments is not proposed under any alternative or EDRR.

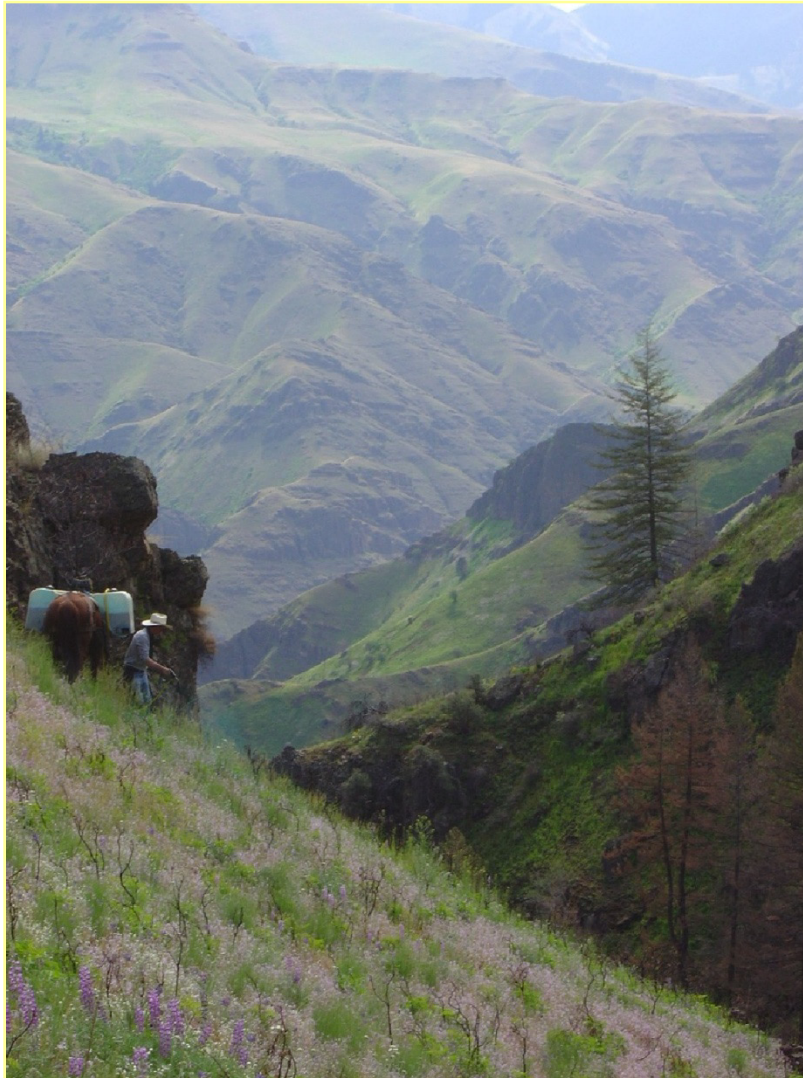


Figure 12. Contract worker spraying invasive plants in the Wilderness from horseback

Picture by Leigh Dawson

Untrammeled

Treatment of invasive weed infestations within wilderness can be viewed as human manipulation on the landscape. Evidence of human manipulation can detract from the “untrammeled” feel of wilderness.

There will be short-term evidence of weed treatments including dead or wilting plants and areas of disturbed soils where plants have been pulled up or grubbed out. Where plants are dead or dying, some people may recognize that herbicides were sprayed.

These effects may not appear natural to the forest visitor. Hikers and pack stock users are typically traveling at a slow pace and these changes may be noticeable. Biocontrol measures would be not be noticeable to the casual visitor and would not affect the apparent naturalness of the area.

The amount of area proposed to be treated in wilderness is very small; approximately 197 acres of 304,925 acres in wilderness on the forest. Effects would be localized to the treatment areas and effects to the wilderness ecosystem are limited to these treatment areas. Regional standards and project design features are in place to protect ecological resources including non-target botanical species, water, soils, fisheries and wildlife. Refer to the botany, hydrology, soils, fisheries and wildlife reports for details concerning the effects of invasive plants and the effects of invasive plant treatments on these resources. Apparent naturalness of treatment areas will improve as the evidence of invasive plants decreases and they are replaced with native vegetation.

Natural

Aggressive treatment of weeds in the wilderness would improve natural integrity under all alternatives. Invasive weed treatments would decrease establishment and expansion of invasive species in wilderness areas, and allow native vegetation and ecological processes to continue. Apparent naturalness of treated areas would improve as the evidence of invasive plants decreases and they are replaced with native vegetation.

Early Detection/Rapid Response treatment strategy would allow managers to treat infestations within wilderness quickly while the infestation is still small. This strategy would reduce the opportunity for the spread of invasive plants within wilderness, protecting the natural integrity of the wilderness. In addition, treating areas while small will reduce the visual effects of treatments. Impacts to apparent naturalness would be less.

Undeveloped

No new developments, facilities, or structures are proposed by any alternatives. There would be no impact to the undeveloped quality of wilderness.

Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation

Forest visitors may encounter workers applying herbicides using hand sprayers, backpack or horseback sprayers in the wilderness. The sounds from battery or solar powered electric pumps would be localized to the treatment area and would not disrupt entire watersheds. Visitors may also encounter worker digging, grubbing or pulling invasive plants. These encounters may affect some people's sense of remoteness and their opportunity for solitude. This effect would be short term, typically one to several days, and backcountry crews treating weeds would be small (typically 1-4 people). Duration of effects would depend on size of invasive plants site being treated.

Early Detection/Rapid Response treatment strategy would allow managers to treat invasive plants while the infestation is still small. Treatment methods and duration would be less intrusive to the forest visitor if areas are treated when small. Less time would be necessary for workers to be in an area, reducing the opportunity for forest visitors to encounter work crews. New infestations would be treated 1-2 times per year until the invasive weeds were eliminated.

Under EDRR, treatment methods would be limited to non-mechanical hand treatments and herbicide application methods as described previously.

Wilderness trailheads would be posted, informing visitors that herbicides have been or will be sprayed in the area. This may cause the visitor to recreate elsewhere, reducing their opportunity to engage in wilderness recreation. Invasive plant treatments overall would not detract from the

opportunity for primitive recreation. Effects would be the same under Early Detection/Rapid Response treatment strategy.

Wild and Scenic Rivers

The presence of invasive plants and treatments of them may impact the outstandingly remarkable values for which the rivers were designated or deemed eligible. Outstandingly remarkable values include scenery, recreation, geology, fisheries, wildlife, and botany/ecology, historic or cultural resources. Effects of invasive plants and invasive plant treatments on resource values other than recreation are covered in their respective resource report. Each resource area has identified project design features to protect their resource.

Regional standards and project design features are in place for herbicide use near water to protect water quality. Refer to the hydrology and soils sections of the analysis for detailed information concerning these resources.

The Wenaha River has outstandingly remarkable values of scenery, fisheries and geology. Granite Creek and North Fork Asotin Creek are noted for their fisheries resource. Refer to those respective resource reports for details. The Wenaha River and a portion of Granite Creek are located within wilderness. Effects of invasive plants and visitor perceptions of treatments along these rivers would be the same as those described for wilderness.

The NFJD, Grande Ronde, Desolation Creek and Tucannon River have recreation identified as an outstandingly remarkable value, in addition to other resource values mentioned above. See Table 50 for those values and refer to the respective resource reports for detailed information regarding these resources.

Visitors may notice dead vegetation due to herbicide application when traveling forest roads or when floating rivers. Effects to these rivers and the outstandingly remarkable value of recreation would be similar to those effects common to recreation for all action alternatives.

Early Detection/Rapid Response treatment strategy would allow managers to treat infestations within WSR corridors quickly while the infestation is still small. This strategy would reduce the opportunity for the spread of invasive plants within WSR corridors, protecting the outstandingly remarkable values for which they were designated or deemed eligible.

Alternative B - Proposed Action

Approximately 184 acres of 197 acres are proposed to be treated with herbicides in wilderness. The remaining treatments are five acres of biocontrol and eight acres of manual treatment. The effects on the wilderness character qualities of untrammeled, natural, undeveloped, and outstanding opportunities for solitude or primitive and unconfined recreation would be the same as described for all action alternatives. Broadcast application from horseback mounted pumps could be an application method utilized (see figure 12). Larger areas of vegetation may be treated and dead and dying plants may be more noticeable to forest visitors, reducing the apparent naturalness. The following table summarizes the acres of invasive plants to be treated by treatment method.

Table 54. Wilderness Areas and Acres of Proposed Treatments

Wilderness Name and Acres		Acres of Proposed Treatments				
		Biocontrol	Chemical	Chemical Riparian	Manual	Total
Wenaha-Tucannon	177,432	0	66	84	8	158
North fork Umatilla	20,435	0	5	12	0	17
North Fork John Day	107,058	5	13	4	0	22
Total Acres	304,925	5	84	100	8	197

Approximately 616 acres of 637 acres would be treated with herbicides in WSR corridors. The majority of these acres occur in riparian areas. There are 19 acres of biocontrol and two acres of manual treatments proposed under this alternative.

Effects would be the same as those for all action alternatives. The following table summarizes the acres of invasive plants to be treated by treatment method.

Table 55. Wild and Scenic Rivers, Designation, and Acres of Proposed Treatments

Wild and Scenic River Name and Designation		Acres of Proposed Treatments				
		Biocontrol	Chemical	Chemical Riparian	Manual	Total
Grande Ronde	Recreation	0	0	0	0	0
	Wild	0	0	28	0	28
Grande Ronde Total		0	0	28	0	28
NFJD	Recreation	0	17	28	0	45
	Scenic	0	7	91	0	98
	Wild **	2	0	32	2	35
NFJD Total		2	24	151	2	179
Wenaha	Recreation	0	5	0	0	5
	Wild **	0	2	13	0	15
Wenaha Total		0	7	13	0	20
Desolation Creek (Eligible)	Recreation	0	19	8	0	27
Granite Creek (Eligible)	Recreation	6	77	25	0	108
NF Asotin Creek (Eligible)	Scenic	0	0	159	0	159
Tucannon River (Eligible)	Scenic	11	3	102	0	116
Grand Totals		19	130	486	2	637

**These acres occur in designated wilderness and would be subject to laws, standards and project design features pertaining to wilderness.

Alternative C - No Broadcast Herbicide Application in Riparian

Of the 637 acres identified for herbicide treatment in wilderness and WSR, 486 acres are within the riparian zone. Most access into the wilderness is along trails that follow the riparian area of streams and rivers. By using methods other than broadcast spraying, less herbicide would be used overall. Individual plants would be targeted and resulting dead vegetation would be less noticeable. Potential for impacts to non-target plants would be reduced, reducing the effects on untrammelled and natural wilderness character qualities.

Application of herbicide to individual plants is typically more work intensive. There may be more workers in the wilderness for more days than if broadcast methods were used. Visitors may feel a loss of solitude due to the presence of workers in the wilderness.

Impacts to WSR and the outstandingly remarkable values of fisheries, botany, ecology and wildlife would be reduced by eliminating broadcast spraying in riparian areas. Potential impacts to non-target plants, delivery of herbicides to water and subsequent impacts on fish would be reduced. Refer to the respective resource reports for details about this alternative.

By using methods other than broadcast spraying, less herbicide would be used overall. Individual plants would be targeted and resulting dead vegetation would be less noticeable to forest visitors. Impacts to recreation as an outstandingly remarkable value of WSR's would be the same as those common to recreation for all action alternatives.

Alternative D - No Aerial Application

There are no aerial treatments proposed in congressionally designated areas under alternative D. The direct and indirect effects would be the same as those common to all action alternatives.

Effects on Developed Recreation Sites

Alternative A - No Action Alternative

Approximately 13 acres of invasive plants in five developed recreation sites would continue to be treated under current decision documents in alternative A. These sites include Alder Thicket, Woodland, Woodward and Tollgate Campgrounds and Spout Spring Winter Sports/Ski Area. New invasive plant infestations would be treated by manual methods. These treatments have proven ineffective and it is likely invasive plants would spread. Developed sites are considered high spread potential sites. Humans, the vehicles they use, pets and pack stock, associated with developed recreation sites would continue to be vectors spreading invasive plants and propagating plant parts.

Effects Common to all Action Alternatives

Many campgrounds, rental cabins, trailheads and picnic site are destination recreation sites. Recreation visitors that have made plans to use a certain facility may find that herbicides have been applied within or near the site. Recreationists may choose to recreate elsewhere due to the presence of herbicides.

Alternative B - Proposed Action

Approximately 86 acres in 32 out of 39 developed recreation sites would be treated with herbicides in alternative B. If all developed recreation sites were treated at the same time, recreationists that do not want to be exposed to herbicides would have a limited choice of facilities to use. This scenario is not likely due to program priorities, budget constraints and different weed species require treatments at different times of the year.

Standard 21 prohibits aerial application of herbicides within 300 feet of a developed recreation facility. No invasive plant sites in or adjacent to developed recreation facilities would receive aerial application of herbicides.

If new infestations were found near developed sites and aerial application was determined to be the most effective method of application, new NEPA analysis would have to be conducted for that site because aerial application is not included in the EDRR process as a method for treating new infestations. The following table summarizes the acres of invasive plants to be treated by treatment method.

Table 56. Ranger District, Site Name and Acres of Proposed Treatments

Ranger District and Site Name		Acres of Proposed Treatments			
		Biocontrols	Chemical	Chemical Riparian	Total
Heppner	Bull Prairie Campground	0	6.2	0	6.2
	Fairview Campground	0	10.3	0	10.3
	Penland Lake Campground	0	.2	0	.2
	Coalmine Hill Campground	0	.1		.1
	Ditch Creek Guard Station Rental	0	.5	0	.5
Heppner Totals		0	17.3	0	17.3
Pomeroy	Alder Thicket Campground	0	2.6	0	2.6
	Pataha Campground	0	0	.1	.1
	Meadow Creek Trailhead	0	0	.9	.9
	Panjab Trailhead	0	0	2.8	2.8
	Tucannon Trailhead	0	0	.6	.6
	Rose Spring Winter Sports Area	0	2.5	0	2.5
Pomeroy Totals		0	5.1	4.4	9.5

Ranger District and Site Name		Acres of Proposed Treatments			
		Biocontrols	Chemical	Chemical Riparian	Total
North Fork John Day	Bear Wallow Campground	0	0	2.2	2.2
	Big Creek Meadows Campground and Trailhead	0	0	.2	.2
	Driftwood Campground	0	0	2.3	2.3
	Gold Dredge Campground	0	0	2.7	2.7
	Oriental Campground & Trail Head	0	1.1	0	1.1
	Tollbridge Campground	0		.3	
NFJD Totals		0	1.1	7.7	8.8
Walla Walla	Jubilee Lake Campground	0	4.6	0	4.6
	Target Meadows Campground	0	2.4	0	2.4
	Umatilla Forks Campground	0	0	1.6	1.6
	Woodland Campground	0	0	1.6	1.6
	Woodward Campground	0	18.9	0	18.9
	Fry Meadows Guard Station Rental	0	.2	0	.2
	Burnt Cabin Trailhead	.5	0	0	.5
	Whitman Route Interpretive Site	0	4.3	0	4.3

Ranger District and Site Name		Acres of Proposed Treatments			
		Biocontrols	Chemical	Chemical Riparian	Total
	Corporation Organizational Camp	0	0	1.9	1.9
	Buck Creek Organizational Camp	0	0	.1	.1
	Andies Prairie Snow Play Area	0	0	4.3	4.3
	Bone Springs Winter Sports Area	0	3.7	0	3.7
	Spout Springs Ski Area	0	0	5.8	5.8
	Ruckle Junction Winter Sports Area	0	.1	0	.1
	Woodland Snow Play Area	0	0	.8	.8
Walla Walla Totals		.5	34.2	16.1	50.8
Grand Totals		.5	57.7	28.2	86.4

Alternative C- No Broadcast Herbicide Application in Riparian

Alternative C would have the same effects as the proposed action however; the 28 acres in riparian zones would receive an individual plant method application of herbicide or an alternate treatment type. Overall, less herbicide would be used by targeting individual plants. There would be less chance for herbicide to drift to the areas commonly used by visitors such as picnic tables, campsites, water sources and bathroom facilities.

Alternative D- No Aerial Application

There are no aerial treatments are proposed in or adjacent to developed recreation sites in alternative D. This alternative would have the same effect as those described in the proposed action.

Effects on Trails

Alternative A - No Action Alternative

Approximately 92 acres of 454 acres of known invasive plants within trail corridors would be treated. Additional invasive plant sites would not be treated. Trails are considered high spread

potential sites and it would be expected that existing and new infestations would continue to spread along trail corridors.

Effects Common to all Action Alternatives

Direct Effects

Non-motorized trail users such as hikers and pack stock users are typically traveling at a slow pace and dead vegetation immediately adjacent to trails would be noticeable. Non-motorized trails users may be more likely to come in contact with vegetation treated with herbicides by walking along recently treated trail areas.

Motorized trail users will also notice dead vegetation but should pass through an area faster than non-motorized users. Motorized trail users would be less likely to come in contact with vegetation treated with herbicides as the trail tread is maintained to a width that accommodates the motorized vehicle.

Indirect Effects

Trailheads would be posted alerting recreationists that herbicides have been applied to vegetation along the trail. This may cause recreationists to recreate elsewhere, regardless of the trail type.

Alternative B - Proposed Action

Approximately 454 acres of invasive plants within trail corridors would be treated under this alternative. Of this, 345 acres would be treated with herbicides, 107 acres treated with biocontrol measures and two acres would receive manual treatments. There are three treatment areas proposed for aerial application of herbicides that occur along non-motorized trails. One site (#06140400086) occurs along Salter Trail and is approximately seven acres in size. Two sites occur along Hixon Canyon Trail (#061404000495 and #06140400051). The first site is five acres and the other is three acres. The Salter and Hixon Trails would be directly impacted by this alternative. The trails would have to be closed during the aerial spraying operations for safety reasons. Users would be displaced to other trails. The closure would be short term, lasting during the aerial spraying operation. Spraying operations on these two small sites would last probably a day, but at most a few days. These trails receive low use during the regular summer season; however use increases during big game hunting season. The following table summarizes the acres of invasive plants to be treated by treatment method.

Table 57. Trail Type and Acres of Proposed Treatment

Trail Type	Acres of Proposed Treatments				
	Biocontrol	Chemical	Chemical-Riparian	Manual	Total
OHV/Motorcycle	26	13	11	0	50
Hiking/Pedestrian	0	22	1	0	23
Pack and Saddle	24	87	98	2	211
Cross Country Ski	57	112	1	0	170
Total	107	234	111	2	454

Alternative C- No Broadcast Herbicide Application in Riparian

This alternative would have the same effects as the proposed action, however; approximately 111 acres that are proposed for chemical treatment in riparian areas would be treated with non-broadcast herbicide methods or an alternate treatment type.

Alternative D- No Aerial Application

The effects of alternative D would be the same as those described for the proposed action, however; areas identified for aerial application would receive an alternate method of herbicide application or treatment type. The trails would not have to be closed for aerial spraying operations, however; herbicide would most likely be applied by another broadcast spraying method.

Effects on General Forest Area***Alternative A - No Action Alternative***

Of 24,649 acres of known invasive plants, 3,154 acres would be treated under the no action alternative. The remaining acres could be treated by manual methods. Manual treatments are less practical and effective for treating large infestations. Invasive plants would be expected to continue to spread throughout the forest.

Effects Common to all Action Alternatives**Direct Effects**

Approximately 23,275 acres of the general forest area would be treated for invasive plants over the next 10 to 15 years. Approximately 19,461 acres would be treated with herbicides. These acres occur along roads, quarries, rangelands, parking areas and dispersed sites as well as forest lands. These acres are not associated with destination recreation facilities, trails, wilderness or Wild and Scenic Rivers.

The forest visitor is most likely to encounter invasive plant treatments while traveling through an area on a forest road. Visitors may notice dead vegetation, signs informing visitors that an area has been treated with herbicides or people with equipment applying herbicides.

Visitors gathering mushrooms, berries and other forest products may be displaced to areas where herbicides have not been applied. Refer to the Pacific Northwest Region Final Environmental Impact Statement, Preventing and Managing Invasive Weeds, 2005 for discussion of human health and safety regarding exposure to herbicides.

Indirect Effect

Indirect effects would be similar to those described as common to recreation for all action alternatives.

Alternative B - Proposed Action

Treatments will utilize all available tools, including biocontrols, chemical, mechanical, aerial and manual methods. Approximately 675 acres of aerial application or herbicide are proposed on the Pomeroy District. The majority of chemical aerial application acres are in one contiguous 631-acre block. This site is in the Jim Creek area, west of Forest Highway 46, near the forest boundary. This area would be closed to the public during aerial operations and posted to inform visitors that herbicides have been applied. The area would be closed to public access only during the aerial application operations. This impact would be short term. Other effects would be similar to those

described as common to recreation for all action alternatives. The following table summarizes the acres of invasive plants to be treated by treatment method.

Table 58. Recreation Areas, General Forest and Acres of Proposed Treatment

Recreation Area	Biocontrol	Chemical	Chemical Riparian	Manual	Total
Wilderness	5	84	100	8	197
WSR	19	130	486	2	637
Developed Recreation	1	57	28	0	86
Trails	107	234	111	2	454
General Forest Area	3785	14626	4835	29	23275
Grand Totals	3917	15131	5560	41	24649

Alternative C- No Broadcast Herbicide Application in Riparian

This alternative would have the same effects as the proposed action; however, approximately 5,560 acres that are proposed for chemical treatment in riparian areas would be treated with non-broadcast herbicide methods or an alternate treatment type.

Alternative D- No Aerial Application

This alternative would have the same effects as the proposed action, except the 675 acres identified for aerial application of herbicide would be treated with alternative, applicable methods.

Cumulative Effects

The effects to recreation associated with invasive plant treatments are short-term. Recreation facilities, trails, wilderness areas or Wild and Scenic Rivers would not be treated for invasive plants at the same time; therefore, recreationists that are displaced due to their concern about herbicide exposure would be able to recreate in alternate facilities or other areas. Similar recreation opportunities would be available on the forest and adjacent public lands or some private land that may not have been treated with herbicides.

3.7 Effects of Herbicide Use on Workers and the Public

Changes between the DEIS and FEIS for Section 3.7

This section has been generally rewritten for clarification based on public comment and internal review.

Section 3.7.1 inserts table 59. Indicator for public issue identified by the public related to human health for all alternatives, and table 60. Human Health Issue Measurement: Character of PDFs reducing worker and public exposure to herbicides

3.7.1 Summary

This section focuses on the health effects to workers and the public if herbicide treatments are applied to invasive plants as proposed in the alternatives. The R6 2005 FEIS - appendix Q: Human Health Risk Assessment detailed the potential for health effects from the use of the herbicides proposed for this project. Herbicide active ingredients, metabolites, inert ingredients, and adjuvants and people with particular herbicide sensitivity were addressed. The Umatilla Forest Plan as

amended by the R6 2005 ROD adopted standards to minimize herbicide exposures of concern to workers and the public based on the human health risk assessments. Herbicides are an important component of the integrated weed management methods needed to meet the purpose and need for this project.

Many people expressed concerns about the effects of herbicides on human health in their response to scoping. People wondered if they could be sickened by brushing up against contaminated vegetation, or by eating berries, mushrooms, fish or game that may have been exposed to herbicides. They worried that they might drink water contaminated by herbicides. People expressed concern about the health and safety of forest workers who are more likely to be exposed to herbicides. Some believe that the potential cost to human health is too high and other methods should be used to treat invasive plants. While herbicides can be associated with human health hazards, the likelihood of harmful exposures under this project is very low.

Site-specific PDFs were developed to further minimize or eliminate exposures of concern to workers and the public, plausible given the regional standards. The PDFs ensure that herbicides and surfactants are used in rates low enough, or that methods are selective enough, to avoid exposures of concern. There are no differences in alternatives in terms of risk to human health. No exposures exceeding a threshold of concern are predicted, based on facts about the chemistry of the herbicides considered for use, and the mechanisms by which exposures of concern might occur. Scientific risk assessments do not indicate that any person would be adversely affected in any way by these herbicides used in the manner proposed for this project. This applies to all alternatives.

Table 59. Indicator for public issue identified by the public related to human health for all alternatives

Issue Component	Unit of Measurement	(No Action) Alternative A	(Proposed Action) Alternative B	Alternative C	Alternative D
1 Human Health.	Character of PDFs reducing worker and public exposure to herbicides	Forest Plan standards and project design features eliminate plausible harmful exposure scenarios in all alternatives. The R6 2005 FEIS displayed herbicide exposure scenarios that could result in human health impacts (such as nausea, skin rash, breathing trouble) based on risk assessments. Worst case exposure scenarios for workers and the public were studied. This project does not involve any exposure scenarios of concern for people. Rates of herbicide and surfactant application are limited in the PDFs, which eliminate the worst-case scenarios that could hurt people. The only scenario of concern remaining is drinking out of a pond contaminated pond by a direct spill of large proportions. This is not likely to occur given all of the safeguards associated with the project. In addition, there are many PDFs related to coordination with landowners, tribal members, forest products gatherers, and others to make sure inadvertent exposures do not occur. Public notification and sign posting would occur (see implementation plan).			

People live near, spend time in, work in, drink water from, and depend on the forest and forest products from the Umatilla National Forest. Thus, while the likelihood of harmful exposure is very low, there remains high concern about the impact of herbicide use to public and worker health.

3.7.2 Affected Environment

Infested sites are scattered and occupy less than three percent of National Forest System lands; however they transcend forest boundaries onto other privately owned land. Therefore, invasive plant treatments are implemented in partnership with the local counties, and at times other partners. Municipal watersheds, dispersed and developed recreation areas (trailheads, campgrounds, picnic areas, recreation sites, work centers, etc), and special forest product collection areas are currently near invasive plant sites. Municipal watersheds are described in chapter 3.4. Recreation areas are described in chapter 3.6.

Special forest products such as blackberries, huckleberries, salal, mushrooms and herbs are gathered for personal use and commercial sale. People who harvest special forest products may have more contact with sprayed vegetation than other forest visitors. People who gather special forest products tend to be ethnically diverse. A recent unpublished study of commercial permit holders demonstrated that the largest ethnic groups involved with forest product gathering are Hispanics and Southeast Asians (Khmer, Khmer Krom, Laotian and Vietnamese).

Crews often come from the communities located near the National Forest. Herbicide applicators are required to be licensed and well-trained in safe handling and application practices.

Civil Rights and Environmental Justice

The R6 2005 FEIS found that some minority groups may be disproportionately exposed to herbicides because they are most likely to be forest workers, special forest product collectors, or subsistence gatherers. It suggested that Hispanic forest workers and American Indians may be minority groups that could be disproportionately affected by herbicide use.

Hispanic and non-Hispanic herbicide applicators would be more likely to be exposed to herbicides than other people. Contractors for the Forest and/or County would likely apply herbicide treatments. County invasive plant control departments do not indicate that they employ any specific population group that could be disproportionately affected during invasive plant treatments.

Regardless, effects to all county or contract employees engaged in invasive plant control would be negligible due to project design features and compliance with occupational health and safety standards.

People of Hispanic and Southeast Asian (Khmer, Khmer Krom, Laotian and Vietnamese) descent are minority groups that tend to gather mushrooms; however, no mushrooms are target species and project design features are in place to protect fungi. Whenever herbicide treatment is going to happen, the Forest will notify tribes, plant collectors and the general public with media postings, handouts attached to permits, annual tribal contacts and on-the-ground signing. Information about invasive plant treatments would be added to existing multi-lingual mushroom gathering permit material to eliminate inadvertent exposures if appropriate. Some areas may be closed to gathering following treatment to avoid exposures. Even given plausible inadvertent exposures, the HQ values would not exceed the threshold of concern.

This project would not have an impact on anyone's civil rights. It is the policy of the Forest Service that the Responsible Forest Service Official (FSM 1704) review proposed actions for civil rights impacts and take either of the following actions in compliance with DR 4300-4 and 1010-1 (FSM 1730.1): prepare a civil rights impact analysis and statement of its findings for any proposed policy or organizational action which may have a major civil rights impact, or document the determination that a civil rights impact analysis and a statement of findings are not needed. In order to make the

determination that a Civil Rights Impact Analysis and a statement of findings were not needed, we scoped with more than 400 individuals, organizations, tribes, and other agencies as part of the NEPA process.

Human Health Risk Assessment Methodology

The R6 2005 FEIS evaluated human health risks from herbicide and non-herbicide invasive plant treatment methods. Hazards normally encountered while working in the woods (strains, sprains, falls, etc) are possible for herbicide and non-herbicide invasive plant treatment operations. Such hazards are mitigated through worker compliance with occupational health and safety standards and are not a key issue for this project-level analysis.

The human health hazards associated with each herbicide active ingredient were also evaluated. Herbicide active ingredients can be associated with short-term effects such as nausea, headache, dizziness, eye or skin irritation, and coughing and long-term effects such as cancer; reproductive, endocrine, immunologic, neurologic effects, and genetic mutations. However, no herbicide exposures exceeding a threshold of concern are associated with the herbicides in this project given the ingredient proposed at the specified application methods and rates. This conclusion is based on herbicide risk assessments prepared for the Forest Service by Syracuse Environmental Research Associates (SERA).

Forest Service/SERA risk assessments use peer-reviewed articles from the open scientific literature and current EPA documents, including Confidential Business Information. Specific methods used in preparing the Forest Service/SERA herbicide risk assessments are described in SERA, 2001. The risk assessment for the adjuvant NPE (nonylphenol polyethoxylate) was conducted and documented by David Bakke, Forest Service Pesticide-Use Specialist, consistent with the assumptions, methodologies, and protocols developed by SERA. The NPE Risk Assessment (Bakke 2003) was peer-reviewed by SERA toxicologists and other Forest Service and independent experts; it is included in the “Forest Service/SERA herbicide risk assessments” used throughout this EIS.

The toxicological database for each herbicide was reviewed for acute, subchronic, and chronic effects in laboratory animal studies. Judgments about the potential hazards of herbicides to humans are necessarily based in large part on the results of toxicity tests on laboratory animals. Information on actual human poisoning incidents and effects on human populations supplements the laboratory animal test results, where such information is available. For a background discussion of all toxicological tests and endpoints considered in Forest Service Risk Assessments, refer to SERA, 2001.

Herbicide formulations may contain additional compounds besides the herbicide active ingredient; these are termed impurities or inert ingredients. Other additives, called adjuvants and surfactants, may be mixed with the diluted formulation before spraying to either enhance the herbicide activity or to modify undesirable properties of the spray mixture. Additionally, when organisms in the environment internalize chemical herbicide formulation in their physiologic systems, they may transform them into other compounds called metabolites. Of these categories of substances, only the NPE group of surfactants has been tested and data produced that identify specific and quantifiable hazards to human health (Bakke 2003).

The following terminology describes relative toxicity of herbicides proposed for use.

Exposure Scenario: The way a person may be exposed to herbicide active ingredients or additives. How much herbicide a person may be exposed to is influenced by the application rate and method.

Threshold of Concern: A level of exposure below which the potential for adverse effects to an organism is low. This level was made more conservative in the R6 2005 FEIS to add a margin of safety to the risk assessment process

Hazard Quotient (HQ): The amount of herbicide or additives to which a person may be exposed over a specified period, divided by the estimated daily exposure level at which no adverse health effects are likely to occur. An HQ less than or equal to one indicates an extremely low level of risk; therefore, an HQ less than or equal to one is presumed to indicate a level of exposure below the threshold of concern for adverse health effects.

All alternatives are designed to limit exposures to herbicides by workers and the public to levels below a hazard quotient of 1, meaning that adverse health effects are unlikely to occur. This is done by limiting the potential for exposure so that it is below a threshold of concern, based on the risk assessment information. Even with a hazard quotient of less than 1, a person could still become sick.

The following information was adapted from SERA 2009, Control/Eradication Agents for the Gypsy Moth – Support Material for Response to Comments.

Some people feel that they suffer from Multiple Chemical Sensitivity (MCS), which is sometimes referred to as Idiopathic Environmental Intolerances (IEI). In general, individuals with MCS report that they experience a variety of adverse effects as a result of exposures to very low levels of environment chemicals (including herbicides) that are tolerated by individuals who do not have MCS. A distinction should be made between sensitive individuals in the general population and individuals reporting MCS. Reference doses derived by the U.S. EPA and used in Forest Service risk assessments incorporate an uncertainty factor of 10 to account for sensitive individuals, which may or may not eliminate risk that an individual may suffer symptoms. While not explicitly noted, the uncertainty factor for sensitive individuals addresses variability in tolerances within a normal population. Individuals reporting MCS assert, either explicitly or implicitly, that they are atypically sensitive.

A major problem in constructively addressing comments on MCS, however, involves the diagnosis of and remediation measures for this condition. While it is beyond the scope of the FEIS to address MCS in detail, it is worth noting that there is no current consensus on the diagnosis and cause of MCS. What appears to be an emerging view in several recent publications (e.g., Bornschein et al. 2008a, b; Das-Munshi et al. 2006, 2007; Eis et al. 2008) is encapsulated in the recent review of MCS by Das-Munshi et al. (2006), who state:

We conclude that persons with MCS do react to chemical challenges; however, these responses occur when they can discern differences between active and sham substances, suggesting that the mechanism of action is not specific to the chemical itself and might be related to expectations and prior beliefs.

Das-Munshi et al. 2006, p. 1257

In other words, MCS is clearly a condition that exists in the human population and individuals with MCS do experience adverse effects. The above quotation, however, suggests that these individuals may be responding to a perception of hazard rather than to a specific chemical.

While the above quotation may be a basis for suggesting that MCS is psychosomatic, other investigators are more cautious:

Regarding the psychological assessment it should be kept in mind that until the etiology and pathogenesis of MCS has been clarified an organic cause of the MCS associated symptoms and symptom complexes cannot be entirely ruled out. Lacour et al. 2005, p. 149.

This cautionary note is clearly justified by incidents reported in some studies which conclude that the existence of MCS is questionable. For example, the recent double-blind study by Bornschein et al. (2008a) concludes that:

Patients with a clinical presentation of MCS were unable to discriminate between exposure to chemicals and clean air placebo. There were no significant differences in objective physiological and neuropsychological parameters between chemical and placebo exposures. ... The results of our study suggest that a patient's attributions can be deceptive and a history of "multiple chemical sensitivities" must be questioned in the majority of cases. Other causes (e.g., cognitive sensitization, somatoform disorders, and other organic or psychiatric illnesses) always have to be considered.

The Bornschein et al. study, however, also describes an individual who dropped out of the controlled study after four controlled exposures – two exposures to solvents and two placebo exposures. In both exposures to solvents, the individual evidenced clear adverse effects – i.e., weakness, fatigue, and difficulty concentrating. These effects were not invoked in either of the placebo exposures.

In terms of this project, it is well beyond the scope and authority of the Forest Service to attempt to resolve concerns for MCS. The condition clearly exists and is the subject of serious study by the medical community.

3.7.3 Environmental Consequences

No Action

The herbicides and herbicide applications approved in no action were previously analyzed in the 1995 EA. No significant potential risks to health for workers or the public were associated with the 1995 project.

Action Alternatives

Worker Exposure to Herbicides

Applicator exposure to herbicides is influenced by the application rate selected for the herbicide; the number of hours worked per day; the acres treated per hour; and variability in human dermal absorption rates. In routine broadcast and spot applications, workers may contact and internalize herbicides mainly through exposed skin, but also through the mouth, nose or lungs. Contact with herbicide formulations may irritate eyes or skin.

Appendix Q: Human Health Risk Assessment in the R6 2005 FEIS displayed risks for typical and maximum label rates under a range of conditions. Four potential exposure levels were evaluated for workers, ranging from predicted average exposure (typical application rate-typical exposure variables) to a worst-case predicted exposure (maximum application rate-maximum exposure variables).

Accidental worker exposures are most likely to involve splashing a solution of herbicides into the eyes or on the skin. Two general types of exposure were modeled: one involving direct contact with a solution of the herbicide and another associated with accidental spills of the herbicide concentrate onto the surface of the skin. For this risk assessment, two exposure scenarios are developed for each

of the two types of dermal exposure, and the estimated absorbed dose for each scenario is expressed in units of mg chemical/kg body weight.

Exposure scenarios involving direct contact with herbicide solutions are characterized by immersing unprotected hands for 1 minute or wearing contaminated gloves for 1 hour. While it is unlikely that workers would immerse their hands in herbicide solutions, the contamination of gloves or other clothing is possible. For these exposure scenarios, the key element is the assumption that wearing gloves saturated with a chemical solution is equivalent to immersing the hands in a solution.

In either case, the concentration of the chemical in solution that is in contact with the surface of the skin and the resulting dermal absorption rate are essentially constant. Exposure scenarios involving chemical spills onto the skin are characterized by a spill onto the lower legs as well as a spill on to the hands. In these scenarios, it is assumed that a solution of the chemical is spilled on to a given surface area of skin and that a certain amount of the chemical adheres to the skin.

The ten herbicides proposed for use under the action alternatives, used at rates and methods consistent with PDFs, have little potential to harm a worker or a member of the public. In most cases, even when maximum rates and exposures were considered, HQ values were below the threshold of concern (HQ values ranged from 0.01 to 1).

There are two exceptions to this finding in appendix Q of the R6 2005 FEIS: the herbicide triclopyr and the surfactant NPE. Even at typical rates, there is potential for a worker to be exposed to herbicide over a threshold of concern from spot spraying triclopyr, especially the Garlon 4 formulation. Broadcast of the surfactant NPE at typical rates may also result in worker exposure over a level of concern.

PDFs eliminate this exposure scenario by favoring use of Garlon 3A, minimizing application rates of all triclopyr formulations, and following safe work practices and label advisories.

Public Exposure to Herbicides

The general public would not be exposed to levels of any herbicides used in the implementation of this project. R6 2005 FEIS appendix Q considered the plausible direct, acute and chronic exposures from herbicide ingredients. The Forest Service/SERA risk assessments considered acute exposures and longer-term or chronic exposures.

Acute exposures assume that a person has contact with the herbicide either during or shortly after an application. Specific scenarios estimate herbicide doses received from direct spray, from dermal contact with sprayed vegetation, or from consumption of contaminated fruit, water or fish. Direct spray scenarios assume that a naked child is completely covered with herbicide during a broadcast ground herbicide application. The assumption of 100 percent body coverage with herbicide is much greater than would plausibly happen in a real-world accidental overspray. An additional set of scenarios are included involving a young woman who is accidentally sprayed over the feet and legs. Detailed summaries of the public exposure scenarios can be found in Forest Service/SERA Risk Assessments.

Risk assessments indicate there is a potential for harm to a woman or child directly sprayed with triclopyr. There is virtually no chance of a person being directly sprayed given spot and hand/select methods considered for this project.

Exposures exceeding a level of concern also could occur if a person accidentally contacts vegetation spot-sprayed with triclopyr (Garlon 4®). Direct contact is implausible because of the high degree of

operator control inherent in spot spraying. In addition, the use of Garlon 4® is further limited by the PDFs (there would be no use of Garlon 4® allowed within 150 feet of any water body or stream channel; Garlon 4® would be avoided in special forest product gathering areas, campgrounds, or administrative sites). Forest product gathering areas, campgrounds and administrative sites may be closed immediately after Garlon 4® application to prevent accidental exposures.

An analysis was also conducted to determine whether people could be sickened from eating fish, berries, or mushrooms (etc.) exposed to herbicide. Several exposure scenarios for recreational and subsistence fish consumption were considered in the SERA Risk Assessments; none are near any herbicide exposure level of concern. Fish contamination is unlikely given the project design features that reduce potential herbicide delivery to water.

The R6 2005 FEIS and appendix Q disclosed exposure scenarios for both short term and chronic consumption of contaminated berries. These scenarios also approximate the effects of eating other contaminated products, such as mushrooms (Durkin and Durkin 2005).” Of the ten herbicides considered in this project, triclopyr was the single herbicide with exposure scenarios exceeding a level of concern if berries or mushrooms containing herbicide residue were consumed. To respond to this concern, PDFs limit the application methods and rate of application for triclopyr and NPE. Special forest product gathering areas may be closed to public use immediately after triclopyr application and NPE application to avoid inadvertent exposure.

Restricting the application rate, method and location of use of Garlon 4® and NPE would reduce the potential exposure in all alternatives to below a threshold of concern.

People who harvest and consume special forest products may be exposed through directly handling contaminated plant material, then chewing or eating it. Such doses would be additive, but are still unlikely to exceed a threshold of concern (see Cumulative Effects, below).

Acute longer-term or chronic exposures from direct contact or consumption of water following herbicide application were also evaluated in the R6 2005 FEIS. Risks from two hypothetical drinking water sources were evaluated: 1) a stream, contaminated with herbicide residues by runoff or leaching from an adjacent herbicide application; and 2) a pond, into which the contents of a 200-gallon tanker truck that contains herbicide solution is spilled. The only herbicide scenarios of concern would involve a person drinking from a pond contaminated by a spill of a large tank of herbicide solution.

The risk of a major accidental spill is not linked in a cause-and-effect relationship to how much treatment of invasive plants is projected for a particular herbicide; a spill is a random event. A spill could happen whenever a tank truck involved in an herbicide operation passes a body of water.

The potential risk of human health effects from large herbicide spills into drinking water are mitigated by project design features that require an Herbicide Transportation and Handling Plan be developed as part of all project safety planning, with detailed spill prevention and remediation measures to be adopted.

Table 60. Human Health Issue Measurement: Character of PDFs reducing worker and public exposure to herbicides

Concern	Project Design Feature to Address Concern
Workers	Reduced application rates of some herbicides; limitations on broadcast of triclopyr as per Standard 16.
Public	Reduced application rates of some herbicides; limitations on broadcast of triclopyr as per Standard 16. These limitations reduce risks to the general public, even considering multiple exposures.
Special Forest Projects	Reduced application rates of some herbicides; posting areas, supplying info to permittees; Using flagging to mark treated areas; Ensuring some areas are available that will not be treated. Detectable impacts are implausible except in the event of an unpredictable exposure. Even multiple exposures (eating contaminated fish, drinking contaminated water, skin irritation) would not result in exposure levels of concern.
Cultural Use Plants	Where an area is known as a collecting area, the use of herbicides will be avoided during season of collection and when the cultural use plants are present. Annual consultation with American Indian tribes will help ensure notification.
Drinking Water	Reduced application rates of some herbicides; Transportation and Handling Safety Plan and Spill Plan. Detectable impacts are implausible except in the event of a spill.

Human Health Cumulative Effects

Workers and the public may be exposed to herbicides used to treat invasive plants under all alternatives in this project; however, no exposures exceeding a threshold of concern are predicted. This conclusion is based on facts about the chemistry of the herbicides considered for use and the mechanisms by which exposures of concern might occur.

The proposed use of herbicides in all alternatives could result in multiple or additive doses of the same or different herbicides to workers or the general public. People could conceivably be exposed to herbicides in more than one place on the Forest, or elsewhere. However, the herbicides proposed for use do not bioaccumulate in humans and are rapidly eliminated from the body. Thus, chronic exposures do not add up in the body.

Chronic (daily over a period of time) worker exposure was considered in SERA Risk Assessments; no chronic exposures reached a level of concern. Chronic public exposure was also assessed, including repeated drinking of contaminated water, repeated consumption of contaminated berries, and repeated consumption of contaminated fish. No chronic exposure scenarios were over a level of concern for the public.

A person could be exposed to herbicides by more than one scenario; for instance, a person handling, and then consuming sprayed berries. The cumulative impact of such cases may be quantitatively characterized by adding the HQs for each exposure scenario. Using glyphosate as an example, the typical levels of exposure for a woman being directly sprayed on the lower legs, staying in contact with contaminated vegetation, eating contaminated fruit, and consuming contaminated fish leads to a combined (acute) HQ of 0.012. Similarly, for all of the chronic glyphosate exposure scenarios, the addition of all possible pathways lead to HQs that are two orders of magnitude less than 1, indicating an acceptable level of cumulative risk even with multiple exposure scenarios.

Even if an herbicide with a greater hazard quotient than glyphosate was used, berry harvesting (dermal exposure) and the subsequent eating (oral exposure) would allow the body to metabolize some of the initial dose before receiving the second dose, thus reducing the cumulative dose. These factors make the risk implausible that a combined dose would exceed the threshold of concern.

The R6 FEIS considered the potential for synergistic effects of exposure to two or more chemicals: “Combinations of chemicals in low doses (less than one tenth of Rf) have rarely demonstrated synergistic effects. Review of the scientific literature on toxicological effects and toxicological interactions of agricultural chemicals indicate that exposure to a mixture of pesticides is more likely to lead to additive rather than synergistic effects (ATSDR 2004; U.S.EPA/ORD 2000). Based on limited data available on chemical combinations involving the ten herbicides considered in this EIS, it is possible, but unlikely, that synergistic effects could occur as a result of exposure to herbicides considered in this analysis. Synergistic or additive effects, if any, are expected to be insignificant” (USFS 2005a, p. 4-3). This finding is borne out by evidence from State of Oregon Pesticide Use Reporting in 2007 (http://www.oregon.gov/ODA/PEST/purs_index.shtml).

Herbicides are sometimes used in combination with additives such as surfactants. NPE surfactant has been associated with human health risks at certain exposure levels. NPE has estrogen-like properties, although they are much weaker (1,000 to 100,000 times weaker) than natural estrogen. NPE is widely used and present in personal care products (moisturizers, deodorants, perfumes, shampoos, and soaps) and detergents. Animal studies suggest that acute exposures at high levels may cause subclinical effects to the liver or kidneys.

The risk analysis for NPE (Bakke 2004) found that typical backpack application of herbicide containing NPE surfactant at typical exposures and a rate of 1.67 lbs/acre would add 0.1 to the cumulative HQ for these types of chemicals. For the public, values ranged between 0.00001 (eating contaminated fish) to 0.2 (consuming a pound of berries at typical exposures). These are relatively small increases in hazard and do not significantly increase the potential for cumulative effects from use of NPE surfactant and herbicides.

3.8 Range Resources

3.8.1 Introduction

Invasive Plants and Range Resources

Presently 74 percent of the Umatilla National Forest is appropriated into range allotments (1,038,829 acres). There are 48 cattle allotments in which 94 percent of the invasive species sites (1948 of the 2067) are located totaling approximately 80 percent of the infested acres forest wide (19,770 acres of the total 24,649 infested acres forest wide). Approximately 74 percent (2,000 of the 2,770 acres) of acres approved for treatment in the 1995 EA are located in active allotments. Thirty eight percent of these allotments have recently evaluated noxious weed issues under the current forest plan standards. Table 61 lists the allotment name, acreage, present use, and the invasive weed acres.

3.8.2 Affected Environment

Direct impacts of invasive species to grazing animals, include nitrate poisoning from Canada thistle in ruminants, fatal poisoning of horses from Russian knapweed and yellow starthistle, excessive salivation and diarrhea in cattle from leafy spurge (Knight and Walter 2003). Domestic and wild grazing animals contribute to invasive plant establishment and spread through selective eating, redistribution of invasive plant seeds in scat, skin or fur, and hooves, and soil disturbance, therefore creating conditions favorable for seed germination. Historically, several intentional and unintentional introductions of invasive plants into native plant communities have been associated with livestock management, resulting in widespread invasions (Baker 1974; Sheley and Petroff 1999).

Healthy and vigorous vegetation capable of resisting weed invasion is possible through proper grazing methodologies (Sheley et al. 1996).¹⁸

Table 61. Range allotments and invasive weed acres

Range Allotment	Use (A=active, V=vacant)	District	Forest Service lands allotment acres	Number of Invasive species sites	Number of Invasive Species present within allotment ¹	Acres of invasive species
ASOTIN	A	Pomeroy	39,076	41	10	1,592
BROCK	A	WW	942	2	2	2
BUTCHER CREEK	A	NFJD	10,890	4	5	34
CENTRAL DESOLATION	A	NFJD	14,133	19	5	70
COALMINE	A	Heppner	6,919	2	3	2
COLLINS BUTTE	A	Heppner	20,099	75	6	519
COOPER CREEK	A	NFJD	4,443	1	2	2
CUNNINGHAM	A	NFJD	43,726	12	35	58
DITCH CREEK	A	Heppner	37,545	110	7	1,121
EDEN	A	WW	40,753	177	13	1,328
F. G. WHITNEY	A	NFJD	52,237	58	7	674
GOODMAN	V	WW	30,908	49	16	425
HARDMAN	A	Heppner	23,918	77	6	472
HIDAWAY	A	NFJD	31,901	25	8	131
HUTCHISON	A	NFJD	1,697	0	0	0
INDIAN CREEK	A	NFJD	77,387	63	9	1,523
JIM CREEK	A	Pomeroy	104	2	1	95
JOHNSON	V	NFJD	399	1	1	1
KLONDIKE	A	NFJD	23,642	35	10	500
LITTLE WALL	A	Heppner	37,312	78	4	475
LUCKY STRIKE	A	NFJD	17,115	25	5	575
MACKEE	V	Pomeroy	38	0	0	0
MATLOCK	A	NFJD	10,706	5	2	88
MCDONALD SPRING	A	NFJD	139	0	0	0
MONUMENT	A	Heppner	19,099	35	4	99
NORTH END	A	WW	126,221	406	20	3,614
NORTH FORK	V	NFJD	683	0	0	0
PEDRO	V	NFJD	643	0	0	0
PEOLA	A	Pomeroy	22,973	31	10	625
POMEROY	A	Pomeroy	21,225	127	11	811
POTAMUS	V	NFJD	350	1	3	0
SPRING CANYON	V	NFJD	165	0	0	0
SPRING MOUNTAIN	A	WW	33,688	96	11	1,302
STONEHILL	A	Umatilla NF	2,945	0	0	0

¹⁸ For a complete review of the influence of ungulates on non-native plant invasions in forests and rangelands, see the Regional FEIS, Appendix D, PNW Causal Paper Ungulates. This paper presents the current understanding in the Region with respect to ungulates as contributors to the spread of invasive plants. Selective foraging, effects of site disturbance or alteration, and knowledge gaps and future research needs are discussed.

Range Allotment	Use (A=active, V=vacant)	District	Forest Service lands allotment acres	Number of Invasive species sites	Number of Invasive Species present within allotment ¹	Acres of invasive species
SWALE CREEK	A	Heppner	27,057	35	4	378
SWISS FLAT	V	NFJD	174	0	0	0
TAMARACK	A	Heppner	19,438	70	5	856
TEXAS BAR	A	NFJD	58,803	69	11	229
THOMPSON FLAT	A	NFJD	6574	12	5	29
TOUCHET	V	WW	22,735	19	8	445
TROUT MEADOWS	CLOSED	NFJD	25,934	3	1	9
WALLA WALLA	V	WW	28,805	32	12	326
WENAH	V	Pomeroy	14,919	17	8	36
WENATCHEE	A	Pomeroy	6,271	20	5	231
WESTERN DESOLATION	A	NFJD	13,400	19	5	130
WINLOCK	A	Heppner	5,149	35	4	288
YELLOW JACKET	A	Heppner	17,229	60	4	675
TOTAL	47		1,038,829	1,948		19,770

Data for allotment acreages were derived from Umatilla National Forest INFRA database (9_14_06). Overlay of invasive weed sites were completed using Umatilla National Forest corporate database (BMP_Prov)

Diffuse and spotted knapweed, Canada thistle, and houndstongue are invasive species that are most prevalent in the allotments forest-wide (table 62), and mostly found along roads. Dispersal vectors for houndstongue seed (burs) are primarily by cattle. It is also thought that deer, elk and other small mammals readily disperse houndstongue seed, but minor compared to cattle (Clerck-Floate 1997). Canada thistle is found along many of the roads especially in the Asotin allotment on the Pomeroy district. In many instances cattle and other browsers will avoid areas where invasive weeds are prevalent in large monocultures, and move to areas where there is better forage. In areas where occasional invasive species occur with other desirable species it is highly likely that these animals would ingest some invasive weed seed and disperse viable seed in feces. Some weed seeds are destroyed within the gastrointestinal tract; however, leafy spurge and spotted knapweed seeds can pass thru sheep, goats, and mule deer and some of the seeds remain viable (Lacey et al. 1992). Leafy spurge seed was shown to be viable in feces 10 days post ingestion by mule deer. Long-lived seeds and hard seeded species of dicots and grasses consumed by grazers have been reported to survive passage thru gastrointestinal tracts of cows and grizzly bears (Janzen 1984). It is suggested that land managers control movement of domestic ruminants, and that these animals should not be moved from infested areas to noninfested areas where viable seed is present on the stems. Alternatively, the animals could be confined into a dry lot for 5 to 10 days to allow any viable weed seeds to pass ensuring no further dispersal of invasive seed is possible (Sheley and Petroff 1999).

Watering systems such as troughs and tanks with frequent animal visitation and other range structural improvements where the ground is disturbed and invasive species can be easily established and dispersed represent approximately 387 acres of the high potential spread areas. Additionally, cattle often exhibit trailing behavior along fence lines that can result in disturbed areas for invasive species to establish. Estimates of fence lines with potential trailing impacts from cattle is suggested to be approximately 50 percent of fence lines in allotments forest-wide (M. Bulthuis 2006). This estimate would suggest that there is approximately 1,900 additional acres where invasive species could establish. Presently, there are 70 invasive weed sites (representing 113 acres) near fences (10 foot

fence line corridor) located within the 50 allotments along the 3,133 miles of fence on the Umatilla National Forest (Umatilla NF GIS database 10/06).

Table 62. Invasive species acres in Umatilla National Forest grazing allotments -

Invasive Species ¹	Estimates of Total Acres infested ²
Diffuse knapweed	8807
Canada thistle	4355
Houndstongue	2413
Spotted knapweed	2078
St. John's wort	1368
Scotch thistle	220
Yellow starthistle	189
Common burdock	170
Sulphur cinquefoil	165
Dalmatian toadflax	82
Tansy ragwort	72
Whitetop	44
Musk thistle	42
Leafy spurge	21
Scotch broom	6
Russian knapweed	3
Medusa head	3
Rush skeletonweed	0
Orange hawkweed	0

1 For Scientific names see botany report

2 These acreages are gross acres where areas are delineated by the outer perimeter of the weed infestation and may contain significant areas that are not currently occupied by weeds.

Table 63. Invasive species in all allotments across the Umatilla National Forest -

Range improvement	Number of improvements (all allotments)	Acres in high spread
Water system (spring, metal trough or tank with concrete bottom)	337	385
Handling facility	1	1.5
Fence lines	3,133 miles	113 current 1,908 potential ¹
Total	N/A	500

These acreages are gross acres where areas are delineated by the outer perimeter of the weed infestation and may contain significant areas that are not currently occupied by weeds.

1 Based on 10' wide path along 50% of fence lines

3.8.3 Environmental Consequences

Direct and Indirect Effects

This section will present the direct and indirect effects analysis for range resources. Issues presented during public scoping and effects related to range resources will be presented by alternative.

The R6 2005 ROD amended the existing forest plan, therefore, all action alternatives require incorporation of invasive plant prevention practices in annual operating instructions/plans and allotment management plans. The incorporation of these prevention practices are expected to reduce environmental impacts of livestock grazing forest wide. Ultimately, invasive plant prevention practices may result in some reduction to livestock grazing, but prevention of invasive plants is only one of several resource protection measures that reduce grazing. Consideration of multiple factors including range condition, stream protection, and endangered species management will also influence allotment management. For complete discussion of these practices in relation to range resources see the R6 2005 FEIS, chapter 3. The effects analysis described in this document analyze effects of the alternatives on grazing allotment permittees and range resources.

Table 64. Comparison of factors affecting ability of alternatives to reduce invasive species spread on grazing allotments on the Umatilla National Forest

Comparison Factors	Alt A – No Action	Alt B Proposed Action	Alt C. No Broadcast Riparian	Alt D. No Aerial Broadcast Treatment
Loss of native plant communities and plant bio-diversity	+++	+	++	++
# of herbicide formulations available for use	2	10	10	10
Acres of invasive plant that could be treated within existing allotments (all methods – Manual, Biocontrol, and/or Herbicide)	3,154	20,040	20,040	20,040
Acres of invasive plant sites that could be treated with herbicides either alone or in combination with other techniques within allotments	742	16,898	16,989	16,898
EDRR (including herbicide use)	No	Yes	Yes	Yes
Treatment Effectiveness (derived from Botany section)	Low	Highest	High	High
% of Total Forest Landbase Treated with Chemicals (all identified acres/annually) ³	Apprx: 0.12%, <0.008% annually	Apprx: 1.5%, 0.3% annually	Apprx: 1.5%, 0.3% annually	Apprx: 1.5%, 0.3% annually

Alternative A - No Action

This alternative is legally required and forms the basis for comparison against the action alternatives. Under this alternative, there would be no change in current management direction or in the level of ongoing management activities. Currently, approximately 2,000 acres in grazing allotments are approved for treatment under the existing 1995 EA

Invasive plants are currently damaging the ecological integrity of lands within and outside these allotments. Despite management direction in the 1995 EA, invasive plants continue to increase and occupy previously noninfested areas. Invasive plants spread at a rate of 8-12 percent annually (USDA 2005) within National Forest System lands and neighboring areas, affecting all land ownerships (See existing condition section in the Botany report, available in the Project Record, for estimates of invasive species growth forest wide based on current treatment effectiveness). As the current conditions change, and as invasive species continue to spread via common dispersal methods, management activities such as livestock grazing will be affected. Livestock and their human managers have the potential to spread invasive species. As the spread of invasive species becomes

more obvious to the public, they will put more pressure on public land managers to restrict vectors the spread invasive species. This includes livestock and livestock operations.

Under current, allowable treatments, invasive weeds would likely continue to displace palatable native vegetation and could reduce forage on grazing allotments. Activities within allotments will continue to serve as seed dispersal vectors as these invasive species sites continue to grow. Loss of native plant communities may continue to occur as invasive weeds occupy and out-compete native species. Once invasive species begin to dominate these communities, a loss of species diversity, composition, and ecosystem function could occur.

Noxious weeds would likely continue to spread into areas that are not currently infested, such as recently burned areas. Once weeds become established, these areas would likely serve as weed seed source for other areas of the forest and nearby non-National Forest System lands.

Toxic species such as Canada thistle and leafy spurge would continue to increase under the no action alternative. Most of the Canada thistle is along roadsides and grazing animals would likely avoid these areas in search of more palatable forage elsewhere. Leafy spurge is only documented on 20 acres across the forest and even with the potential for spread it is likely cattle will avoid these areas and no impacts to cattle from toxic properties from either of these two species would occur with this alternative.

This alternative would not meet the desired future condition of the area which is to “retain healthy native plant communities that are diverse and resilient, and restore ecosystems that are being damaged, and to provide high quality habitat for native organisms throughout the forest, and assure that invasive plants do not jeopardize the ability of the forest to provide goods and services communities expect” (See chapter 1.2). Invasive species will continue to spread as documented from past inventories compared to the current inventories.

Alternative B - Proposed Action

This alternative proposes to address problems posed by invasive plants that compromise our ability to manage native ecosystems on the Forests. New management direction and tools made available for use in Region 6 will be utilized. Analysis will tier to the *R6 Invasive Plant Program Final Environmental Impact Statement* (USDA Forest Service 2005a), including the use of the newly approved herbicides as described in the document. There is a need to reduce the extent of specific invasive plant infestations on the known weed sites, and to protect noninfested areas using early detection rapid response.

Long-term effects of invasive weed treatments on the 48 affected grazing allotments (approximately 20,000 acres) would be the retention of currently available forage, reduction in spread from existing and unknown future sites, and recovery of native vegetation in areas currently impacted by invasives. Because herbicides are analyzed based on 4,000 acres per year, treatment sites will be prioritized at each individual district level. Operators may experience a slight loss of grazing opportunity however, many of the grazing strategies within allotments have deferred rotations and by focusing invasive weed treatments to the pastures during the resting phase would avoid most all potential impacts to operators

Some herbicides have label use restrictions that will be followed regarding livestock grazing and/or slaughtering post herbicide treatment and subsequent exposure. As mentioned previously, treating pastures that are currently in rest due to grazing management rotations would eliminate any potential effects. If movement of livestock is not possible and pastures or allotments require treatment while animals are present all label use restrictions will be followed in addition to PDFs that require

permittee notification prior to any proposed aerial application. Notification and coordination should also occur during annual operating instruction/plan meetings and by posting/signing areas to be treated prior to and after treatment (USDA 2005b). For aerial herbicide application within allotments, permittees would be notified of proposed expected timeframes for treatment to allow the option to remove animals. No adverse effects to large mammals were found from direct spray of herbicides that could be applied aerially at the highest expected rates (R6 2005 FEIS, SERA Risk Assessment-Effects to Wildlife). Of the 675 acres proposed for aerial herbicide treatment, there are presently 287 acres proposed within grazing allotments and could be additional sites in the future. Most aerial sites are located in steep terrain with limited access areas where livestock generally do not prefer however, PDFs would provide additional protection in the event stray grazing animals were present in areas (see PDFs N-1, N-2 in Section 2.2.3 above).

Under the proposed action it is acknowledged that more chemicals would be used in the environment while effectively treating invasive species (See chapter 2.2.3) compared to the no action alternative. The potential for a spill to occur during herbicide operations would be greater than under the no action alternative based on the additional number of acres that would be treated. Minimal to no effects are anticipated to grazers or operators due to strict adherence to label handling directions and spill containment protocols in the unlikely event of a spill. There has been a concern that livestock grazing is a major cause of non-native plant invasions (Belsky and Gelbard 2000) and that removal of livestock would reduce much of the cause of invasive species spread. No manipulative studies with appropriate treatments and controls have rigorously tested this hypothesis. Additionally, no known manipulative experiments of grazing effects of wild ungulates on non-native plant species dynamics have been done (Parks et al. 2005). Scientific support is growing for the hypothesis that large herbivores facilitate the invasion and establishment of non-native plants, however, substantial controversy exists about the specific process in time and space and the associated predictions of effects.

Under this alternative treatment of invasive species including eradication at some locations, would allow grazing activities to remain much as they are under current conditions and would meet the desired future conditions within the project area. Additional benefits to this alternative would be the reduction of potential spread of invasive species into noninfested disturbed areas such as fence lines. Also, early detection and response for any newly established invasive species would occur. Compared to the no action alternative the impacts, especially long-term impacts, to permittees would potentially be reduced, because native and desirable non-native vegetation would increase. The treatment of existing and future documented sites under this alternative would positively affect range resources.

Alternative C - Riparian Restriction

Alternative C would meet the same objectives as alternative B, but intends to minimize impacts from chemical use in riparian areas by not allowing broadcast herbicide treatments within riparian areas. This alternative would not allow broadcast herbicide treatments in approximately 2,005 riparian acres in allotments. This means that any invasive species that are presently known or discovered in the future could only be treated with manual spot treatments and in accordance with all PDFs (see section 2.2.3).

Impacts to livestock and operators would be similar to those described in alternative B, but the potential for exposure of livestock and livestock managers will be slightly decreased as less chemical will be used within riparian areas. The potential for reestablishment of species with seed present in the riparian area soil seed bank are greater because riparian areas may not be as effectively treated as allowed under alternative B.

Alternative D - No Aerial Herbicide Application

Alternative D would meet the same objectives as alternative B, but would avoid potential effects from drift by not allowing aerial application of herbicides. Because the 287 acres of grazing allotment may still be treated by other methods, little impact to forage availability is expected. It is anticipated that these existing infestations will likely recover to native vegetation in the future, however, the treatment method may not be as effective or recovery of vegetation may not happen as quickly as suggested in the proposed alternative. Livestock do not prefer to graze on steep slopes where most aerial treatments are proposed, therefore, impacts from no aerial herbicide treatments would likely have little to no effect.

By not aerially treating, the potential for exposure to livestock and livestock managers will be reduced. Other benefits of this alternative would be the same as the alternative B.

Implementation of alternatives B, with appropriate environmental protection would not result in irreversible or irretrievable loss of range resources. Implementing alternative A (no action) would likely result in eventual irreversible impacts on grazing resources as weeds would continue to spread and invade in and around the proposed treatment areas. Implementing alternative C&D would likely result in eventual irreversible impacts on grazing resources as weeds would continue to spread and invade in and around the proposed treatment areas that are treated with methods not as effective as those proposed in alternative B, however, at a level much lower level of loss compared to the no-action alternative.

Cumulative Effects

The cumulative effects spatial project area is the Umatilla National Forest and nearby adjacent Tribal, private, State and other federal lands. The time frame of the analyses includes the past 20 years and the next 15 years, which is expected to be the life expectancy of this document. Invasive plants and programs to treat them have been present on the Forest more than 20 years; however, most Land Resource Management Plans in the late 1980s and early 1990s did not recognize the specific details of the ecologic implication of invasive plants.

Present and reasonably foreseeable future actions continue to provide opportunities for invasive plant species to establish. The R6 2005 FEIS estimates that invasive plants continue to spread at a rate of 8-12 percent annually. Treatment effectiveness of all methods approved within the R6 2005 FEIS, including the site specific treatment methods evaluated in alternatives B, C, and D, is expected to increase to 80 percent compared to the 35 percent effectiveness presently reported (see Botany report). For a full discussion of direct indirect and cumulative effects to native vegetation that is linked to grazing see effects analysis in the Botany report.

Forest Service projections suggest that recreational use of National Forests will continue to increase, and other land management and use activities such as grazing, vegetation management, fuels management (Healthy Fuels Initiative), and fire suppression will continue to cause ground disturbances and contribute to the introduction, spread and establishment of invasive plants on National Forest System lands (USDA Forest Service 2005a).

Land uses and development on lands adjacent to or outside National Forest boundaries will likely continue to contribute to the potential for invasive plant species to be distributed in the Forest. For example, the use of invasive plants by landowners for landscaping, while small individually, can collectively result in significant impacts, especially along riparian corridors (USDA Forest Service 2005a).

Cumulative effects are expected to be positive for the action alternatives because more aggressive treatments combined with Early Detection Rapid Response activities, as well as cooperative efforts with other Federal, State and private landowners will reduce potential for additional spread of invasive plant species and loss of desired available forage.

3.9 Social and Economic Impacts

Changes between the DEIS and FEIS for Section 3.9

Section 3.9.1 inserts table 65. Summary of Effects by Alternative

The Cumulative Effects section for the action alternatives is at the end of the section instead of under each alternative

3.9.1 Introduction

The impact of invasive plants is many and varied. They can poison livestock and pets, contribute to increased fire hazards, compete with desirable plants, reduce the suitability of wildlife habitats, and change the nature and composition of plant communities. A 2000 report by The Research Group estimated the cost of controlling these invaders, which impacts both private and public budgets. It is estimated that 21 of the 99 weeds listed as noxious in Oregon reduced the State's total personal income by about \$83 million. This equated to approximately 3,329 annual jobs lost to Oregon's economy. It was estimated that these 21 species cost the citizens of Oregon a total of about \$100 million per year. The effect of all 99 noxious weeds is likely significantly greater (The Research Group 2000).

This analysis focuses on the costs of implementing each of the alternatives described in chapter 2. The cost of treating acres proposed in the action alternatives nears \$4 million, averaging about \$200 per acre. The action alternatives are estimated to cost about \$550,000 per year to treat 4,000 acres. Control of the known inventory is likely to take many years; at this treatment level known infestations could be controlled in approximately 19 years under the action alternatives.

Although alternative A has the lowest net annual equivalent cost among the alternatives analyzed, the average cost per effectively treated acre of \$814, is over four times as much as that proposed under the action alternatives. Additionally, approximately 87 percent of currently inventoried infestations would remain untreated under alternative A, allowing the continued spread of invasive species. Therefore, until future action could be taken to arrest the spread of these species, potential long-term costs are unlimited under the no action alternative as existing infestations continue to spread at a rate of 8 to 12 percent annually (Laufmann 2006).

For example, in twenty years, assuming an average rate of spread of 10 percent and no treatment efforts beyond those currently authorized, infested acres could grow to approximately 525 percent of current infestations. Deferring treatment for that period of time would result a similar growth in the required future expenditures needed to manage the larger infestation.

Among the action alternatives, alternative B has the lowest net annual equivalent cost followed by D and then C. Each of the action alternatives are projected to contain or control existing inventoried infestations and prevent the spread of invasive species on the Umatilla National Forest. Future treatment costs are minimized under all action alternatives relative to alternative A.

The analysis of various annual treatment levels reveals that under all alternatives, long-term costs are reduced by implementing as large an annual treatment program as possible within budgetary

constraints. Even though annual costs under larger treatment levels increase, long-term costs are reduced because containment and control can be achieved in a shorter period of time, reducing the need for future investments in treatment activities.

Table 65. Summary of Effects by Alternative

Indicator	Alternative A	Alternative B	Alternative C	Alternative D
Average Cost per Acre	\$814	\$197	\$201	\$200
Total Cost for One Time Treatment	\$641,695	\$3,887,460	\$3,963,010	\$3,942,840
Average cost per year to treat 4,000 acres	\$133,700 for 31 years	\$539,030 for 19 years	\$549,790	\$546,950

Untreated acres under alternative A would continue to spread resulting in an increasingly rapid decline in resource conditions and biodiversity across the forest and on neighboring lands. Commodity and non-commodity values would continue to decline at ever escalating rates as more and more native species succumb to invasive species. Future efforts to treat invasive species may require increasingly aggressive measures in order to achieve containment or control. The potential costs and socio-economic effects of these future efforts would continue to mount until action is taken to successfully arrest the spread of these species.

The programs of treatment proposed under alternatives B, C, and D, are projected to result in declining populations of invasive species, allowing the biodiversity of native species to be maintained and enhanced. The adverse economic effects of non-native invasive species would be contained and reduced as the treatment programs proposed reduce the occurrence of these species.

Methodology

The Project Area is the ten counties most directly influenced by the Umatilla National Forest. Four counties in southeast Washington; and six counties are in northeast Oregon. The time frame used for the analysis of direct, indirect, and induced economic effects is approximately seventeen years. This is the estimated period of time required to achieve purpose and need based on projections developed using the assumptions described below.

In order to compare the alternatives, implementation costs were estimated based on a uniform set of assumptions. The cost estimates displayed in this report should not be assumed to be exact. They are an approximation intended to provide a method for comparing alternatives. Regardless of which alternative is selected, costs will vary from year to year based on factors such as annual budget allocations, the annual operating plan, the conditions present in the sites scheduled for treatment, opportunities for cost savings afforded by partnerships with Forest stakeholders, and the availability of external funding.

The area to be treated annually is generally constrained by budget allocations. For the analysis purposes, annual herbicide treatments were estimated to average 4,000 acres. However, the cost of treatments at various levels was estimated to determine annual and long-term costs should budget levels vary from those projected. Many variables affect the cost of treatment activities, including: treatment methods (e.g., mechanical, manual, herbicide, etc.); method of herbicide application (e.g., aerial, broadcast spraying, spot application, etc.); species, and site conditions. Many of the sites to be treated are likely to require repeated entries; the phenology of individual invasive species and the

effectiveness of a given treatment influence the number of entries that may be needed. It is expected that in some cases, multiple treatment methods may be employed on the same site. For example, a site with multiple species may be treated with spot application of herbicide to address one species, and physical treatments, such as hand pulling to address other species. In some cases a combination of treatment options are proposed, such as manual, mechanical, and/or herbicide. On these acres, one treatment method may be utilized initially, with another method used for follow-up treatments, such as herbicide treatments applied in year one followed by manual treatments in year two.

To estimate cost impacts, two analyses were conducted. The first estimate is the total undiscounted cost to treat all affected acres one time together with the cost of associated monitoring. For this estimate, no effort was made to approximate the acres of re-treatment, acres of spread or early detection rapid response (EDRR). While the dollar value developed should not be construed as the total project cost, it is useful for the purposes of comparing alternatives. The result of this calculation was then divided by the estimated number of acres effectively treated. Treatment effectiveness under alternative A was estimated at 25 percent of acres treated based forest experience utilizing the current treatment strategy. Treatment effectiveness under the action alternatives was estimated at 80 percent of acres treated based on commercially acceptable standards. The second cost estimate examines the discounted annual and long-term costs to control current inventoried sites at an average annual herbicide treatment level of 4,000 acres.

- The average efficacy of the more limited suite of treatment methods available under the no action alternative (alternative A) was estimated at 25 percent based on the assessment of past treatment activities on the Forest (see previous section on treatment effectiveness)
- Average efficacy of the suite of treatment methods available for use under the action alternatives (alternatives B, C, and D) was assumed to be 80 percent based on commercially acceptable standards (see previous section on treatment effectiveness)
- Under alternative A, the application of treatment methods on acres identified for treatment using manual, mechanical, and/or herbicide is approximated based on the five-year average. From 2001 through 2005, 65 percent of treatments utilized manual and mechanical methods and 35 percent utilized herbicide ground applications
- Under alternatives B, C, and D, acres identified for treatment using manual, mechanical, and/or herbicide were projected to be treated primarily with herbicides initially and as population size is decreased, manual and mechanical methods would be used. Treatment costs per acre were estimated based on an assumption of 90 percent herbicide and 10 percent manual or mechanical. Annual caps do not apply to non-herbicide treatments.
- Costs per acre for treatment activities are estimated using regional averages adjusted for local costs variances and are displayed in table 66

Table 66. Cost per acre of invasive species treatment methods

Treatment Method	Cost per Acre
Manual/Mechanical Treatments	\$340
Biological Treatments	\$70
Aerial Herbicide Treatments	\$42
Ground Broadcast and Spot Herbicide Treatments (Avg.)	\$100
Ground Spot Herbicide Treatments only	\$125
Manual/Mechanical and/or Herbicide Treatments – Alternatives B, C, and D	\$124
Manual/Mechanical and/or Herbicide Treatments – Alternatives A*	\$256
Inventory and Monitoring	\$47

* Because of restrictions on the use of herbicides under the no action alternative, the cost to treat acres identified for manual, mechanical, and or herbicide treatment methods is higher than would occur under the action alternatives as described above.

These costs represent estimated open market costs and do not necessarily equate to actual Forest Service expenditures. In some cases, actual Forest Service costs per acre may be lowered through the use of Forest Service crews, cooperative agreements, partnerships, and external funding. The use of these alternative approaches can only be determined on a case by case basis, taking into consideration available funding, funding sources, and the areas and species to be treated from year to year. It is not possible to accurately anticipate the scale of cost savings that may be achieved. Use of the costs listed above provides a “worst case” scenario that allows for a consistent, relative comparison of costs between the alternatives.

Jobs and Income

Estimates of total industry output and jobs potentially supported under each alternative are calculated through the use of IMPLAN, using data for 2003. IMPLAN is an economic modeling program originally developed by the Forest Service in cooperation with the Federal Emergency Management Agency and the Bureau of Land Management. IMPLAN has since been privatized and is now provided by Minnesota IMPLAN Group (MIG). IMPLAN utilizes a database of basic economic statistics constructed by MIG. Information for this database was obtained from major government sources such as the Bureau of Economic Analysis, County Business Patterns, REIS, Bureau of Labor Statistics, U.S. Census, etc., and converted to a consistent format using widely accepted methodologies.

An IMPLAN Project Area model was used to determine the employment and income consequences through the economy of one-million-dollar changes for each kind of impact. The results are called response coefficients. Because input-output models are linear, multipliers or response coefficients need only be calculated once per model and then applied to the direct change in output. Effects were estimated by multiplying the response coefficients by estimated cost of treatment activity. Specifications for developing response coefficients and levels of dollar activity are stated below.

Herbicide Treatment - The economic sector (a group of industries or businesses producing the same or similar products or services) which reflects the economic activities associated with invasive plant treatment services is Agricultural Services, designated in IMPLAN as Sector 18. One million dollars of exports were modeled through Sector 18, to determine a response coefficient. The cost of a contract to conduct herbicide treatments was estimated based on the assumptions described above, which was then multiplied by the appropriate response coefficient to determine total economic impact.

Federal Salary Impacts - Forest Service employment costs by alternative were estimated based on the assumptions described above. Salary impacts result from Forest employees spending a portion of their salaries locally. IMPLAN includes a profile of personal consumption expenditures for several income categories. The average annual compensation for employees involved in the implementation of the alternatives is approximately \$25,000 to \$60,000. Only a portion of which is take home pay. One million dollars was modeled using this expenditure profile to determine a response coefficient.

Federal Expenditure Impacts- An average of Forest obligations by budget object code for actual expenditures in Fiscal Years 2002, 2003, and 2004 were obtained from the National Finance Center through the agency’s Inventory and Monitoring Institute to estimate how the budget expenditures would be spent. Non-salary expenditures were determined by using this budget object code

information. This profile was input into the IMPLAN model for non-salary expenditures. Purchases by the Federal Government were treated as new money coming into the local economy from outside the model area. Sales to the federal government were treated in the same manner as exports; money coming from outside the model area. As above, one million dollars was modeled using this expenditure profile to determine a response coefficient.

3.9.2 Affected Environment

The impact of invasive plants is many and varied. They can poison livestock and pets, contribute to increased fire hazards, compete with desirable plants, reduce the suitability of wildlife habitats, and change the nature and composition of plant communities. The cost of controlling these invaders impacts both private and public budgets. A report prepared for the Oregon Department of Agriculture by The Research Group in 2000, estimated that 21 of the 99 weeds listed as noxious in Oregon reduced the State's total personal income by about \$83 million. This was equated to approximately 3,329 annual jobs lost to Oregon's economy. It was estimated that these 21 species cost the citizens of Oregon a total of about \$100 million per year at that time. The effect of all 99 noxious weeds was likely significantly greater (The Research Group 2000). This analysis addresses the treatment of 24,649 acres of invasive plant species on the Umatilla National Forest. Eleven species present on the Forest were included in the Oregon study.

The Forest most directly influences ten counties: Asotin, Columbia, Garfield, and Walla Walla in Washington; and Grant, Morrow, Umatilla, Union, Wallowa, and Wheeler in Oregon. The local economy and lifestyle tend to revolve around agriculture, ranching, government, and the timber industry. Portions of Umatilla and Morrow counties along the Columbia River in Oregon are more industrialized (USDA 1990). The population in these counties is displayed in table 66 (US Census Bureau 2000).

Table 67. Project Area Population by County (2000 Census)

Location	Population
Grant County, OR	7,935
Morrow County, OR	10,995
Umatilla County, OR	70,548
Union County, OR	24,530
Wallowa County, OR	7,226
Wheeler County, OR	1,547
Asotin County, WA	20,551
Columbia County, WA	4,064
Garfield County, WA	2,397
Walla Walla County, WA	55,180
Project Area Total Population	204,973

As displayed in table 68, the majority of Project Area residents (83 percent) are White, followed by Hispanic or Latino (11.9 percent), and American Indian (1.7 percent) (US Census Bureau 2000).

Table 68. Race and Ethnicity by County (2000 Census)

Location	White	Black or African Am.	Am. Indian or Alaska Native	Asian	Native Hawaiian & Other Pacific Islander	Some Other Race	Two or More Races	Hispanic or Latino*
Grant County, OR	94.6%	0.1%	1.6%	0.2%	0.04%	0.08%	1.4%	2.1%
Morrow County, OR	71.9%	0.1%	1.3%	0.4%	0.08%	0.4%	1.4%	24.4%
Umatilla County, OR	77.5%	0.7%	3.2%	0.7%	0.07%	0.2%	1.5%	16.1%
Union County, OR	93.1%	0.4%	0.8%	0.8%	0.6%	0.4%	1.4%	0.2%
Wallowa County, OR	95.7%	0.03%	0.7%	0.2%	0.04%	0.1%	1.4%	1.8%
Wheeler County, OR	92.5%	0.06%	0.5%	0.3%	0%	0%	1.6%	5.1%
Asotin County, WA	94.5%	0.2%	1.2%	0.5%	0.02%	0.08%	1.6%	2.0%
Columbia County, WA	90.7%	0.2%	0.8%	0.4%	0.05%	0%	1.5%	6.4%
Garfield County, WA	96.1%	0%	0.4%	0.6%	0.04%	0.04%	0.8%	2.0%
Walla Walla County, WA	78.8%	1.6%	0.7%	1.1%	0.2%	0.2%	1.7%	15.7%
Project Area	83.0%	0.8%	1.7%	0.8%	0.2%	0.2%	1.5%	11.9%

* Hispanic or Latino persons may be of any race.

Per capita incomes in the counties of the Project Area range from a low of \$15,803 in Morrow County, OR to a high of \$17,748 in Asotin County, WA.

This is lower than the 2000 per capita incomes for both Oregon and Washington at \$20,940 and \$22,973 respectively. The percentage of the Project Area population with incomes below poverty level is displayed by race in table 69. Poverty levels are highest among minority populations.

Table 69. Project Area Population below Poverty Level by Race, 2000 Census

Race/Ethnicity	Percentage Below Poverty Level
White	12.4%
Black or African American	22.3%
American Indian & Alaska Native	21.5%
Asian	15.1%
Native Hawaiian & Other Pacific Islander	32.1%
Some Other Race	26.9%
Two or More Races	23.7%
Hispanic or Latino*	26.2%

*Hispanic or Latino may be of any race.

Although many members of the public desire commodity uses of the National Forest, increasingly, forest users are placing a greater importance on non-commodity values such as the aesthetic, recreational, and spiritual aspects of the forest. Visual resource qualities not only attract visitors, but

are appreciated by local residents as an aesthetic value that enhances the local lifestyle and culture. Likewise, the recreation opportunities afforded by the National Forest attract visitors and residents. A variety of special places such as scenic areas, scenic byways, wild and scenic rivers, wilderness areas, and research natural areas contribute to the educational, interpretive, and other recreational experiences available within the Umatilla National Forest (USDA 2004). These opportunities contribute to the desirability of the area as a place to live and also attract visitors who support the local tourism industry.

Invasive species are threatening native plant communities throughout the forest. Currently, over half of the watersheds on the forest have a high risk of noxious weed invasion and spread (USDA 2004). Noxious weed infestations are of concern to both those who desire commodity uses and those who place a higher value on non-commodity uses. Both groups want a healthy ecosystem; however, some members of the public believe that the use of herbicides presents an unacceptable risk to the health of non-target native plants, wildlife, and humans. Concern has also been expressed that the use of herbicides is too costly relative to agency budgets and the value of the lands treated.

Tribal Interests

The Umatilla maintains government to government relations with numerous American Indian tribes who have treaty reserved or Executive Order rights on the Forest. These rights include fishing, hunting, gathering, and trapping. The tribes with rights on the Umatilla National Forest include:

- Confederated Tribes of the Umatilla Indian Reservation
- Confederated Tribes of the Warm Springs
- Nez Perce Tribe
- Joseph Band of Nez Perce-Colville Confederated Tribes (USDA 2004)

Tribal members utilize native plant species for a variety of cultural uses such as food, medicine, dress, basketry, and ceremonial purposes. Wildlife and fish are harvested for subsistence and traditional cultural uses. Invasive plants may interfere with rights granted to Native American Tribes. Invasive plants can crowd out plants traditionally gathered and can impact wildlife and fish. Additionally, the potential for human health impacts through contact with or consumption of plants and animals exposed to herbicides as a result of treatment activities are a concern. There is also a potential for treatment activities to impact traditional cultural properties or grave sites.

3.9.3 Environmental Consequences

Alternative A – No Action Alternative

The Umatilla National Forest has been treating invasive plants under direction found in the 1995 decision implementing the *Umatilla National Forest Environmental Assessment for the Management of Noxious Weeds*. This program of treatment would continue under the no action alternative. The treatment methods recommended in the 1995 EA took a conservative approach, requiring years of manual or mechanical treatments on a site prior to the use of herbicides. It did not provide the ability to respond quickly to new infestations because the process only applied to those sites known at the time of the 1995 decision. The 1995 decision identified approximately 3,154 acres for treatment.

Herbicide applications in the 1995 decision approved the use of glyphosate, dicamba, or picloram, and no herbicide applications were allowed within 100 feet of streams or standing water. Picloram was prohibited from use in riparian areas, and dicamba could only be used on drier sites or transitional uplands further than 100 feet from water. Aerial applications were not approved.

The R6 2005 ROD approved a list of ten herbicides for use in Region 6; however, it restricted the use of dicamba.

Direct and Indirect Effects of Alternative A

Under this alternative, invasive treatment activities would continue to utilize a conservative approach as authorized under the 1995 decision for the management of noxious weeds. Priority would be placed on the use of physical treatment methods. The use of herbicides would be limited to Glyphosate or Picloram and would be utilized only after other methods of treatment have failed. Treatments would be applied to some of the acres analyzed in the 1995 decision.

Past experience with these treatment methods has resulted in a rate of effectiveness of only 25 percent (Erickson 2006). This is due to the limited choice of herbicides and the limited project area that does not include the majority of current sites. The potential for spread from these areas would remain unchanged from the existing condition. Additionally, the remaining inventoried acres of invasive species would go untreated and would likely continue to spread unabated.

Those opposed to the use of herbicides due to concerns about impacts to non-target native plant communities, wildlife, and human health would favor this alternative over the action alternatives, however; many stakeholders would perceive adverse effects. Those who value commodity values and uses of the Forest would see declining resource conditions and biodiversity as invasive species continue to spread. Invasive species can drastically reduce livestock carrying capacity (Asher and Spurrier 1998). Likewise, those who place a higher worth on non-commodity resources would also see a decline in the values they seek. Forage production on Forest rangelands would be reduced, adversely impacting habitat capability to support wildlife as well as reducing forage available for domestic livestock. In a report to the Governor of Idaho Weed Summit in 1998, Jerry Asher and Carol Spurrier of the Bureau of Land Management cite numerous studies that found that populations of native wildlife species declined as habitats became dominated by non-native plant species (Asher and Spurrier, 1998). Scenic areas, scenic byways, wild and scenic rivers, wilderness areas, and research natural areas are adversely affected as invasive species spread, resulting in the loss of native species and biological diversity. These impacts may reduce the recreational and/or educational value of these areas to some users. In severe cases, some users may relocate their activities to other areas of the forest or to other public lands (Asher and Spurrier 1998).

Neighboring private and public lands would be adversely impacted as invasive species populations spread to their lands from the Umatilla National Forest. Land values would be reduced (Asher and Spurrier 1998) and costs to control infestations for neighboring land owners or administrative agencies (federal, state, and local governments) would be increased.

American Indian Tribes with interests in the Umatilla National Forest would be adversely impacted. Populations of native plant species used for cultural purposes such as food, medicine, dress, basketry, or ceremonial activities may be reduced as a result of the spread of invasive species. The spread of invasive species (Asher and Spurrier 1998) from the Forest to Tribal trust lands would adversely impact Tribal interests. In the long-term, invasive species populations may threaten traditional gathering areas. The potential for the exposure of tribal members to herbicides is lowest under this alternative. Approximately 2,774 acres could potentially be treated with herbicides. This represents approximately 0.2 percent of the National Forest System lands administered by the Umatilla National Forest.

Economic Effects

Assumptions used for the development of cost estimates are described under “Methodology” above. The undiscounted cost of implementing treatments on all affected acres one time in one year is estimated at \$641,695 in 2006 dollars. This estimate includes inventory and monitoring costs. It is estimated that treatments would be effective on 25 percent of treated acres. The average cost per effectively treated acre is the highest under this alternative at an estimated \$814 per acre. This equates to approximately \$133,700 per year for a period of 31 years.

The existing invasive plant populations on the Forest would never be contained or controlled under this alternative because so many areas would not receive effective treatments. Without effective treatment, the remaining inventoried infestations would likely spread at an estimated annual rate of 8 to 12 percent (R6 2005 FEIS). At an average of 10 percent annually, by year 20, infested acres could increase by more than 525 percent of the currently affected acres. As the scope and size of the infestation continues to grow, future costs to contain or control the growing population of invasive plant species would continue to escalate. Prevention may reduce the rate of spread; however, the R6 2005 FEIS disclosed that without effective treatment, the acres of invasive plants would increase annually, regardless of how well prevention reduces the spread rate.

The economic activity potentially stimulated through implementation of alternative A is estimated in the form of jobs and income. In addition to direct impacts, each economic sector produces indirect and induced effects, in varying degrees, depending on the spending patterns within each industry. A sector’s total economic impact is made up of its direct, indirect, and induced effects, as well as other factors (see the Economic Specialist Report for more information on jobs associated with the alternatives).

Businesses that provide invasive plant treatment services response to the demand for the services they provide by employing a sufficient number of positions to produce the appropriate level of service needed to meet demand. The services or output produced and the employment required to produce that level of output are the direct effects of that business on the economy. In order to produce the output included in the direct effects, the businesses providing invasive plant treatment must purchase supplies and services from other industries. The output and employment stimulated in other industries by these purchases are indirect effects. In addition to the direct and indirect effects, induced effects represent the output and employment stimulated throughout the local economy as a result of the expenditure of new household income generated by direct and indirect employment.

Part of the monies spent by businesses such as those providing invasive plant treatment services may be spent outside of the local economy. The money expended outside the local economy is often referred to as leakage as the dollars spent outside the local area “leak” out of the local economy. By the same token economic activity is introduced when goods and services produced within the local economy are exported. In other words those from outside the area purchase goods and services produced within the local area, thereby bringing new money into the local economy.

IMPLAN attempts to estimate these complex economic relationships in order to approximate the effects on the economy as a whole. Multipliers were developed as a means to estimate the change in direct, indirect, and induced effects as a result of the level of demand for invasive plant treatment services. These multipliers also take into account the effects of leakage and exports.

The following table displays the potential employment and income that may be supported within the local economy as a result of implementing alternative A. The figures displayed in the second column (Total to Contain/Control Acres Proposed for Treatment) represent the total impact over the life of the alternative. The estimated average annual impact is displayed in the third column. The impact of

inventory and monitoring activities are included. The employment figure presented represents potential full-time, part-time, and/or seasonal positions.

Table 70. Alternative A Estimated Job and Income Impacts

Impact	Total to Contain/Control Acres Proposed for Treatment ¹	Average Annual Impact
Jobs	105	3
Labor Income (\$1,000s)	\$2,673	\$86

¹ Using assumptions regarding treatment effectiveness and rate of spread described earlier under "Methodology" it was estimated that the acres approved for treatment under the 1995 EA would be controlled in 31 years.

Many other anticipated economic costs and benefits are not easily converted to dollar amounts. In addition to job and income benefits, there would be additional intangible and difficult to quantify economic benefits and costs. Some of those include

- Maintenance of biodiversity on those acres successfully treated
- Loss of biodiversity on those acres not treated or on which treatments are ineffective
- Reduced forage for wildlife as well as domestic cattle grazing as a result of the spread of invasive species
- Spread to adjacent lands as discussed above
- Increased future costs to the Forest Service to treat invasive species infestations that have continued to spread unchecked

Other potential benefits and costs under this alternative are discussed in detail in specialist reports for other affected resources.

Environmental Justice

Alternative A was assessed to determine whether there would be a disproportionately adverse impact to minority or low-income populations in accordance with Executive Order 12898 (President 1994). No concerns relative to disparate impacts to minority or low income populations were identified through scoping. However, American Indian tribes may be disproportionately affected because they are dependent on native plants for cultural and traditional uses. The racial composition of work crews implementing treatment activities are expected to be generally similar to that of the Project Area population, with a potential for a slightly higher percentage of minorities. Work crews may experience injury during manual treatments or may be exposed to chemical treatments.

The National Visitor Use Monitoring survey asked visitors to categorized themselves into one of seven race/ethnicity categories. The results for the Umatilla indicated that of Forest visitors sampled from October 2002 through September 2003, showed that 96.9 percent of visitors indicated they were white. Approximately 3.5 percent of visitors sampled indicated Native American, 1.8 percent indicated Asian, 0.8 percent indicated Hispanic or Latino, and 0.4 percent indicated Pacific Islander (USDA 2004a).

Native American plant areas are likely at greater risk due to the spread of invasive species under alternative A than under the other alternatives. Native plants important for cultural uses could potentially be crowded out of some areas forcing Native American users to seek these resources in other areas of the forest or on other land ownerships. Populations of culturally important plants could be decreased to the point of being insufficient to meet demand. Visitors from other racial or ethnic backgrounds or low income visitors seeking to supplement family incomes may also be impacted as

areas important for berry picking, mushroom gathering, or other gathering activities would be adversely impacted by the spread of invasive species.

The potential for human exposure to herbicides is lowest under this alternative for all user groups due to the limitations on the implementation of chemical treatment activities. However, herbicide treatments over the last five years have averaged approximately 2,600 acres annually, including the re-treatment of some acres. Similar treatments would continue under alternative A. These acres of treatment represent approximately 0.2 percent of the National Forest System (NFS) lands administered by the Umatilla National Forest. Herbicide application methods would be selected to not only ensure effective results, but to minimize movement offsite in soil, water, or wind.

The R6 ROD amended the Umatilla Forest Plan to incorporate standards for the implementation of herbicide treatment activities. The R6 ROD and FEIS (USDA 2005a; USDA 2005b) found that the potential for adverse human health and safety impacts from herbicide use would be adequately resolved through adherence these standards. Additionally, the R6 ROD amended the Umatilla Forest Plan (USDA 1990; USDA 2005b) to incorporate requirements to ensure timely public notification and that signs are posted to inform the public and forest workers of herbicide application dates and the name of herbicides used. If requested, individuals may be notified in advance of spray dates. These measures would provide visitors who wish to avoid any potential for herbicide exposure with the information they need to do so.

Worker exposure to herbicides and risks associated with physical treatment methods would be minimized through strict adherence to health and safety requirements for all workers. Application of any herbicides to treat invasive plants would be performed or directly supervised by a State or Federally licensed applicator. Herbicide transportation and handling safety plan would be developed and implemented for all treatment activities.

Based on the above analysis, American Indian tribes may be disproportionately affected because they are dependent on native plants for cultural and traditional uses. No other disproportionate adverse impacts to minority or low income groups are anticipated under this alternative. No civil rights impacts are associated with this alternative.

Alternative B – Proposed Action

Treatment effectiveness under this alternative would be expected to approach 80 percent or higher. All acres inventoried for treatment would eventually be treated; however herbicide treatments would be capped at an average of 4,000 acres annually (40,000 acres of treatment maximum over the life of the project). Priority sites determined to be high would be treated first. As infestations are effectively treated, management would be initiated on new acres each year.

The potential for invasive plant species to adversely impact populations of native plant species used for cultural purposes such as food, medicine, dress, basketry, or ceremonial activities would be reduced through implementation of alternative B. The potential for spread of invasive species from the Forest to Tribal trust lands would be reduced.

Economic Effects

The cost of this alternative was calculated as though all acres were to be treated one time within one year. The estimated undiscounted cost of implementing treatments on all affected acres one time is estimated at \$3,887,460 in 2006 dollars. This estimate includes inventory and monitoring costs. At the estimated rate of effectiveness of 80 percent of treated acres, the average cost per effectively

treated acre is the lowest of the alternatives considered at an estimated \$197 per acre under this alternative.

Early detection, rapid response (EDRR) would be utilized to address new infestations of currently occurring species or new species at an estimated average cost of \$199 per effectively treated acre. Only methods proposed and analyzed through the EIS would be utilized, however, aerial application methods would not be used for EDRR treatments. Implementation of EDRR would reduce future costs and environmental impacts by eliminating or controlling new infestations before they could become established. Annual costs would average about \$539,030 to treat 4,000 acres (see methodology previous in this section). The known inventory could be controlled in approximately 19 years at this rate.

As described under alternative A, some annual costs may be covered through external funding sources, which historically have averaged approximately \$120,000. If Title II funding is not extended by Congress, external funding sources would likely drop to a total of approximately \$25,000 annually. The appropriated funding would be required to cover the balance of annual expenditures.

The following table displays the potential employment and income that may be supported within the local economy as a result of implementing alternative B. The figures displayed in the second column (Total to Contain/Control Acres Proposed for Treatment) represent the total impact over the life of the alternative. The estimated average annual impact is displayed in the third column. The impact of inventory and monitoring activities are included. The employment figure presented represents potential full-time, part-time, and/or seasonal positions.

Table 71. Alternative B Estimated Job and Income Impacts

Impact	Total to Contain/Control Acres Proposed for Treatment ¹	Average Annual Impact
Jobs	326	17
Labor Income (\$1,000s)	\$8,338	\$439

¹ Using the assumptions regarding treatment effectiveness and rate of spread described earlier under "Methodology" it was estimated that the acres approved for treatment under alternative B would be controlled in 19 years.

In addition to job and income impacts, there would be additional intangible and difficult to quantify economic benefits and costs. Some of those include maintenance or improvement of biodiversity, improved forage for wildlife and domestic cattle grazing, and prevention of spread to adjacent lands. Other potential benefits and costs under this alternative are discussed in detail in the specialist reports for other affected resources.

Environmental Justice

Alternative B was assessed to determine whether there would be a disproportionately adverse impact to minority or low-income populations in accordance with Executive Order 12898 (President 1994). No concerns relative to disparate impacts to minority or low income populations were identified through scoping.

The 2004 report of the National Visitor Use Monitoring Results (NVUM) for the Umatilla National Forest estimated that approximately 652,000 people visit the Forest annually, plus or minus 18.6 percent at the 80 percent confidence interval. Of the of Forest visitors sampled from October 2002 through September 2003, 96.9 percent indicated they were white. Approximately 3.5 percent of

visitors sampled were Native American, 1.8 percent were Asian, 0.8 percent were Hispanic or Latino, and 0.4 percent were Pacific Islander (USDA 2004a). Of these minority groups, as stated above, Native American visitors may have the greatest potential to be impacted by herbicide applications, however visitors from other racial or ethnic backgrounds or low income visitors seeking to supplement family incomes, also engage in berry picking, mushroom gathering, or other gathering activities on the Umatilla National Forest.

The NVUM survey results indicated that of those surveyed, approximately 23 percent indicated that they participate in gathering forest products, 17 percent engage in fishing, and 28 percent participate in hunting activities at some time during the year.

Risk to Native American cultural plant gathering areas as well as other forest product gathering sites as a result of the spread of invasive species is lowest under alternative B. The higher rate of effective containment, control, or eradication of invasive species anticipated under this alternative would help to protect native plant areas important to Native Americans and other visitors by reducing the threat of invasive species. There is concern that herbicides treatments could adversely impact non-target, culturally important plants, or wildlife species. Treatments applied to each site would consider the minimization of exposure to non-target species through such means as the method of herbicide application and timing. The R6 FEIS and ROD found that the potential for herbicides to harm non-target plants, plant pollinators, or terrestrial and aquatic wildlife were likely to be resolved by adherence to the standards incorporated in the Umatilla Forest Plan through that decision. In addition, site specific project design features would be in place at the time of treatment to further reduce potential for harm to non-target species.

Some users have expressed concern about the potential for human exposure to herbicides. Low income populations who may hunt, fish, or gather forest products for subsistence or income purposes would have a potential risk of exposure through contact with or consumption of forest products or wildlife exposed to herbicides. The potential for human exposure to herbicides in treatment areas is higher under this alternative than under alternative A due to the larger number of acres to be treated. However, annual treatments are analyzed at approximately 4,000 acres of herbicide treatments per year, which represents 0.3 percent of the National Forest System lands administered by the Umatilla National Forest.

In total, the area to be treated across the forest through implementation of this alternative represents less than two percent of the acres administered by the Umatilla National Forest. Herbicide application methods would be selected to not only ensure effective results, but to minimize movement offsite in soil, water, or wind.

The R6 ROD amended the Umatilla Forest Plan to incorporate standards for the implementation of herbicide treatment activities. The R6 ROD and FEIS (USDA 2005a; USDA 2005b) found that the potential for adverse human health and safety impacts from herbicide use would be adequately resolved through adherence to these standards. Additionally, the R6 ROD amended the Umatilla Forest Plan (USDA 2005b USDA 1990;) to incorporate requirements that ensure timely public notification and that signs be posted to inform the public and forest workers of herbicide application dates and the name of herbicides used. If requested, individuals may be notified in advance of spray dates. These measures would provide visitors who wish to avoid any potential for herbicide exposure with the information they need to do so.

The racial composition of work crews implementing treatment activities are expected to be generally similar to that of the Project Area population, with a potential for a slightly higher percentage of minorities. Work crews may experience injury during manual treatments or may be exposed to

chemical treatments. Worker exposure to herbicides and risks associated with physical treatment methods would be minimized through strict adherence to health and safety requirements for all workers. Application of any herbicides to treat invasive plants would be carried out or directly supervised by a State or Federally Licensed Applicator. Herbicide transportation and handling safety plan would be developed and implemented for all treatment activities.

Based on the above analysis, no disproportionate adverse impacts to minority or low income groups are anticipated under this alternative.

Alternative C

The estimated cost of implementing treatments on all affected acres one time is estimated at \$3,616,050 in 2006 dollars. This estimate includes inventory and monitoring costs. At the estimated rate of effectiveness of 80 percent of treated acres, the average cost per effectively treated acre is \$201 under alternative C; this is the highest cost of any of the action alternatives considered, but lower than alternative A. The annual cost of treating 4,000 acres would be about \$549,790. The known inventory could be controlled in approximately 19 years at this rate.

As described under alternative A, some annual costs may be covered through external funding sources, which historically have averaged approximately \$120,000. If Title II funding is not extended by Congress, external funding sources would likely drop to a total of approximately \$25,000 annually. The appropriated funding would be required to cover the balance of annual expenditures.

Early detection, rapid response (EDRR) would be utilized to address new infestations of currently occurring species or new species at an estimated cost of \$203 per effectively treated acre. Only methods proposed and analyzed through the EIS would be utilized, however aerial treatment methods would not be utilized to for EDRR treatments. Implementation of EDRR would reduce future costs and environmental impacts by eliminating or controlling new infestations before they can become established.

The following table displays the potential employment and income that may be supported within the local economy as a result of implementing alternative C. The figures displayed in the second column (Total to Contain/Control Acres Proposed for Treatment) represent the total impact over the life of the alternative. The estimated average annual impact is displayed in the third column. The impact of inventory and monitoring activities are included. The employment figure presented represents potential full-time, part-time, and/or seasonal positions.

Table 72. Alternative C Estimated Job and Income Impacts

Impact	Total to Contain/Control Acres Proposed for Treatment ¹	Average Annual Impact
Jobs	335	18
Labor Income (\$1,000s)	\$8,550	\$450

¹ Using the assumptions regarding treatment effectiveness and rate of spread described earlier under "Methodology" it was estimated that the acres approved for treatment under alternative c would be controlled in 19 years.

In addition to job and income impacts, there would be additional intangible and difficult to quantify economic benefits and costs. Some of those include maintenance or improvement of biodiversity, improved forage for wildlife and domestic cattle grazing, and prevention of spread to adjacent lands.

Other potential benefits and costs under this alternative are discussed in detail in the specialist reports for other affected resources.

Environmental Justice

Alternative C was assessed to determine whether there would be a disproportionately adverse impact to minority or low-income populations in accordance with Executive Order 12898 (President 1994). Effects under this alternative are the same as described above under alternative B. Based on the above analysis no disproportionate adverse impacts to minority or low income groups are anticipated.

Alternative D

This alternative is the same as the proposed action except that aerial application of herbicides would not be allowed. Some areas excluded from aerial application of herbicide may not be treated with other methods due to remoteness, terrain, and worker safety issues.

The estimated undiscounted cost of implementing treatments on all affected acres one time is estimated at \$3,942,840 in 2006 dollars. This estimate includes inventory and monitoring costs. At the estimated rate of effectiveness of 80 percent of treated acres, the average cost per effectively treated acre is \$200 under alternative D. This represents an effective cost per acre that is slightly higher than alternative B, slightly lower than alternative C, and considerably lower than alternative A. The average cost of treating 4,000 acres in a given year is \$546,950. The known inventory could be controlled in approximately 19 years at this rate.

As described under the other alternatives, some annual costs may be covered through external funding sources, which historically have averaged approximately \$120,000. If Title II funding is not extended by Congress, external funding sources would likely drop to a total of approximately \$25,000 annually. The appropriated funding would be required to cover the balance of annual expenditures.

EDRR would be utilized to address new infestations of currently occurring species or new species at an estimated average cost of \$200 per effectively treated acre. Only methods proposed and analyzed through the EIS would be utilized. Implementation of EDRR would reduce future costs and environmental impacts by eliminating or controlling new infestations before they can become established.

The following table displays potential employment and income supported within the local economy as a result of implementing alternative D. The figures displayed in the second column represent the total impact over the life of the alternative. The estimated average annual impact is displayed in the third column. The impact of inventory and monitoring activities are included. The employment figure represents potential full-time, part-time, and/or seasonal positions.

Table 73. Alternative D Estimated Job and Income Impacts

Impact	Total to Contain/Control Acres Proposed for Treatment¹	Average Annual Impact
Jobs	332	17
Labor Income (\$1,000s)	\$8,493	\$447

¹ Using the assumptions regarding treatment effectiveness and rate of spread described earlier under "Methodology" it was estimated that the acres approved for treatment under alternative D would be controlled in 19 years.

In addition to job and income impacts, there would be additional intangible and difficult to quantify economic benefits and costs. Some of those include maintenance of biodiversity or improvement of biodiversity, improved forage for wildlife and domestic cattle grazing, and prevention of spread to adjacent lands. Other potential benefits and costs under this alternative are discussed in detail in the specialist reports for other affected resources.

Environmental Justice

Alternative D was assessed to determine whether there would be a disproportionately adverse impact to minority or low-income populations in accordance with Executive Order 12898 (President 1994).

Effects under this alternative are the same as described above under alternative B. Based on the above analysis no disproportionate adverse impacts to minority or low income groups are anticipated under this alternative.

Cumulative Effects

Under Alternative A, untreated infestations on the Forest would lead to a long-term decline in the health and sustainability of native plant communities. The resulting decrease in biological diversity and reduction in the economic and social returns natural plant communities provide adversely impacts all stakeholders. Costs incurred by adjoining land ownerships to treat invasive plant infestations would likely continue to escalate as a result of the increasing likelihood and scale of the spread of these species from untreated areas of the Umatilla National Forest. Additionally, deferring the treatment of invasive plant populations would result in increased future costs to the Forest Service and thus to tax payers to treat larger, more widespread populations that would continue to develop over time.

The action alternatives would contribute to efforts by private land owners and other federal, state, and local governments administering lands adjacent to the Forest to reduce the occurrence and spread of invasive plant species. Treatment of infestations on the Forest would lead to long-term improvements in the health and sustainability of native plant communities. Maintenance or improvements in biological diversity would contribute to economic and social returns provided by natural plant communities; benefiting all stakeholders. Costs incurred by adjoining land ownerships to treat invasive plant infestations are expected to be reduced in the long-term as result of the reduced potential for spread of invasive plants from National Forest System lands. Effective treatment of invasive plant populations would result in decreased future costs to the Forest Service and thus to tax payers as the occurrence of invasive plants is reduced and controlled over time.

3.10 Heritage Resources

Section 106 of the National Historic Preservation Act (NHPA) requires Federal agencies to consider the potential effects their undertakings may have on historic properties. The definition of undertaking encompasses all agency decision-making actions including the approval of land management plans such as the Umatilla National Forest Invasive Plants Treatment Final Environmental Impact Statement (FEIS). The NHPA also compels agencies to consult tribes in determining whether the undertaking has potential to pose an effect on historic properties. Government-to government tribal consultation has been initialized for the Invasive Plant Treatment Plan and will be on-going during project implementation. Under the Programmatic Agreements among the United States Department of Agriculture Forest Service Pacific Northwest Region (Region 6), the Advisory Council on Historic Preservation, and the Oregon (signed June 2004) and Washington (signed April 1997) State Historical Preservation Officer Regarding Cultural Resource Management, yearly Section 106

review of proposed treatments will take place to determine if any protection measures are necessary. Tribes will be notified of annual treatments areas, as stated in chapter 2, PDF M1. A **no effect** determination has been made for the Invasive Plant Treatment FEIS. Documentation to this affect will be forwarded to the Oregon and Washington SHPO, in compliance with the National Historic Preservation Act of 1966 (as amended), and the Oregon and Washington Programmatic Agreements.

3.11 Impacts to Cultural Uses and Treaty Rights

3.11.1 Introduction

The following is a summary of information provided by the tribes on their internet sites and/or taken from information and maps prepared for the Interior Columbia Basin project. The intent of the section is to characterize use and interests of the lands managed by the National Forest and in no way is intended to indicate differences between tribal use and culture.

3.11.2 Affected Environment

Confederated Tribes of the Umatilla Indian Reservation: The Cayuse (Weyiiletpuu), Walla Walla (Waluulapan), and Umatilla (Imatalamlama) tribes make up the members of this reservation. Their reservation lands are adjacent to the Umatilla and Wallowa-Whitman National Forests and the city of Pendleton, Oregon. Their interest area includes the Malheur River and Malheur and Harney Lakes to the south, the Grande Ronde and lower Snake River in the east and north, the Yakima, John Day, and Umatilla Rivers and the Columbia River from Vantage, Washington, to west of The Dalles, Oregon. Important fisheries rivers include the Grande Ronde, Imnaha, John Day, Tucannon, Walla Walla, Wallowa, Touchet, Umatilla, Columbia, and Minam along with their tributaries. The Tribe has been active with salmon restoration in the Umatilla and Walla Walla Rivers. They have worked locally with several agencies to return water to these two streams in order to maintain migratory routes.

Confederated Tribes of the Warm Springs Reservation: The Wasco Bands, the Warm Springs Bands and the Northern Paiutes are members of the reservation. Their area of interest includes Malheur and Harney Lakes in the southeast to the headwaters of the Deschutes River in the southwest, crossing Mount Hood to west of Portland, Oregon and along the Columbia River to the mouth of the Snake River along with the John Day system. There are historic family connections with the Umatillas and since the co-location of other tribes to the reservation, other family connections have developed. Important streams are the Columbia, Crooked, Deschutes, Hood, and John Day River and Fifteen Mile Creek. Their Treaty ceded the majority of the John Day system to the United States.

Nimi'ipuu (Nez Perce): Their treaty established a reservation for the Nez Perce tribe. The reservation is located along the Clearwater River, east of Lewiston Idaho. Their area of interest includes lands east of the Snake River as far north as Coeur d'Alene, Idaho. It extends westward including the Snake and Palouse Rivers and the Columbia to The Dalles. To the south it includes the North Fork of the John Day to the confluence of the Malheur and Snake Rivers. Important streams include the Clearwater, Grande Ronde, Imnaha, Powder, Rapid, Salmon, Lower Snake, Lochsa, Selway, and Columbia Rivers.

Deep canyons were the traditional Nez Perce lands. They traveled with the seasons relying on the rivers, mountains and prairies for sustenance. In early spring, the women traveled to the lower valleys to dig root crops and the men traveled to the Snake and Columbia rivers to intercept the early salmon runs. In mid-summer all the people of the village moved to higher mountainous areas setting up temporary camps to gather later root crops, fish the streams, and hunt big game. By late fall they

settled back into their traditional villages along the Snake, Clearwater, and Salmon rivers. Salmon and other fish, game, dried roots and berries provided winter foods.

The basic roots gathered for winter storage include camas bulb (kehmmes), bitterroot (thlee-tahn), khouse (qawas), wild carrot (tsa-weetkh), wild potato (keh-keet), and other root crops. Fruit collected includes service berries, 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.

3.11.3 Environmental Consequences

Impacts Common to all Alternatives

Direct and Indirect Effects

Access: Access to the National Forest Systems lands would not be impacted by invasive plant treatments. The Forest's Access and Travel Management Plan would not be changed. If an open road or a road permitted for Off Highway Vehicle (OHV) use needs to be closed as part of the effective treatment prescription, a separate analysis would be performed. The proposed invasive plant treatments would not impact access to the forest to exercise treaty rights.

Gathering: (Also see the botany report) When herbicides are used as the selected treatment method, individual tribal members may shift to other locations for gathering cultural plants. Early involvement with the Tribes prior to treatment would allow a schedule to be developed so that gathering could occur prior to treatments or in the case of huckleberries, early enough prior to fruit setting so any residual herbicides would be gone. Most treatments (72 percent of the acres) would occur within 20 feet of a road, disturbed site, or other high use area; occasionally treatments would extend to 100 feet. The areas adjacent to these high use areas do not provide quality habitat for cultural plants and can be easily avoided during gathering. Areas receiving herbicide treatments would be posted with warning signs. Herbicide treatments adjacent to high use areas would have low impacts on the gathering of cultural plants. Nor would they impact the quantity or quality of the plants collected since the treatment areas can be avoided.

The most extensive invasive plant sites beyond the high use areas have yellow starthistle. These sites are located in dry grasslands or moist meadows that are potential habitat for cous and camas. Biological control methods are the primary treatment method and would not impact cultural plants or their use. Biocontrol is proposed on approximately 16 percent of the treatment acres. High densities of yellow starthistle displace native plants and likely would not be strongholds of cultural use plants; these areas are likely to not be used for gathering. Controlling the spread of yellow starthistle would preserve native plant habitat; reduced yellow starthistle densities would allow native plants to recover.

If herbicides are used to treat yellow starthistle, there is an increased possibility of herbicide contact with cultural plants. This can be reduced by the application method. If the site is located in a traditional use area, the treatment could be designed around the target and cultural plant life cycles. If effective, spot treatments could be used; however, the density of yellow starthistle would normally require broadcast treatments. Since cous and camas normally go dormant between mid July and August on the Forest (depends on elevation and year) it would be possible to treat after the cultural plants are dormant and/or in the fall as yellow starthistle germinate.

A mixture of methods could be used as well depending on the size of the invasive plant site. For knapweeds growing with lomatiums (cous), it would be possible to pull the knapweed to delay the rosette stage until after the lomatiums are dormant to follow up with herbicide at a later visit. This could be used around rock sources, particularly when other cultural gatherings are planned for the area in early summer.

In the higher elevations where huckleberries are found, the vast majority of invasive plants are associated with roads. Very few invasive plants would be found off the roads because forest cover and herbaceous plants would inhibit invasive plant growth. Any areas treated with herbicide would be posted. Since treatments would be along the road edges and surface, contact with herbicide can be avoided by moving further from the road.

Invasive plant treatments are not expected to impact the gathering of plants, roots, or berries. When herbicides are used, the areas can be avoided. The area treated would be largest the first year with follow-up treatments in later years either covering fewer acres or using non-herbicide methods. Displacement of tribal members would vary depending on the success of treatments and the amount of time needed to control or eradicate the target species. Since the treatment is mainly associated with roads and other high use areas, impacts to gathering will be low. Approximately 10 percent of the total acres proposed for herbicide treatment are distant to roads meaning that very little of the Forest landscape outside of high use areas would be impacted by treatments. Informing the tribes of proposed treatments each year would help avoid conflicts and allow the Forest and Tribe to work together if restoration is necessary due to invasive plants displacing cultural plants.

Fish habitat and water quality: Impacts to fisheries habitat are analyzed in the Fisheries Report. The project design features are expected to keep herbicides levels well below levels of concern for fish reproduction or human use. The low levels of herbicide used in riparian areas are not expected to concentrate in fish or create health issues. The project design features would limit activities along stream banks when fish are spawning. Areas of high quality riparian habitat are distant from roads and contain very few sites. These areas would not have any measurable impacts from herbicide use and would continue to function as strongholds for recovery efforts.

Hunting: Impacts to big game are disclosed in the Wildlife Report. Big game or birds are not expected to bioconcentrate herbicides. With the majority of treatments near roads, the potential use of forage treated with herbicide is low.

During the time of treatments, animals would disperse due to the workers being present and noise of equipment. The activity is short duration and would not impact hunting or the populations of game species.

Impacts Associated with Alternative C

Alternative C does not use broadcast spray methods in riparian areas. There would be a slight reduction in the amount of herbicide used near streams but would not be measurable.

More care would be taken to make sure herbicides are applied directly on the target species; however, when target species densities are high, the amount of chemical needed would be similar to broadcast treatments. See the fisheries and water quality reports.

Impacts Associated with Alternative D

The alternative does not use aerial application methods on 675 acres. There would be little differences in the amount of chemical used when hand treatments are used. Herbicide moving off site

by aerial drift would be reduced but immeasurable because project design features already reduce the risk of drift reaching riparian areas. The majority of the sites receiving aerial treatments are small (See map in appendix B); however, one is approximately 300 acres. Impacts to wildlife that continue to use the 300-acre site after treatments would not change. Hand treatments could break up the site into smaller treatment units, but would extend the amount of time animals are exposed to herbicide. Even with the animals being exposed to chemicals, 300 acres is a small part of their utilizable range which reduces the amount of time animals spend in the area. The site is also remote (this is why the site was proposed for aerial treatment) and not likely to be used for gathering or hunting.

Cumulative Effects

Other than harassing of fish or game from other resource management actions or recreational uses when they occur at the same time as treatment, there would be few cumulative effects expected with other ongoing or reasonably foreseeable future actions.

3.12 Irreversible or Irretrievable Use of Resources

No irreversible or irretrievable uses of resources are associated with the proposed action of this project. This project restores native vegetation in areas where non-native plants have been introduced. Herbicide treatments in accordance with the alternatives would have relatively short-lived impacts; effects on non-target species would be minimized through the implementation of Forest Plan Standards and project design features disclosed in Section 2.2.3. Such effects would not be permanent.

The no action alternative is a continuation of the present invasive plant treatment program. To date while some locations have succeeded in controlling weeds, overall the presence and effect of weeds has spread. In time this could have irreversible/irretrievable effects on range resources, range ecology and the management of programs dependent on range.

3.13 Effects of Short-term Uses and Maintenance of Long-term Productivity

Positive effects on site productivity would be expected as native vegetation is restored. Some herbicides have potential to reduce soil productivity. Project design features for the action alternatives are intended to avoid the use of such herbicides where soil productivity may be reduced.

3.14 Consistency with Forest Service Policies and Plans

The proposed project is consistent with all Forest Service policies and existing plans. The laws and policies applicable to this project are listed in Section 1.5 of this FEIS. Policy consistency includes following the Forest Plan (1990) as amended by PACFISH (1995) and the R6 2005 FEIS. Specific standards that apply to invasive plants treatment were reviewed in planning this project.

All alternatives would meet visual quality objectives associated with the various management areas. Most of the treatment areas on the Umatilla National Forest are along roadsides and in recreation sites. Therefore, the existing scenic condition for most of the National Forest treatment areas is of a developed setting in the immediate foreground. Notable exceptions are in wilderness areas and meadows, which appear undeveloped. Treatments would maintain the scenic integrity of these areas by helping to restore native vegetation and are consistent with visual quality objectives associated with undeveloped areas.

There would be no cutting, sale or removal of timber, and no road construction or road reconstruction within any inventoried roadless areas with this project. This project is consistent with Forest Service roadless area policies.

3.15 Conflicts with Other Plans

No conflicts with existing plans have been noted. A recent lawsuit *Washington Toxics Coalition et al. v. EPA*, regarding the lack of Endangered Species Act consultation on use of certain herbicides, was resolved by requiring certain buffers near streams.

Herbicide use on federal land was exempt from the buffer zone requirement because such use already “implements safeguards routinely required” by the regulatory agencies.

3.16 Adverse Effects That Cannot Be Avoided

Most of the important issues are resolved through adherence to project design features that minimize or eliminate the potential for adverse effects. However, some adverse effects are inherent to invasive plant treatments and cannot be avoided. These include:

- Taxpayers will likely be responsible for the costs of some if not all the treatments
- Herbicide toxicity exceeding thresholds of concern are unlikely but possible given an herbicide spill
- Minor to moderate physical injuries due to forestry work are possible
- Local effects on some groups of soil micro-organisms that may be temporarily sensitive to certain herbicide chemicals.
- Some common non-target plants are likely to be killed by their close proximity to treatments. This is most likely with broadcast herbicide treatments and less likely (but possible) for all other treatment methods. The adverse effects of the invasive plants themselves far outweigh the potential for adverse effects of treatment

Chapter 4 - List of Preparers, Consultation and Coordination, Glossary, References

4.1 List of Preparers

The following people were the primary authors of this EIS.

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In addition, the following people were responsible for overseeing the process and information for this document.

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Steve Bulkin	Regional Oversight, Human Health (Retired)
Craig Busskohl	Forest Soil Scientist
Vicky Erickson	Regional Plant Geneticist
Delanne Ferguson	Operations Staff Officer (Acting)
Joan Frazee	Forest Botanist
David Hatfield	Planning Staff Officer
Kevin D. Martin	Forest Supervisor
Al Scott	Wildlife Biologist (Retired)
Rochelle Desser	NEPA Coordinator for Invasive Plants

4.2 Consultation with Regulatory Agencies

The Forest Service has completed consultation with the US Fish and Wildlife Service and NMFS regarding potential adverse effects on Endangered Species. Consultation occurred jointly with the invasive plant treatment project on the Wallowa-Whitman National Forest so may cover species that are not on the Umatilla National Forest, such as McFarlane's Four'O Clock.

Regarding species found on the Umatilla National Forest, The US Fish and Wildlife Service Biological Opinion states: "The Forests have determined, and we concur, that the impacts associated with the proposed project may affect, and are likely to adversely affect bull trout and designated bull trout critical habitat. In addition, the Forest determined, and the Service concurs, that the project may affect, but is not likely to adversely affect, gray wolf."

In their Biological Opinion, NMFS also concluded "the proposed action is likely to adversely affect but will not jeopardize the continued existence of Snake River Spring/ Summer (SR) Chinook salmon, Snake River Fall Chinook Salmon, SR sockeye salmon, Snake River Basin (SRB) steelhead, or Middle Columbia River (MCR) steelhead, or result in the destruction or adverse modification of designated critical habitat or critical habitats for all the above-listed species."

The Forest Service will follow terms and conditions in both Biological Opinions to minimize "taking" of any endangered species.

4.3 Consultation with Tribes

Letters were sent to Tribal leaders of the Nez Perce, Confederate Tribes of the Umatilla Indian Reservation (CTUIR), and Confederate Tribes of the Warm Springs Reservation in April of 2006. None of tribes responded to the letter. The Forest had meetings with various tribal resource staff. During these meetings the tribes were supportive of the Forest's efforts to treat invasive plants and being able to use all

the tools/methods described in the proposed action. The experience of the CTUIR using aerial treatments for yellow starthistle is described as successful when integrated with other land owners. The Nez Perce felt that biological treatments should be an integrated approach used on the landscape. All tribes have a concern about coordinating herbicide treatments with traditional gathering activities and areas. A process will be developed for notifying each tribe when herbicides are being used as required by the project design features in chapter 2.

4.4 Consultation with Counties

The Forest Service has worked closely with the County Weed Boards. County staff have presented information to the Forest Service (Available in the Project Record) and participated in field visits. The Counties often implement projects for the Forest Service and other land managers in the area and fully support this project.

4.5 Consultation with Others

Many people within and outside the Forest Service helped the team develop and analyze the project. Managers and specialists from the National Forest reviewed analysis documentation and suggested changes.

Public scoping has occurred on this project since 2005. The public has been apprised of project progress through the newspaper, direct mailings, Notices of Intent published in the Federal Register in 2005, the Forest Schedule of proposed actions, informal meetings and discussions, and other media.

4.6 Distribution of this FEIS

This document is available in hard copy or compact disc. The full FEIS and Appendices are also available electronically by website: <http://www.fs.fed.us/R6/uma/projects> or on request (see cover page for more information or to request a CD or hard copy). A compact disc was sent to the following list of individuals, organizations, agencies and tribal governments and groups.

Confederated Tribes of the Umatilla Indian Reservation

Honorable Elwood Patawa, Board of Trustees Chairman
Gerald Reed, Cultural Resources Committee Chairman
Eric Quaempts, Department of Natural Resources Director
Aaron Hines, General Council Chair
Teara Farrow, Cultural Resources Protection Program Manager
Carl Scheeler, Wildlife Program Director
Gary James, Fisheries Program Director
Audie Huber, Intergovernmental Affairs Manager

Confederated Tribes of the Warm Springs Indian Reservation

Honorable Delvis Heath, Sr., Warm Springs Chief
Honorable Nelson Wallulatum, Wasco Chief
Honorable Joseph Moses, Paiute Chief
Honorable Ron Suppah, Tribal Chairman
Bobby Brunoe, Natural Resources Program General Manager/ THPO
Sally Bird, Cultural Resources Program Manager
Scott Turo, Off Reservation Habitat Biologist
Clay Penhollow, Natural Resources

Nimiipuu Tribe (Nez Perce)

Honorable Samuel N. Penny, Chair, Nez Perce Tribal Executive Committee
 Julia A. Davis Wheller, Vice Chair, Nez Perce Tribal Executive Committee
 Ira Jones, Watershed Management
 Mike Lopez, Office of Legal Council
 Dave Johnson, Fisheries Division
 Aaron Miles, Natural Resources Division
 Brooklyn D. Baptiste, Chairman Natural Resources Subcommittee
 Emmitt Taylor, Watershed Management
 Paul Kraynak, Watershed Management
 Patrick Baird, Tribal Historic Preservation Officer
 Larry Green, Vice Chair Natural Resources

Back Country Horseman of Washington

Arlyn Boatsman	Jeanne Koester	Dan and Jeanie Chappel
Cynthia Gauthier	Ken Bailey	Randy Darling
Dan Jennings	Krohn Treversie	Dave Jackson

Union County Board of Commissioners

John LaMoreau
 Steve McClure

Agencies

Baker County Weed Board
 Morrow County Road Department
 Morrow County Weed District
 National Marine Fisheries Service
 Umatilla County Weed Control, Dan Durfey
 US Fish and Wildlife Agency, John Kinney
 Washington State Noxious Weed Control Board, Steve McGonical
 EPA Region 10, Theo Mbabaliye
 US Department of Interior, Lloyd Woosley
 USDA, National Agricultural Library
 US Environmental Protection Agency, Office of Federal Activities

Individuals and Organizations

Blue Mountains Biodiversity Project, Karen Coulter
 Center for Water Advocacy, Harold Shepherd
 Hells Canyon Preservation Council, Brian Kelly
 Northwest Coalition for Alternatives to Pesticides, Norma Grier
 Oregon Natural Desert Association, Peter M. Lacy
 Oregon Wild, Doug Heiken
 Asante Riverwind
 Umatilla Basin Watershed Council, Tracy Bosen
 Walla Walla Basin Watershed Council
 Wallowa County Courthouse
 Wallowa Resources, Mark C. Porter
 Dupont, John Catlon and Donald Kambitsch
 Jerry Asher
 Lee Dawson
 Mike Zeimantz
 Dick Artley

4.7 Glossary

Active ingredient (a.i.) - In any pesticide product, the component (a chemical or biological substance) that kills or otherwise controls the target pests - Pesticides are regulated primarily on the basis of active ingredients. The remaining ingredients are called “inerts.”

Acute effect - An adverse effect on any living organism in which severe symptoms develop rapidly and often subside after the exposure stops.

Acute exposure - A single exposure or multiple brief exposures occurring within a short time (e.g., 24 hours or less in humans). The classification of multiple brief exposures as “acute” is dependent on the life span of the organism. (See also, chronic exposure and cumulative exposure.)

Acute toxicity - Any harmful effect produced in an organism through an acute exposure to one or more chemicals.

Adaptation - Changes in an organism's physiological structure or function or habits that allow it to survive in new surroundings.

Adapted - How well organisms are physiologically or structurally suited for survival, growth, and resistance to pests and diseases in a particular environment.

Additive effect - A situation in which the combined effects of exposure to two chemicals simultaneously is equal to the sum of the effect of exposure to each chemical given alone. The effect most commonly observed when an organism is exposed to two chemicals together is an additive effect.

Adjuvant(s) - Chemicals that are added to pesticide products to enhance the toxicity of the active ingredient or to make the active ingredient easier to handle or mix.

Administratively Withdrawn Areas (AWA) - Areas removed from the suitable timber base through agency direction and land management plans.

Adsorption - The tendency of one chemical to adhere to another material such as soil.

Aerobic - Life or processes that require, or are not destroyed by, the presence of oxygen. (See also, anaerobic.)

Affected Environment - Existing biological, physical, social, and economic conditions of an area subject to change, both directly and indirectly, as the result of a proposed human action.

Agent - Any substance, force, radiation, organism, or influence that affects the body. The effects may be beneficial or injurious.

Agency for Toxic Substances and Disease Registry (ATSDR) - Federal agency within the Public Health Service charged with carrying out the health-related analyses under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Superfund Amendments and Reauthorization Act (SARA).

Alien species - “With respect to a particular ecosystem, any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem” (Executive Order 13112, 2/3/99). (See also, invasive, noxious, and weed species.)

Allelopathy - The suppression of growth of one plant species due to the release of toxic substances by another plant.

Alluvial - Relating to clay, silt, sand, gravel, or similar detrital material deposited by flowing water. Alluvial deposits may occur after a heavy rain storm.

Ambient - Usual or surrounding conditions.

Amphibian - Any of a class of cold-blooded vertebrates (including frogs, toads, or salamanders) intermediate in many characteristics between fishes and reptiles and having gilled aquatic larvae and air-breathing adults.

Anadromous - Fish that spend their adult life in the sea but swim upriver to fresh water spawning grounds to reproduce.

Anaerobic - Life or process that occurs in, or is not destroyed by, the absence of oxygen. (See also, aerobic.)

Anions - Negatively charged ions in solution e.g., hydroxyl or OH⁻ ion. (See also, cations.)

Annual - A plant that endures for not more than a year. A plant which completes its entire life cycle from germinating seedling to seed production and death within a year.

Annuity - Payment or receipt of a series of equal amounts at stated intervals for a specified number of time periods. An “annuity due” is a series of equal value outputs or inputs occurring for N equal time periods with “payments” made at the beginning of each period.

Anoxia - Literally, “without oxygen.” A deficiency of oxygen reaching the tissues of the body especially of such severity as to result in permanent damage.

Aquatic Influence Zone – The inner half of a Riparian Reserve.

Aqueous - Describes a water-based solution or suspension.

Aquifer - An underground geological formation, or group of formations, containing usable amounts of groundwater that can supply wells and springs.

Arid - A terrestrial region lacking moisture, or a climate in which the rainfall is not sufficient to support the growth of most vegetation.

Background level - In pollution, the level of pollutants commonly present in ambient media (air, water, soil.)

Bacteria - Microscopic living organisms that metabolize organic matter in soil, water, or other environmental media. Some bacteria can also cause human, animal and plant health problems.

Basal application - In pesticides, the spreading of a chemical on stems or trunks of plants just above the soil line.

Base - Substances that (usually) liberate hydroxyl (OH⁻) anions when dissolved in water and weaken a strong acid.

Benchmark - A dose associated with a defined effect level or designated as a no effect level.

Benthic region - The bottom layer of a body of water.

Benthos - The plants and animals that inhabit the bottom layer of a water body.

Best Management Practices (BMP) - A practice or combination of practices determined by a state or an agency to be the most effective and practical means (technological, economic, and institutional) of controlling point and non-point source pollutants at levels compatible with environmental quality.

Bioaccumulation - The increase in concentration of a substance in living organisms as they take in contaminated air, water, or food because the substance is very slowly metabolized or excreted (often concentrating in the body fat.)

Bioassay - (1) To measure the effect of a substance, factor, or condition using living organisms. (2) A test to determine the toxicity of an agent to an organism.

Bioconcentration - The accumulation of a chemical in tissues of a fish or other organism to levels greater than in the surrounding water or environment.

Bioconcentration Factor (BCF) - The concentration of a compound in an aquatic organism divided by the concentration in the ambient water of the organism.

Biodegradability - Susceptibility of a substance to decomposition by microorganisms; specifically, the rate at which compounds may be chemically broken down by bacteria and/or natural environmental factors.

Biodiversity or biological diversity - The diversity of living things (species) and of life patterns and processes (ecosystem structures and functions). Includes genetic diversity, ecosystem diversity, landscape and regional diversity, and biosphere diversity.

Biological control - The use of natural enemies, including invertebrate parasites and predators (usually insects, mites, and nematodes,) and plant pathogens to reduce populations of nonnative, invasive plants.

Biological magnification - The process whereby certain substances such as pesticides or heavy metals increase in concentration as they move up the food chain.

Biologically sensitive - A term used to identify a group of individuals who, because of their developmental stage or some other biological condition, are more susceptible than the general population to a chemical or biological agent in the environment.

Biomass - The amount of living matter.

Biota or Biome - All living organisms of a region or system.

Body Burden - The amount of a chemical stored in the body at a given time, especially a potential toxin in the body as the result of exposure.

Broadcast application - Herbicide treatment method generally used along roads; boom truck spray is directed at target species. Broadcast methods are used for larger infestations where spot treatments would not be effective.

Bryophytes - Plants of the *phylum Bryophyta*, including mosses, liverworts, and hornworts; characterized by the lack of true roots, stems, and leaves.

Buffer Zone - A strip of untreated land that separates a waterway or other environmentally sensitive area from an area being treated with pesticides.

Candidate species - Those plant and animal species that, in the opinion of the Fish and Wildlife Service (FWS) or National Oceanic and Atmospheric Administration (NOAA) Fisheries, may qualify for listing as “endangered” or “threatened.” The FWS recognizes two categories of candidates. Category 1 candidates are taxa for which the FWS has on file sufficient information to support proposals for listing. Category 2 candidates are taxa for which information available to the FWS indicates that proposing to list is possibly appropriate, but for which sufficient data are not currently available to support proposed rules.

Capillary fringe - The zone above the water table within which the soil or rock is saturated by water under less than atmospheric pressure.

Carcinogen - A chemical capable of inducing cancer.

Carrier - A non-pesticide substance added to a commercial pesticide formulation to make it easier to handle or apply.

Chemical Abstracts Service (CAS) Registry Number - An assigned number used to identify a chemical. Chemical Abstracts Service is an organization that indexes information published in Chemical Abstracts by the American Chemical Society and that provides index guides to help locate information about particular substances in the abstracts. Sequentially assigned CAS numbers identify specific chemicals. The numbers have no chemical significance. The CAS number is a concise, unique means of chemical identification.

Cations - Positively charged ions in a solution. (See also, anion.)

Characteristic Landscape - The naturally established landscape within a scene or scenes being viewed.

Chemical Control - The use of naturally derived or synthetic chemicals called herbicides to eliminate or control the growth of invasive plants.

Chronic exposure - Exposures that extend over the average lifetime or for a significant fraction of the lifetime of the species (for a rat, chronic exposure is typically about two years). Chronic exposure studies are used to evaluate the carcinogenic potential of chemicals and other long-term health effects. (See also, acute and cumulative exposure.)

Chronic Reference Dose (RfD) - An estimate of a lifetime daily exposure level (in mg/kg/day) for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects. Chronic RfDs are specifically developed to be protective for long-term exposure to a compound (seven years to lifetime.)

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

Code of Federal Regulations (CFR) - Document that codifies all rules of the executive departments and agencies of the federal government. It is divided into fifty volumes, known as titles. Title 40 of the CFR (referenced as 40 CFR) lists all environmental regulations, including regulations for EPA pesticide programs (40 CFR Parts 150-189).

Competitive seeding - Treatment method; most effective after weed populations have been reduced by other control actions.

Congressionally Designated Areas - Areas that require Congressional enactment for their establishment, such as National Parks, Wild and Scenic Rivers, National Recreation Areas, National Monuments, and Wilderness. Also referred to as Congressional Reserves. Includes similar areas established by Executive Order, such as National Monuments.

Conifer - An order of the *Gymnospermae*, comprising a wide range of trees and a few shrubs, mostly evergreens that bear cones and have needle-shaped or scale-like leaves. Conifer timber is commercially identified as softwood.

Connected actions - Exposure to other chemical and biological agents, in addition to exposure to a specific pesticide formulation in a field application to control pest organisms.

Contaminants - For chemicals, impurities present in a commercial grade chemical. For biological agents, other agents that may be present in a commercial product.

Control - Means, as appropriate, eradicating, suppressing, reducing, or managing invasive species populations, preventing spread of invasive species from areas where they are present, and taking steps such as restoration of native species and habitats to reduce the effects of invasive species and to prevent further invasions (Executive Order 13112, 2/3/99).

Cultural control - The establishment or maintenance of competitive vegetation, use of fertilizing, mulching, prescribed burning, or grazing animals to control or eliminate invasive plants.

Cumulative Effect (CE) - The impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions—regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time (40 CFR 1508.7).

Cumulative exposure - Exposure resulting from one or more activities that are repeated over a period of time. (See also, acute and chronic exposure.)

Detritus - Loose fragments, particles, or grains formed by the disintegration of organic matter or rocks.

Discount - In economics, discounting is the process of carrying an end value backward in time at compound interest.

Distance Zones - Landscape areas denoted by specified distances from the observer. Used as a frame of reference in which to discuss landscape attributes or the scenic effect of human activities in a landscape.

Disturbance - An effect of a planned human management activity, or unplanned native or exotic agent or event that changes the state of a landscape element, landscape pattern, or regional composition.

Dosage/Dose - (1) The actual quantity of a chemical administered to an organism or to which it is exposed. (2) The amount of a substance that reaches a specific tissue (e.g. the liver). (3) The amount of a substance available for interaction with metabolic processes after crossing the outer boundary of an organism.

Dose Rate - In exposure assessment, dose per time unit (e.g. mg/day); also called dosage.

Dose Response - Changes in toxicological responses of an individual (such as alterations in severity of symptoms) or populations (such as alterations in incidence) that are related to changes in the dose of any given substance.

Drift - The portion of a sprayed chemical that is moved by wind off of a target site.

Emergent Vegetation - Plants growing out of or standing in water, in contrast to “submerged aquatic vegetation (SAV),” which grows entirely underneath the waters’ surface.

Endangered Species - Any species listed in the Federal Register 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 U.S. Fish and Wildlife Service or the NOAA Fisheries 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 NOAA Fisheries on federal actions that may affect these species or their designated critical habitat.

Endemic - A species or other taxonomic group that is restricted to a particular geographic region due to factors such as isolation or response to soil or climatic conditions. (Compare to “Indigenous” and “Native.”)

Environmental justice - Executive Order 12898 of February 11, 1994 requires federal agencies, to the greatest extent practicable and permitted by law, to make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions, the District of Columbia, the Commonwealth of Puerto Rico, and the commonwealth of the Mariana Islands.

Exposure assessment - The process of estimating the amount of contact with a chemical or biological agent that an individual or a population of organisms will receive from a pesticide application conducted under specific, stated circumstances.

Exotic – Non-native species; introduced from elsewhere, but not completely naturalized. (See also alien and introduced species.)

Extirpate - To destroy completely; wipe out.

Extrapolation - The use of a model to make estimates of values of a variable in an unobserved interval from values within an already observed interval.

Fauna - The animals of a specified region or time.

Federally listed species - Formally listed as a threatened or endangered species under the Endangered Species Act. Designations are made by the Fish and Wildlife Service or the National Marine Fisheries Service.

Federal Insecticide and Rodenticide Act (FIFRA) Pesticide Ingredient - An ingredient of a pesticide that must be registered with EPA under the Federal Insecticide, Fungicide, and Rodenticide Act. Products making pesticide claims must submit required information to EPA to register under FIFRA and may be subject to labeling and use requirements.

Fertilization - Treatment method involving adding of nutrients, which could improve the success of desirable species; may be limited, depending on species/soil characteristics.

Flora - Plant life, especially all the plants found in a particular country, region, or time regarded as a group. Also, a systematic set of descriptions of all the plants of a particular place or time.

Foaming - Hot foam is a mechanical method that is effective on seedlings and annuals and can be applied under certain weather conditions, including wind and light rain.

Food chain - A hierarchical sequence of organisms, each of which feeds on the next, lower member of the sequence

Forage - Food for animals. In this document, term applies to both availability of plant material for wildlife and domestic livestock.

Formulation - A commercial preparation of a chemical including any inerts and/or contaminants.

Fungi - Molds, mildews, yeasts, mushrooms, and puffballs, a group of organisms that lack chlorophyll and therefore are not photosynthetic. They are usually non-mobile, filamentous, and multi-cellular.

Game fish - Species like trout, salmon, or bass, caught for sport. Many of them show more sensitivity to environmental change than non-game fish.

Grazing animals - Treatment method which requires matching the invasive species with the appropriate grazer for best success.

Groundwater Loading Effects of Agricultural Management Systems (GLEAMS) – A model which displays herbicide concentrations in streams under a variety of conditions.

Groundwater - The supply of fresh water found beneath the Earth's surface, usually in aquifers, which often supply wells and springs.

Habitat - The place where a population (e.g., human, animal, plant, microorganism) lives and its surroundings, both living and non-living.

Halftime or half-life - The time required for the concentration of the chemical to decrease by one-half.

Hand/Selective application - Herbicide treatment of individual plants through wicking, wiping, injecting stems, etc., with low likelihood of drift or delivery of herbicides away from treatment sites. This method ensures no herbicide directly contacts soil.

Hand-pulling/Grubbing - Treatment method which is labor-intensive but effective on single plants or on small, low-density infestations.

Hazard Quotient (HQ) - The ratio of the estimated level of exposure to a substance from a specific pesticide application to the RfD for that substance, or to some other index of acceptable exposure or toxicity. A HQ less than or equal to one is presumed to indicate an acceptably low level of risk for that specific application.

Hazard identification - The process of identifying the array of potential effects that an agent may induce in an exposed of humans or other organisms.

Herbaceous - A plant that does not develop persistent woody tissue above the ground (annual, biennial, or perennial.) Herbaceous vegetation includes grasses and grass-like vegetation, and broadleaved forbs.

Herbicide - A chemical preparation designed to kill plants, especially weeds, or to otherwise inhibit their growth.

Humus - Organic portion of the soil remaining after prolonged microbial decomposition.

Tribal and Treaty Rights - Native American treaty and other rights or interests recognized by treaties, statutes, laws, executive orders, or other government action, or federal court decisions.

Indian Tribe - Any American Indian or Alaska Native tribe, band, nation, pueblo, community, rancheria, colony, or group meeting the provisions of the Code of Federal Regulations Title 25, Section 83.7 (25 FR 83.7), or those recognized in statutes or treaties with the United States.

Indigenous - An indigenous species is any which were or are native or inherent to an area. (See also, native.)

Inerts - Anything other than the active ingredient in a pesticide product; not having pesticide properties.

Infested area - A contiguous area of land occupied by, in this case, invasive plant species. An infested area of land is defined by drawing a line around the actual perimeter of the infestation as defined by the canopy cover of the plants, excluding areas not infested. Generally, the smallest area of infestation mapped will be 1/10th (0.10) of an acre or 0.04 hectares.

Integrated Weed Management (IWM) - An interdisciplinary weed management approach for selecting methods for preventing, containing, and controlling noxious weeds in coordination with other resource management activities to achieve optimum management goals and objectives

Interdisciplinary Team (IDT) - A group of individuals with varying areas of specialty assembled to solve a problem or perform a task. The team is assembled out of recognition that no one scientific discipline is sufficiently broad enough to adequately analyze the problem and propose action.

Introduced species - An alien or exotic species that has been intentionally or unintentionally released into an area as a result of human activity. (See also exotic, invasive, and noxious.)

Introduction - "The intentional or unintentional escape, release, dissemination, or placement of a species into an ecosystem as a result of human activity" (Executive Order 13112, 2/3/99).

Invasive plant species - An alien plant species whose introduction does or is likely to cause economic or environmental harm or harm to human health (Executive Order 13112, 2/3/99) (See also exotic and introduced species)

Irreversible effect - Effect characterized by the inability of the body to partially or fully repair injury caused by a toxic agent.

Irritant - Non-corrosive material that causes a reversible inflammatory effect on living tissue by chemical action at the site of contact as a function of concentration or duration of exposure.

LC50 (Lethal Concentration50) - A calculated 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.

LD50 (Lethal Dose50) - The dose of a chemical calculated to cause death in 50 percent of a defined experimental animal population over a specified observation period. The observation period is typically 14 days.

Label - All printed material attached to, or part of, the pesticide container.

Land allocation - Commitment of a given area of land or a resource to one or more specific uses (e.g. wilderness). In the Northwest Forest Plan, one of the seven allocations of Congressionally Withdrawn Areas, Late-Successional Reserves, Adaptive Management Areas, Managed Late-Successional Areas, Administratively Withdrawn Areas, Riparian Reserves, or Matrix.

Landscape - An area composed of interacting ecosystems that are repeated because of geology, land form, soils, climate, biota, and human influences throughout the area. Landscapes are generally of a size, shape, and pattern which is determined by interacting ecosystems.

Landscape Character - Particular attributes, qualities, and traits of a landscape that give it an image and make it identifiable or unique.

Landscape Setting - The context and environment in which a landscape is set; a landscape backdrop. It is the combination of land use, landform, and vegetation patterns that distinguish an area in appearance and character from other areas.

Leachate - Water that collects chemicals as it trickles through soil or other porous media containing the chemicals.

Leaching - The process by which chemicals on or in soil or other porous media are dissolved and carried away by water, or are moved into a lower layer of soil.

Level of Concern (LOC) - The concentration in media or some other estimate of exposure above which there may be effects.

Lichens - Complex thallophytic plants comprised of an alga and a fungus growing in symbiotic association on a solid surface (such as a rock.)

Littoral zone - (1) That portion of a body of fresh water extending from the shoreline lakeward to the limit of occupancy of rooted plants. (2) The strip of land along the shoreline between the high and low water levels.

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.

Manual Control - The use of any non-mechanized approach to control or eliminate invasive plants (i.e. hand-pulling, grubbing)

Material Safety Data Sheet (MSDS) - A compilation of information required under the OSHA Communication Standard on the identity of hazardous chemicals, health and physical hazards, exposure limits, and precautions.

Mechanical Control - The use of any mechanized approach to control or eliminate invasive plants (i.e. mowing, weed whipping, hot foam.)

Microorganisms - A generic term for all organisms consisting only of a single cell, such as bacteria, viruses, protozoa and some fungi.

Minimum tool - Use of a weed treatment alternative that would accomplish management objectives and have the least impact on resources

Modification - A visual quality objective meaning human activities may dominate the characteristic landscape but must, at the same time; utilize naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in foreground or middleground.

Mollusks - Invertebrate animals (such as slugs, snails, clams, or squids) that have a soft, un-segmented body, usually enclosed in a calcareous shell; representatives found on National Forest System land include snails, slugs, and clams.

Monitoring - A process of collecting information to evaluate if objectives and anticipated or assumed results of a management plan are being realized or if implementation is proceeding as planned.

Morbidity - Rate of disease, injury or illness.

Mowing - Invasive plant treatment method which is limited to level/gently-sloping smooth-surface terrain. Treatment timing is critical, and must be conducted for several consecutive years.

National Environmental Policy Act (NEPA) - An Act passed in 1969 to declare a national policy that encourages productive and enjoyable harmony between humankind and the environment, promotes efforts that prevent or eliminate damage to the environment and biosphere, stimulates the health and welfare of humanity, enriches the understanding of the ecological systems and natural resources important to the nation, and establishes a Council on Environmental Quality.

National Forest Management Act (NFMA) - A law passed in 1976 as an amendment to the Forest and Rangeland Renewable Resources Planning Act, requiring preparation of Forest Plans and the preparation of regulations to guide that development.

National Marine Fisheries Service (NMFS) - The federal agency that is the listing authority for marine mammals and anadromous fish under the ESA (also referred to as NOAA Fisheries).

National Pollutant Discharge Elimination System (NPDES) - As authorized by the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Point sources are discrete conveyances such as pipes or man-made ditches. Individual homes that are connected to a municipal system, use a septic system, or do not have a surface discharge do not need an NPDES permit; however, industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters.

National Visitor Use Monitoring (NVUM) - A permanent, ongoing sampling system which measures national forest visitor demographics, experiences, preferences, and impressions. A stratified random sample is done for 25% of the National Forest system each year according to a national research protocol. NVUM responds to the need to better understand the use and importance of, and satisfaction with, national forest system recreation opportunities.

National Wilderness Preservation System (NWPS) - The Wilderness Act of 1964 established the national Wilderness Preservation System to ensure that certain federally owned areas in the United States would be preserved and protected in their natural condition. The Act defines a wilderness area, in part, as

an area which generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable. Areas included in the system are administered for the use and enjoyment of the American people in such manner as to leave them unimpaired for future use and enjoyment as wilderness.

Native species - With respect to a particular ecosystem, a species that other than as a result of an introduction historically occurred or currently occurs in that ecosystem (Executive Order 13112, 2/3/99).

Naturalized - Applied to a species that originally was imported from another country but that now behaves like a native in that it maintains itself without further human intervention and has invaded native populations.

Non-local native - This term has two meanings: (1) a population of a native plant species which does not occur naturally in the local ecosystem and/or (2) plant material of a native species that does not originate from genetically local sources.

Non-target species - Any plant or animal that is not the intended organism to be controlled by a pesticide treatment.

No-Observed-Adverse-Effect level (NOAEL) - Exposure level at which there are no statistically or biological significant differences in the frequency or severity of any adverse effect in the exposed or 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 in the exposed or control populations.

Not Likely to Adversely Affect (NLAA) - Determinations are applied to those species that had very little habitat on National Forests in Region Six, were not in habitats susceptible to invasive plants, or were known to tolerate herbicide treatments without effects.

Noxious weed - "Any living stage (including but not limited to, seeds and reproductive parts) of any parasitic or other plant of a kind, or subdivision of a kind, which is of foreign origin, is new to or not widely prevalent in the United States, and can directly or indirectly injure crops, other useful plants, livestock, or poultry or other interests of agriculture, including irrigation, or navigation or the fish and wildlife resources of the United States or the public health" (Public Law 93-629, January 3, 1975, Federal Noxious Weed Act of 1974).

Outstandingly Remarkable Value (ORV) - A characteristic of rivers or sections of rivers in the national Wild and Scenic River System. In order for a river to be included in the system, it must possess at least one "outstandingly remarkable" value, such as scenic, recreational, geologic, fish, wildlife, historic, cultural, or other similar features. ORV's are values or opportunities in a river corridor which are directly related to the river and which are rare, unique, or exemplary from a **regional or national perspective**.

Partial Retention - A visual quality objective which in general means human activities may be evident but must remain subordinate to the characteristic landscape.

Pathogen - A living organism, typically a bacteria or virus that causes adverse effects in another organism.

Percolation - Downward flow or filtering of water through pores or spaces in rock or soil.

Perennial - A plant species having a life span of more than two years.

Periphyton - Microscopic plants and animals that are firmly attached to solid surfaces under water such as rocks, logs, pilings and other structures.

Persistence - Refers to the length of time a compound, once introduced into the environment, stays there.

Personal Protective Equipment (PPE) - Clothing and equipment worn by pesticide mixers, loaders and applicators and re-entry workers, hazmat emergency responders, workers cleaning up Superfund sites, et. al., which is worn to reduce their exposure to potentially hazardous chemicals and other pollutants.

Pest - An insect, rodent, nematode, fungus, weed or other form of terrestrial or aquatic plant or animal life that is classified as undesirable because it is injurious to health or the environment.

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, etc.

Pesticide tolerance - The amount of pesticide residue allowed by law to remain in or on a harvested crop.

pH - The negative log of the hydrogen ion concentration. A high pH (greater than seven) is alkaline or basic and a low pH (less than seven) is acidic.

Population - A group of individuals of the same species in an area.

Population at Risk - A population subgroup that is more likely to be exposed to a chemical, or is more sensitive to the chemical, than is the general population.

Porosity - Degree to which soil, gravel, sediment, or rock is permeated with pores or cavities through which water or air can move.

Potable Water - Water that is considered safe for drinking and cooking.

Project design features (PDF) - A set of implementation Design Features/features applied to projects to ensure that the project is done according to environmental standards and adverse effects are within the scope of those predicted in this Environmental Impact Statement.

Proposed species - Any plant or animal species that is proposed by the Fish and Wildlife Service or NOAA Fisheries in a Federal Register notice to be listed as threatened or endangered.

Potential Vegetation Type (PVT) - The term Potential Vegetation Type is used to represent the combination of species that could occupy the site in the absence of disturbance.

Protozoa - Single-celled, microorganisms without cell walls containing visibly evident nuclei and organelles. Most protozoa are free-living although many are parasitic.

Recreational Rivers - A classification within the national Wild and Scenic River System. Recreational rivers are those rivers, or sections of rivers, that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

Reference Dose (RfD) - The RfD is a numerical estimate of a daily exposure to the human population, including sensitive subgroups such as children, that is not likely to cause harmful effects during a lifetime. RfDs are generally used for health effects that are thought to have a threshold or minimum dose for producing effects.

Registered Pesticides - Pesticide products which have been approved for the uses listed on the label.

Registration - Formal licensing with EPA of a new pesticide before it can be sold or distributed. Under the Federal Insecticide, Fungicide, and Rodenticide Act, EPA is responsible for registration (pre-market licensing) of pesticides on the basis of data demonstrating no unreasonable adverse effects on human health or the environment when applied according to approved label directions.

Restoration - Ecological restoration is the process of assisting the recovery and management of ecological integrity. Ecological integrity includes a critical range of variability in biodiversity, ecological processes and structures, regional and historical context, and sustainable cultural practices.

Retention - A visual quality objective which in general means human activities are not evident to the casual forest visitor.

Revegetation - The re-establishment of plants on a site - The term does not imply native or nonnative; does not imply that the site can ever support any other types of plants or species and is not at all concerned with how the site 'functions' as an ecosystem.

Riparian Area - A geographic area containing an aquatic ecosystem and adjacent upland areas that directly affect it.

Riparian Habitat Conservation Areas - Areas along live and intermittent streams, wetlands, ponds, lakes, and unstable and potentially unstable areas where riparian-dependent resources receive primary emphasis. Riparian Habitat Conservation Areas are important to the terrestrial ecosystem as well, serving as dispersal habitat for certain terrestrial species.

Risk Assessment - An analytic process that is firmly based on scientific considerations, but also requires judgments to be made when the available information is incomplete. These judgments inevitably draw on both scientific and policy considerations.

Risk - The chance of an adverse or undesirable effect, often measured as a percentage.

Risk assessment - The qualitative and quantitative evaluation performed in an effort to estimate the risk posed to human health and/or the environment by the presence or potential presence and/or use of specific chemical or biological agents.

Saturated zone - A subsurface area in which all pores and cracks are filled with water under pressure equal to or greater than that of the atmosphere.

Scenery Management - The art and science of arranging, planning, and designing landscape attributes relative to the appearance of places and expanses in outdoor settings.

Scenic - Of or relating to landscape scenery; pertaining to natural or natural-appearing scenery; constituting or affording pleasant views of natural landscape attributes or positive cultural elements.

Scenic Rivers - A classification within the national Wild and Scenic River System. Scenic rivers are those rivers, or sections of rivers, that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

Seen Area - The total landscape area observed based upon landform screening. Seen-areas may be divided into zones of immediate foreground, foreground, middleground, and background. Some landscapes are seldom seen by the public.

Sensitive species - Species identified by the Regional Forester for which population variability is a concern, as evidenced by significant current or predicted downward trend in population numbers or density; or significant current or predicted downward trends in habitat capability that would reduce a species existing distribution.

Species of Local Interest (SOLI) - Threatened, endangered and proposed species; Regional Forester's Sensitive species, management indicator species, and other rare or endemic species of concern.

Species - "A group of organisms, all of which have a high degree of physical and genetic similarity, generally interbreed only among themselves, and show persistent differences from members of allied groups of organisms." (Executive Order 13112, 2/3/99).

Spot application - Herbicide treatment involving use of a backpack sprayer or other means. Application is aimed at specific target species, with methods of prevention (such as barriers,) to control damage to non-target species.

Standards and guidelines - The rules and limits governing actions, as well as the principles specifying the environmental conditions or levels to be achieved and maintained

Sub-chronic exposure - An exposure duration that can last for different periods of time (5 to 90 days), with 90 days being the most common test duration for mammals. The sub-chronic study is usually performed in two species (rat and dog) by the route of intended use or exposure.

Sub-chronic toxicity - The ability of one or more substances to cause effects over periods from about 90 days but substantially less than the lifetime of the exposed organism. Sub-chronic toxicity only applies to relatively long-lived organisms such as mammals.

Submerged Aquatic Vegetation (SAV) - Vegetation that lives at or below the water surface; an important habitat for young fish and other aquatic organisms. In contrast to emergent vegetation, which is growing out of or in standing water.

Substrate - With reference to enzymes, the chemical that the enzyme acts upon

Surface water - All water naturally open to the atmosphere (rivers, lakes, reservoirs, streams, impoundments, seas, estuaries, etc.) and all springs, wells, or other collectors which are directly influenced by surface water.

Surfactant - A surface active agent; usually an organic compound whose molecules contain a hydrophilic group at one end and a lipophilic group at the other. Promotes solubility of a chemical, or lathering, or reduces surface tension of a solution.

Synergistic effect - Situation in which the combined effects of exposure to two chemicals simultaneously is much greater than the sum of the effect of exposure to each chemical given alone.

Take - "The term 'take' means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." (Title 16, chapter 35, Section 1532, Endangered Species Act of 1973)

Threatened species - Plant or animal species likely to become endangered throughout all, or a significant portion of, its range within the foreseeable future. A plant or animal identified and defined in accordance with the 1973 Endangered Species Act and published in the Federal Register.

Threshold - The maximum dose or concentration level of a chemical or biological agent that will not cause an effect in the organism.

Tolerances - Permissible residue levels for pesticides in raw agricultural produce and processed foods. Whenever a pesticide is registered for use on a food or a feed crop, a tolerance (or exemption from the tolerance requirement) must be established. EPA establishes the tolerance levels, which are enforced by the Food and Drug Administration and the Department of Agriculture.

Toxicity - The inherent ability of an agent to affect living organisms adversely. Toxicity is the degree to which a substance or mixture of substances can harm humans or animals.

Toxicology - The study of the nature, effects, and detection of poisons in living organisms. Also, substances that are otherwise harmless but prove toxic under particular conditions. The basic assumption of toxicology is that there is a relationship among the dose (amount), the concentration at the affected site, and the resulting effects.

Treatment Area - An infested area where weeds have been treated or retreated by an acceptable method for the specific objective of controlling their spread or reducing their density.

U.S. Fish and Wildlife Service (US FWS) - The federal agency that is the listing authority for species other than marine mammals and anadromous fish under the ESA.

U.S. Forest Service (USDA FS or USFS) - The federal agency responsible for management of the Nation's National Forest system lands.

Variety Class - A particular level of visual variety or diversity of landscape character.

Viability - Ability of a wildlife or plant population to maintain sufficient size to persist over time in spite of normal fluctuations in numbers, usually expressed as a probability of maintaining a specific population for a specified period.

Viable Population - A wildlife or plant population that contains an adequate number of reproductive individuals appropriately distributed on the planning area to ensure the long-term existence of the species.

Viewshed - Total visible area from a single observer position, or the total visible area from multiple observer position. Viewsheds are accumulated seen-areas from highways, trails, campgrounds, towns, cities, or other viewer locations. Examples are corridor, feature, or basin viewsheds.

Visual Quality Objective - A desired level of excellence based on physical and sociological characteristics of an area. Refers to degree of acceptable alteration of the characteristic landscape.

Well-distributed - Distribution sufficient to permit normal biological function and species interactions, considering life history characteristics of the species and the habitats for which it is specifically adapted.

Wetland - An area that is regularly saturated by surface or ground water and subsequently is characterized by a prevalence of vegetation that is adapted for life in saturated soil conditions. Examples include swamps, bogs, fens, marshes, and estuaries.

Wild and Scenic River System - The Wild and Scenic Rivers Act of 1968 established a system of selected rivers in the United States, which possess outstandingly remarkable values, to be preserved in free-flowing condition. Within the national system of rivers, three classifications define the general character of designated rivers: Wild, Scenic, and Recreational. Classifications reflect levels of

development and natural conditions along a stretch of river. Classifications are used to help develop management goals for the river.

Wilderness - Areas designated by Congressional action under the 1964 Wilderness Act. Wilderness is defined as undeveloped federal land retaining its primeval character and influence without permanent improvements or human habitation. Wilderness areas are protected and managed to preserve their natural conditions, which generally appear to have been affected primarily by the forces of nature with the imprint of human activity substantially unnoticeable; have outstanding opportunities for solitude or for a primitive and confined type of recreation; include at least 5,000 acres, or are of sufficient size to make practical their preservation, enjoyment, and use in an unimpaired condition; and may contain features of scientific, educational, scenic, or historical value as well as ecological and geologic interest.

Wild Rivers - A classification within the national Wild and Scenic River System. Wild rivers are those rivers, or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted.

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Chapter 5 – Response to Comments

5.1 Introduction

This chapter 1) lists the names of individuals, agencies, and organizations that commented on the Draft EIS; 2) explains how public comments were processed and evaluated; 3) shows individual comments received and responses to them, and 4) provides entire copies of federal and state agency letters received.

5.2 Processing and Evaluating Public Comments

The Draft EIS was circulated for public comment and a Notice of Availability was published in the Federal Register Friday, June 22, 2007. Comments received about the Draft EIS were reviewed in their entirety by the interdisciplinary team. Comments were processed using a method called content analysis, which provides a simple approach to identify and consolidate substantive comments by subject, and helps resource specialists (wildlife biologists, hydrologists, etc.) respond to comments in their area of expertise. Substantive comments are those that relate specifically to the proposed project. All comment letters are located in the project record. The names of all respondents are listed below with an identification number.

Some comment letters were voluminous in nature; therefore, to keep this chapter to a reasonable size only the portions of comments that provided the main points or key issues are included here. Responses to comments are focused on comments raising issues, concerns or problems. Extraneous comments or comments not specific to this project typically have brief responses.

5.3 List of Respondents

Table 74. List of people who responded to the Draft EIS

ID #	First Name	Last Name	Organization Name	Notes
1	Jerry	Asher		Phone conversation with Chris Tootell pdf plus pdf of accompanying e-mail
2	Karen	Coulter	Blue Mountains Biodiversity	Attachments
3	Leigh	Dawson	Individual	
4	Doug	Heiken	Oregon Wild	Formerly Oregon Natural Resource Council (ONRC)
5	Brian	Kelly	Hells Canyon Preservation Council	Sections duplicate 8
6	Theo	Mbabaliye	US Environmental Protection Agency, Region 10	EPA technical contact
7	Mark	Porter	Wallowa Resources	combined e-mail, cover letter, and comments into one pdf
8	Asante	Riverwind	Oregon Chapter Sierra Club	Sections duplicate 5
9	Lloyd	Woosley	US Department of Interior	DOI technical contact
10	Donald	Kambitsch	Dupont	Duplicate with 11
11	John	Cantlon	Dupont	Duplicate with 10
12			Umatilla County	Cover letter with Potter (Letter 7) as attachment

5.4 FS Direction Relative to Comments and Responses (1909.15 Chapter 20)

(a) An agency preparing a final environmental impact statement shall assess and consider comments both individually and collectively, and shall respond by one or more of the means listed below, stating its response in the final statement. Possible responses are to:

- (1) Modify alternatives including the proposed action.
- (2) Develop and evaluate alternatives not previously given serious consideration by the agency.
- (3) Supplement, improve, or modify its analyses.
- (4) Make factual corrections.
- (5) Explain why the comments do not warrant further agency response, citing the sources, authorities, or reasons which support the agency's position and, if appropriate, indicate those circumstances which would trigger agency reappraisal or further response.

One or more possible response types (1-5 above) are identified for each comment in the table below.

5.5 Responses to Comments

5.5.1 Comments and Responses by Topic

Comments are segregated by topic and topics are arranged in alphabetical order. Each comment is followed by the identification number of the individual(s) that made the comment. Comments are in bold type. In order to find comments by subject more quickly, please see the following index.

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Alternatives

1. COMMENT: We support the prohibition of broadcast spraying of herbicides in riparian areas as described in alternative C. (5)

RESPONSE: Comment will be considered and rationale for final decision will be in ROD.

2. COMMENT: We support the prohibition of broadcast spraying of herbicides in riparian areas as described in alternative C. (8)

RESPONSE: Duplicate with comment #1.

3. COMMENT: The DEIS admits that the three action alternatives are very similar, with mostly the same effects, leaving not much choice for people favoring far less use or no use of toxic chemicals. (2)

RESPONSE: The DEIS considered, in addition to the three action alternatives, 7 other alternatives that covered a broad array of herbicide use including ‘no herbicide use. These are discussed in Chapter 2.3. One of those alternatives would not have allowed herbicide use in riparian and other special areas (DEIS section 2.3.5) but was eliminated from detailed study because such alternatives would allow invasive plants to persist and likely increase in these areas.

4. COMMENT: Alternatives C and D should logically be combined, as most people in favor of no broadcast spraying in riparian areas would also favor no aerial spray. (2)

RESPONSE: Each alternative was developed to address specific issues and the analysis allows tradeoffs to be considered. Elements of each of these alternatives could be combined in the final selected decision.

Biocontrol

5. COMMENT: The inability to control the spread of released exotic biocontrols is of concern as they are not exhaustively tested against native plants, but instead against crop plants (see DEIS p. 116)

RESPONSE: Biocontrols that meet Standard 14 have not been shown to have impacts on non-target species after ongoing testing...see appendix B for details.

Botany

6. COMMENT: There should be no herbicide use within 100 feet of *Botrychium* species. Impacts to soil organisms and fungi may not be detectable.

RESPONSE: PDFs I-1, I-2 and I-3 listed in Chapter 2 adequately protect *Botrychium* species. In addition, an alternative was considered that would buffer *Botrychium* species from herbicide applications. Alternative 2.3.5 in Chapter 2 was modified to consider exempting certain SOLs from herbicide treatment. Leaving weed infestations untreated to 'protect' botrychium would allow weeds to spread, potentially threatening the very plants needing protection.

This rationale (section 2.3.5) is at the heart of deciding not to consider this alternative in detail because it would not adequately achieve the project's Purpose and Need. PDFs that limit types and distance (relative to location) of applications, combined with post treatment monitoring are expected to fully protect soil organisms and fungi associated with this species.

7. COMMENT: Because aquatic invasives are an emerging issue on National Forest land and elsewhere, EPA encourages the FS to include at-risk water bodies (such as those used for recreational purposes) in future monitoring and inventory efforts. If there are infestations of aquatic invasive plants (floating or submerged in water) on the Forest, we recommend that the final EIS include information about such infestations and how they would be treated to prevent deterioration of water quality within waterbodies found on the Forest. (6)

RESPONSE: Treatment of infestations of floating and submerged aquatic invasive plants is outside the scope of this EIS because the purpose and need focus on terrestrial invasive plants. Aquatic invasives are not currently known to threaten streams or lakes on the Umatilla National Forest. Level II stream survey protocol currently includes identification of invasives, both plants and invertebrates. If aquatic invasive plants are identified on the Umatilla National Forest, additional NEPA would be required to allow treatment.

8. COMMENT: We further ask that the DEIS address the increasing population of *Ventenata dubia* and *Bromus tectorum*. (8)

RESPONSE: *Ventenata dubia* and *Bromus tectorum* were considered by Forest staff. Combined with the wide spread distribution of these two species on and off the forest and the low probability of effective

control, the Forest staff does not consider these two species to be high priority species to control considering the monetary effort it would entail at this time.

9. COMMENT: We further ask that the DEIS address the increasing population of *Ventenata dubia* and *Bromus tectorum*. (5)

RESPONSE: Duplicate to comment # 8.

10. COMMENT: Table 5. I would like to see a separate column for biological control to weigh it equally with herbicide treatment

- **Expand on timing of treatments**
- **Not all knapweed or their treatments are the same**
- **What about grazing?**
- **Add other species (J. Knotweed, Common Crupina, Perennial Pepper weed, Italian Thistle) (3)**

RESPONSE: The Common Control Measures table 3 has been updated based on public and internal comment. Incorporated by reference is the R6 2005 FEIS which includes detailed information about biological controls and control measures for each individual species. No grazing (a type of cultural treatment) is proposed.

11. COMMENT: Table 5 on page 39 is extremely confusing to read and understand. It does not conform well to the decision tree style of thinking and clouds the issue with options that are not useful. For example:

- a. Combining three species of knapweeds together is not useful. Diffuse Knapweed had very effective biological controls and should only be treated in high spread areas and in small satellite populations. Spotted and Meadow Knapweeds are aggressive perennials that do not have effective biocontrols and should be hand broadcast as a rule.*
- b. Dalmatian Toadflax has an excellent biocontrol agent and should be treated similarly to Diffuse Knapweed as outlined above.*
- c. If plants (i.e. Yellow Starthistle) are pulled or clipped they should remove all the above ground biomass and get well below the root crown.*
- d. Covering plants with plastic tarps is non selective and lethal to all species present.*
- e. Metsulfuron methyl (particularly by itself) is NOT an effective treatment for Sulfur Cinquefoil).*

Therefore Table 5 should be reexamined and revamped or removed from the document. (7)

RESPONSE: The Common Control Measures table 3 has been updated based on public and internal comment. Incorporated by reference is the R6 2005 FEIS which includes detailed information about biological controls and control measures for each individual species. .

12. COMMENT: Address the loss of vegetative diversity due to use of herbicides. (2)

RESPONSE: Changes in diversity are discussed in several places in the EIS such as non-target plant and soil effects (sections 3.2.4 and 3.4.3).

13. COMMENT: All Alternatives, Herbicide Effects on Plant Diversity, page 122; and Section 3.3.5, Effects to Threatened, Endangered, and Sensitive (TES) Species, page 171 and page 173, There are

many statements that reference studies conducted or models used, and statements regarding the effects of the proposed action on species. Statements of fact about species, statements about previous studies on species, and statements regarding what models were used need to have supporting references. Examples of where these citations should be provided include: "Some studies cited in this EIS found that species diversity was not affected by herbicide treatment." (page 122, 3rd paragraph) "Recent theoretical models predict that decreasing plant diversity leads to lower plant productivity. These models also show diversity and composition are equally important determinants of ecosystem functioning." (page 122, 4th paragraph) "Even if they fed, for a lifetime, upon fresh-water fish that had been contaminated by an accidental spill of herbicide, they would not receive a dose that exceeds any known NOAEL [No observed adverse effect level]." (page 171, 2nd paragraph) "Studies have shown that even if a bald eagle fed, for a lifetime, upon fresh-water fish that had been contaminated by an accidental spill of herbicide, they would not receive a dose that exceeds any known NOAEL." (page 173, last bullet) (9)

RESPONSE: Reference citations that relate to the topics in the sections cited in the comment have been added

14. COMMENT: Page 107. Is MacFarland's 4 O Clock relevant? (3)

RESPONSE: *Mirabilis macfarlanei* (MacFarland's four o'clock) is a federally listed plant species that is only documented on the Wallowa Whitman National Forest in Region 6. This plant species is not relevant because it is not documented on the Umatilla National Forest, nor is it suspected to occur on the Umatilla National Forest; therefore MacFarland's four o'clock is not addressed in this document.

15. COMMENT: Explain the discrepancy between literature that states that broadcast herbicide use leads to sustained losses in native vegetation and the conclusion that aerial spray of clopyralid would only lead to short term losses of non-target species. (2)

RESPONSE: Aerial application is proposed in relatively small remote areas where repeated treatments are not likely and native vegetation nearby is likely a sufficient seed source for native species re-establishment, although there could be impacts to native vegetation from sustained use of herbicides in areas where there is continual disturbance and re-infestation of invasive species. Aerial sites are not expected to have repeated treatments over time that would cause a sustained loss of native vegetation. There would also be a revegetation plan that would likely include native seeding if needed as a supplement. If major ground disturbance is needed to establish a seed bed, additional NEPA would occur to cover the ground disturbance. Passive and low impact site restoration action actions are expected to take place with these alternatives.

16. COMMENT: Page 130. Use of same chemicals may create plants to become immune, thus being less effective (3)

RESPONSE: Herbicide resistance is discussed in the R6 2005 FEIS (Chapters 3. and 4.2.), and in the Umatilla DEIS (see 3.1.4 Treatment Effectiveness).

17. COMMENT: No justification is given for herbicide impacts to non-target native plants not being considered as great as invasive plant threats or greater. Herbicides are designed to kill plants and many are non-selective and can be taken up by roots, drift or overland surface flows as well as direct contact. (2)

RESPONSE: The R6 2005 FEIS Chapter 3.2 describes the Influence of Invasive Plants on Ecosystem Components. Invasive plants disrupt herbivore/plant ecological relationships, changes the local ecology

of keystone plant species that has cascading effects on plant and wildlife composition and habitat use, and loss of biological diversity, ecological integrity, and ecosystem structure/function. Chapter 4.3 describes the potential impacts of herbicides to target and non-target plants including native species. The Umatilla EIS is tiered to the R6 2005 FEIS; Chapter 3.2 of the Umatilla EIS discusses effects of treatment on the plant communities and botanical species of local interest specific to this Forest. The analysis in Chapter 3.2 also considers the potential effects to non-target species including potential effects due to drift and other unintended delivery mechanisms (such as wet soils). Herbicide use would be done in a manner that minimizes adverse effects on non-target plants.

18. COMMENT: We are concerned by recent declines and disorientation in honey bees, which has been suggested to be related to herbicide use as well as other possible factors and may be affecting native pollinators in similar ways. Significant data gaps regarding native plant pollinators increase our concern and are acknowledged in the DEIS. The maximum herbicide application rates should not be used as they increase risk to pollinators. Glyphosate and triclopyr use should be avoided. NP3 surfactant formulas should not be used as they pose greater health risks and have not been tested for toxicity to bees. Risks to native plants and pollinators are not estimated in terms of specific impacts or quantified beyond ambiguous "High, medium and low" evaluation terminology, There is no way to assess from this DEIS how serious or long-term high risk may be. There is no analysis of combined effects to the viability of SOL1 plants or other native plants in the cumulative effects analysis. How would this project interact with others and private land management to affect the viability of SOL1 and ecological plant community? It seems these values are disregarded or sacrificed with every Forest Service project. (2)

RESPONSE: The SERA risk assessments (R-6 FEIS 2005) describe the toxicity of each herbicide relative to honeybees. There is a potential for some impacts to individual insects from herbicide or from vegetation changes due to invasives or their removal. However, herbicide use as proposed for this project would not be extensive or intensive enough to have a discernable effect on pollination. Chapter 4.3 describes the potential impacts of herbicides to target and non-target plants including native species. Herbicide use would be done in a manner that minimizes adverse effects on non-target plants. The discussion about pollinators has been clarified in the FEIS.

Cultural Sites

19. COMMENT: Project design features may not totally eliminate the contamination risks to human health, water quality, fisheries, native plants, and wildlife. All commonly used edible and medicinal plants, drinking water sources and fish habitat should be off limits to herbicide use. Native people should not be forced to shift to "other" cultural gathering locations or to risk health problems from toxins. Many traditional gathering sites have been used for countless generations-perhaps even thousands of years. Displacement to other sites breaks this cultural continuity. Some root food is diggable by elders because of this long period of digging use, contamination or loss of cultural plant sites could be an irreversible and irretrievable loss of cultural sites. Traditional food sources and cultural plants should take precedence over herbicide use. There are also emotional and spiritual losses from the knowledge that the cultural site has been contaminated, It is obviously not traditional to gather food from a poisoned place. (2)

RESPONSE: Local American Indian tribes have not expressed these concerns about the project. They see invasive plants as a potential detriment to their ability to maintain cultural ties to the landscape. Tribes would like to see invasive plants controlled and are not opposed to the use of herbicides. The Forest has approached the (Confederate Tribes of the Umatilla Indian Reservation (CTUIR) about how to notify

gatherers about potential treatments so that the timing of treatments can be worked to minimize impacts to yearly gathering cycles; this is still in the development process. The Forest is also working with the CTUIR to coordinate the use of our vegetation databases to identify potential sites that support cultural plants. This information can then identify an alternate site if one is being treated. This notification plan will allow the Forest and CTUIR or other tribes to better orchestrate gathering and treatments to further reduce the risk of contamination. Knowing when a site is sensitive to a tribe will allow special measures to be taken as to methods of application.

An alternative in Chapter 2.3.5 considers exempting special areas; traditional gathering areas can be considered special areas. This alternative was not considered in detail because Tribes have supported aggressive invasive plants treatment (Section 1.7), and because exempting such areas could allow weeds a 'safe haven' from which they could spread.

Cumulative Effects

20. COMMENT: Wildfire and heavy rainfall can act cumulatively with herbicide use by creating toxic combustion products, spreading herbicide impacts through surface overland flow, and increasing aerial and broadcast drift out of target areas. (2)

RESPONSE: These interactions are analyzed in the risk assessments and addressed where appropriate in Chapter 3 of the DEIS. "Toxic combustion products" are not plausible from this treatment, even if an area was to burn shortly after treatment. No treatments are planned within 24 hours of predicted rainfall and aerial and broadcast treatments would be suspended during periods of rainfall and/or wind greater than eight miles per hour. Drift will be properly managed through standard procedures.

Economics

21. COMMENT: Aerial treatments are extremely economical and with today's GIS and herbicide application technologies can be extremely precise. Currently aerial treatment in canyon lands cost between \$30 and 65 per acre. The same acres treated on the ground can cost between \$300-750 per acre. This price difference is critical because without the use of aerial treatment it would be near to impossible for the WWNF to manage their noxious weeds under current budget scenarios. An alternative that does not consider aerial treatment would not be viable. (7)

RESPONSE: The analysis acknowledges that aerial application methods are more economical than ground application methods in the cost assumptions utilized (EIS Section 3.9.1 Projected Costs). Cost estimates used were based on regional averages, adjusted for local variations. The cost of aerial application methods was estimated at \$42 per acre. For areas to be treated on the Umatilla, ground application methods can generally be implemented at a costs averaging from \$100 to \$125 per acre. Two alternatives were considered that would utilize aerial application methods. Alternatives B and C would treat approximately 675 acres with the aerial application of herbicides. The estimated costs as well projections for achieving containment and control of currently inventoried sites under all alternatives are analyzed and displayed in the EIS Section 3.9.3 and are summarized in table 84 on page 355.

The treatment of noxious weeds on the Wallowa-Whitman National Forest is outside the scope of this analysis.

Editorial

22. COMMENT: The following citation on page 398 is missing both the author(s) and the year of publication: "Mechanisms underlying the impacts of exotic plant invasions. Ecology Letters. 7:975–989." (9)

RESPONSE: The Title references a different journal: Levine J.M., Vila M., D'Antonio C., Dukes J.S., Grigulis K. & Lavorel S. (2003). Mechanisms underlying the impact of exotic plant invasions. Phil. Trans. Roy. Soc., 270, 775–781. The completed citation has been added to the reference list.

23. COMMENT: The following citation on page 407 is incomplete: "Techniques for Natural Areas. The Nature Conservancy," (9)

RESPONSE: Thank you for pointing this out. The correct citation is:
Tu, M., C. Hurd, and J. M. Randall. 2003. Weed Control Methods Handbook: Tools & Techniques for Natural Areas. The Nature Conservancy,
<http://tncweeds.ucdavis.edu/handbook.html>, version. June 2003. The completed citation has been added to the reference list

24. COMMENT: The following citation on page 408 is incomplete: "Thesis, University of Maine, Orono, Maine, 87 pp." (9)

RESPONSE: This citation has been dropped because it is not cited in the EIS.

25. COMMENT: The following cited websites on page 393 lack a complete reference:

1. <http://tncweeds.ucdavis.edu/handbook.html>, version. June 2003.
2. <http://www.nwfsc.noaa.gov/publications/techmemos/index.cfm> (9)

RESPONSE: The complete UC Davis citation (in addition to the web address) is : Tu, Mandy; Callie Hurd, & John M. Randall. “Weed Control Methods Handbook: Tools and Techniques for Use in Natural Areas”

The second citation is a duplication and goes with the “Howell, P.J., and D.V. Buchanan.” Citation just above where the web address is found. Sorry for the confusion.

- 26. COMMENT: The link provided for Wood (2001) does not lead to the USGS publication. The correct link is http://or.water.usgs.gov/pubs_dir/WRIR01-4065/. (9)**

RESPONSE: Thank you for pointing this out and giving us the correct link.

Wood, Tamara. 2001. Herbicide Use in the Management of Roadside Vegetation, Western Oregon, 1999–2000: Effects on the Water Quality of Nearby Streams, USGS, Water-Resources Investigations Report 01–4065.(http://or.water.usgs.gov/pubs_dir/WRIR01-4065/).

- 27. COMMENT: The Morse citation on page 399 could not be found in the main body of the DEIS. (9)**

RESPONSE: This citation has been dropped.

- 28. COMMENT: The only listed Levine reference on page 396 is a 2004 citation that does not include a title of the review paper. The only Levine reference cited in the main body of the DEIS is on page 121, which is a 2003 publication: "One study has indicated that exotic plants may compete better for native plant pollinators by producing more desirable nectar and therefore increasing fitness and reproductive ability of the non-native plant (Levine et al. 2003)." (9)**

RESPONSE: Thank you for pointing this out. Replace Levine 2003 with: Chittka, L. & Schurkens, S. 2001 Successful invasion of a floral market. Nature 411, 653–654.

- 29. COMMENT: The two Mech citations on page 398 are not listed in the main body of the DEIS, and one may assume that important facts about the species may have been left out of the discussions in the appropriate sections of the DEIS. (9)**

RESPONSE: The Mech citations have been added to the text.

- 30. COMMENT: Page 10. PDFs are not located in section 2.3.3 as stated; but on pg.49 (3)**

RESPONSE: Thank you for pointing this out. The location has been corrected.

- 31. COMMENT: Page 116. Bio agents are often used where access and safety are issues. Recognize that we work cooperatively with ODA (3)**

RESPONSE: The follow statement under the “Biological Control” heading of section 3.2.4 attests to the cooperation with the state: “In compliance with the R6 2005 FEIS, Standard #14 which stipulates to use only APHIS and State (ODA)-approved biological control agents and agents demonstrated to have direct negative impacts on non-target organisms would not be released, the regional office will annually provide

a list of agents that may not be released because they do not meet the standard (Pacific Northwest Region Six White Paper, 2006 (See appendix B this EIS)).”

32. COMMENT: Page 35. Note that aerial spraying is often done in partnership with adjacent private lands (3)

RESPONSE: Partnering with adjacent private landowners is stated multiple times in the EIS. Integrated pest management (EIS section 2.2.3) acknowledges the need for partnerships and treatments on multiple adjacent ownerships. They are expected treatment strategies to effectively control target species. Forest Service specialists would be expected to seek these partnerships to reach common and community goals.

33. COMMENT: Reference to tables or figures should include pg. # for user convenience (3)

RESPONSE: References to tables and figures are linked so reader can go to cited data or illustration.

34. COMMENT: Page 36. When talking treatment prescription, reference restoring site to desired future condition as our goal as well as protection and enhancement of native vegetation (3)

RESPONSE: Section 1.2 of this EIS describes the desired future condition. In it protection and enhancement of native vegetation is stated.

35. COMMENT: Section 4.6, References, beginning on page 384: There are a number of references that are not cited in the main body of the DEIS or are incomplete citations, which may lead one to question the integrity of the section. The references should be cross-checked making sure they are correctly cited and also confirming that the references are complete. (9)

RESPONSE: Thank you for pointing out the incomplete or extra citations. Corrections were made.

36. COMMENT: Consider including a recommended monitoring form for district use. Consider including a recommended site proposal form that outlines steps to take for site to achieve desired future condition (3)

RESPONSE: Forest or Districts will use existing, or develop monitoring forms as part of project implementation. Developing forms for implementation is beyond the NEPA scope of this EIS.

37. COMMENT: Consider an index for acronyms....they are scattered throughout the document and often hard to find their meaning (3)

RESPONSE: An acronym index was included on pages ix - xi in the DEIS.

EDRR

38. COMMENT: Section 3.4.3, Environmental Consequences, Early Detection Rapid Response, page 230, 1st paragraph; and Aerial Application, pages 217-218 It is not clear why the risks associated with aerial spraying are considered higher at the Early Detection Rapid Response (EDRR) sites than elsewhere. The reasons given on page 230 - such as unpredictable weather and difficult to recognize stream channels - would apply to all sites, not just the EDRRs. It would be helpful if the reasons these risk factors are of lesser concern or eliminated at the other (non-EDRR) sites could be explained. (9)

RESPONSE: These risk factors increase the uncertainties of the effects of aerial treatment, thus further NEPA would be needed once infestation sites are known and can be more fully analyzed. Spot and hand treatments are more easily controlled by the operator (applicator), thus effects are less variable and there is less risk of offsite movement of herbicides. Aerial treatment must be analyzed assuming increased risk of offsite movement (drift) and thus, the analysis specificity needs to be greater. Though aerial application may be safe for many EDRR sites, because of the uncertainties acknowledged in the DEIS, the Forest staff has chosen not to include aerial applications in EDRR.

39. COMMENT: How can EDRR be included in the analysis when the future treatment sites are unknown? (2)

RESPONSE: The EDRR analysis approach is based on the premise that similar treatments on similar sites will have similar impacts. The effects of treating approximately 4,000 acres per year are disclosed in the EIS. The PDFs and buffers predict and minimize risk. The EIS limits what newly discovered infestations could be treated under EDRR. For example, a newly discovered invasive infestation of emergent vegetation could not be treated under this EIS because this EIS doesn't include the treatment of invasive emergent vegetation. So the same exclusions, limitations, and safeguards developed for currently known sites would be in place when considering treatment of invasive sites discovered in the future.

40. COMMENT: Predictions of 80% effectiveness are too high for biocontrol. (1)

RESPONSE: The prediction of 80 percent applies to effectiveness using all methods available within the EIS. It is recognized that biocontrols are not meant to eradicate invasives and likely are not in and of themselves likely to be 80 percent effective. The proposed action indicates that approximately 4,000-plus acres will be treated with bio-control agents based on present conditions (site conditions). However, in the future if biocontrol site conditions change, EDRR provides the opportunity to re-evaluate the site and treat with other methods (herbicides) that in fact may be 80 percent-plus effective.

When biological control is chosen, it means that we would live with the invasive plant on the landscape. Eradication is not possible. The biological control method would attempt to contain the targeted species because the infestation is too large for other methods to control or would require continued treatments. Plants found outside the containment area could use other methods if eradication was possible.

41. COMMENT: EDRR direction is great!!!!!! (3)

RESPONSE: Thank you for your supportive comment.

Effectiveness

42. COMMENT: The idea that spot treatment should be used whenever possible is naïve. The minimum herbicide application for effectiveness is rarely spot spraying and more often a hand broadcast. Noxious weeds got to be noxious weeds because they are HARD to control. Using spot treatment as you have defined it is using a slow approach to the application of herbicides will not be effective. Hand broadcasting residual herbicides with buffers around each plant (somewhere between 5-50 feet plant depending on the plant, the time the weed has been on the site, and the site itself...) is the most effective method of chemical treatment. Spot treatments almost invariably miss rosettes, seeds, and roots that sprout up (from) existing plants. In the long run this will allow weeds to increase and native plant communities and natural productivity will suffer. (7)

RESPONSE: The Forest Service recognizes spot treatments may not, in all cases, be the best method to control weeds; however, this proposal allows compromising some treatments to protect other resource values. At the time of application, site conditions will be evaluated for invasive species present, morphological and reproductive characteristics (including the ability to spread via seedbanks and rhizomes) of the invasives present, the density of the target invasive species, and other resource issues in need of protection.

43. COMMENT: Page 133. I like the comparison that shows limited % of forest lands will be treated; but have concern for broad statement ...herbicide use expected to decline....again, is probably true on a site to site basis but overall future of weeds is unknown...(3)

RESPONSE: The objective to reduce reliance on herbicides over time was adopted in the R6 2005 FEIS. Use of herbicide is expected to successfully control or eradicate target species. As the desired condition is approached, less herbicide would be needed. The cap of 4,000 acres in a year for this project would not likely allow for a steady decline in herbicide use over time. .

44. COMMENT: What is the basis for the 80 percent efficiency estimate for herbicide use? Generally herbicides have to be used for years, several or a few times each year to achieve control, just like more ecologically benign manual and mechanical control methods. There is no unbiased comparison of different control method efficiencies in the DEIS. (2)

RESPONSE: There is no way to precisely estimate exactly how invasive plant populations will respond to each treatment. Results vary widely depending on the species being treated, the length of time for which the target population has been established, the objectives of treatment, and local conditions (including but not limited to density and size of infestation, topography, soils, weather during time of treatment). Practitioners report that the same treatment on a similar site may be more or less effective. The 80 percent estimate is based on anecdotal evidence consistent with other invasive plant projects across the Pacific Northwest Region. The 80 percent effectiveness assumption illustrates that some repeated treatment will be necessary to accommodate skips and regrowth.

Fisheries

45. COMMENT: Need better explanation for why effects are insignificant and discountable. Finding that project is not likely to result in a loss of fish viability is not supported. (2)

RESPONSE: The Endangered Species Act Section 7 Findings and Determinations have been changed since release of the DEIS based on results of consultation with the FWS and NMFS. Effects are no longer characterized as insignificant or discountable, however herbicides proposed for use are not expected to reach streams in concentrations that would kill fish or significantly degrade habitat (discussed in detail Chapter 3 of the FEIS and the ESA consultation record).

General

46. COMMENT: Herbicides should not be sprayed in aquatic and terrestrial amphibian habitat, or in any areas with habitat and/or presence of biodiverse species of concern. (5)

RESPONSE: This alternative was considered but eliminated from further study because it would limit the ability of the Forest Service to effectively treat invasive plants in these areas.

47. COMMENT: Because of concerns about water quality and missing information, we have assigned a rating of EC-2 (Environmental Concerns – Adequate) to the draft EIS. (6)

RESPONSE: The FEIS has been supplemented to address water quality and other questions posed by EPA. Chapter 1.5 adds language to address tribal water quality standards, Chapter 3.4 displays the most current 303(d) list for water quality, and adds language about water quality and the 2002 MOU.

48. COMMENT: Page 15. Define mechanical scarification: is depth of scarification considered? (3)

RESPONSE: Mechanical scarification is any activity using mechanical methods that purposefully disturbs the soil surface to prepare the soil for planting or seeding. This EIS analysis does not analyze nor propose such activity.

49. COMMENT: Strongly support Aerial application... Support spot spraying, hand applications in riparian areas; although it might not be practical. (3)

RESPONSE: Comment noted

50. COMMENT: Page 17. “Plan to last 10-15 years” but invasives and treatments are fluid- how are we going to allow for new technology; new species which often go undetected until their invasiveness becomes known. (3)

RESPONSE: EDRR under this analysis would allow the treatment of infestations discovered in the future, and/or new invasive species identified in the future as long as it involves similar treatment on similar sites that have been analyzed under this EIS

51. COMMENT: Page 32. Aerial Application – are we limiting ourselves to helicopters? (Aerial)...goal is to become less dependent on herbicides...this is true on a “per site” basis but it is a difficult statement to make on a general basis because of the “fluid” nature of invasives (3)

RESPONSE: This EIS analyzes aerial treatment of existing, known weed infestations only. Aerial application is not proposed for any new infestations and is not in EDRR protocols. Aerial applications would likely be accomplished using helicopters which can typically control drift better in varied terrain than fixed wing aircraft.

52. COMMENT: We share the Forest Service’s concern about the spread of invasive species. We should do all we can to protect the integrity of native plant communities. We support treatment of invasive species using the least impactful methods that are also effective. (4)

RESPONSE: We agree that the “least impactful” methods are desirable. Least impactful is complex and may require the short-term effects of using herbicides to achieve the long term protection of native grassland ecosystems from long term impacts of invasive plant species. This is the central desire of the purpose and need stated in Chapter 1.

53. COMMENT: Keep workers who are conducted [sic] plant treatments out of areas that have hazardous trees and snags that may pose a safety hazard. If you can't make that promise, please disclose the cumulative impacts of lost snag habitat across thousands of acres and surrounding hazard zones. (4)

RESPONSE: Invasive plant treatment will be accomplished with workers safety as a primary prerequisite. No felling of snags is proposed.

54. COMMENT: We appreciate your considerable efforts toward the preparation of this invasive plant DEIS. Thank you for the opportunity to comment on this proposal and for your attention to the importance of invasive weeds and native plant communities. (5)

RESPONSE: Thank you for your supportive comment.

55. COMMENT: Thank you for the incredible energy that went into this EIS....it is very exciting for weed managers everywhere! (3)

RESPONSE: Thank you for your supportive comment.

56. COMMENT: We hereby incorporate by reference the entirety of the comments and administrative appeal submitted regarding the Region 6 2005 FEIS [FEIS] on invasive plant management by Blue Mountains Biodiversity-Project, League of Wilderness Defenders as part of these comments on the Umatilla DEIS. These comments and the appeal reflect many remaining concerns we have about potential impacts to ecosystems, species , ecological integrity, biodiversity and human health and safety stemming from the Region 6 invasive plant management plan...which it often reiterates and uses as a basis for effects analysis and findings of no significant impact. (2)

RESPONSE: The comment does not state which concerns were not resolved in the appeal of the regional document. The R6 2005 ROD was affirmed after a “deliberative and extensive review process.” (August 15, 2006 Appeal Decision, http://www.fs.fed.us/emc/applit/includes/woappdec/r6_ipp_decision.pdf).

57. COMMENT: Since there would be no more NEPA public process prior to treatment at specific sites, exact locations of planned herbicide use should be disclosed, especially to local residents and regional Native Nations, and concerns or alternative option suggestions solicited from the public on a sites-specific basis, with appropriate analysis of each site’s conditions—type of soils, native plant proximity, TES species presence, water flows, type of invasive plants and their biology and control options, cultural uses of the area, etc. Although each invasive plant site has been identified by the Forest Service, this complete set of relevant information for decision-making has not been disclosed to the public. Further, widespread public concern over herbicide use alone should either necessitate greater ability for the public to participate in decision-making or far less herbicide use based on a much more precautionary approach.(2)

RESPONSE: Maps are included in Chapter 2 of this EIS showing locations of each specific site planned for treatment. In addition, the EIS directs interested persons to the Forest’s web site for detailed, 1:24000 scale maps showing specific treatment sites. The DEIS described the types of treatments considered for identified sites, and the resource issues associated with each site along with project design features used to resolve resource conflicts. Treatment methods have been analyzed using the design features and have been shown to be effective in reducing impacts to the various resource of concerns. The direct, indirect and cumulative effects of treating invasive plants have been disclosed. Additional NEPA during implementation is not necessary. The implementation planning process would identify the type of treatment and resources of concern so that proper protection measures would be implemented. The sites would be reviewed by specialists and any new information incorporated into the project treatment plan. Individuals and communities will be notified prior to treatment and treatment areas would be posted so the public is informed.

58. COMMENT: Inadequate site-specific analysis for a project level EIS, leading to implementation of actions on specified sites, failure to adequately: describe or quantify the ecological or human health consequences of effects discussed; failure to analyze an accidental spill as a plausible worst case scenario; inadequate analysis and lack of disclosure of scientific controversy or failure to disclose many recent relevant scientific findings, e.g. the human health and safety which is conspicuously short, lacking in detail and buried in the back of the DEIS. (2)

RESPONSE: The Forest Service has considered the best available scientific information in this EIS and applied it to specific areas. Measures to reduce risk of accidents and potential for adverse effects from accidental spills are included in the project. For example, the quantity of herbicides to be transported to treatment sites would be limited to small amounts and an herbicide transportation and handling safety plan would be required. The Human Health section is tiered to the R6 2005 FEIS which includes detailed discussions about the potential health effects of herbicides to workers and the public. The focus in this project level EIS is reducing the risks identified in the R6 2005 FEIS through project design features such as limitations on the use of the surfactant NPE that poses a potential hazard to people. .

59. COMMENT: Herbicides should not be sprayed in aquatic and terrestrial amphibian habitat, or in any areas with habitat and/or presence of biodiverse species of concern. (8)

RESPONSE: This alternative was considered but eliminated from detailed study because it would not meet the purpose and need (see Chapter 2.3.5). Design features have been developed for protection of these resources. The analysis of effects to amphibian habitat and other non-target species includes these protection measures which have been shown to be effective.

60. COMMENT: The management approaches advocated by the DEIS are likely to result in irreparable and unlawful adverse impacts from herbicides upon human health, fish and wildlife, and non-target native plants. (8)

RESPONSE: Impacts from herbicide use to human health, fish and wildlife and non-target plants are analyzed and disclosed in this EIS. None of the impacts were found to be irreparable or unlawful. .

61. COMMENT: Inadequate cumulative effects analysis. (2)

RESPONSE: Cumulative effects analysis has been updated and clarified in the FEIS.

62. COMMENT: Potential of the Endangered Species Act regarding federally listed species, violation of the Magnuson-Stevens Fishery Conservation and Management Act, the Clean Water Act , PAC-fish and the National Forest Management Act. (2)

RESPONSE: The EIS addresses relevant environmental laws, policies and plans.

63. COMMENT: Biased conclusions that sometimes directly contradicts factual statements made in preceding analysis (e.g., that none of the herbicides proposed for use bio-accumulate after stating that Picloram is retained in the body (e.g., p, 188) and that herbicide spraying proposed for Wilderness Areas will not violate the Wilderness Act after admitting that motorized spray pumps may be used. (2)

RESPONSE: Thank you for pointing out that contradiction regarding bio-accumulation. Picloram, according to its SERA risk assessment, is rapidly eliminated from mammals through urine. In fish the bioconcentration factor is 1 for picloram, which is very low. Therefore, there is no contradiction because picloram does not significantly bioaccumulate. We have made the appropriate edits to the text you referred to by dropping the reference to picloram.

Use of battery or solar powered pumps would not violate the Wilderness Act. They make very little sound and have no internal combustion emissions; therefore, the untrammeled, nature solitude sought by wilderness visitors would be preserved. The only possible intrusion is the presence of the applicator and possibly his/her stock, which could occur by encounters with other wilderness visitors.

64. COMMENT: We hereby incorporate by reference the entirety of the comments and administrative appeal submitted regarding the Region 6 2005 FEIS on invasive plant management by Blue Mountains Biodiversity-Project and League of Wilderness Defenders as part of these comments on the Umatilla DEIS. These comments and the appeal reflect many remaining concerns we have about potential impact to ecosystems, species, ecological integrity, biodiversity and human health and safety stemming from the Region 6 invasive plant management plan, to which the Umatilla EIS is tiered and often reiterated and used as a basis for facts and findings. (2)

RESPONSE: The R6 2005 ROD was affirmed after deliberative and extensive review (August 15, 2006 Appeal Decision, http://www.fs.fed.us/emc/applit/includes/woappdec/r6_ipp_decision.pdf). This comment is not specific enough to warrant further response.

Herbicides

65. COMMENT: No chlorsulfuron, glyphosate, imazapyr, metsulfuron methyl, or triclopyr should be used near or in riparian areas. (2)

RESPONSE: An alternative to exclude some specific herbicides from riparian areas was not considered; however, an alternative was considered that would have excluded all herbicide application in riparian areas (see Chapter 2.3.5). The five herbicides suggested are needed to control or eradicate some weed species, thus, similar to eliminating all herbicides, the riparian area becomes a safe harbor for establishment and proliferation of those species. This would not accomplish the purpose and need of this project and therefore is not an alternative considered in detail. Use of these herbicides in Alternatives B and D would be done according to specific buffers that control the application method and type of herbicide that may be used near streams. Alternative C provides further restriction on broadcasting near streams. The result of the analysis is that adverse impacts are unlikely given the measures included in all three action alternatives, along with the small extent of treatment in comparison to riparian habitats.

66. COMMENT: Herbicide use should be prohibited within 100 feet of SOLI or rare plants. (2)

RESPONSE: Alternative considered (see section 2.3.5) but eliminated because the botany analysis indicates this measure goes beyond what is necessary to protect the SOLI.

67. COMMENT: We are opposed to toxic herbicide use in Wild and Scenic River corridors due to risks to river values. (2)

RESPONSE: Eliminating all herbicide use from large areas like W&S river corridors creates a safe harbor for weeds, which allows them to expand their area and influence/compromise native plant ecosystems. This is in direct conflict with the purpose and need for this project, so this alternative was not considered in detail. Herbicides will be used in these areas with risks minimized by project design features.

68. COMMENT: Page 20. More details on consequences needed in this alternative [A]. I am concerned about the present limited chemical choices and consequences of multiple applications; also the effects of glyphosate in riparian zones on native vegetation (3)

RESPONSE: Weeds have increased during the life of this alternative. The implications of the existing limited choice in herbicides that would continue under this alternative are discussed in more detail in chapters 3.1 and 3.2.

69. COMMENT: Toxic impacts to workers and horses from backpack and horse-mounted spray tanks are not analyzed. (2)

RESPONSE: The same procedures and precautions in the handling, mixing and spraying herbicides that minimize risk of exposure and minimize risk from exposure would be observed by the licensed applicators working in wilderness settings. The risks have been analyzed and reported in appendix Q of the R6 2005 FEIS and reported in section 3.7 of this EIS.

While no herbicide exposure studies were reported for pack stock directly, the SERA risk assessments have been done for other mammals. These assessments study both chronic and acute exposure using surrogate mammals. The results conclude negligible risk to mammals, suggesting little potential for negative toxic impacts to pack stock. These assessment results can be read in appendix O of the R6 FEIS (USDA 2005a). Reference to the applicable SERA risk assessments have been added to the EIS text.

70. COMMENT: Establish clear measurable standards to implement the goal of reduced herbicide use over time. (4)

RESPONSE: Establishing a standard for measuring herbicide use over time is not possible given the annual herbicide treatment cap of 4,000 acres. Herbicide use will vary from year to year up to that point. At any one treatment site, herbicide use is expected to decline over time.

71. COMMENT: Any herbicide use should prioritize wicking, then spot-spraying as the most effective methods for preventing impacts to non-target plants, water, wildlife, soils, etc. Boom and aerial broadcast spraying are the most indiscriminate methods, subject to toxic drift and creation of bare ground encouraging more invasive plant infestation and should be prohibited. (2)

RESPONSE: Broadcast and aerial methods would only be used when other methods would not be cost-effective or involve unreasonable safety hazards. The PDFs and buffers restrict some special areas to spot and hand treatments. Alternative C would prohibit broadcast treatment in riparian areas, and alternative D would prohibit aerial treatment. Comparative effects are discussed in the EIS.

72. COMMENT: As the majority of invasive plant sites are along roads, trails and other highly disturbed sites, with repeated use by weed vectors such as livestock and vehicles, high approved use of herbicides may take quite awhile to be (be) reduced, as Region 6 prevention standards are not sufficiently stringent regarding control of invasive plant dispersal by livestock, off-road vehicles other vehicles and logging. So invasives will continue to appear along these travel corridors and areas of high disturbance and the Forest Service personnel will want to keep dumping herbicides on them as the perceived cheapest and easiest control method. This is a foreseen and plausible outcome of this project which should give rise to a far more precautionary approach to herbicide use in order to avoid long-term chronic poisoning of waterbodies, soils, listed fish species, big game species, neo-tropical songbirds, amphibians, riparian ecosystems. Invertebrates, humans using the forest for hunting, fishing, wild food and medicine gathering, recreation and work (including especially herbicide applicators, Native people and Hispanic and Asian mushroom harvesters) These are the resources, values and populations most at risk of chronic toxic impairment or unacceptably high losses from acute toxicity.(2)

RESPONSE: R6 2005 FEIS and ROD considered programmatic approaches and effects prevention standards, which were added to the Umatilla National Forest Plan and apply to all projects on the forest. The R6 ROD acknowledged that decades would likely pass before invasive plant spread is controlled across the region. However, "long-term chronic poisoning of waterbodies, soils, listed fish species," etc. would not be the result of the proposed action.

Herbicide use would be completed according to PDFs which limit the extent and rate of application and the method of application. Chronic impacts were considered in the risk assessments and no adverse effects from chronic exposure are associated with the type of herbicide use proposed. The Umatilla NF EIS addresses potential site-specific effects on people, animals, fish, soils and water.

73. COMMENT: We are concerned about the large acreage of herbicide use planned in Asotin, Looking Glass, Meachem and Wall Creeks. Can some of the less aggressive species be treated without herbicide? (2)

RESPONSE: Herbicides are necessary to have in the toolbox for most of the sites due to the location of the sites, the aggressive nature of the invasive plants, and the local knowledge that hand (manual/mechanical) treatments alone have not been effective. The direct, indirect and cumulative effects of treatments have been analyzed and disclosed in Chapter 3 of this EIS.

74. COMMENT: There is extreme over-reliance of toxic herbicide use planned despite much public concern regarding the effects of herbicides, Out of 24,649 acres of invasive plant infestations, somehow the Forest Service could only find 41 acres for which only manual or mechanical control would be used while 20,693 acres would be subjected to herbicide poisoning in addition to other methods. It must be understood that herbicides are not the solution to the invasive weed problem but merely a quick fix addressing symptoms. (2)

RESPONSE: See response to comment #73.

75. COMMENT: The Forest Service is overly reliant on chemical treatments and overly dismissive of non-chemical methods. The Forest Service should have considered non-chemical alternatives (and strictly limited chemical alternatives) even if such methods were thought to be less effective because (1) the Forest Service needs to conduct the NEPA analysis before they conclude that the non-chemical treatments are not effective, (2) the Forest Service needs to compare and disclose the effects of the chemical and no-chemical methods so they are fully informed of the trade-offs, and (3) non-chemical treatments and no-action are not the same thing. (4)

RESPONSE: The Forest Service considered many alternatives that would restrict the use of herbicides. A no herbicide alternative was considered but eliminated from detailed study. Such an alternative was fully considered and rejected in 1995. The 2005 R6 FEIS also concluded that herbicides would be needed to effectively treat certain existing populations of invasive plants. Effects of herbicide compared to non-herbicide treatments are discussed in detail in the R6 2005 FEIS. The Umatilla NF project EIS focuses on the tools necessary to bring the invasive plant treatment program into compliance with the new Forest Plan standards generated by the R6 2005 ROD and allow for more effective treatments to control invasives. The intent is to most effectively treat invasives while minimizing adverse effects of treatment.

The current program (no action alternative) allows for very limited herbicide use, and is not effectively treating invasive plants. A wider range of herbicide options and an EDRR approach are necessary to contain control and/or eradicate many invasive species (see Common Control Measures table 3 in the FEIS). The FEIS includes an annual cap of 4,000 acres per year which limits the amount of herbicide that would be used across the Forest.

76. COMMENT: For reduced reliance on herbicide use over time to be achieved, herbicide use should not be so drastically increased first (artificially making 'reductions' huge increases over past use) and a set schedule for achieving reduction objectives needs to be set. For Instance, in 10 years, a 50% reduction from the starting baseline; 20 years out, a 50% reduction from the 50% already achieved at 10 years; 10 years later, 50% less than what was being used at 20 years, etc.

until there is no more herbicide use. Without set goals along a timeline, Objective 3.2 is unlikely to ever be met.(2)

RESPONSE: The Forest Service expects herbicide use to decline over time at individual treatment sites.. Treatments will be followed by either active or passive restoration, and the restoration would be monitored over time. The restoration is aimed at establishing native plant communities, which would reduce and eliminate the need to use herbicides over time.

77. COMMENT: We expect that chemical treatment be used as a last resort, and that prevention of the introduction and spread invasive weeds be the primary means of controlling weeds. Use only proven safe herbicides and only as a last resort. (4)

RESPONSE: The no action (the current program) includes a stipulation that chemical treatment be used as a last resort. The R6 2005 ROD explains why the Regional Forester did not adopt this language because it “deviates from Integrated Weed Management principles” (FSM 2080.5). (R6 2005 ROD page 6). Prevention standards were incorporated into the Forest Plan, and are intended to prevent new introductions and reduce the rate of spread of invasive plants.

78. COMMENT: A precautionary approach with herbicide use is further warranted because of data gaps for impurities, metabolites, inerts and adjuvant formula ingredients as well as for whole herbicide formulas and chronic toxicity of repeated exposures causing long-term health and ecological effects. (2)

RESPONSE: These issues were addressed in the R6 2005 FEIS. The toxicity of active and inert ingredients and both chronic and acute exposures were addressed in the herbicide risk assessments. The regional risk assessments can be viewed at www.fs.fed.us/r6/invasiveplant-eis/ (click on Risk Assessments).

79. COMMENT: Herbicides are a dubious and often dangerously toxic component of the DEIS proposed “integrated approach” for control of invasive weeds. However, avoidance of known and suspected herbicide toxins, favoring biological control and manual / cultural treatments should be utilized, researched and developed in effectiveness, recognizing that the harmful impacts of toxic herbicides most often negate any potential initial control benefits they may be attributed. Herbicide spraying alone will not solve invasive plant problems, and without addressing prevention and natural control methods, long-term cumulative ecological harms will incrementally occur across the region, with as yet unforeseen consequences to the ecological integrity of natural ecosystems, native species biodiversity, and human community health and well-being. Often, the use of herbicides can create additional problems, as well as compound existent ones. The proposed management actions failures to effectively address and curtail the sources of introduction and spread of invasive plants will ensure that the use of harmful toxic herbicides is not on perpetual, but incrementally increases over time. This underscores concerns about the cumulative effects of herbicides over time, as well as potential unknown effects from combinations of different chemicals and adjuvants. The Forest Service must make a specific measurable commitment and clear prohibitions significantly reducing or eliminating the use of known and suspected toxic herbicides. (8)

RESPONSE: The Forest Service acknowledges that the invasive plant management program involves prevention, education, treatment, monitoring and adaptive management. The R6 2005 FEIS addressed all of these program components. NEPA allows us to tier to broader programs, thus the focus of this EIS is mainly on using herbicides in a manner that complies with the new standards in the Forest Plan.

The SERA risk assessments that form the basis for toxicity analysis include the best available scientific information. Measures are proposed for this project to minimize the potential for adverse environmental effects disclosed in the risk assessments.

80. COMMENT: Maximum rates may be used for non-broadcast methods (DEIS page 31). Maximum rates should not be used. Why would greater than typical rates be needed to be effective? Was this addressed in the R6 2005 FEIS? (2)

RESPONSE: The R6 2005 FEIS analyzed typical and maximum rates reported for National Forests in the USA. Application rate does influence risk, which is discussed at length in the 2005 FEIS and supporting risk assessments. Maximum rates may be needed to effectively treat some invasive species and requiring spot or selective application methods if maximum rates are used ensures that this would be used in small discrete areas and daily exposures would be limited due to labor involved. This project accurately limits application rate to typical in models that assume broadcasting as the application method.

81. COMMENT: Potential human health implications of toxic contamination of native plant foods gathered, medicinal plants used, fish and deer/elk eaten, water consumed from rivers and streams (etc.) [are not] discussed in any sufficient detail. (2)

RESPONSE: The Risk Assessments and R6 2005 FEIS considered various acute and chronic herbicide exposure routes. People will not be exposed to harmful amounts of herbicide from this project, given all of the design features that minimize risk.

82. COMMENT: The effects of accidental spills should be analyzed as a worst case scenario. The herbicide transportation and handling safety plan should be disclosed and analyzed. (2)

RESPONSE: The risk assessments and R6 2005 FEIS disclose effects of an accidental spill. These effects would not be expected to occur. The PDFs ensure that herbicide would not enter streams in large amounts. The elements of the transportation and handling safety plan are listed in PDF “G” in section 2.2.3 of this EIS. The plan will be specific to the treatments implemented each year.

83. COMMENT: The DEIS is not clear as to under what conditions herbicide use would not be considered warranted and [nearly all sites] would probably receive herbicide use in the first year and...for more than one year. Yet the effects of toxic chemical application for years on one site, with the same or different chemicals, top soils, native plants, riparian ecosystems, fish, wildlife and human receptors may use that same site year after year (as is common with many hunters, anglers, local recreationists and Native people) is not analyzed or mitigated (2)

RESPONSE: Not all sites would receive herbicide treatment the first year. Project Design Feature F2 states: “An average of 4,000 acres per year (maximum 40,000 acres total) would be treated with herbicides over the life of the project”.

The effects of repeated use of herbicides is discussed in the R6 2005 FEIS and addressed in design features that limited repeated use of herbicides that are more persistent (picloram for example). The possibility of repeated, chronic exposure on people, top soils, native plants, riparian ecosystems, fish, and wildlife are discussed in the risk assessments, the R6 2005 FEIS and the Umatilla project DEIS.

Herbicides would be directed at specific target plants and would be taken up by the plant and would not be available for exposure to many organisms. The chemicals proposed for use are rapidly excreted from fish, wildlife and human bodies and would not accumulate even with repeated use. PDFs have been developed to ensure that the most persistent herbicides have time to break down.

84. COMMENT: The Forest Service should fully disclose the environmental impacts of the so-called "inert" ingredients in the herbicide formulations they proposed to use. For all we know these herbicide companies are laundering hazardous waste through the inert ingredient stream. Inert ingredients are a huge blind-spot in the decision-making process which violates the letter and spirit of NEPA's mandate for full-disclosure and informed decision-making. (4)

RESPONSE: Risk assessments do include the effects of active and inert ingredients in formulations. Please see www.fs.fed.us/r6/invasiveplant-eis/ (click on Risk Assessments)

85. COMMENT: We recognize that herbicides are one component of an integrated approach to control of invasive weeds at this point in time. However, we encourage the continuation of biological control and manual / cultural treatments in situations where they are likely to be effective. As you are aware, spraying alone will not solve the problem. In some cases, herbicides can create new problems. Additionally, we are concerned about potential effects of herbicides upon human health, fish and wildlife, and non-target native plants. Other concerns are the potential cumulative effects of herbicides over time, as well as potential unknown effects from combinations of different chemicals and adjuvants. We ask that the Umatilla National Forest make a specific measurable commitment to reducing reliance on herbicides. (5)

RESPONSE: Herbicide use would vary up to the annual cap 4,000 acres per year, depending on staffing, funding, treatment timing, and priorities. At any one treatment site, herbicide use would be expected to decline over time. The extent of herbicide use proposed and the potential for chronic effects is very low, especially compared to statewide use of chemicals.

86. COMMENT: No herbicide should be used within 100 feet of any stream. People swim in streams and accidentally drink water. So the protection for wells should be applied to all streams. (2)

RESPONSE: Tables 6, 7 & 8 in Chapter 2 of this EIS details the buffers that would be utilized during the life of the project; along with the PDFs, the buffers minimize or eliminate the potential for harmful levels of herbicide to reach streams. Without herbicide use in these areas, riparian areas would become safe havens for invasives. Water quality is not likely to be adversely impacted in any action alternative.

87. COMMENT: Page 12 of the DEIS references that the Forest Service unit of measure is a "subjective sense" of hazard. This is less cautious than the public. (2)

RESPONSE: The Human Health issue has been described in a different manner in response to this comment. The analysis focuses on the best available scientific information regarding hazards of herbicide use to people and ways to minimize risk of exposure.

88. COMMENT: Picloram and clopyralid are both acknowledged in the DEIS to be carcinogenic. Spraying known carcinogens could cause cancer, which is a significant issue. Dismissing such concerns as non-significant artificially narrows the scope of analysis to the detriment of full consideration of the problem at hand and potential alternate or combined solutions. (2)

RESPONSE: Risk assessments indicate that the type and rate of herbicide use would not measurably contribute to accumulation of cancer-causing agents. The proposed action avoids all scenarios associated with discernable risk to workers and the general public identified in the risk assessments. EPA's threshold of concern of 1 in 1 million for cancer would not be approached.

89. COMMENT: Livestock should not be allowed to be contaminated with herbicide. Wouldn't this be a public health hazard if people ate contaminated meat? (2)

RESPONSE: Eating meat from animals that have fed on sprayed vegetation was analyzed in the risk assessments. This exposure route to humans is not plausible because all mammals rapidly excrete the chemicals proposed and they do NOT bio-concentrate. The risk for contamination is further reduced by following grazing restrictions on herbicide labels.

90. COMMENT: People pick huckleberries near roads; posting might not be noticed or come down while residues persist. (2)

RESPONSE: Huckleberries are not a target species and would not likely be impacted by the project. Posting would be augmented by other types of notices and ongoing public contact in the field. This exposure mechanism would not likely occur and amounts of herbicide to which a person would be exposed in this scenario is very low.

Implementation

91. COMMENT: Limitations on the amount of invasive weed sites that can be controlled annually may be a major reason for the previous more precautionary approach failing to limit expansion of invasive populations. If more manual/mechanical only control was allowed for appropriate sites, more cost and labor sharing could be done with multiple groups (e.g. volunteer hand pulls and mechanical control by local communities, environmental groups, civic groups, Youth Conservation Corps, etc.) enabling more sites to be managed at once. Waiting for Forest Service budgets or staffing to increase to pursue more herbicide spraying will not be likely to prevent the 8 to 12% population expansion of uncontrolled invasive sites predicted by the Forest Service. More community involvement would also assist in self-regulation and individual efforts to control invasives through hands-on community learning about invasives. This would also benefit prevention of private land contamination of public lands with invasive plant dispersal. (2)

RESPONSE: The Forest Service welcomes partnerships and volunteer help where hand pulls would effectively reduce invasive plant populations. Prevention will be part of all land uses and when combined with treatment and restoration, the rate of spread of invasive plants will decline over time.

The proposed action allows for a range of treatment options depending on workforce available and effectiveness of common control measures.

92. COMMENT: Although this purports to be a site-specific EIS, we think it would be advisable to create a more detailed site-level plan for each treatment area and allow for public comment before implementation. (4)

RESPONSE: Annually, each Forest Service District office would determine the specific prescription for treatment sites prioritized for that year. Members of the public are welcome to visit District offices to review and discuss the annual implementation plan. Effects would be within the range of those disclosed in this EIS.

Inventory

93. COMMENT: The document says the whole Forest has been thoroughly inventoried however he had been told by Forest staff that the wilderness areas have not been thoroughly inventoried. (1)

RESPONSE: Thank you for pointing this out. The FEIS has been edited to note that wilderness and roadless areas have not been fully inventoried. Wilderness inventories have been confined to trails and trail heads where the greatest possibility of disturbance and weed spread occur.

Monitoring

94 COMMENT: Monitoring needs to be a priority. Small control study areas should be assessed prior to large scale treatments, to assure the effectiveness and assess the adverse impacts of proposed treatment methods. (8)

RESPONSE: More information on monitoring is in the FEIS. Treatment effectiveness will be reported for all herbicide applications based on at least half the sites revisited in the field following treatment.

95. COMMENT: Monitoring needs to be a priority. Before an area has large amount of herbicide applied we suggest a small controlled study be conducted on site to assure the effectiveness and efficiency of the herbicide in a site specific area, especially in situations where a proposed chemical treatment has not been locally proven to be effective on a particular weed species. (5)

RESPONSE: See response to Comment 94 above.

96. COMMENT: An independent study of the effectiveness of past Forest Service chemical and non-chemical control in each District with disclosure of results, as suggested, is reasonable and desirable to ensure effective future actions. (2)

RESPONSE: See response to Comment 94 above.

NEPA

97. COMMENT: Given that certain Forest Service projects are treated as categorical exclusions and not analyzed under environmental impact statements, we therefore ask that the Umatilla National Forest DEIS address invasive plant concerns for categorical exclusion projects. Management activities proposed as categorical exclusion projects should be assessed in light of their effects upon invasive plant prevention. (8)

RESPONSE: A prevention plan is required to meet Forest Plan Standard 1 which requires that invasive plant prevention measures be considered in all planning processes; the type of documentation does not relieve the requirement. A prevention plan would be described for each project as part of the decision.

98. COMMENT: Given that certain Forest Service projects are treated as categorical exclusions and not analyzed under environmental impact statements, we therefore ask that the Umatilla National Forest DEIS address invasive plant concerns for categorical exclusion projects. Management activities proposed as categorical exclusion projects should be assessed in light of their effects upon invasive plant prevention. (5)

RESPONSE: See response to Comment 97.

New Alternative

99. COMMENT: Page 55. “Application of herbicide aerially will not be used EDRR.” What about small infestation adjacent to private lands where they are treating aerially? Can we consider supervisor/regional approval for worst case scenario? (3)

RESPONSE: Aerial spraying is proposed for a discrete acreage that makes up less than five percent of the proposed project. Future needs for aerial treatment would be handled through site-specific NEPA. The vast majority of EDRR sites are likely to be effectively treated using ground based methods.

100. COMMENT: In a very large complex rugged environment you may need a helicopter for EDRR. (7)

RESPONSE: See response to comment 99.

101. COMMENT: Herbicide should not be broadcast sprayed anywhere. (8)

RESPONSE: Broadcast treatments are considered necessary to effectively treat dense or extensive populations of invasive plants. Restrictions on broadcasting of some or all herbicide ingredients are included in all alternatives to address risks to botanical species of concern and riparian areas.

102. COMMENT: Page 34 only 625 [actually 675] acres of aerial spraying. With no EDRR for aerially applying (National park serve is aerially spraying 11,000 acres in Roosevelt National Park, Devils Tower and Badlands). Why are you being so restrictive? (1)

RESPONSE: Most known invasive plant sites on the Forest are readily accessible for ground-based application methods. Aerial spraying is proposed for a discrete acreage that makes up less than five percent of the proposed project.

103. COMMENT: Prescription grazing of weeds should be listed as a tool unto itself and should be added as a treatment method to this document. Carefully done and considering wildlife/livestock interactions it can be an excellent tool for large and landscape scale infestations. Over time, it may prove a very useful and potentially economically productive tool. Though weed awareness is growing and more and more people are getting educated it is not uncommon to detect weeds for the first time at the scale of hundreds or thousands of acres. (7)

RESPONSE: Use of grazing as a cultural treatment methods is discussed in the R6 2005 FEIS appendix D, “PNW Causal Paper Ungulates” Parks et al. Grazing of this type must be managed intensively, which is not compatible with the small scattered invasive populations proposed for treatment in this project.

104. COMMENT: Prohibit use on [of] non-selective herbicides in native grasslands. (2)

RESPONSE: Herbicides would be applied according to the Common Control Measures, PDFs and buffers described in Chapter 2 of the EIS. This would limit the potential for adverse effects to native grasslands. Herbicide selectivity is a consideration in choice of herbicide. Native grasses would be more seriously threatened by the presence of invasives than the proposed herbicide use (see FEIS chapter 3.2).

105. COMMENT: There should be no herbicide use on roads that are hydrologically connected to streams. (2)

RESPONSE: All alternatives considered in detail allow herbicide use along roads including those hydrologically connected to streams. Because road-sides are where weeds are found and roads are strong vectors for weed seed dispersal, it is extremely important to effectively treat weeds along roads. The

PDFs and buffers established would minimize the potential for herbicide delivery to streams. Herbicides are necessary to effectively treat infestations along roads.

106. COMMENT: There should be no-herbicide use in traditional cultural plant gathering areas and in riparian areas in order to be truly responsive to both Native and general public concerns. (2)

RESPONSE: See response to comment 19. An alternative (chapter 2 section 2.3.5) was considered that would not allow herbicide applications in riparian areas and other special areas. This alternative was not considered in detail because the large land area thus exempted from herbicide treatment could become a safe harbor for existing and future weeds. Since this condition would not adequately achieve the project's purpose and need, the alternative was eliminated from detailed consideration.

107. COMMENT: What is the latest status of including Milestone as one of the approved chemicals? (3)

RESPONSE: Aminopyralid now has a Forest Service Risk Assessment and thus, given an appropriate NEPA decision, is available for use on National Forests. Aminopyralid would increase herbicide options on most broadleaf invasive plants and poses less risk to fish and wildlife than some other herbicides. The Umatilla NF may consider a separate NEPA analysis in the future to add milestone.

108. COMMENT: Range of alternatives is inadequate, no alternative that avoids herbicide use altogether or avoids riparian herbicide use and broadcast/aerial application. (2)

RESPONSE: The Forest Service considered many alternatives that would restrict the use of herbicides. A no herbicide alternative (see 2.3.3) was considered but eliminated from detailed study. Such an alternative was fully considered and rejected in 1995. Another alternative (see 2.3.5) would have reduced the area treatable by herbicides from approximately 20,000 acres to about 14,000 acres. An alternative that would have eliminated herbicide use in riparian and other special areas was also considered but eliminated from detailed study because modeling analysis showed that invasive plants would likely increase because of the geography and treatment method limitations imposed by this alternative. The 2005 R6 FEIS also concluded that herbicides would be needed to effectively treat certain existing populations of invasive plants. The current program (alternative A: no action) allows some herbicide use, but is not effectively treating invasive plants. A wider range of herbicide options and an EDRR approach are necessary to contain control and/or eradicate many invasive species (see Common Control Measures in Chapter 2).

109. COMMENT: Removing the sulfonylurea family from the aerial treatment scenarios severely limits the ability of managers effectively to treat large infestations of the mustard family (whitetop and perennial pepperweed). Though this may not be an issue today for the UNF, it may well be soon. (7)

RESPONSE: This standard from the R6 2005 ROD (Standard 16) became part of the Umatilla National Forest Plan, due to the risks from aerial drift associated with these high-potency herbicides. The Umatilla Forest Supervisor may consider amending the Forest Plan should this need arise in the future.

110. COMMENT: No broadcast spray in riparian or amphibian habitat. (5)

RESPONSE: This was an alternative considered but eliminated from further study because this alternative would be contrary to the purpose and need of eradicating, controlling, and containing invasive plants (also see response to comment 108).

Outside the Scope

111. COMMENT: Page 22. Consider role of fire in spread of invasives. (3)

RESPONSE: Mechanisms related to the spread of invasive plants, including fire, are discussed in detail in the R6 2005 FEIS, to which this analysis is tiered.

112. COMMENT: The UNF should require the use NAWMA standards for weed free certification or equivalent, rather than “similar processes” as delineated in the R6 Invasive Plants ROD on all of their lands. Only NAWMA equivalent or better will insure that the use of certified forages is actually enforceable and effective. This would significantly strengthen weed prevention in the area. (7)

RESPONSE: This EIS focuses on treatment, rather than prevention, of invasive plants. The Umatilla National Forest’s weed free feed program is consistent with the regional and state programs. All of the states in the northwest have weed free feed certification programs underway.

113. COMMENT: Invasive weed concerns should be a priority during transportation planning on the Forest. All motorized travel should be limited to designated routes, cross-country motorized use should be eliminated, and unnecessary roads should be closed. Opportunities should be explored to provide washing stations to prevent the spread of weeds by vehicles. (5)

RESPONSE: The Forest Service’s new travel management rule provides the framework for each national forest and grassland to designate those roads, trails and areas open to motor vehicle use. Designated routes and areas will be identified on a motor vehicle use map. This is accomplished through existing Forest Service policy 36 CFR parts 212, 251, 261, and 295 (Travel Management; Designated Routes and Areas for Motor Vehicle Use). Prevention Standard 1 from the R6 2005 ROD requires that travel management plans consider ways to prevent spread along roads. Prevention is an ongoing consideration in managing national forests, regardless of the decision resulting from this project level EIS. The R6 2005 ROD concluded that washing stations may not be economically feasible (pg 11). However, some programs have vehicle washing requirements; such as optional timber sale contract provisions.

114. COMMENT: While the Guide to Noxious Weed Prevention Practices included in Appendix E provides selected prevention techniques, there are inadequate provisions addressing effective implementation and monitoring in the field. It is of utmost importance that weed prevention and treatment activities be effectively incorporated into individual projects and carried out under the regulation and guidance of these programs. Monitoring projects for effective prevention of invasive weeds is essential. Education is an important element of invasive weed prevention. All National Forest visitors should be educated about the problem and what must be done to prevent the spread of invasive plants. The EIS must develop clear effective provisions for public education and prevention programs. We ask that you directly address specific measures to prevent invasive weeds on the Umatilla National Forest and describe how they will be implemented. (8)

RESPONSE: The Forest Service agrees that prevention is an important part of the invasive plant management program. All prevention standards in the R6 Invasive Plant ROD amended the Umatilla NF Forest Plan on March 1, 2006. These prevention standards are incorporated into individual projects. Education programs are also underway.

The Forest Service needs the flexibility to rapidly and effectively respond to invasive plant infestations, regardless of adjacent land use decisions. Land use practices can be adjusted any time, regardless of decisions made for this project, and this project can continue regardless of land use decisions made during the life of the project. Prevention is an ongoing consideration in managing National Forests, regardless of the decision resulting from this project level EIS. The relationship between prevention and treatment was

fully explored in the R6 2005 FEIS to which our analysis is tiered. The R6 2005 also adopted a monitoring framework that would encompass this project. .

115. COMMENT: Treatments should not be utilized in areas where the root source of past and continuing introduction and spread of invasive plants has not been curtailed first. (8)

RESPONSE: The R6 2005 FEIS addressed the relationship between prevention, land uses, and treatment and concluded that there may be situations where no reasonable options exist to reduce or eliminate conditions that favor the presence of invasive plants (i.e. open road systems), yet treatments may still be needed (page 2-38).

116. COMMENT: Treatments should not be utilized in areas where the root source of past and continuing introduction and spread of invasive plants has not been curtailed first. (5)

RESPONSE: See response to comment 115.

117. COMMENT: It is legally and scientifically deficient that the Umatilla Draft EIS does not provide additional prevention measures other than those already included in Appendix E of the Regional Invasive Plant Program EIS and ROD. Yet prevention is perhaps the most important component in the control of invasive plants. The revised EIS should emphasize and expand upon measures that prevent invasive plants from entering and spreading on the National Forest. Livestock grazing, and soil disturbance activities (logging, roads, OHVs, etc.) must be addressed and curtailed, helping to effectively address invasive plants issues at their source of introduction. The failure to address the effects of motorized vehicles, timber management, and livestock grazing on the introduction and spread of invasive plants within the DEIS violates the expert, reasonableness, and scientific requirements of the NEPA, and if implemented would violate the NFMA, MBTA, and CWA. These activities introduce and spread invasive plants. This is well-documented in scientific literature. (8)

RESPONSE: Prevention is an important component of invasive plant management. The relationship between prevention of invasive plant introduction, establishment, and spread and invasive plant treatments was discussed at length in the programmatic R6 2005 FEIS. All activities on National Forest System lands are subject to the prevention standards. To meet the standards, prevention practices will be applied to new and ongoing land use projects. For example, invasive plant practices are incorporated into road or vegetation management projects as they are planned.

The National Environmental Policy Act requires that connected actions be considered in a single analysis. Invasive plant prevention practices applied to various land uses are not connected actions with the current project because treatments of invasive plants would be needed regardless of how land uses are adjusted to incorporate invasive plant prevention measures. Prevention standards are being implemented in all projects, regardless of decisions made as a result of this EIS.

118. COMMENT: Program activities such as logging, grazing and motorized vehicle use should be modified, restricted, or prohibited as necessary in order to prevent the spread of invasive weeds and to prevent conditions favorable to their establishment. (8)

RESPONSE: See response to comment 117.

119. COMMENT: Activities that could influence invasive plant populations and are covered under other programs should also be considered here for site-specific prevention analysis. The Region 6 FEIS on invasive plants clearly includes controllable vectors such as livestock, OHVs, logging and roads/transportation within the scope of the plan. The Umatilla DEIS is tiered to the Region 6 FEB

and must consider prevention more specifically ensuring effective attainment of project purpose and need objectives. (2)

RESPONSE: Prevention must be considered in all site-specific project assessments as per the R6 2005 ROD. All activities on National Forest lands are subject to the prevention standards. These are not connected actions because treatments of invasive plants would be needed regardless of the site-specific prevention measures taken. The relationship between prevention and treatment was fully explored in the R6 2005 FEIS to which our analysis is tiered.

120. COMMENT: Education is an important element of invasive weed prevention. All National Forest visitors should be educated about the problem and what must be done to prevent the spread of invasive plants. (5)

RESPONSE: The Forest Service recognizes that education is an important element of invasive plant management; however, is not the focus of this EIS. Educational activities are not subject to NEPA.

121. COMMENT: As a central part of the integrated weed management program, we urge the Forest Service to explicitly consider avoiding and/or limiting activities that increase the risk of invasive species including: (a) activities that disturb soil (e.g. logging, OHVs, livestock grazing, road activities, etc.); (b) activities that open the canopy and increase the availability of light, water, and nutrients for the growth of invasive species (e.g. logging, fuel reduction, brush control); and (c) activities that provide vectors for the spread of weed seeds (e.g. roads, OHVs, logging, grazing). Require "weed free" feed for all stock throughout the forests (not just wilderness). If necessary phase this requirement in so certification programs can become established.

Include clear standards to ensure forest management activities (e.g. logging, grazing, OHVs, roads) do not create conditions conducive to the introduction and spread of weeds. This will by necessity require grazing to be restricted to ensure maintenance of diverse communities of vigorous plants that can best resist invasion by weeds. But we have to treat the causes and not just the symptoms ...most of the identified weed sites are located along roads which have chronic soil disturbance, limited canopy of native plants, and chronic seed dispersal vectors. After these treatments, the FS should prioritize closing the roads that pose the greatest problems. (4)

RESPONSE: The Forest Service agrees that prevention is an important part of the invasive plant management program. All prevention standards in the R6 Invasive Plant ROD amended the Umatilla NF Forest Plan on March 1, 2006. These prevention standards are incorporated into individual projects.

The Forest Service needs the flexibility to rapidly and effectively respond to invasive plant infestations, regardless of adjacent land use decisions. Land use practices can be adjusted any time, regardless of decisions made for this project, and this project can continue regardless of land use decisions made during the life of the project. Prevention is an ongoing consideration in managing national forests, regardless of the decision resulting from this project level EIS. The relationship between prevention and treatment was fully explored in the R6 2005 FEIS to which our analysis is tiered (see response to comment 114).

122. COMMENT: I recognize that the Regional EIS dealt with prevention thus education but forest commitment to prevention/education should be mentioned. Are we going to discuss weed free hay policy and enforcement? (3)

RESPONSE: The Forest Service recognizes that prevention is an important part of the invasive plant management program. Education has been included in the project level prevention plans along with maps showing the location of known invasive plant sites. However, this project EIS focuses on new treatment

methods made available through the R6 2005 FEIS. Weed free hay policy and enforcement is outside the scope of this project.

123. COMMENT: Use concepts of biocomplexity as a tool to prevent invasives (e.g. limit contagious spread of invasive species by avoiding homogeneity). (4)

RESPONSE: This EIS recognizes the importance diversity in preventing invasive plant spread. Section 1.2, the Desired Condition, expresses need to maintain "...diversity, function, and sustainability of desired native plant communities..." Such healthy plant communities tend to resist invasion of weeds.

124. COMMENT: We are disappointed that the Umatilla Draft EIS does not provide additional prevention measures other than those already included in Appendix E of the Regional Invasive Plant Program EIS and ROD. We feel that prevention is the most important component in the control of invasive plants and that the DEIS should emphasize and expand upon measures that prevent invasive weeds from entering and spreading on the National Forest. We ask that you directly address specific measures to prevent invasive weeds on the Umatilla National Forest and describe how they will be implemented. Relying on the Region 6 plan is not specific enough to accurately address forest-level invasive plant problems. Incorporate weed prevention, treatment and monitoring into all National Forest program activities. Program activities such as logging, grazing and motorized vehicle use should be modified in order to prevent the spread of invasive weeds and to prevent conditions favorable to their establishment. (5)

RESPONSE: See response to comment 121.

125. COMMENT: Limit use of non-essential roads that are high risk vectors for weeds. OHV policy should be "closed unless designated open" starting NOW. (4)

RESPONSE: The Umatilla National Forest has a "closed unless designated open" OHV policy in place in accordance with the Forest Service's new travel management rule. The Forest has designated those roads, trails and areas open to motor vehicle use. Designated routes and areas are identified on a Forest motor vehicle use map. Prevention Standard 1 from the R6 2005 ROD requires that travel management plans consider ways to prevent spread of invasives along roads.

126. COMMENT: Invasive weed concerns should be a priority during transportation planning on the Forest. All motorized travel should be limited to designated routes, cross-country motorized use must be eliminated, and unnecessary roads must be effectively closed. Opportunities should be explored to provide washing stations to prevent the spread of weeds by vehicles. (8)

RESPONSE: See response to comment 113.

127 COMMENT: Without more stringent prevention measures...the purpose and need for this project will be virtually impossible to meet. We urge the Umatilla to adopt more stringent prevention measures in these areas, such as those suggested in the Restore Native Ecosystem Alternative (RNEA) submitted to Region 6. (2)

RESPONSE: The project tiers to the R6 2005 FEIS. While some parts of the RNEA were not considered in detail (see R6 2005 FEIS page 2-36), the R6 2005 FEIS analyzed an alternative that included many of the RNEA suggestions. The R6 2005 ROD explained why this alternative was not selected. Invasive plant prevention plans are included for every project. If more stringent measures are needed, project level planning is the place they would be included and disclosed to the public.

128. COMMENT: We are disappointed that the effects of motorized vehicles, timber management, and livestock grazing are specifically excluded from the DEIS. These activities spread invasive weeds. This is documented in scientific literature. While the Guide to Noxious Weed Prevention Practices included in Appendix E provides some good prevention techniques, we are concerned that they may not be effectively implemented and monitored in the field. It is of utmost importance that these weed prevention and treatment activities will be effectively incorporated into individual projects and carried out under the regulation and guidance of these programs, as stated in the DEIS (page 15). Monitoring of these projects for effective prevention of invasive weeds is essential. (5)

RESPONSE: The R6 2005 FEIS provided a comprehensive NEPA analysis that discussed the relationship between forest activities (such as livestock grazing) and the spread of invasive plants. R6 2005 ROD Standard 1 requires that all projects include analysis of impacts on invasive plant spread. ROD Standard 6 specifically requires grazing projects to consider prevention. The Forest Service needs the flexibility to respond rapidly and effectively to invasive plant infestations, regardless of adjacent land use decisions. Land use practices can be adjusted any time, regardless of decisions made for this project, and this project can continue regardless of land use decisions made during the life of the project. Prevention is an ongoing consideration in managing national forests, regardless of the decision resulting from this project level EIS.

129. COMMENT: You also need to look at your future program of work. Fuel reduction is presents a significant and growing threat of invasive weeds because it creates ideal conditions for weeds - it's a widespread and chronic activity that disturbs soil, increases light and water availability, and increases weed vectors. The same could be said of OHVs. The DEIS fails to incorporate these old, new, and emerging threats into a comprehensive NEPA analysis. (4)

RESPONSE: The R6 2005 FEIS provided a comprehensive NEPA analysis that discussed the relationship between forest activities (such as fuels reduction) and the spread of invasive plants. R6 2005 ROD Standard 1 requires that all projects consider how they might impact invasive plant spread. This project EIS is limited in scope to the treatment of invasive plant sites, and includes project design features to prevent the spread of invasives during treatment activities.

130. COMMENT: How does this proposal comply with Executive Order 13112, and Linda Goodman's direction on prevention of October 1, 2004?" (4)

RESPONSE: This project complies with the Executive Order by following direction in the R6 2005 ROD. Prevention practices were adopted by the Umatilla National Forest in response to the Regional Forester's direction of 2004.

Proposed Action

131. COMMENT: I am concerned about the sideboards and/or requirements via this document that may hinder effective weed management efforts. An effort to streamline these requirements is desired thus enabling field personnel, not hindering them. (3)

RESPONSE: The EIS endeavors to fully disclose the mechanisms by which impacts from herbicide treatments are minimized or eliminated, as per Forest Plan Invasive Plant Treatment/Restoration Standard 16. Sometimes lengthy and cumbersome explanations are used to make sure all relevant information is disclosed.

132. COMMENT: On page 3 in paragraph 4 it is stated that "Ten years of monitoring shows that the slow approach to the application of herbicides has not successfully reduced the impact and

spread of invasive species”. If the goal is to “protect ecosystems form (from) the impacts of invasive plants through an integrated approach that emphasizes prevention, early detection and early treatment” (on page 7 Goal 1), then a manager must be able to move quickly from discovery to treatment. The general prescriptions outlined in Table 5 of Common Control Measures are confusing, often unrealistic (i.e. when regular volunteers are available or Cut Mow at least 3 times per year) and many of the PDFs in this document are restrictive beyond necessity. These regulations will demand huge amounts of time and energy if not simplified, stream lined, and relaxed to allow managers to accomplish their work. The mindset with which this document attempts to restrict treatment might apply in a small flower garden but is not helpful in a large complex natural landscape increasingly under siege from invasives and will be detrimental to protecting the ecosystems from the impact of invasives if it is not changed. (7)

RESPONSE: See response to comment 131.

133. COMMENT: PDF F7 is overkill. The applicator should comply with the label and avoid the type of soils listed the label. This is his/her legal responsibility anyway. Mapping soils which at a small and accurate scale is hugely time consuming and at a large scale is too course to detect the types of soil you are trying to avoid is too much.(7)

RESPONSE: F-7 requires that soils be evaluated prior to treatment to determine whether there are potential concerns. Areas that have greater potential for certain soils (based on NRIS data) are identified in table 3 and appendix D of the FEIS.

134. COMMENT: For infested sites, develop site strategy within 2 years of site identification. (4)

RESPONSE: The timing of treatment would be dependent on priority which may vary from year to year. A treatment strategy would be developed before initial treatment of any site, but some sites will not be treated during the first two years of this project.

135. COMMENT: I support the Umatilla National Forest Alternative B. The forest must be efficient utilizing public money resulting in a high reduction or eradication of targeted invasive plants. Limiting the use of herbicides and the various ground or aerial application methods are fundamentally inefficient, result in high cost and allow for the continued invasion of current and new invasive species. Alternative C and D are unacceptable. Alternative A - no action will result in a collapse of the forest's ecological health. Assumptions that herbicides possess unacceptable risk defies EPA findings, good science and are the result of misaligned perception rather than toxicological fact. (11)

RESPONSE: This concern is acknowledged and will be discussed in the ROD.

136. COMMENT: I support the Umatilla National Forest Alternative B. The forest must be efficient utilizing public money resulting in reducing or eradicating invasive plants. Limiting the use of herbicides and the various ground or aerial application methods are fundamentally inefficient, result in high cost and allow for the continued invasion of current and new invasive species. Alternative C and D are unacceptable. Alternative A - no action will result in a collapse of the forest's ecological health. Assumptions that herbicides possess unacceptable risk defies EPA findings. (10)

RESPONSE: This concern is acknowledged and will be discussed in the ROD.

137. COMMENT: In various places throughout the DEIS, it is admitted that most invasive plant sites targeted are small, which begs the question of why there is so much herbicide use planned.

Smaller infestations are easier to control with manual and mechanical methods, which should be prioritized over more damaging toxic chemicals. (2)

RESPONSE: Herbicides would be used on most of the existing sites given the aggressive nature of the invasive plants and the past lack of effectiveness of non-herbicides methods.

138. COMMENT: The UNF needs to be able to use Aminopyralid (Milestone) at the first opportunity. It was recently labeled (fast tracked by the EPA), innocuous in the environment and to people. (7)

RESPONSE: See response to comment 107.

139. COMMENT: The draft EIS is unclear about how weeds found within planned buffers around waterways would be treated. (6)

RESPONSE: The buffer tables (Chapter 2, Tables 6, 7 & 8) show how certain types of treatments, herbicide selection, timing and methods of application are restricted near wet and dry streams, lakes, wetlands and species or habitats of local interest. The closer to a resource of concern, the more limited the treatment options...for instance, treatments within hydric (wet) soils, wetlands or stream channels are limited to selective and spot applications of aquatic labeled formulations. If no effective treatment option is available, further analysis would be necessary. Conditions would be evaluated before treatment to determine which treatment options would be allowed at a given site. Herbicide applications are generally limited to spot or selective applications of lower risk and/or aquatic labeled herbicides within the first 15 feet of wet streams.

140. COMMENT: We strongly support Alternative B with the modifications stressed in the referenced comments as the only effective option outlined in your draft EIS. Alternative C is unacceptable because it limits broadcast spraying and ATV use. Alternative D is also unacceptable because it limits aerial treatment which is also an essential tool to weed management today. (12)

RESPONSE: This concern is acknowledged and will be discussed in the ROD.

141. COMMENT: PDF 8 with all of its requirements will make aerial treatment so onerous that it will not be an effective tool for the UNF. Some of the requirements are certainly important like SOLI buffers and municipal watersheds. However, buffers are generally too large, monitoring overdone, and communications necessary are exaggerated. PDF F8 takes the helicopter out of the EDRR prescription un-necessarily. An EDRR site of 20 acres or 100 acres in the rugged back country might be treated effectively and precisely with a helicopter for a reasonable price while hand treatments may be too expensive to actually implement. (7)

RESPONSE: See response to comment 99. Also the Forest acknowledges that PDF 8 represents a conservative approach to managing aerial applications. The benefit of this approach is minimizing hazards from of aerial herbicide applications.

142. COMMENT: Page 29. Definition of spray techniques. Need to consider entire plant and seed dispersal area for spot spraying. In most cases it is inefficient to only treat the plant. Also when reference to aerial always address the safety factor of working in steep rugged, and inaccessible terrain. (3)

RESPONSE: Spot treatments are proposed when the density of an infestation is low and broadcast treatments are not needed. It would also be used when fine control is needed to protect a resource value. Monitoring the effectiveness of the treatment would occur and follow-up herbicide applications needed

on new seedlings. Spot treatments are designed to treat individual plants and protect native vegetation including SOLI propagules and seeds nearby, protect groundwater or nearby streams, and minimize the amount of soil contact with herbicide when broadcast treatments are not needed.

143. COMMENT: Classical Biological Control methods of weed treatment are not well addressed. And should be the primary tool for large or landscape scale infestations when effective agents are available (i.e. diffuse knapweed) and/or in purposeful combination with other tools. Many available agents are not effective. Therefore biocontrol agents should be employed with the advice and support of State and local partners. (7)

RESPONSE: Biological control would be used on large infestations. Best science and experience would be used in determining the best treatment methods.

144. COMMENT: Effective cultural / mechanical and biological treatments must be considered in all situations and utilized in preference to chemical treatments. (8)

RESPONSE: Where effective and affordable, non-herbicide treatment methods would be implemented. Non-herbicide treatments would more likely be used in combination with herbicide treatments, according to IWM principles.

145. COMMENT: We also ask the Forest be proactive in addressing non-herbicide and other treatment methods of *Phalaris arundinacea*. Many of the listed methods are not effective because generally Reed canary grass is located in riparian areas. (8)

RESPONSE: The proposed action would approve spot applications of aquatic glyphosate and would be allowed in riparian areas to treat reed canary grass when it is not an emergent.

146. COMMENT: Chlorsulfuron is the most effective control tool for many of your perennial weed problems. Use of this material will result in little, if any, environmental foot print. This material can be sprayed in terrestrial areas where moving or standing water is not present. Seasonally dry areas can be treated. Rapid reduction of these infestations will result in a diverse community of desirable species. (11)

RESPONSE: The proposed action approves the use of chlorsulfuron according the Forest Plan (R6 2005 ROD) standards.

147. COMMENT: Effective cultural / mechanical and biological treatments must be considered in all situations and utilized in preference to chemical treatments. (5)

RESPONSE: See response to comment 144.

148. COMMENT: We also ask the Forest be proactive in addressing non-herbicide and other treatment methods of *Phalaris arundinacea*. Many of the listed methods are not effective because generally reed canary grass is located in riparian areas. (5)

RESPONSE: See response to comment 145.

149. COMMENT: In Alt B, management plans associated with problem weeds are captured per label instructions and local guidelines. For difficult to control species such as Russian knapweed, dalmatian toadflax or yellow toadflax, herbicides used in the fall will provide a greater population reduction and limit regrowth. Spring bud - bloom applications of invasive species treated with

chlorsulfuron or metsulfuron herbicides will reduce seed viability and the further dispersion of seed. (11)

RESPONSE: Thank you for your comment.

150. COMMENT: In Alt B, management plans associated with problem weeds are captured per label instructions and local guidelines. For difficult to control species such as Russian knapweed, Dalmatian toadflax or yellow toadflax, herbicides used in the fall will provide a greater population reduction and limit regrowth. Spring bud - bloom applications of invasive species treated with chlorsulfuron or metsulfuron herbicides will reduce seed viability and the further dispersion of seed. (10)

RESPONSE: See response to comment 149 (duplicate).

151. COMMENT: Chlorsulfuron is the most effective control tool for many of your perennial weed problems. Use of this material will result in little, if any, environmental foot print. This material can be sprayed in terrestrial areas where moving or standing water is not present. Seasonally dry areas can be treated. Rapid reduction of these infestations will result in a diverse community of desirable species. (10)

RESPONSE: See response to comment 146 (duplicate).

152. COMMENT: Most target species in Table 5 can be controlled by manual, mechanical, and/or biocontrol methods, suggesting that greater use of these less damaging methods is possible. Most herbicide use of formulas suggested in Table 5 for invasive plants is noted to result in high risk of aquatic delivery with high water tables or porous soils, which should advise against their use in riparian areas. (2)

RESPONSE: Past experience shows that relying on non-herbicide methods alone is not effective in containing, controlling, or eradicating invasive plant species.

The PDFs (Previously table 5 in the FEIS) and buffers (Tables 6, 7, and 8 in the FEIS) were developed to respond to concerns about herbicide delivery in certain soil and/or streamside conditions. The PDFs and buffers avoid herbicide use in situations where herbicide could be delivered to surface waters in amounts that may result in harm to aquatic resources.

153. COMMENT: Proposed aerial spray sites are mostly not that large and even near roads in some cases and could be managed by other method. Significant information such as rate of spread, density of plants, past control history and steepness of slopes have not been provided. Manual control is easier and safer on steep slopes than herbicide use unless the slope is un-walkable. (2)

RESPONSE: Alternative D avoids aerial treatment and provides a tradeoff between risks and benefits of aerial application. Information pertinent to the analysis has been provided.

154. COMMENT: Why only 41 acres of manual only treatment? (2)

RESPONSE: Herbicides are proposed for most acres due to the aggressive nature of the invasive target species.

155. COMMENT: Page 114 states that the effectiveness of an alternative to treat invasive plants increases with number of tools (herbicides) available. This is biased. Effectiveness would be increased with prevention of new introductions and more emphasis on matching the treatment to

the biology of the invasive plant and the timing of treatment. The variety of tools available should not be construed as just the variety of herbicides. (2)

RESPONSE: Integrated weed management is the basis for the treatment of invasive plants on the Forest. Integrated weed management includes prevention measures as well as an active treatment program that takes account of the ability to use multiple methods. The rate of spread of invasive plants is influenced by the level of prevention (R6 2005 FEIS Chapter 4.2). Forest actions and projects incorporate prevention. The effectiveness of treatment is influenced by many factors including phenology of individual plants. This is discussed at length in the Common Control Measures document (Mazzu 2005). The variety of herbicide options, families, and modes of operation reduces potential for herbicide resistance and allows for more flexibility in adaptive management to respond to site-specific variations. As a site reaches a control level, other methods of treatment can become effective and non-herbicide methods may be considered and not used. If it is determined when monitoring a treatment site that a species has reached a control level where hand pulling would be effective without additional visits, it would be pulled.

156. COMMENT: Species prioritization must be coordinated with state lists county listings. It is important that even within a district the prioritization of any one weed can change depending on its location and proximity to other sites etc. Effective prioritization and coordination between entities becomes more critical as the number of weed sites and species increases. (7)

RESPONSE: As described on pg 36 of the DEIS the Umatilla National Forest will continue to work in "Cooperation with Public and Private Landowners, and Other Agencies: By partnering with other landowners and agencies involved with invasive weed control, treatment effectiveness can be optimized. Recognizing this, the Umatilla Forest staff has, and will continue to cooperate with others regardless of what alternative is adopted."

157. COMMENT: Sulfur Cinquefoil is an extremely aggressive and fast spreading weed that if not contained, controlled and (eradicated where possible) will cause huge biological and economic problems. This weed needs to a top priority over the entire forest. (7)

RESPONSE: Ninety-eight percent of the sulfur cinquefoil sites identified on the Forest are identified as a species priority number one; the other two percent are identified as priority number two. All number one and number two sites receive top priority on the Umatilla National Forest. Each district prioritizes their annual treatment of species based on funding available and optimization of treatment using previous monitoring and inventory results.

158. COMMENT: The first box in the decision tree should be consistent with the WWNF 's own rating system (using priority level 1-4 rather than Oregon's A, T and new invader). If not, then defer to the Oregon or Washington's state list here and explain the rationale. (7)

RESPONSE: The Umatilla National Forest has its own priority list. Though classes A, T, and new invader are listed, the etc includes the Forest's priority list by District.

159. COMMENT: We think that climate change will increasingly disturb and displace native vegetation, lengthen growing seasons, and increase the risk of weeds in the coming decades. Let's adopt a realistic expectation that many ecosystems that we are familiar with today will disassemble and reassemble in new configurations in new locations. Let's avoid a situation in the future when we may find ourselves pointlessly throwing tons of chemicals at waves of perceived "invasives" that are unstoppable because of the overwhelming influence of climate change. Let's try to distinguish between "new arrivals" from the south or from lower elevations (which would be expected due to climate change) versus "true invaders" from other continents. We should nevertheless continue to

strive to avoid human-induced environmental modifications that increase the risk of weed spread: soil disturbance, native canopy removal, and seed dispersal vectors. (4)

RESPONSE: The focus of this project is the treatment of invasive plants, which are defined as “alien plant species whose introduction does or is likely to cause economic or environmental harm or harm to human health” (Executive Order 13112). The use of an early-detection/rapid response strategy may become increasingly important for dealing with new invasions quickly while the populations are small. There is no intention of containing native plants as they adapt to new habitat conditions as the result of climatic change. The plants targeted for treatments are those that local and state experts have listed as species of concern. Invasive plant prevention strategies will continue to be incorporated into new and ongoing actions.

Range

160. COMMENT: High acreage of invasives in allotments suggest grazing should be curtailed at least until these areas are treated. Will the ongoing process of allotment management plan revision be altered to reflect the R6 prevention mandate? We suggest grazing allotments be canceled. (2)

RESPONSE: The reason it appears that there is a high percent of invasives within allotments is because 74 percent of the Umatilla National Forest is dedicated to grazing allotments. Forest Plan (as amended by the R6 2005 ROD) prevention Standard 1 states “prevention of invasive plant introduction, establishment and spread will be addressed in various plans including grazing allotment management plans.”

161. COMMENT: Explain how PDFs protect grazing animals from herbicide exposure. (2)

RESPONSE: EPA has set standards for labeling herbicides identifying the risks to animals. All label recommendations will be implemented to ensure grazing animals are protected. Additionally, PDFs require permittees to be notified prior to treatment in an allotment; allowing permittees to remove livestock before treatments begin.

Recreation

162. COMMENT: No aerial near recreation sites. (2)

RESPONSE: No aerial treatments are proposed near developed recreation sites. The LRMP as amended by the 2005 R6 ROD, Standard 21, prohibits aerial application of herbicides within 300 feet of developed recreation facilities.

163. COMMENT: How will backcountry users be notified about scheduled or past spraying so they can avoid exposure? (2)

RESPONSE: Signs would be posted at key access points and trailheads to advise back country users of the presence of herbicides, newspaper notices will also be published. People may request to be individually notified in advance of spray dates.

164. COMMENT: The recreation analysis trivializes herbicide impacts and does not acknowledge lingering potential for herbicide exposure to the ecosystem and people. (2)

RESPONSE: Herbicide exposure to people and the environment was thoroughly discussed in the R6 2005 FEIS and is addressed throughout the Umatilla National Forest EIS. Adverse impacts have been avoided or minimized. No lingering effects to the recreation resource are predicted as a result of herbicide application.

Restoration

165. COMMENT: We ask that the Umatilla National Forest begin a proactive role in having a forb component in native seed mixtures to accurately reflect the plant communities on the Forest. (8)

RESPONSE: This has been addressed in the R6 2005 FEIS Restoration Standard 12. The Pacific Northwest Region and the Umatilla National Forest are striving to develop native seed mixtures for restoration that contain a proportion of forbs for distribution and use in restoration projects. See appendix H Guidelines for Revegetation of Invasive Weed Sites and Other Disturbed Areas on National Forests and Grasslands in the Pacific Northwest.

166. COMMENT: Page 15. More detail on restoration is needed. It is a key element in IWM (integrated weed management) and achieving the site's desired future condition. (3)

RESPONSE: R6 2005 FEIS Restoration Standard 12 requires that prior to initializing treatment; the forest must develop a long-term site strategy for restoring/revegetating invasive plant sites. Additionally, R6 2005 FEIS Restoration Standard 13 requires native plant materials to be the first choice when revegetating for restoration and rehabilitation where timely natural regeneration of native plant communities is not likely to occur. It is difficult to provide more detail for site specific recommendations because conditions vary from site to site and year to year. Refer to appendix B, for revegetation guidelines developed by the Pacific Northwest Region.

167. COMMENT: Restoration methodologies should be covered in this document. A decision matrix and multiple methods of revegetation techniques should be laid out in this document so that managers have some guidance and a range of tools available to them. Many of the sites that need revegetation need extensive work. (7)

RESPONSE: The Umatilla LRMP as amended by the R6 2005 ROD covers passive restoration such as seeding and mulching by adopting Treatment/Restoration Standards 11-16 (appendix A). These standards do not address ground-disturbing restoration activities, which would require additional NEPA analysis. This EIS does not address extensive, ground disturbing site preparation work in advance of restoration activities. Such ground disturbing restoration would require additional NEPA.

168. COMMENT: The restoration of treated sites is an essential part of invasive weed control. Native plant species that belong to the local plant community should be used to re-occupy the site and reduce the risk of re-infestation by invasive weeds. Seed and other plant propagation materials should be native and collected as locally as possible. Species diversity is beneficial and native forbs as well as native grasses should be included. (5)

RESPONSE: See response to comment 166.

169. COMMENT: We ask that the Umatilla National Forest begin a proactive role in having a forb component in native seed mixtures to accurately reflect the plant communities on the Forest. (5)

RESPONSE: See response to comment 165.

Social

170. COMMENT: Page 115. Be careful listing partners...ODA, Tri County CWMA, Tri State CWMA are big players! Are CWMA's discussed in this document? (3)

RESPONSE: Thank you for pointing this out. This oversight has been corrected.

171. COMMENT: Page 10: What is the Public Notification Plan and who is responsible for it? Is this a plan that is updated annually and available (how) to public and tribes? (3)

RESPONSE: Districts are responsible to develop annual Public Notification Plans in accordance with the Forest Plan. It gives the "who, what, where, when and how" of notifying various publics in advance of invasive plant treatments.

Soil

172. COMMENT: Page 209 states that adverse impacts to local effects on some groups of microorganisms may be temporarily sensitive to picloram and two other herbicides. What does local mean? What groups of microorganisms? What does temporarily sensitive mean? How long would the effects last? (2)

RESPONSE: Local means in the immediate area of the applied herbicide. Soil organisms degrade the herbicides by using them as growth substrate or directly through other means such as adjusting the pH of the soil environment. Metsulfuron methyl has the highest toxic effect on a certain bacteria. Picloram has some evidence for select toxicity at moderate herbicide levels. Imazapyr, chlorsulfuron, metsulfuron methyl, and triclopyr are toxic to select groups of microbes at high doses. This toxicity is temporary because herbicides are generally rapidly degraded and persistence is managed by the PDFs, and local as because the area affected would be limited to the application site.

173. COMMENT: How do you know that only using sulfometuron methyl once per year will prevent soil productivity damage? (2)

RESPONSE: The once a year limit is a conservative estimate. The half life is listed as 10-100 days in the SERA (2003) risk assessment. Assuming an average half life of 50 days, the highest concentration one year later would be 100 times less than the initial spraying concentration.

Special Forest Products

174. COMMENT: No herbicide use in special forest product areas; these should be considered free of chemical contamination. (2)

RESPONSE: Leaving special forest products areas untreated could allow invasive plants to threaten plant diversity and therefore the very plants that yield special forest products. This threat has been recognized by the Tribes, and is reflected in their comments to this proposed project. Their input in section 1.7 of this EIS urges the Forest Service to aggressively treat invasive plants including in traditional gathering areas of cultural plants. These are not the only special forest products areas, but they offer an example that the project attempts to protect and restore by treating invasive plants; often doing so with herbicides. Posting proposed treatment and warning signs in the area of treatments would allow any users to avoid the area.

In most cases, treatments would be confined to the road edges and allow user or gathers to move away from treated sites.

Water Quality

175. COMMENT: Although not discussed in the draft EIS, some water bodies may not be meeting current Confederated Tribes of the Warm Springs and the Umatilla Reservations' water quality standards, which were approved by EPA. The final EIS should include a discussion of how these Tribes' water quality standards would be met and how water quality issues related to the Nez Perce Tribe were addressed during FS consultations with this particular Tribe. (6)

RESPONSE: The tribes were consulted about this treatment proposal, as discussed on Page 9 and 10 of the EIS. The water quality standards for the Confederated Tribes of the War Springs and the Umatilla Reservations water quality standards were reviewed and our standards are found to be congruent. Copies of these standards can be found in the project file. The use of PDFs listed in Chapter 2 effectively reduces the risk of adverse effects to water quality.

176. COMMENT: Section 3.4.1, Introduction, page 200, 3rd and 4th paragraphs This section describes assumptions used in the risk assessment model that are somewhat different from expected field conditions, and correctly describes how some of the assumptions would cause the model to over-predict delivered concentrations, while other assumptions would underestimate concentrations. However, the reader is left with no clear sense of whether the predicted net effect will be positive (reduced delivered concentrations) or negative (increased delivered concentrations) compared to the actual field concentrations. It would benefit the public if the section included information supported by references outlining which processes will dominate in the transport and potential attenuation of herbicides. Based on this information, a description should be provided outlining how the model assumptions have taken into account the most dominant processes along with conclusions about how these assumptions result in more conservative estimates of concentrations delivered to receiving waterbodies. With this supplemental information, the public will then gain some degree of confidence in the conclusions concerning potential exceedences (or lack thereof) of threshold concentrations for the herbicides to be applied. Alternatively, the section should quantify the uncertainty in the predictions described in the last sentence in the fourth paragraph. (9)

RESPONSE: The original modeling done with GLEAMS for the SERA risk assessments and the site specific modeling for this project using the SERA spreadsheets allowed for changes in herbicide concentration, rainfall and soil type. A newer version of the model called the GLEAMS-Driver allows for much more site specific use of data.

The Mount Hood National Forest did extensive comparisons of the two models. Where both models are run for the same sites, the herbicide concentrations in water are much lower with the GLEAMS-Driver. The major reasons that the herbicide concentrations are so much lower with GLEAMS-Driver, as compared to the standard GLEAMS scenario used in the risk assessments, is due to the ability to use better, more site-specific weather data, application buffers as prescribed in PDFs, use of spot treatments as well as broadcast treatments and actual treatment acres versus a set ten acre plot. The weather data incorporates over 100 years of weather information, and thus is a much better predictor of actual precipitation in the Forest and Scenic Area. The ability to incorporate application buffer PDFs allowed us to better model actual application methods instead of the "broadcast spray up to edge of the stream" assumption used in the risk assessment scenario. Accurate treatment acres (treated field area), coupled

with the total field area (which influences the overall amount of runoff as well as infiltration) better describes actual treatment application amounts for a given treatment area.

For the Umatilla National Forest, all modeled sites had hazard quotients under one with the original modeling. Given that the older model tends to overestimate concentrations of herbicide compared to GLEAMS-Driver it is unlikely that herbicide concentrations in water would reach a threshold of concern.

177. COMMENT: The analyses presented in the draft EIS indicate that waters within various parts of the project area do not currently meet Oregon and Washington State water quality criteria, especially temperature and sediment (9 creeks) in OR and temperature (2 creeks) in WA (p. 204). Planned activities under the preferred alternative (Alternative B), such as vegetation removal could further degrade water quality with respect to these parameters, especially where treatments would occur within 15 ft. of 303(d) listed waters (p. 79). In drier areas, manual and mechanical/physical removal of weeds could result in increased sediment delivery until sites are seeded and vegetation is re-established. When roads, prescribed fire and livestock management activities are added to invasive plant treatments, cumulative sediment delivery, temperature, and other impacts to water quality could also be significant. (6)

RESPONSE: A new 303(d) list was approved in February 2007 after the water quality section of the draft EIS was written. The new list is now in the EIS. No streams are presently 303(d) listed for sediment. There are no ground disturbing activities that would add measurable sediment or temperature changes associated with the proposed project.

Manual removal of weeds is planned to occur on less than five acres within 100 feet of streams. No more than two of these acres, scattered in 10 small polygons, are along 303(d) listed streams, but these streams are no longer listed for sediment. Most of the sites are very small with a mixture of invasives and native species, so would still have vegetation on site to limit movement of sediment after treatment and to provide seeds for natural reseeding. These sites would be treated once or twice a year until treatment goals are met. The amount of sediment generated at any site from manually pulling scattered plants would be too small to measure and is not expected to contribute significantly to cumulative effects.

Mechanical treatments refer primarily to mowing along roads and are also unlikely to affect stream sediment or temperature.

Most of the invasive plants targeted with this project are not tall enough to provide sufficient shade to affect water temperature. Removal of these small plants would not affect water temperature.

178. COMMENT: The document does not explicitly describe the potential effects to ground water. There are very general and qualitative statements, such as the last sentence on page 211, which states that "[h]ighly drained soils have greater propensity to transfer herbicides to groundwater stores," and the first paragraph on page 215, which describes project design features that prohibit use of mobile persistent herbicides, such as clopyralid in areas of sandy soils to limit possibility of movement to ground water. The Department recommends that a description of ground-water occurrence and vulnerability in the study area be included. The description should include a discussion of where ground water is most susceptible to contamination from activities on the land surface and where ground water may be less susceptible to contamination due to the presence of low-permeability layers. Knowledge of the direction of ground-water movement, and the location of recharge and discharge areas also would be valuable in understanding resource vulnerability, because areas of ground-water discharge will be less vulnerable to contamination from herbicides applied to the land surface than areas of ground-water recharge, regardless of soil types.(9)

RESPONSE: The following discussion has been added to section 3.4 of this EIS to clarify your concerns about groundwater. The regional aquifers consist of both alluvial aquifers and basalt aquifers. On the Forest the aquifers are primarily in basalts. Basalt aquifers tend to recharge from the more weathered tops and bottoms of the flows. Much of the rest of the flow is very dense with low porosity and permeability (Whitehead, 1994, http://capp.water.usgs.gov/gwa/ch_h/ accessed 10/5/2007).

The primary natural recharge areas for groundwater in the Umatilla National Forest are at higher elevations. These areas are recharged through rain and snow. The primary discharge areas are along streams at lower elevations. There are also more localized areas where groundwater lies above the regional ground water table due to a lens of impermeable rock or soil. These often discharge as seeps or springs on a hillside.

To protect groundwater as well as surface water, PDFs were developed to limit use of herbicides in conditions where they were likely to move from the application site. This includes restrictions on use of the more mobile herbicides on high porosity soils. Aerial and broadcast treatments across intermittent streams, which can be recharge areas for groundwater, would not occur with the proposed project. This also lowers the likely hood of herbicide moving into either surface or groundwater.

In general, precipitation is low in the project area and herbicide application would occur during the dryer times of the year. Low precipitation reduces movement of herbicide through soils. Application during dryer times of the year allows the plants time to uptake the herbicide and for the herbicide in the soil to begin degrading. Given these natural conditions and the PDFs groundwater resources would be protected.

While general information on groundwater occurrence for the project area is available, specific information on ground water occurrences and depths to ground water are incomplete or unavailable at each proposed treatment site. Under FSH 1909.15_13.01a and 40 CFR 1502.22 acquiring this information is not required if acquiring the information has an exorbitant cost or if assumptions can be made to fill the void.

In this case the assumption is made that recharge areas are primarily along intermittent streams and below shallow soils. Both of these areas are protected by PDFs. In addition, PDF H-2 prohibits broadcast of picloram along fractured basalt road cuts. Together these PDFs ensure groundwater recharge zones are adequately protected.

179. COMMENT: The final EIS should therefore include information regarding agreements in the 2002 MOU and any recent amendments thereof to inform the public of specific actions that will be taken to address 303(d) listed waters and anti-degradation measures for waterbodies where water quality standards are currently met. (6)

RESPONSE: The 2002 MOU between Oregon DEQ and USFS Pacific Northwest Region addresses meeting state and federal water quality standards. Protection of water resources is a high priority. The PDFs associated with this project were designed to protect water resources and to meet water quality standards during implementation of the project.

180. COMMENT: We are concerned about the project's potential to further degrade water quality within a number of water bodies that are already on 303(d) list due primarily to temperature and sediment loads exceedences and other water quality criteria. We recommend that the FS continue to work with Oregon Department of Environmental Quality (ODEQ) and Washington State Department of Ecology (Ecology) to assure that each state's water quality standards will be met. The FS should also work with the Confederated Tribes of the Warm Springs and the Umatilla Indian Reservations to assure that tribal water quality standards are met. The draft EIS must

disclose which waters may be impacted by the project, the nature of potential impacts, and specific pollutants likely to impact those waters. It should also report those water bodies potentially affected by the project that are listed on each of the States' and Tribes' most current EPA approved 303(d) list. We recommend that the final EIS include information from the most current 303(d) lists, note any differences between the old and new 303(d) lists for relevant parameters and water bodies in the project area, and discuss analyses and conclusions that may be affected by the more recent information. (6)

RESPONSE: The 303(d) list for Oregon has recently been updated and no streams in the project area are presently listed for sediment.

Both Oregon and Washington water quality standards would be met or exceeded with the project PDFs. The FS will continue to work with the tribes on this pro ct.

Changes to the 303(d) list will be discussed in the final FEIS.

181. COMMENT: The conclusion that Alternative B is unlikely to have significant effects on soil and water resources is not supported by the analysis. (2)

RESPONSE: Best available science was used to characterize risks. PDFs (see 2.2.3), and buffers reduce the potential for herbicides to adversely impact soils or water. Annual treatment cap of 4,000 acres limits the extent of treatment approved each year. The small and scattered nature of the infestations along with design features, buffers and caps support the analytical conclusions in the EIS.

182. COMMENT: The GLEAMS model is not accurate because it is an agricultural model. (2)

RESPONSE: The GLEAMS model and associated spreadsheets used for the SERA risk assessments tend to overestimate herbicide runoff because it uses less vegetation than found in forested areas, and it includes no buffer on surface water. The newer model, GLEAMS-Driver, has settings that reflect a forested setting and account for many variables found at project sites. As the original model overestimates herbicide concentration its use could be considered a conservative and cautious approach for modeling potential herbicide concentrations in water. A GLEAMS-Driver analysis was done for all 6th field watersheds having more than 10 acres treatment in riparian areas. None of these site-specific treatment scenarios resulted in the model predicting concentrations of herbicide over a threshold of concern to fish or water quality.

Wilderness

183. COMMENT: It is not just the visible signs of disturbance that are of concern in wilderness. How can herbicide use be consistent with wilderness values? The sight of workers applying toxic chemicals in wilderness would be deeply disturbing. Can't the 197 wilderness acres be treated without herbicides? (2)

RESPONSE: Page 295 of the DEIS discussed wilderness and invasive plant management. Managers are faced with a dilemma in that treatment requires active vegetation manipulation, however, without effective treatment; invasive plants will continue to threaten the natural integrity of the wilderness. An alternative that excluded herbicide use in the wilderness was considered but eliminated from detailed study because it would allow invasive plants to persist in these areas. See Chapter 2.3.5 of the FEIS for a full discussion. The option of using herbicides is essential to effective treatment of the 197 estimated

acres within wilderness. Effects to the wilderness qualities of naturalness, untrammeled, undeveloped and opportunities for solitude or primitive recreation are discussed in Chapter 3 of the FEIS.

Wildlife

184. COMMENT: Prohibit aerial spray in green-tailed towhee habitat. (2)

RESPONSE: Alternative D was developed to include this prohibition. Tradeoffs will be considered and rationale for the decision provided in the ROD.

185. COMMENT: The 10 foot no-herbicide stream buffer in Alternative C is not sufficient to prevent herbicide delivery to the water. The buffer should be at least 100 feet. (2)

RESPONSE: Alternative C does not allow broadcasting of herbicide in riparian areas. An alternative was considered to eliminate all herbicide use in riparian areas. This alternative was not developed in detail because it would be tantamount to no action by allowing invasives to persist in these areas. A 100 foot no-herbicide buffer is not warranted by information in the risk assessments. The existing buffers listed in Chapter 2, (Tables 6, 7 & 8 of the FEIS) would adequately protect streams from herbicide delivery.

186. COMMENT: Recommend the following measures for bighorn sheep, wolverine and gray wolf. No NPE, no triclopyr or picloram, no aerial spray. (2)

RESPONSE: A prohibition on aerial spraying is in alternative D. An alternative prohibiting NPE, triclopyr and/or picloram was considered but eliminated from detailed study because:

- 1) Exposures to triclopyr that exceed a level of concern are not plausible because triclopyr cannot be broadcast sprayed. This reduces potential exposure below a level of concern.
- 2) At typical application rates, picloram “worst case” exposures did not exceed any level of concern for birds or mammals. There is no basis for a restriction of picloram in bighorn sheep, wolverine or gray wolf habitat.
- 3) At 0.5 lb/ac NPE does not exceed any level of concern for mammals, so there is no basis for a restriction for bighorns, wolverines, or wolves.
- 4) At typical application rates, none of the herbicides that could be aerially applied exceeded any levels of concern for mammals, so there is no basis for a restriction.

187. COMMENT: No invasive plant treatments should be done in the reproductive season for birds. (2)

RESPONSE: This is an alternative considered but eliminated from detailed study because the reproductive season for any and all birds would likely encompass almost the entire treatment season for invasive plants. The “No Herbicide” alternative or the “Managed through Natural Processes” alternatives would closely approximate this scenario. Such restrictive alternatives would prohibit herbicide use on a large portion of the infested landscape which would allow invasive plants to persist. In the proposed action, the PDFs minimize adverse effects on wildlife through timing, distance, and seasonal restrictions for species sensitive to disturbance.

188. COMMENT: Prohibit NPE use in green-tailed towhee habitat or better explain the consequences of such use. (2)

RESPONSE: Green-tailed towhees are uncommon on the Umatilla NF. While there is approximately 70,000 acres of potential habitat, few sightings have been recorded.

Analysis for NPE uses the mammal level of concern because it is lower than available data for birds. Bird data for NPE indicates that there are no behavior changes or mortality at 5,000 ppm. The estimated dose from the exposure scenario is 20 ppm. This provides a large margin for error in assuming the potential for adverse effects. In addition, as discussed on page 186, green-tailed towhees are unlikely to feed exclusively on contaminated food, which is what would be required to receive the dose of 20 ppm. The low likelihood of exposures of concern occurring, along with the very conservative assumptions in the toxicity threshold values, indicate that a strict prohibition on NPE use in green-tailed towhee habitat is not necessary to protect the species from likely adverse effects.

189. COMMENT: What is the source of the 7,000 foot denning preference for wolverines? (2)

RESPONSE: Copeland, J.P.; J.M. Peek; C.R. Groves; W.E. Melquitst; K.S. McKelvey; G.W. McDaniel; C.D. Long; and C.E. Harris. 2007. Seasonal habitat associations of the wolverine in central Idaho. *Journal of Wildlife Management* 71(7): 2201-2221.

190. COMMENT: Toxicity impacts to TES species are not outweighed by speculative habitat improvements (page 187). Page 198 conclusion(s) that short term impacts are outweighed by long term benefits is not supported. (2)

RESPONSE: Toxicity impacts are likely to be short term and discountable because:

1) Toxic effects to any TES species are highly unlikely. Exposure scenarios do not account for species foraging behavior, seasonal presence, PDFs, different application techniques, or other important exposure factors.

2) Adverse effects of invasive plants and benefits to wildlife habitat from their removal are discussed in numerous peer-reviewed articles, including:

Rice et al. 1997; DiTomaso et al. 1999; Schmidt and Whelan 1999; Trammel and Butler 1995; Rawinski and Malecki 1984; Germaine et al 1998; and D'Antonio and Vitousek 1992, among others.

191. COMMENT: Page 186 states that the food habits of green-tailed towhees are poorly studied, so how can you say that these birds do not feed on invasive plants and contaminated insects? (3)

RESPONSE: The analysis on page 186 assumes that the green-tailed towhee could feed on some invasive plant seeds or contaminated insects. However, based on the data available, their diet is varied. Thus, they are unlikely to feed exclusively on contaminated food items. The amount of plausible herbicide exposure to the birds is very low.

192. COMMENT: Songbird impacts are not rare, there been a sharp population decline partly attributed to herbicides. (2)

RESPONSE: None of the herbicides proposed for use in the DEIS have been implicated in bird population declines. Data from laboratory studies, and quantitative exposure estimates, indicate that none of the herbicides proposed, used at typical application rates and with limited exposure from triclopyr, results in any plausible adverse effect to songbirds (p. 167).

193. COMMENT: The connection between PDFs listed on page 191 and risks on page 189 is not clear. (2)

RESPONSE: The PDFs were developed in reference to the analysis summarized on page 189 which indicates that some herbicides could harm amphibians. Thus, PDFs were developed to address these concerns in Columbia spotted frog habitats:

- Broadcast spray of any herbicide is prohibited
- Selective application only of sulfometuron methyl and NPE and POEA surfactants

These PDFs were developed to address potential concerns to amphibians from these herbicide ingredients and additives.

194. COMMENT: Paragraph 2 on page 189 states that certain herbicides pose a low risk of mortality to amphibians. These herbicides should not be used. Page 190 contradicts this by only mentioning adverse effects possible from one herbicide and one surfactant used at maximum rates. (2)

RESPONSE: The herbicides identified as “low risk” did not result in exposures that exceeded levels of concern. As disclosed, data does not exist to precisely quantify effects on amphibians from most herbicides, but available data suggests that they do not create adverse effects at proposed rates (see appendix C, p. C-65 to C68).

The PDFs that protect water quality and fish (H-1 through H-13) would also help reduce the risk to amphibians from herbicides that could pose more than a “low” risk of adverse effects.

195. COMMENT: How can there be no cumulative effects to woodpecker when logging of the habitat is a major effect? (2)

RESPONSE: Cumulative effects are based on effects of an action in combination with other activities. If there is no effect on woodpecker habitat from the proposed action, then there can be no cumulative effects with other actions.

196. COMMENT: Cumulative exposure could add up in habitat and equal a higher application dose and be acutely toxic. (3)

RESPONSE: Cumulative exposures cannot add up to a higher dose because the herbicides proposed do not bioaccumulate or bioconcentrate and are rapidly excreted (see appendix C).

197. COMMENT: Page 166 states there will be no risk to species’ habitat. How can this be when herbicides can contaminate habitat for fish, amphibians, insects, songbirds, elk and sheep? (2)

RESPONSE: Risk from treatment is reduced by the fact that the majority of treatments do not occur in suitable habitats for these species. In addition, treating invasive plants does not remove native habitat for wildlife (p. 166). Herbicide presence does not alter native habitat availability. Appropriate structure, food, water, cover and other important native habitat elements would still be present and provide for wildlife.

198. COMMENT: The admission that Picloram is retained in the body (bioaccumulates) increases our concern for effects to Wolverines, Canada lynx, Gray wolves, Pine marten, Fisher (not analyzed as it should have been), American Peregrine falcon, and Rocky Mountain Bighorn sheep, scavengers, small predators, big game predators and sensitive-listed herbivores from Picloram and herbicide use in general regarding cumulative exposure. (2)

RESPONSE: Picloram does not bioaccumulate and is not retained in the body of mammals. There is an editorial error on page 181 that inadvertently gives this impression. Picloram excretion and metabolism has been studied in humans, rats, dogs, and cattle and studies show that picloram is rapidly and efficiently

excreted from the body (SERA 2003 Picloram). Because it is not retained, there is no reason to suggest that secondary ingestion from prey or cumulative exposures are likely.

199. COMMENT: The more likely presence of rarer and TES listed species in Wilderness and Roadless areas advises against herbicide use in these areas. It can't be assumed there are no Canada Lynx, Gray wolves or Wolverine on the forest, especially in Wilderness Areas and Roadless Areas but also foraging, dispersing or denning elsewhere as these are wide-ranging carnivores. Suitable habitat and potential presence should be enough to kick in ESA requirements to protect habitat and individuals. With no population data, viability thresholds cannot be determined and significant harm as could be expected from herbicide bioaccumulation, heavy doses or chronic exposure must be avoided. Gray wolves, Canada lynx and Wolverines do eat small mammals so chronic effects are possible. (2)

RESPONSE: 1) At typical application rates, none of the proposed herbicides result in a dose that exceeds the level of concern for birds or mammals, except triclopyr (p. 167). This is one reason why triclopyr exposures are limited to selective application techniques in the R6 2005 ROD Standard 16. This would reduce exposure below a level of concern for mammals. 2) The proposed herbicides do not bioaccumulate or bioconcentrate, and are rapidly excreted from the body of prey animals (appendix C, p. C-74 to C-124), so chronic doses from this pathway will not occur. The statement regarding picloram on p. 181 is an error and will be corrected. 3) Because there is a low likelihood that wildlife would consume contaminated food, chronic exposures from contaminated food are also highly unlikely (p. 175 – 181).

200. COMMENT: Why are the effects to vesper sparrows the same as green tailed towhee's? How can you conclude that focal species would not be chronically exposed to herbicide? What PDFs limit chronic exposure to birds from herbicides? (2)

RESPONSE: The physical properties of the herbicides themselves (e.g. no bioaccumulation or bioconcentration, rapid excretion, etc.) and the foraging behavior of small birds relative to invasive plants makes any potential for chronic exposures in both sparrows and towhees highly unlikely (see p.186).

201. COMMENT: With no population studies of green-tailed towhee, it is impossible to conclude that invasive plant control would not lead to a loss of viability. You have no idea whether the birds are present in the area. (2)

RESPONSE: The proposed control of invasive plants does not remove native plant habitat or have any substantial impact on habitat elements. Available data indicate that no mortality or loss of reproduction to green-tailed towhees would occur (p. 161-164). Since there is no loss in habitat or population expected, a conclusion of loss of viability cannot be supported.

202. COMMENT: No treatments should be allowed within ½ mile of wolf line of sight. How do you know how to evaluate what would disturb a wolf? (2)

RESPONSE: Activities and the effects of disturbance to wolves is discussed in the summary of their life history found in U.S. Fish and Wildlife Service 2003. This citation has been added to the FEIS.

203. COMMENT: We are very concerned about potential impacts to Columbia Spotted frogs, painted turtles and Northern Leopard frogs from herbicide use. Columbia Spotted frogs are recognized to use rock pits, old mining ponds and livestock ponds, all of which often have invasive plants. There should be no herbicide use in riparian or other suitable habitat for these species. Ripple effects to riparian and aquatic species could be pervasive from contaminating riparian areas and nearby herbaceous plants and insects, Many riparian wildlife species have very small home

ranges, NPE surfactants should not be used due to the potential for harmful doses to birds and mammals that eat plants or insects that were sprayed, (see DEIS discussion p, 164). (2)

RESPONSE: No herbicide use in riparian areas was considered as an alternative but not analyzed in detail because it would be tantamount to no action by allowing invasives to persist in these areas.

5.5.2 Required Agency Letters



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

Available data indicates that proposed herbicides used at the rates allowed in the EIS did not result in exposures that exceeded levels of concern for amphibians (p. 190). PDFs that would reduce potential exposure to NPE and herbicides of concern to amphibians are: F4, H8, H9, J4 and J5, in addition to the buffers in Tables 6, 7 and 8 of Chapter 2.

August 7, 2007

Reply To
Attn Of: ETPA-088

Ref: 06-018-AFS

Kevin D. Martin, Forest Supervisor
Umatilla National Forest
2517 SW Hailey Avenue
Pendleton, OR 97801

Dear Mr. Martin:

The U.S. Environmental Protection Agency (EPA) has reviewed the draft Environmental Impact Statement (EIS) for the proposed **Invasive Plant Treatment** project on Umatilla National Forest (UNF or Forest) in Asotin, Columbia, Garfield, Walla Walla Counties in Washington and Grant, Morrow, Umatilla, Union, Wallowa, Wheeler Counties in Oregon. Our review was conducted in accordance with our responsibilities under the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act. Section 309, independent of NEPA, specifically directs EPA to review and comment in writing on the environmental impacts associated with all major federal actions. Under our policies and procedures, we also evaluate the document's adequacy in meeting NEPA requirements.

The draft EIS assesses the impacts of a proposal to use integrated weed management strategies to control, contain, or eradicate invasive plants across UNF. Nearly 25,000 acres of the Forest are now infested with invasive plants, which are displacing native plants, destabilizing streams, reducing the quality of fish and wildlife habitat, and degrading natural areas within and adjacent to the Forest. The Forest Service (FS) therefore needs to treat the invasive plants safely and effectively and restore treated sites to improve forest health and to severely limit the spread of such plants on the Forest and surrounding areas. Before the proposed invasive plant treatment program can be implemented, however, the FS developed and analyzed the following four alternative actions, A through D, to evaluate what environmental effects, if any, would be associated with the proposed project.

A. No action. Under this alternative, the FS would continue current invasive plant treatments without change. Since no new invasive plant treatments would be approved, invasive species infestation would continue to spread at the current annual rate of 8-12%, and their impacts to forest and other resources would continue to increase. Current treatments are limited to manual or mechanical methods prior to any

herbicide use. Approved herbicides are limited to Glyphosate and Picloram that can only be applied using spot or ground based broadcast methods.

B. Proposed and Preferred action. Under this alternative, the FS would treat existing and new invasive plant infestations using a combination of methods, including physical (manual, mechanical, and cultural); biological; and chemical (spot spray, wicking, stem injection, and hand, boom and aerial broadcasts). The treatments would be used based on priority plant species and site location, and would be adjusted based on management objectives. This alternative would also include project design features (PDFs) to avoid and reduce potential effects on resources. The PDFs include both prevention and restoration standards (p. 50).

C. The features of this alternative would be the same as alternative B, with the exception that there would be no broadcast application of herbicides in riparian areas. Although alternative C would minimize herbicide drift into terrestrial and aquatic ecosystems, thus protecting human health; it would increase treatment costs and decrease treatment effectiveness.

D. Under this alternative, there would be no aerial applications of herbicides. Other than this limitation, all other features of alternative D would be the same as in alternative B and C. alternative D would result in minimal herbicide drift into terrestrial and aquatic ecosystems, thus enhancing human health protection. Under this alternative, the cost of invasive plant treatments would also increase substantially and the treatments would be ineffective. Some sites would not be treated due to accessibility and safety issues.

The above three alternative actions, B, C and D, are essentially the same, with the exception of disallowing broadcast and aerial spraying of herbicides under alternative C and D, respectively. While these omissions would reduce herbicide drift impacts to both terrestrial and aquatic ecosystems, the remaining treatments under each alternative (C and D) would decrease treatment effectiveness and increase treatment cost. Because broadcast and aerial spraying of herbicides would be allowed under alternative B, the FS believes that the proposed invasive plant treatments under alternative B would be most aggressive in managing weeds on the Forest, be up to 80% effective, less costly, and would result in the least adverse effects to human health and the environment.

EPA understands the risks invasive plants may pose to resources within the Forest, if these were not treated. Thus, we appreciate FS planning efforts for this project, especially the incorporation of Integrated Pest Management (IPM) principles in the preferred alternative and consideration of public scoping comments in the development of this EIS. We promote IPM strategy because it is a prudent approach to understanding and dealing with environmental concerns that may result from invasive plant treatments. The IPM approach does not blindly embrace new technology nor does it reject technology. Instead, the strategy promotes a thoughtful awareness of the pest management inherent in natural systems through an understanding of pest life cycles, and through the use of beneficial organisms, cultural modifications, physical barriers and other mechanical controls. IPM does not rule out judicious use of herbicides.

In general, we agree with the proposed invasive plant treatments identified in the preferred alternative and which are put forward to improve resource conditions in the project area. However, we are concerned about the project's potential to further degrade water quality within a number of water bodies that are already on 303(d) list due primarily to temperature and sediment loads exceedances and other water quality criteria. We recommend that the FS continue to work with Oregon Department of Environmental Quality (ODEQ) and Washington State Department of Ecology (Ecology) to assure that each state's water quality standards will be met. The FS should also work with the Confederated Tribes of the Warm Springs and the Umatilla Indian Reservations to assure that tribal water quality standards are met. The final EIS should include additional information as explained in our comments that follow.

Water quality

Water quality degradation is one of EPA's primary concerns. Section 303(d) of the Clean Water Act (CWA) requires the States of Oregon and Washington and Tribes with approved water quality standards to identify water bodies that do not meet water quality standards and to develop water quality restoration plans to meet established water quality criteria and associated designated uses. The draft EIS must disclose which waters may be impacted by the project, the nature of potential impacts, and specific pollutants likely to impact those waters. It should also report those water bodies potentially affected by the project that are listed on each of the States' and Tribes' most current EPA approved 303(d) list.

The draft EIS identifies impaired waters in the Project area (p. 204) and indicates that only two Sub-basin level Total Daily Loads (TMDLs) have been completed for 303(d) listed water bodies partially located on the Forest. We noted that the Oregon State's EPA-approved 2002 303(d) list and Washington State's EPA-approved 2004 303(d) list referred to in the draft EIS (p. 203) are outdated. The most current 303(d) lists approved by EPA are the 2004 list for the State of Oregon and 2006 for Washington State. We recommend that the final EIS include information from the most current 303(d) lists, note any differences between the old and new 303(d) lists for relevant parameters and water bodies in the project area, and discuss analyses and conclusions that may be affected by the more recent information.

The analyses presented in the draft EIS indicate that waters within various parts of the project area do not currently meet Oregon and Washington State water quality criteria, especially temperature and sediment (9 creeks) in OR and temperature (2 creeks) in WA (p. 204). Planned activities under the preferred alternative (alternative B), such as vegetation removal could further degrade water quality with respect to these parameters, especially where treatments would occur within 15 ft. of 303(d) listed waters (p. 79). In drier areas, manual and mechanical/physical removal of weeds could result in increased sediment delivery until sites are seeded and vegetation is re-established. When roads, prescribed fire and livestock management activities are added to invasive plant treatments, cumulative sediment delivery, temperature, and other impacts to water quality could also be significant.

Although there are no TMDLs for individual 303(d) listed streams in the project area, we recognize that ODEQ and FS have made significant progress in reaching agreement on working cooperatively to meet State and Federal water quality rules and regulations (Memorandum of Understanding (MOU), 2002). EPA supports decisions that have been reached between the two agencies, especially the FS commitment to manage National Forest System lands to protect, restore and maintain water quality so that Federal and state water quality laws and regulations are met or exceeded to support designated uses. Further, we recommend that the FS continue to coordinate with ODEQ and Ecology as water quality restoration plans, including TMDLs for individual streams are developed and implemented to meet water quality standards. The final EIS should therefore include information regarding agreements in the 2002 MOU and any recent amendments thereof to inform the public of specific actions that will be taken to address 303(d) listed waters and anti-degradation measures for waterbodies where water quality standards are currently met. Also, it is not clear in the draft EIS how weeds found within planned buffers around waterways would be treated.

Tribal water quality and consultations

The proposed project has the potential to impact the Confederated Tribes of the Warm Springs, Umatilla, and Nez Perce Indian Reservations' resources as described in the draft EIS (p. 357-359), including waterways associated with their lands. As a result, activities occurring within the Umatilla National Forest, such as the proposed action, may influence water quality within such waterways (lakes, rivers, and streams) that serve as sources of drinking water or as sacred places for tribes. Examples of waterbodies associated with tribal lands include the Columbia, Grande Ronde and John Day Rivers. Although not discussed in the draft EIS, some of these water bodies may not be meeting current Confederated Tribes of

the Warm Springs and the Umatilla Reservations' water quality standards, which were approved by EPA. The final EIS should include a discussion of how these Tribes' water quality standards would be met and how water quality issues related to the Nez Perce Tribe were addressed during FS consultations with this particular Tribe.

Executive Order (EO) 13175 (*Consultation and Coordination with Indian Tribal Governments*) requires agencies of the U.S. government "to work with Indian tribes on a government-to-government basis to address issues concerning Indian tribal self-government, trust resources, and Indian tribal treaty and other rights."

Aquatic Invasives

The draft EIS invasive plant inventory did not document the existence of aquatic invaders. As a result, the document does not address invasive plants floating or submerged in water. Because aquatic invasives are an emerging issue on National Forest land and elsewhere, EPA encourages the FS to include at-risk water bodies (such as those used for recreational purposes) in future monitoring and inventory efforts. If there are infestations of aquatic invasive plants (floating or submerged in water) on the Forest, we recommend that the final EIS include information about such infestations and how they would be treated to prevent deterioration of water quality within waterbodies found on the Forest.

Because of concerns about water quality and missing information, we have assigned a rating of EC-2 (Environmental Concerns – Adequate) to the draft EIS. This rating and a summary of our comments will be published in the *Federal Register*. For your reference, a copy of our rating system used in conducting our review is enclosed.

If you have questions or would like to discuss these comments, please contact me at 206-553-1601 or Theo Mbabaliye at 206-553-6322. Thank you for the opportunity to provide these comments.

Sincerely,

/s/ Christine B. Reichgott, Manager
NEPA Review Unit

Enclosures

cc:

EPA Oregon Operations Office
EPA Washington Operations Office
Confederated Tribes of Warm Springs

The Nez Perce Tribe of Indians
Confederated Tribes of Umatilla

United States Department of the Interior
OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
500 NE Multnomah Street, Suite 356
Portland, Oregon 97232-2036

9043.1

IN REPLY REFER TO:

ER07/528

Electronically Filed

August 7, 2007

Kevin D. Martin
Supervisor
Umatilla National Forest
2517 SW Hailey Avenue
Pendleton, Oregon 97801

Dear Mr. Martin:

The U.S. Department of the Interior (Department) has reviewed the Draft Environmental Impact Statement for the Umatilla National Forest Invasive Plant Treatment Project for Asotin, Columbia, Garfield, and Walla Walla Counties, Washington, and Grant, Morrow, Umatilla, Union, Wallowa, and Wheeler Counties, Oregon. The Department offers the following comments for use in developing the Final Environmental Impact Statement (FEIS) for the project.

GENERAL COMMENT

The document does not explicitly describe the potential effects to ground water. There are very general and qualitative statements, such as the last sentence on page 211, which states that "[h]ighly drained soils have greater propensity to transfer herbicides to groundwater stores," and the first paragraph on page 215, which describes project design features that prohibit use of mobile persistent herbicides, such as clopyralid in areas of sandy soils to limit possibility of movement to ground water. The Department recommends that a description of ground-water occurrence and vulnerability in the study area be included. The description should include a discussion of where ground water is most susceptible to contamination from activities on the land surface and where ground water may be less susceptible to contamination due to the presence of low-permeability layers. Knowledge of the direction of ground-water movement, and the location of recharge and discharge areas also would be valuable in understanding resource vulnerability, because areas of ground-water discharge will be less vulnerable to contamination from herbicides applied to the land surface than areas of ground-water recharge, regardless of soil types.

SPECIFIC COMMENTS

Section 3.4.1, Introduction, page 200, 3rd and 4th paragraphs

This section describes assumptions used in the risk assessment model that are somewhat different from expected field conditions, and correctly describes how some of the assumptions would cause the model to over-predict delivered concentrations, while other assumptions would underestimate concentrations. However, the reader is left with no clear sense of whether the predicted net effect will be positive (reduced delivered concentrations) or negative (increased delivered concentrations) compared to the actual field concentrations. It would benefit the public if the section included information supported by

references outlining which processes will dominate in the transport and potential attenuation of herbicides. Based on this information, a description should be provided outlining how the model assumptions have taken into account the most dominant processes along with conclusions about how these assumptions result in more conservative estimates of concentrations delivered to receiving waterbodies. With this supplemental information, the public will then gain some degree of confidence in the conclusions concerning potential exceedances (or lack thereof) of threshold concentrations for the herbicides to be applied. Alternatively, the section should quantify the uncertainty in the predictions described in the last sentence in the fourth paragraph.

Section 3.4.3, Environmental Consequences, Early Detection Rapid Response, page 230, 1st paragraph; and Aerial Application, pages 217-218

It is not clear why the risks associated with aerial spraying are considered higher at the early detection rapid response (EDRR) sites than elsewhere. The reasons given on page 230 - such as unpredictable weather and difficult to recognize stream channels - would apply to all sites, not just the EDRRs. It would be helpful if the reasons these risk factors are of lesser concern or eliminated at the other (non-EDRR) sites could be explained.

Section 3.2.4, Treatment of Effectiveness and General Impacts to Native Vegetation Common to All Alternatives, Herbicide Effects on Plant Diversity, page 122; and Section 3.3.5, Effects to Threatened, Endangered, and Sensitive (TES) Species, page 171 and page 173

There are many statements that reference studies conducted or models used, and statements regarding the effects of the proposed action on species. Statements of fact about species, statements about previous studies on species, and statements regarding what models were used need to have supporting references. Examples of where these citations should be provided include:

"Some studies cited in this EIS found that species diversity was not affected by herbicide treatment." (page 122, 3 paragraph) 3

"Recent theoretical models predict that decreasing plant diversity leads to lower plant productivity. These models also show diversity and composition are equally important determinants of ecosystem functioning." (page 122, 4 paragraph)

"Even if they fed, for a lifetime, upon fresh-water fish that had been contaminated by an accidental spill of herbicide, they would not receive a dose that exceeds any known NOAEL [No observed adverse effect level]." (page 171, 2 paragraph)

"Studies have shown that even if a bald eagle fed, for a lifetime, upon fresh-water fish that had been contaminated by an accidental spill of herbicide, they would not receive a dose that exceeds any known NOAEL." (page 173, last bullet)

Section 4.6, References, beginning on page 384

There are a number of references that are not cited in the main body of the DEIS or are incomplete citations, which may lead one to question the integrity of the section. The references should be cross-checked making sure they are correctly cited and also confirming that the references are complete. These include the following:

The only listed Levine reference on page 396 is a 2004 citation that does not include a title of the review paper. The only Levine reference cited in the main body of the DEIS is on page 121, which is a 2003 publication: "One study has indicated that exotic plants may compete better for native plant pollinators by

producing more desirable nectar and therefore increasing fitness and reproductive ability of the non-native plant (Levine et al. 2003)."

The two Mech citations on page 398 are not listed in the main body of the DEIS, and one may assume that important facts about the species may have been left out of the discussions in the appropriate sections of the DEIS.

The following citation on page 398 is missing both the author(s) and the year of publication: "Mechanisms underlying the impacts of exotic plant invasions. Ecology Letters. 7:975–989."

The Morse citation on page 399 could not be found in the main body of the DEIS.

The following citation on page 407 is incomplete: "Techniques for Natural Areas. The Nature Conservancy,"

The following citation on page 408 is incomplete: "Thesis, University of Maine, Orono, Maine, 87 pp."

The following cited websites on page 393 lack a complete reference:

<http://tncweeds.ucdavis.edu/handbook.html>, version. June 2003.
<http://www.nwfsc.noaa.gov/publications/techmemos/index.cfm> 4

Section 4.6, References, page 418

The link provided for Wood (2001) does not lead to the USGS publication. The correct link is http://or.water.usgs.gov/pubs_dir/WRIR01-4065/.

Thank you for the opportunity to review and comment on this DEIS. If you have any questions concerning the Department's comments, please contact Lloyd Woosley, Chief of the USGS Environmental Affairs Program, at (703) 648-5028 or at lwoosley@usgs.gov. If you have any other questions, please contact me at (503) 231-6157.

Sincerely,

Preston Sleeper
Regional Environmental Officer

[-Salmon-Listings/Salmon-Populations/Index.cf](#)

Appendix A – Forest Plan

The Umatilla Forest Plan Standards and guidelines and goals pertaining to the treatment of invasive plants printed in the DEIS was not reprinted for this FEIS, but are available on request or on line at www.fs.fed.us/r6/uma/projects

Appendix B – Botany

The item *Herbicide Effects to Plants* printed in the DEIS was not reprinted for the FEIS, but is available on request or on line at www.fs.fed.us/r6/uma/projects

The information about the item *Common Control Measures for Invasive Plants of the Pacific Northwest* (Mazzu 2005) printed in the DEIS was not reprinted for the FEIS, but is available on request or on line at www.fs.fed.us/r6/uma/projects

The white paper containing biological control information printed in the DEIS was not reprinted for the FEIS, but is available on request or on line at www.fs.fed.us/r6/uma/projects

The section on the Implementation Planning Process was moved to Chapter 2, and replaced here with a treatment site example

The document *Revegetation Guidelines* printed in the DEIS was not reprinted for the FEIS, but is available on request or on line at www.fs.fed.us/r6/uma/projects

Umatilla National Forest Site Implementation Guide Example

Introduction

An existing site in the Pearson Creek drainage was selected to provide an example of how the Implementation Planning Process will be used to develop a site-specific treatment prescription that will have effects within the scope of the FEIS. Site 06140500265 is a 74-acre area that contains scattered houndstongue (an equivalent of about 2 acres will actually have treatments within the larger area).

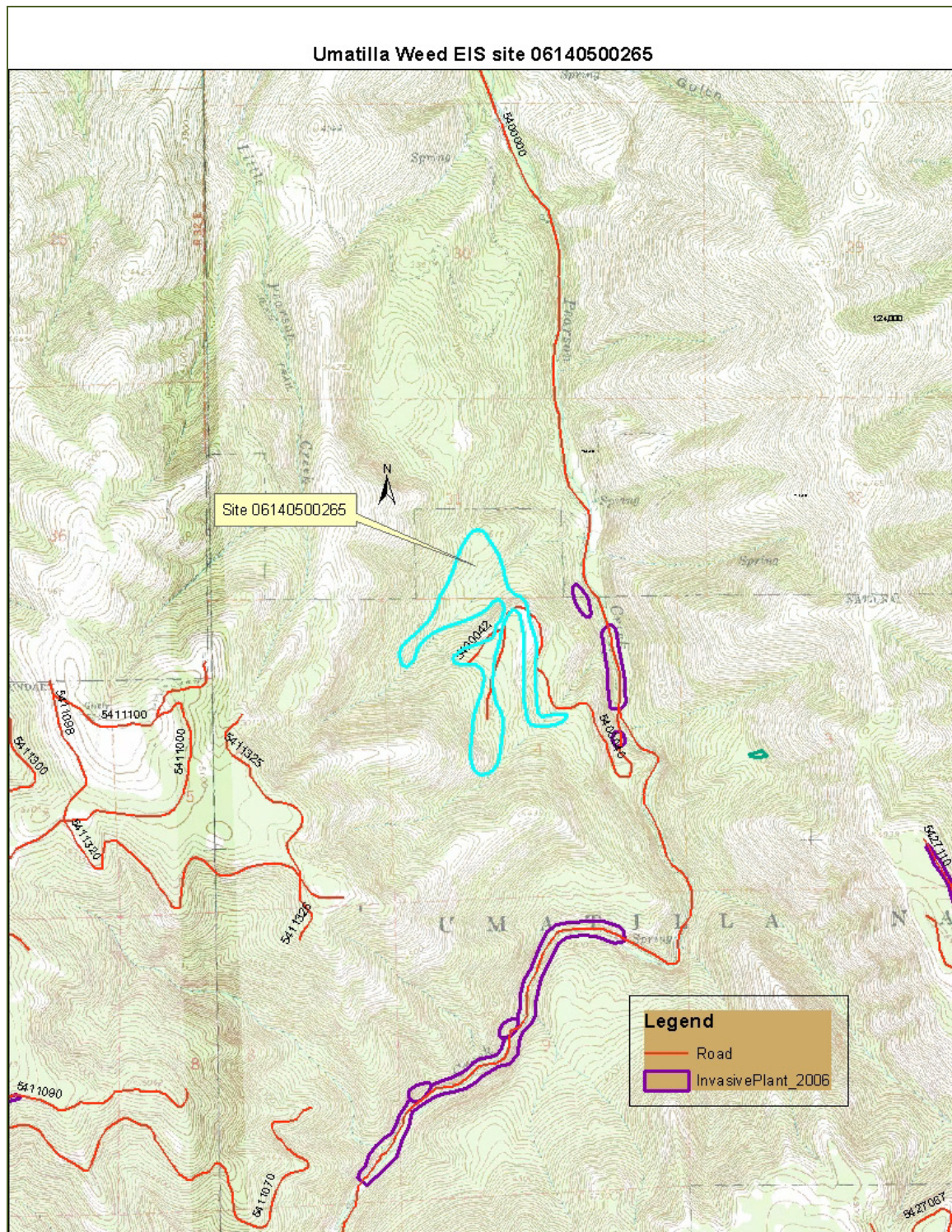
The example site is upslope of Pearson Creek, which provides critical habitat for spawning mid-Columbia steelhead. The site was not considered riparian in the 2006 inventory, however a small portion of the infested area may be within 100 feet of an intermittent stream and a perennial stream. Houndstongue is considered a high priority invasive plant species in the EIS. The long-term desired condition for this area is control of the invasive species to prevent it from reproducing or spreading off of the site.

The soil type on the site where the houndstongue plants occur is silt loam. No powdery, ashy, dry soil or light, sandy soil that is unstable, highly disturbed and/or lacking vegetative cover is present; therefore there are no concerns with herbicide drift caused by wind erosion.

This site does not constitute a high risk in the R6 Monitoring Framework. It will be visited post treatment to determine efficacy of treatment and whether passive restoration is effectively allowing desirable vegetation to become established.

Spot (backpack) application with metsulfuron methyl is prescribed because it is the most cost effective treatment for this scattered population. A nonionic surfactant (Spreader 90™) will be needed with this product. Broadcast treatment is not proposed for this site due to patchy distribution of the houndstongue. Access from existing closed spur roads will be utilized; a UTV may be used to spot apply herbicide to a few clumps of houndstongue along the road edge. Passive restoration is prescribed at this time; active restoration will be reevaluated following herbicide treatments.

A map of the area follows.



Based on the *Site Implementation Planning Guide Example* prepared by the Forest and discussed below, the treatment described is found to be consistent with the 2009 Umatilla FEIS and ESA consultation requirements. The predicted herbicide exposure would be within the scope of analysis in the 2009 Umatilla FEIS. Treatment extent is far less than 10 acres per 1.6 miles of stream (PDF H-13); concentrations of herbicides that could theoretically enter the stream would be orders of magnitude below a level of concern. No other treatments are planned within 1.5 miles of this treatment. This site would contribute approximately 2 acres toward the 4,000-acre annual herbicide cap.

Site Implementation Planning Guide Example

The following checklist displays the implementation planning process that would be followed each year. Documentation of the process may be streamlined compared to the following example, for instance, groups of sites may be discussed together.

1. Characterize the Infestation

A: Map and describe the target species, density, extent, treatment strategy, and site conditions:

- EIS Site 06140500265 Houndstongue (*Cynoglossum officinale*) (CYOF)
 - Extent: Approximately 2 total acres in patches across a 74-acre treatment site
 - Density: highly variable, small dense patches measuring 10 feet square are Daubenmire cover class 5 (75-95% crown cover) and then as you move away from dense patch, density decreases to Daubenmire cover class 2 (5-25%).
- Treatment Strategy: Control and reduce cover. Control means to prevent the species from reproducing or spreading off site.
 - Site Conditions: Mixed conifer forest; managed timber stands logged 20 to 30 years ago; north and east slopes with grand fir and Douglas-fir and understory shrub cover of ninebark, ocean spray and snowberry; drier west and south slopes with open pine and understory of elk sedge and pinegrass; active cattle allotment/rangeland. The houndstongue infestation is concentrated in old landings and skid trails from timber harvest activities. The site is 0.25 miles upslope from Pearson Creek and FS Road 5400, and contains two closed spur roads (040 and 042); the 040 spur would be used for access and would most likely require some removal of downed trees. Site is adjacent to private property on the north and the infestation of houndstongue is known to occur on the adjacent private parcel. The site was not considered riparian in the proposed action, however a small portion of the 2 acres may be within 100 feet of an intermittent stream and a perennial stream.
- Soils: primarily silt loam with two small areas of sandy loam (Blue Mountain Terrestrial Ecological Unit Inventory with NRCS SSURGO database). The houndstongue plants are not found in the small areas of sandy loam.

B: Resource Concerns:

- Pearson Creek provides critical habitat for spawning mid-Columbia steelhead. No Threatened and Endangered plants or wildlife species are documented in the area; no plant or wildlife species of local interest (SOLI) are present and there is no habitat for SOLI; additional SOLI surveys are not needed. Invasive plant dispersal vectors include cattle, wildlife, humans and wind. Houndstongue is degrading native forestland/rangeland condition.

2. Develop Site Prescriptions

A. Treatment Methods Options

- Manual treatment that removes root crowns is effective on small populations with multiple site visits.
- Biological agents are NOT available for houndstongue in the U.S. Researchers have identified five biological control insects as potential agents but none have been approved due to concerns for negative effects on rare native plant species in the same family as houndstongue.
- Chemical – Metsulfuron methyl (Escort) and Chlorsulfuron (Telar) as listed as effective in the control measures table 3.

B. Preliminary Treatment Prescription:

- Spot (backpack) application with metsulfuron methyl is prescribed because it is the most cost effective treatment for this scattered population. A nonionic surfactant (Spreader 90™) will be needed with this product. Broadcast treatment is not proposed for this site due to the patchy distribution of the houndstongue. Access from existing closed spur roads will be utilized; a UTV may be used to spot apply herbicide to a few clumps of houndstongue along the road edge.

3. Apply Appropriate Project Design Features

A - Pre-Project Planning

A-1: Documented in #1 above.

B – Coordination with Other Landowners and Agencies

B-1: Coordination: Site is on Forest lands; contact range permittee at annual meeting; adjacent private landowner will be contacted to encourage and coordinate treatment on private land.

C - Prevent the Spread of Invasive Plants during Treatment Activities

C-1: Prevention: Educate crews to ensure that vehicles and personal protective clothing are not transporting seeds during treatment implementation.

D - Wilderness Areas

D-1: Wilderness: Not applicable (NA) – site is not in a wilderness area.

E - Non-Herbicide Treatment Methods

E-1: Will limit crew size working on site within 150 feet of streams.

E-2: Fueling will not occur within the RHCA.

F – Herbicide Application

F-1: Labels: All label restrictions will be followed. Herbicide application would be spot spraying only to houndstongue plants primarily via backpack sprayers with some spot application along spur roads via a truck or UTV with tank. No broadcast spraying would be utilized therefore a minimum area would be treated. Metsulfuron is one of the ten approved active ingredients included in R6 2005 ROD.

F-2: Forest Plan standards will be followed.

F-3: Surfactants: POEA surfactants, urea ammonium nitrate or ammonium sulfate will not be used.

F-4: Lowest Effective Label Rates: Infestation will be treated in active growth stage prior to bloom with 0.5 to 1 ounce/acre (consistent with table 2 rates).

F-5: Wind: Guideline will be followed.

F-6: Nozzle: N.A. Broadcast application will NOT be used.

F-7: Metsulfuron is a sulfonylurea herbicide and is being used at this site. Soils have been evaluated (see soil description in 1A above) and are silt loam where the houndstongue plants occur. No powdery ashy dry soil or light sandy soil is present

that is unstable, highly disturbed and/or lacking vegetative cover. Therefore there are no concerns with herbicide drift caused by wind erosion.

F-8 Aerial: NA, treatment ground based.

G – Develop Herbicide Transportation and Handling Safety/Spill Prevention and Containment Plan - The transportation and handling/safety will be developed as outlined.

H - Soils, Water and Aquatic Ecosystems

H-1: Buffers- Spot treatment is allowed to within 15 feet of the water's edge (see buffer table(s) 5-7). Individual houndstongue plants within 15 feet of the waters' edge will be manually removed. This is a very small proportion of the treatment site.

H-2: Broadcast on roads – NA, no broadcast application proposed.

H-3: Riparian vehicle use– vehicles only proposed for use on existing roads; backpacks will be used in riparian areas.

H-4: Clopyralid on porous soils – NA, not using clopyralid.

H-5: Chlorsulfuron on clay soils- NA, not using chlorsulfuron.

H-6: Picloram on shallow or coarse soils - NA, not using picloram. The appendix table of soil limitations lists site 06140500265 CYOF with the limitation of 5 acres of coarse soils for which picloram was excluded for use. This is not relevant since picloram is not being proposed for use.

H-7: Sulfometuron methyl on shallow or coarse soils – NA, not using sulfometuron methyl.

H-8: Lakes and Ponds – NA, no lakes or ponds present.

H-9: Wetlands – will implement treatment when soils are driest.

H-10: Foam – NA

H-11: Wells – NA, no such developments

H-12: Boat transport – NA – not needed

H-13: Aquatic influence zone- this treatment covers far less than 10 acres per 1.6 miles of stream; concentrations of herbicides that could theoretically enter the stream would be orders of magnitude below a level of concern.

I - Vascular and Non-Vascular Plant and Fungi Species of Local Interest

I-1: Consultation with district botanist revealed no need for additional surveys in the area of the infestation. Species of Local Interest (SOLI) or their habitats are not present.

I-2: Habitat – NA, no habitat identified.

I-3: SOLI – No SOLI identified in treatment area

I-4: SOLI within 10 feet of saturated or wet soils – No SOLI in treatment area.

I-5: Picloram use near T&E - no habitat or sites for *Silene spaldingii*

I-6: Aerial application -- NA

I-7: Compliance monitoring – this implementation plan documents compliance with PDFs, etc.

I-8: Effective monitoring for SOLI – NA, no SOLI present.

I-9: SOLI monitoring - NA, no known SOLI sites or habitat

I-10:

I-11: Restoration in vicinity of T&E and SOLI – NA, no *Silene spaldingii* present and no SOLI present.

J. Wildlife Species of Local Interest

J-1: Wildlife: consultation with the district Wildlife Biologist revealed no areas of special concern or additional surveys needed.

K. Public Notification

K-1: The treatment site will be posted and the public will be notified via annual notification in the press.

L – Special Forest Products

L-1: Special Forest Products – NA, and not using triclopyr.

M - American Indian Tribal and Treaty Rights

M-1: Indian Tribes will be notified annually

M-2: No impact on cultural resources.

N – Rangeland Resources

N-1: Permittee will be notified during annual operating meeting. While this site is within an active allotment, grazing does not appear to be a factor on this site.

N-2: EPA labels will be followed for grazing

O - Human Health

O-1: Backpack application rate limitations for sulfometuron methyl and NPE surfactants will be followed

O-2: picloram and sulfometuron application rates – NA, neither of these chemicals are being proposed for use.

O-3: Triclopyr application rates – NA, triclopyr will not be applied

P - Restoration

P-1: Passive restoration with post-treatment effectiveness monitoring to determine potential restoration opportunities

P-2: Not highly disturbed, not applicable

P-3: Broadcast application of herbicide – NA, no broadcast application is proposed.

4. ESA Consultation (Biological Opinion consistency)

The prescribed treatment is consistent with the terms and conditions and conservation measures outlined in the Biological Opinions.

5. Forest Plan Compliance Review

The project is consistent with the Forest Plan. Coordination with American Indian Tribes is occurring.

6. Pesticide Use Proposal

Site is to be included in annual Pesticide Use Proposal form FSM 2100-2.

7. Restoration

Passive restoration likely, however, as invasive plant cover decreases, the site will be evaluated for planting, seeding, and/or mulching opportunities.

8. Coordination

Forest will coordinate treatment with the grazing permittee via the annual operating plan and with private landowner to the north, see PDF N-1 and B-1.

9. FS Caps

This project will contribute approximately 2 acres (a small portion of which is riparian) toward the annual cap averaging 4,000 acres per year.

Appendix C – Wildlife

Information for Forest Service Sensitive Species suspected to be on the Umatilla National Forest and printed in the DEIS was not reprinted for the FEIS, but is available on request or on line at www.fs.fed.us/r6/uma/projects

That information includes:

Affected Environment

American peregrine falcon

Upland Sandpiper

Gray flycatcher

Northern Leopard Frog

Painted Turtle

Striped Whipsnake

Environmental Consequences

Effects to American peregrine falcon

Effects to Upland Sandpiper

Effects to Gray Flycatcher

Effects to Northern Leopard Frog

Effects to Painted Turtle

Effects to Striped Whipsnake

Exposure Groups for Forest Service Sensitive Wildlife

Effects of the Alternatives on Sensitive Wildlife

Tables 6 – 10 Herbicides, printed in the DEIS was not reprinted for the FEIS, but is available on request or on line at www.fs.fed.us/r6/uma/projects

Summary of Herbicide Effects to Wildlife – Shawna Bautista, printed in the DEIS was not reprinted for the FEIS, but is available on request or on line at www.fs.fed.us/r6/uma/projects

Appendix D – Soil and Water

General Herbicide Properties in Relation to Soil

Added between the DEIS and the FEIS

Chemical Treatment Sites with High Risk for Leaching and Wind Translocation

General Herbicide Properties in Relation to Soil

General characteristics for the proposed herbicides are displayed below; these were compiled from the R6 2005 FEIS, label information and SERA Risk Assessments, the Mount Hood National Forest and Columbia River Gorge National Scenic Area (Oregon side) Site-Specific Invasive Plant Treatment FEIS, and the Deschutes, Ochoco and Crooked River National Grasslands Invasive Plants EIS.

Chlorsulfuron

Studies on the effects of chlorsulfuron on soil biota include lab and field studies on nematodes; fungi; populations of actinomycetes, bacteria, and fungi; and soil microorganisms.

- No effects of chlorsulfuron were found for soil biota at recommended application rates, with the exception of transient decreases in soil nitrification.
- The ‘no observable effects concentration’ for soil is 10 mg/kg, based on cellulose and protein degradation.
- Chlorsulfuron degrades in aerobic soil.
- Non-microbial hydrolysis plays an important role in chlorsulfuron breakdown, and hydrolysis rates increase as pH increases.
- Adsorption to soil particles, which affects the runoff potential of chlorsulfuron, is strongly related to the amount of organic material in the soil.
- Chlorsulfuron adsorption to clay is low.
- Chlorsulfuron is moderately mobile at high pH.
- Leaching is reduced when pH is less than six.
- Modeling results indicate that runoff would be negligible in sandy or loamy soils.
- In clay soils, off-site loss could be substantial (up to about 55 percent of the applied amount) in regions with annual rainfall rates of 15 to 250 inches.

Clopyralid

Studies of clopyralid effects on soil invertebrates have been conducted, including field studies on the effects to microorganisms.

- Soil concentrations from USDA Forest Service applications are expected to be 1,000 less than concentrations that would cause toxic effects. Therefore, no effects to soil invertebrates or microorganisms are expected from use of clopyralid.
- Clopyralid is degraded by soil microbes, with an estimated half-life of 14 to 29 days, meaning that one-half of the amount applied remains in the soils after 90 days, one-fourth of the applied amount remains after 28 to 58 days, one-eighth after 42 to 87 days, and so on.
- Increased soil moisture decreases degradation time.

- Clopyralid is weakly adsorbed and has a moderate leaching potential overall but high leaching potential in sandy soils.
- Modeling results indicate clopyralid runoff is highest in clay soils with peaks after rainfall events.
- Clopyralid percolation is highest in sandy loam soils.

Glyphosate

Numerous soil bacteria, fungi, invertebrates, and other microorganisms have been studied for effects of glyphosate application.

- Studies suggest glyphosate does not adversely affect soil organisms.
- Glyphosate is readily metabolized by soil microorganisms and some species can use glyphosate as a sole source of carbon.
- It is degraded by microbial action in both soil and water.
- Sylvia and Jarstfer (1997) found that after 3 years, pine trees in plots with grassy invasive plants had 75 percent fewer mycorrhizal root tips than plots that had been treated 3 times per year with a mixture of glyphosate and metsulfuron methyl to remove invasive plants.
- Glyphosate degrades in soil, with an estimated half-life of 30 days.
- Glyphosate is highly soluble, but adsorbs rapidly and binds tightly to soil.
- Glyphosate has low leaching potential because it binds so tightly to soil.
- Modeling results indicate glyphosate runoff is highest in loam soils with peaks after the first rainfall.

Imazapic

Imazapic is a relatively new herbicide, and there are no studies on the effects of imazapic on either soil invertebrates or soil microorganisms.

- If imazapic was extremely toxic to soil microorganisms, it is reasonable to assume that secondary signs of injury to microbial populations would have been reported.
- Imazapic degrades in soil, with a half-life of about 113 days.
- Half-life is decreased by the presence of microflora.
- Imazapic is primarily degraded by microbes and it does not degrade appreciably under anaerobic conditions.
- Imazapic is weakly adsorbed in high soil pH, but adsorption increases with lower pH (acidic soils) and increasing clay and organic matter content.
- Field studies indicate that imazapic remains in the top 12 to 18 inches of soil and do not indicate any potential for imazapic to move with surface water.
- Modeling results indicate imazapic runoff is highest in clay and loam soils with peaks after the first rainfall.

- Imazapic percolation is highest in sandy soils.

Imazapyr

There are no studies on the effects of imazapyr on soil invertebrates, and incomplete information on the effects on soil microorganisms.

- One study indicates cellulose decomposition, a function of soil microorganisms, can be decreased by soil concentrations higher than concentrations expected from USDA Forest Service applications.
- There is no basis for asserting adverse effects to soil microorganisms.
- Imazapyr degrades in soil, with a half-life of 25 to 180 days.
- Degradation rates are highly dependent on microbial action.
- Anaerobic conditions slow degradation.
- Adsorption increases with time as soil dries and is reversible.
- Field studies indicate that imazapyr remains in the top 20 inches of soil and do not indicate any potential for imazapyr to move with surface water.
- In forest field studies, imazapyr did not run off and there was no evidence of lateral movement.
- Modeling results indicate imazapyr runoff is highest in clay and loam soils with peaks after the first rainfall.
- Imazapyr percolation is highest in sandy soils

Metsulfuron methyl

Studies on the effects of metsulfuron methyl on soil biota are limited to *Pseudomonas* species, though there are a few studies of insects that live in soil. The lowest observed effect concentration is 5 mg/kg, based on the *Pseudomonas* study. At recommended use rates, no effects are expected for insects.

- Effects to soil microorganisms appear to be transient
- Metsulfuron methyl degrades in soil, with a variable half-life up to 120 days.
- Half-life is decreased by the presence of organic matter though microbial degradation of metsulfuron methyl is slow.
- Non-microbial hydrolysis is slow at high pH but rapid at lower pH.
- Adsorption to soil particles, which affects the runoff potential of metsulfuron methyl, increased with increased pH and organic matter.
- Metsulfuron methyl has low adsorption to clay.
- Modeling results indicate that off-site movement due to runoff could be significant in clay soils.
- Metsulfuron methyl percolates in sandy soils.

Picloram

Picloram is a restricted use pesticide in the state of Washington, meaning it may only be used by a certified applicator (this is also a standard for all herbicide use on the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area). The persistence of picloram increases with soil concentration, thus increasing the likelihood that it becomes toxic to soil microorganisms in the short-term (1 to 3 years).

- Since picloram is toxic to microorganisms at low levels, toxic effects can last for some time after application.
- Persistence in soils could affect soil microorganisms by decreasing nitrification.
- Long-term effects to soil microorganisms are unknown.
- Picloram applied at a typical application rate is likely to change microbial metabolism, though detectable effects to soil productivity are not expected.
- Field studies have not noted substantial adverse effects associated with the normal application of picloram that might be expected if soil microbial activity were substantially damaged.
- Substantial effects to soil productivity from the use of picloram over the last 40 years have not been noted.
- Picloram has been studied on a number of soil invertebrates.
- Metabolites may increase toxicity for some soil microorganisms.
- Picloram has a typical half-life of 90 days. However, picloram soil degradation rates vary in soil, depending on application rate and soil depth.
- Picloram is water soluble, poorly bound to soils that are low in clays or organics, has a high leaching potential, and is most toxic in acidic soil.
- Picloram should not be used on coarse-textured soils with a shallow water table, where groundwater contamination is most likely to occur.
- Picloram percolation is highest in loam and sandy soils. However, modeling results indicate picloram runoff (not percolation) is highest in clay soils.

Sethoxydim

Sethoxydim has not been studied on soil invertebrates.

- Assays of soil microorganisms noted transient shifts in species composition at soil concentration levels far exceeding concentrations expected from USDA Forest Service application.
- No adverse effects to soil organisms are expected.
- Sethoxydim is degraded by soil microbes, with an estimated half-life of 1 to 60 days. Adsorption of sethoxymid varies with organic material content.
- Modeling results indicate sethoxymid runoff is highest in clay and loam soils with peaks after the first rainfall.

Sulfometuron methyl

There are no studies on the effects of sulfometuron methyl on soil invertebrates. However, it is toxic to soil microorganisms. Microbial inhibition is likely to occur at typical application rates and could be substantial. Soil residues may alter composition of soil microorganisms.

Sulfometuron methyl applied to vegetation at rates to control undesirable vegetation would probably be accompanied by secondary changes in the local environment that affect the soil microbial community more certainly than direct toxic action of sulfometuron methyl on microorganisms.

- The typical half-life for sulfometuron methyl varies from 10 to 100 days, depending on soil texture. Half-life decreases as soil particle size decreases. Presence of soil microorganisms also decreases half-life, though microbial breakdown occurs slowly. Sulfometuron methyl degradation occurs most rapidly at lower pH soils where rates are dominated by hydrolysis.
- Sulfometuron methyl mobility is generally greater at higher soil pH and lower organic matter content.
- Modeling results indicate sulfometuron methyl runoff is highest in clay and loam soils with peaks after the first rainfall. Sulfometuron methyl percolation is highest in sandy soils. Monitoring results generally support modeling results.
- Sulfometuron methyl applied to vegetation at typical application rates would probably be accompanied by secondary changes to vegetation that affect the soil microbial community more certainly than direct toxic action of sulfometuron methyl on soil microorganisms.

Triclopyr

The five commercial formulations of triclopyr contain one of two forms of triclopyr, BEE (butoxyethyl ester) or TEA (triethylamine). Triclopyr BEE is much more toxic to aquatic organisms than triclopyr TEA. A breakdown product, TCP (3,5,6-trichloro-2-pyridinol), is more toxic than either form of triclopyr. Site-specific cumulative effects analysis buffer determinations need to consider the form of triclopyr used and the proximity of any aquatic triclopyr applications, as well as toxicity to aquatic organisms.

- Triclopyr has not been studied on soil invertebrates.
- Soil fungi growth was inhibited at concentrations 2 to 5 times higher than concentrations expected from USDA Forest Service application rates.
- Triclopyr has an average half-life in soil of 46 days, while TCP has an average half-life in soil of 70 days. Warmer temperatures decrease the time to degrade triclopyr.
- Soil adsorption is increased as organic material increases and decreased as pH increases. Triclopyr is weakly adsorbed to soil, though adsorption varies with organic matter and clay content. Both light and microbes degrade triclopyr.

Chemical Treatment Sites with High Risk for Leaching and Wind Translocation

Sites were highlighted that have a high risk for either contamination to groundwater or relocation by wind for select herbicides. Where high risk, these herbicides were excluded from application unless site specific field verification proves lower risk. The risk for groundwater contamination is from soluble persistent herbicides as detailed in the hydrology analysis. The main risk is for picloram (Tordon K, 22K) and sulfometuron methyl (Oust, Oust XP) in soils coarser than loam, and clopyralid (Reclaim, Curtail, Transline) in loamy sand to sand soils according to herbicide labels. Also, there is a risk for wind relocation of chlorsulfuron (Telar, DF, and Glean) if applied on dry fine textured soils; chlorsulfuron has strong absorption, especially in clay soils.

As a coarse guide, the site locations were correlated to soils from the recently completed soil mapping as of June 2008 (Terrestrial Ecosystem Unit Survey for Umatilla NF Unpublished). Soil clay content, saturated conductivity and the water table depth were key variables used to delineate high risk sites. Initially, drainage from shallow bedrock soils was considered, though feedback from Forest personnel suggested that risk would be low since most of the bedrock is not extensively fractured within range soils that are primarily targeted for chemical treatments (Busskohl 2008, personal communication). Soil drainage was also considered within the landscape context. Footslope and bottomland soils were deemed higher risk for groundwater contamination than upland ridges and steep sideslopes. The northern portion of the forest currently lacks new information and therefore the older Soil Resource Inventory (USDA 1972) was used. Soil surface and subsurface texture, geology and soil depth were indicators used to assess herbicide limits.

The following sites represent an approximation since these findings rely on geographical information system analysis. Ultimately, the infield examination of soil texture and site context is the most reliable judgment for herbicide application. Table 1 below shows weed sites with target weed species and appropriate herbicide alternatives.

References:

Busskohl, C. 2008. [Personal communication]. Discussion and follow-up correspondence for risk of leaching on fractured bedrock for Wallowa Whitman NF. Zoned Forest Soil Scientist for Wallowa-Whitman NF and Umatilla NF. [Oct 24, 2008]

Terrestrial Ecosystem Unit Inventory. Unpublished. Region 6, Wallowa Whitman NF, Baker City, OR.

USDA Forest Service. Soil Resource Inventory For The Umatilla National Forest. USDA Forest Service, Region 6, Umatilla NF. Pendleton, OR.

Table 75. Chemical Treatment Sites with High Risk for Leaching and Wind Translocation

Site	Plant Code	Site (acres)	Soil Concern (Acres)	Recommended herbicide				Soil Limitations	Herbicide excluded
				Herbicide	Herbicide 2	Herbicide 3	Herbicide 4		
06140200003	CEDI3	48	6	Clopyralid	Glyphosate			Coarse soils	Picloram
06140200055	CEDI3	10	10	Clopyralid	Glyphosate			Coarse soils	Picloram
06140200115	HYPE	1	1	Metsulfuron methyl	Glyphosate			Coarse soils	Picloram
06140200192	CEDI3	2	1	Clopyralid	Glyphosate			Coarse soils	Picloram
06140200194	CEDI3	1	1	Clopyralid	Glyphosate			Coarse soils	Picloram
06140200196	CEDI3	6	4	Clopyralid	Glyphosate			Coarse soils	Picloram
06140200238	CIAR4	9	8	Clopyralid	Glyphosate	Chlorsulfuron		Coarse soils	Picloram
06140200267	CEDI3	11	8	Clopyralid	Glyphosate			Coarse soils	Picloram
06140200283	CEDI3	1	1	Clopyralid	Glyphosate			Coarse soils	Picloram
06140200340	CEDI3	10	10	Clopyralid	Glyphosate			Coarse soils	Picloram
06140200442	CEDI3	56	17	Clopyralid	Glyphosate			Coarse soils	Picloram
06140200454	CEDI3	25	5	Clopyralid	Glyphosate			Coarse soils	Picloram
06140200474	CEDI3	28	9	Clopyralid	Glyphosate			Coarse soils	Picloram
06140200492	CEDI3	35	9	Clopyralid	Glyphosate			Coarse soils	Picloram
06140200582	HYPE	18	7	Metsulfuron methyl	Glyphosate			Coarse soils	Picloram
06140200600	CEDI3	12	3	Clopyralid	Glyphosate			Coarse soils	Picloram
06140200664	CEDI3	31	10	Clopyralid	Glyphosate			Coarse soils	Picloram
06140200673	CEDI3	21	4	Clopyralid	Glyphosate			Coarse soils	Picloram
06140200770	CEDI3	58	4	Clopyralid	Glyphosate			Coarse soils	Picloram
06140200917	CEDI3	5	5	Clopyralid	Glyphosate			Coarse soils	Picloram
06140201119	CEDI3	4	4	Clopyralid	Glyphosate			Coarse soils	Picloram
06140201125	CEDI3	10	10	Clopyralid	Glyphosate			Coarse soils	Picloram
06140201377	CEDI3	5	5	Clopyralid	Glyphosate			Coarse soils	Picloram
06140201457	CEDI3	2	2	Clopyralid	Glyphosate			Coarse soils	Picloram

Site	Plant Code	Site (acres)	Soil Concern (Acres)	Recommended herbicide				Soil Limitations	Herbicide excluded
				Herbicide	Herbicide 2	Herbicide 3	Herbicide 4		
06140201577	CEDI3	20	6	Clopyralid	Glyphosate			Coarse soils	Picloram
06140201652	HYPE	6	6	Metsulfuron methyl	Glyphosate			Coarse soils	Picloram
06140201773	CEDI3	5	1	Clopyralid	Glyphosate			Coarse soils	Picloram
06140201948	CEDI3	2	2	Clopyralid	Glyphosate			Coarse soils	Picloram
06140201959	CEDI3	4	4	Clopyralid	Glyphosate			Coarse soils	Picloram
06140202169	CEDI3	373	28	Clopyralid	Glyphosate			Coarse soils	Picloram
06140202426	CEDI3	3	2	Clopyralid	Glyphosate			Coarse soils	Picloram
06140202505	CEDI3	6	5	Clopyralid	Glyphosate			Coarse soils	Picloram
06140202778	CEDI3	1	1	Clopyralid	Glyphosate			Coarse soils	Picloram
06140202828	CEDI3	6	4	Clopyralid	Glyphosate			Coarse soils	Picloram
06140202833	HYPE	2	1	Metsulfuron methyl	Glyphosate			Coarse soils	Picloram
06140202838	LIDA	5	5	Picloram	Imazapic (in native grasses)	Aquatic labeled Glyphosate		Clay soils	Chlorsulfuron
06140202917	HYPE	6	4	Metsulfuron methyl	Glyphosate			Coarse soils	Picloram
06140202919	HYPE	12	4	Metsulfuron methyl	Glyphosate			Coarse soils	Picloram
06140202935	LIDA	22	13	Picloram	Imazapic (in native grasses)	Aquatic labeled Glyphosate		Clay soils	Chlorsulfuron
06140202941	HYPE	2	2	Metsulfuron methyl	Glyphosate			Coarse soils	Picloram
06140202958	LIDA	2	2	Picloram	Imazapic (in native grasses)	Aquatic labeled Glyphosate		Clay soils	Chlorsulfuron
06140203021	CEDI3	221	22	Clopyralid	Glyphosate			Coarse soils	Picloram
06140203027	CEDI3	14	8	Clopyralid	Glyphosate			Coarse soils	Picloram

Site	Plant Code	Site (acres)	Soil Concern (Acres)	Recommended herbicide				Soil Limitations	Herbicide excluded
				Herbicide	Herbicide 2	Herbicide 3	Herbicide 4		
06140203031	CEDI3	39	3	Clopyralid	Glyphosate			Coarse soils	Picloram
06140203035	CEDI3	1	10	Clopyralid	Glyphosate			Coarse soils	Picloram
06140203035	CEDI3	34	10	Clopyralid	Glyphosate			Coarse soils	Picloram
06140203048	CEDI3	17	1	Clopyralid	Glyphosate			Coarse soils	Picloram
06140203056	HYPE	66	1	Metsulfuron methyl	Glyphosate			Coarse soils	Picloram
06140203069	CEDI3	7	3	Clopyralid	Glyphosate			Coarse soils	Picloram
06140203078	CEDI3	7	7	Clopyralid	Glyphosate			Coarse soils	Picloram
06140203080	CEDI3	7	5	Clopyralid	Glyphosate			Coarse soils	Picloram
06140203096	CEDI3	132	6	Clopyralid	Glyphosate			Shallow watertable	Picloram
06140203099	CEDI3	167	30	Clopyralid	Glyphosate			Coarse soils	Picloram
06140203106	CEDI3	10	1	Clopyralid	Glyphosate			Coarse soils	Picloram
06140203109	CEDI3	4	2	Clopyralid	Glyphosate			Coarse soils	Picloram
06140203115	CEDI3	25	18	Clopyralid	Glyphosate			Coarse soils	Picloram
6140400036	CESO3	60	16	Clopyralid	Glyphosate			Coarse and clay soils	Picloram
6140400036	CESO3	60	18	Clopyralid	Glyphosate			Coarse soils	Picloram
6140400054	CEDI3	200	200	Clopyralid	Glyphosate			Coarse and clay soils	Picloram
6140400059	CEDI3	212	18	Clopyralid	Glyphosate			Coarse soils	Picloram
6140400059	CEDI3	212	11	Clopyralid	Glyphosate			Coarse soils	Picloram
6140400059	CEDI3	212	7	Clopyralid	Glyphosate			Coarse and clay soils	Picloram
6140400063	CESO3	8	6	Clopyralid	Glyphosate			Coarse and clay soils	Picloram
6140400083	CEDI3	16	8	Clopyralid	Glyphosate			Coarse and clay soils	Picloram
6140400086	CEDI3	7	7	Clopyralid	Glyphosate			Coarse and clay soils	Picloram

Site	Plant Code	Site (acres)	Soil Concern (Acres)	Recommended herbicide				Soil Limitations	Herbicide excluded
				Herbicide	Herbicide 2	Herbicide 3	Herbicide 4		
6140400098	CEDI3	125	20	Clopyralid	Glyphosate			Coarse and clay soils	Picloram
6140400099	CEDI3	73	10	Clopyralid	Glyphosate			Coarse soils	Picloram
6140400119	CEDI3	292	8	Clopyralid	Glyphosate			Coarse and clay soils	Picloram
6140400119	CEDI3	292	35	Clopyralid	Glyphosate			Coarse soils	Picloram
6140400119	CEDI3	292	71	Clopyralid	Glyphosate			Coarse and clay soils	Picloram
6140400132	CEDI3	80	30	Clopyralid	Glyphosate			Coarse and clay soils	Picloram
6140400146	CEBI2	95	33	Clopyralid	Glyphosate			Coarse and clay soils	Picloram
6140400146	CEBI2	95	59	Clopyralid	Glyphosate			Coarse and clay soils	Picloram
6140400166	ONAC	30	17	Clopyralid	Chlorsulfuron	Metsulfuron	Aquatic labeled Glyphosate	Coarse soils	Picloram
6140400168	CEDI3	23	23	Clopyralid	Glyphosate			Coarse soils	Picloram
6140400186	CEDI3	18	12	Clopyralid	Glyphosate			Coarse and clay soils	Picloram
6140400191	CESO3	134	130	Clopyralid	Glyphosate			Coarse and clay soils	Picloram
6140400194	ONAC	159	18	Clopyralid	Metsulfuron	Aquatic labeled Glyphosate		Coarse and clay soils	Picloram, Chlorsulfuron
6140400201	CEDI3	42	39	Clopyralid	Glyphosate			Coarse and clay soils	Picloram
6140400233	CEDI3	20	14	Clopyralid	Glyphosate			Coarse and clay soils	Picloram

Site	Plant Code	Site (acres)	Soil Concern (Acres)	Recommended herbicide				Soil Limitations	Herbicide excluded
				Herbicide	Herbicide 2	Herbicide 3	Herbicide 4		
6140400236	ONAC	33	18	Clopyralid	Metsulfuron	Aquatic labeled Glyphosate		Coarse and clay soils	Picloram, Chlorsulfuron
6140400236	ONAC	33	13	Clopyralid	Metsulfuron	Aquatic labeled Glyphosate		Coarse and clay soils	Picloram, Chlorsulfuron
6140400238	CEDI3	118	15	Clopyralid	Glyphosate			Coarse and clay soils	Picloram
6140400238	CEDI3	118	13	Clopyralid	Glyphosate			Coarse soils	Picloram
6140400287	CESO3	286	146	Clopyralid	Glyphosate			Coarse and clay soils	Picloram
6140400287	CESO3	286	5	Clopyralid	Glyphosate			Coarse soils	Picloram
6140400287	CESO3	286	54	Clopyralid	Glyphosate			Coarse soils	Picloram
6140400303	CEDI3	10	5	Clopyralid	Glyphosate			Coarse and clay soils	Picloram
6140400358	CEDI3	9	7	Clopyralid	Glyphosate			Coarse and clay soils	Picloram
6140400432	CEDI3	9	7	Clopyralid	Glyphosate			Coarse and clay soils	Picloram
6140400438	CEDI3	8	6	Clopyralid	Glyphosate			Coarse soils	Picloram
6140400499	CESO3	6	6	Clopyralid	Glyphosate			Coarse and clay soils	Picloram
6140400516	CEBI2	32	7	Clopyralid	Glyphosate			Coarse and clay soils	Picloram
6140400520	CYOF	44	17	Metsulfuron methyl	Chlorsulfuron	Imazapic	Glyphosate	Coarse soils	Picloram
6140400524	CEBI2	30	10	Clopyralid	Glyphosate			Coarse soils	Picloram
6140400543	CEBI2	125	26	Clopyralid	Glyphosate			Coarse soils	Picloram
6140400543	CEBI2	125	95	Clopyralid	Glyphosate			Coarse and clay soils	Picloram

Site	Plant Code	Site (acres)	Soil Concern (Acres)	Recommended herbicide				Soil Limitations	Herbicide excluded
				Herbicide	Herbicide 2	Herbicide 3	Herbicide 4		
6140400545	CEBI2	9	5	Clopyralid	Glyphosate			Coarse and clay soils	Picloram
6140400546	CIAR4	869	24	Clopyralid	Glyphosate	Chlorsulfuron	Biocontrols on some sites.	Coarse soils	Picloram
6140400546	CIAR4	869	240	Clopyralid	Picloram	Glyphosate	Biocontrols on some sites.	Clay soils	Picloram, Chlorsulfuron
6140400546	CIAR4	869	14	Clopyralid	Glyphosate	Biocontrols on some sites.		Coarse and clay soils	Picloram, Chlorsulfuron
6140400549	CEBI2	84	7	Clopyralid	Glyphosate			Coarse and clay soils	Picloram
6140400549	CEBI2	84	17	Clopyralid	Glyphosate			Coarse soils	Picloram
06140500017	CEDI3	141	7	Clopyralid	Glyphosate			Coarse soils	Picloram
06140500035	CEDI3	1	1	Clopyralid	Glyphosate			Coarse soils	Picloram
06140500045	CEBI2	26	23	Clopyralid	Glyphosate			Coarse soils	Picloram
06140500045	CEBI2	26	3	Clopyralid	Glyphosate			Shallow watertable	Picloram
06140500048	CYOF	38	5	Metsulfuron methyl	Chlorsulfuron	Imazapic	Glyphosate	Coarse soils	Picloram
06140500051	CEBI2	13	10	Clopyralid	Glyphosate			Coarse soils	Picloram
06140500056	CYOF	7	2	Metsulfuron methyl	Chlorsulfuron	Imazapic	Glyphosate	Coarse soils	Picloram
06140500058	CYOF	221	17	Metsulfuron methyl	Chlorsulfuron	Imazapic	Glyphosate	Coarse soils	Picloram
06140500064	CEDI3	11	11	Clopyralid	Glyphosate			Coarse soils	Picloram
06140500071	CYOF	2	1	Metsulfuron methyl	Chlorsulfuron	Imazapic	Glyphosate	Coarse soils	Picloram
06140500071	CYOF	2	1	Metsulfuron methyl	Picloram	Imazapic	Glyphosate	Clay soils	Chlorsulfuron

Site	Plant Code	Site (acres)	Soil Concern (Acres)	Recommended herbicide				Soil Limitations	Herbicide excluded
				Herbicide	Herbicide 2	Herbicide 3	Herbicide 4		
06140500073	CYOF	141	14	Metsulfuron methyl	Chlorsulfuron	Imazapic	Glyphosate	Coarse soils	Picloram
06140500073	CYOF	141	2	Metsulfuron methyl	Picloram	Imazapic	Glyphosate	Clay soils	Chlorsulfuron
06140500076	CEDI3	10	7	Clopyralid	Glyphosate			Coarse soils	Picloram
06140500077	CEDI3	7	7	Clopyralid	Glyphosate			Coarse soils	Picloram
06140500080	CEDI3	106	4	Clopyralid	Glyphosate			Coarse soils	Picloram
06140500087	CYOF	117	33	Metsulfuron methyl	Chlorsulfuron	Imazapic	Glyphosate	Coarse soils	Picloram
06140500093	SEJA	1	1	Clopyralid	Chlorsulfuron	Glyphosate		Coarse soils	Picloram
06140500142	CEBI2	2	2	Clopyralid	Glyphosate			Coarse soils	Picloram
06140500156	CYOF	58	3	Metsulfuron methyl	Chlorsulfuron	Imazapic	Glyphosate	Coarse soils	Picloram
06140500165	CYOF	103	8	Metsulfuron methyl	Chlorsulfuron	Imazapic	Glyphosate	Coarse soils	Picloram
06140500166	CYOF	74	5	Metsulfuron methyl	Chlorsulfuron	Imazapic	Glyphosate	Coarse soils	Picloram
06140500167	CEDI3	44	26	Clopyralid	Glyphosate			Coarse soils	Picloram
06140500177	CEDI3	11	10	Clopyralid	Glyphosate			Coarse soils	Picloram
06140500229	CYOF	2	2	Metsulfuron methyl	Chlorsulfuron	Imazapic	Glyphosate	Coarse soils	Picloram
06140500245	CYOF	92	26	Metsulfuron methyl	Chlorsulfuron	Imazapic	Glyphosate	Coarse soils	Picloram
06140500265	CYOF	74	5	Metsulfuron methyl	Chlorsulfuron	Imazapic	Glyphosate	Coarse soils	Picloram
06140500270	CYOF	149	2	Metsulfuron methyl	Chlorsulfuron	Imazapic	Glyphosate	Coarse soils	Picloram
06140500291	CYOF	96	8	Metsulfuron methyl	Chlorsulfuron	Imazapic	Glyphosate	Coarse soils	Picloram

Site	Plant Code	Site (acres)	Soil Concern (Acres)	Recommended herbicide				Soil Limitations	Herbicide excluded
				Herbicide	Herbicide 2	Herbicide 3	Herbicide 4		
06140500313	HYPE	5	5	Metsulfuron methyl	Glyphosate			Coarse soils	Picloram
06140500322	HYPE	25	5	Metsulfuron methyl	Glyphosate			Coarse soils	Picloram
06140500357	CEDI3	3	1	Clopyralid	Glyphosate			Coarse soils	Picloram
06140500366	CEBI2	4	4	Clopyralid	Glyphosate			Coarse soils	Picloram
06140500368	CEDI3	2	2	Clopyralid	Glyphosate			Coarse soils	Picloram
06140500373	CYOF	7	2	Metsulfuron methyl	Chlorsulfuron	Imazapic	Glyphosate	Coarse soils	Picloram
06140500378	CEBI2	91	24	Clopyralid	Glyphosate			Coarse soils	Picloram
06140500380	CIAR4	7	2	Clopyralid	Glyphosate	Chlorsulfuron		Coarse soils	Picloram
06140500398	CEDI3	4	4	Clopyralid	Glyphosate			Coarse soils	Picloram
06140500400	CEBI2	1	1	Clopyralid	Picloram	Glyphosate		Coarse soils	Picloram
06140500441	CEDI3	3	1	Clopyralid	Glyphosate			Coarse soils	Picloram
06140500457	PORE5	27	27	Metsulfuron methyl+				Coarse soils	Picloram
06140500513	PORE5	17	2	Picloram	Metsulfuron methyl+			Coarse soils	Picloram
06140500546	CIAR4	2	2	Clopyralid	Glyphosate	Chlorsulfuron		Coarse soils	Picloram
06140500554	CYOF	2	2	Metsulfuron methyl	Chlorsulfuron	Imazapic	Glyphosate	Coarse soils	Picloram
06140500581	CYOF	31	1	Metsulfuron methyl	Chlorsulfuron	Imazapic	Glyphosate	Coarse soils	Picloram
06140500583	CYOF	9	1	Metsulfuron methyl	Chlorsulfuron	Imazapic	Glyphosate	Coarse soils	Picloram
06140500584	CYOF	58	10	Metsulfuron methyl	Chlorsulfuron	Imazapic	Glyphosate	Coarse soils	Picloram
06140500602	CYOF	35	3	Metsulfuron methyl	Chlorsulfuron	Imazapic	Glyphosate	Coarse soils	Picloram

Site	Plant Code	Site (acres)	Soil Concern (Acres)	Recommended herbicide				Soil Limitations	Herbicide excluded
				Herbicide	Herbicide 2	Herbicide 3	Herbicide 4		
6140600004	CANU4	31	6	Clopyralid	Metsulfuron methyl	Glyphosate		Coarse and clay soils	Chlorsulfuron
6140600067	CIAR4	28	15	Clopyralid	Picloram	Glyphosate	Biocontrols	Clay soils	Chlorsulfuron
6140600067	CIAR4	28	5	Clopyralid	Picloram	Glyphosate	Biocontrols	Clay soils	Chlorsulfuron
6140600073	CEDI3	27	12	Clopyralid	Picloram	Glyphosate	Biocontrols	Clay soils	Chlorsulfuron
6140600079	CIAR4	24	17	Clopyralid	Picloram	Glyphosate	Biocontrols	Clay soils	Chlorsulfuron
6140600273	CEBI2	63	47	Clopyralid	Glyphosate			Coarse and clay soils	Picloram
6140600340	CIAR4	45	40	Clopyralid	Picloram	Glyphosate	Biocontrols	Clay soils	Chlorsulfuron
6140600407	CIAR4	40	18	Clopyralid	Picloram	Glyphosate	Biocontrols	Clay soils	Chlorsulfuron
6140600426	CIAR4	86	10	Clopyralid	Glyphosate	Biocontrols		Coarse and clay soils	Picloram, Chlorsulfuron
6140600435	CIAR4	24	23	Clopyralid	Picloram	Glyphosate	Biocontrols	Clay soils	Chlorsulfuron
6140600478	CIAR4	60	31	Clopyralid	Picloram	Glyphosate	Biocontrols	Clay soils	Chlorsulfuron
6140601098	CYOF	27	25	Metsulfuron methyl	Picloram	Imazapic	Glyphosate	Clay soils	Chlorsulfuron

Appendix E – Aquatics

A table indentifying ‘Roads with Proposed Chemical Treatments within 100 Feet of a Fish-Bearing Stream’ printed in the DEIS was not reprinted for the FEIS, but is available on request or on line at www.fs.fed.us/r6/uma/projects

The item ‘Effects of Active Ingredients in Herbicide to Aquatic Organisms’ printed in the DEIS was not reprinted for the FEIS, but is available on request or on line at www.fs.fed.us/r6/uma/projects

Appendix F – Aerial Spray Guidelines and Drift Model Results

Information for ‘Aerial Spray Guidelines and Drift Model Results’ printed in the DEIS was not reprinted for the FEIS, but is available on request or on line at www.fs.fed.us/r6/uma/projects

Appendix G – Adjuvants and Surfactants

This appendix is new since the DEIS was published

Table 76. Adjuvants and Drift Reduction Agents Approved for Use on the Umatilla National Forest (Derived from R6 2005 FEIS).

Formulations	Ingredients of Adjuvants (aka Category))	Manufacturer	Washington State Approved for Aquatic Areas	Risk Assessment ID (comment)
<i>Activator 90®</i>	Alkylphenol ethoxylate-based wetter/spreaders (non-ionic) aka NPE	Loveland Products		
<i>Activator N.F.</i>	Alcohol ethoxylate-based wetter/spreaders (non-ionic)	Loveland Products		<i>may no longer be available</i>
<i>Agri-dex®</i>	Crop Oils and Crop Oil Concentrates	Helena Chemical Co.	YES	
<i>Bond®</i>	Sticker/Spreaders	Loveland Products	YES	
<i>Cide Kick® II™</i>	Vegetable or Seed Oils	Brewer International		
<i>Cide-Kick®</i>	Vegetable or Seed Oils	Brewer International		
<i>Class Act® Next Generation</i>	Fertilizer/Surfactant Mixtures	Agrilliance, LLC		<i>Class Act® Next Generation in section 1</i>
<i>Cohere®</i>	Sticker/Spreaders	Helena Chemical Co		
<i>Colorfast™ Purple</i>	Colorants and Dyes	Becker-Underwood, Inc		Contains Gentian Violet, potential carcinogen. Refer to SERA, 1997
<i>Competitor</i>	Vegetable or Seed Oils	Wilbur-Ellis Company		
<i>Cygnat Plus</i>	Vegetable or Seed Oils	Brewer International	YES	
<i>Dyne-Amic®</i>	Vegetables Oils and Silicone Blends	Helena Chemical Co	YES	
<i>Entry™ II</i>	Ethoxylated fatty amines (Cationic)	Monsanto Company		
	aka POEA			
<i>First Choice® Exciter</i>	Fertilizer/Surfactant Mixtures	Western Farm Service	YES	
<i>Foaminator™</i>	Defoamers	Agrilliance, LLC		
<i>Freeway®</i>	Silicone-based wetter/spreaders	Loveland Products		
<i>Hasten®</i>	Vegetable or Seed Oils	Wilbur-Ellis Company		
<i>Herbimax®</i>	Crop Oils and Crop Oil Concentrates	Loveland Products		
<i>Hi-Light™ Blue</i>	Colorants and Dyes	Becker-Underwood, Inc		Not durable. Lasts hours.
<i>Improved JLB Oil Plus</i>	Vegetable or Seed Oils	Brewer International		
<i>In-Place®</i>	Drift reduction agents	Wilbur Ellis Company		Efficacy of drift reduction agents is

Formulations	Ingredients of Adjuvants (aka Category))	Manufacturer	Washington State Approved for Aquatic Areas	Risk Assessment ID (comment)
				unknown
<i>Intensify</i>	Fertilizer/Surfactant Mixtures	West Link Ag	YES	
<i>InterLock®</i>	Drift reduction agents	Agrisolutions	YES	Efficacy of drift reduction agents is unknown
<i>Kerosene, deodorized</i>	Crop Oils and Crop Oil Concentrates	found in the triclopyr formulation Garlon 4		
<i>Kinetic™</i>	Silicone-based wetter/spreaders	Helena Chemical Company	YES	
<i>Latron AG-98 (N)®</i>	Alkylphenol ethoxylate-based wetter/spreaders (non-ionic)	Dow AgroSciences LLC		<i>may no longer be available</i>
	a NPE			
<i>Latron AG-98®</i>	Alkylphenol ethoxylate-based wetter/spreaders (non-ionic)	Dow AgroSciences LLC		<i>may no longer be available</i>
	aka NPE			
<i>LI-700®</i>	Acidifiers	Loveland Products	YES	
<i>Liberate®</i>	Drift reduction agents	Loveland Products	YES	Efficacy of drift reduction agents is unknown
<i>Magnify</i>	Fertilizer/Surfactant Mixtures	Monterey AgResources	YES	
<i>MSO®</i>	Vegetable and Seed Oils	Loveland Products		
<i>No Foam</i>	Defoamers	Wilbur Ellis Company		
<i>No Foam Dry</i>	Defoamers	Wilbur Ellis Company		
<i>No Foam® B</i>	Defoamers	Creative Marketing and Research		
<i>Phase™</i>	Vegetables Oils and Silicone Blends	Loveland Products		
<i>Pro-Spreader Activator</i>	Alkylphenol ethoxylate-based wetter/spreaders (non-ionic)	Target Specialty Products, Inc.		
	aka NPE			
<i>R-11®</i>	Alkylphenol ethoxylate-based wetter/spreaders (non-ionic)	Wilbur-Ellis Company		
	aka NPE			
<i>R-56®</i>	Sticker/Spreaders	Wilbur-Ellis Co.		

Formulations	Ingredients of Adjuvants (aka Category)	Manufacturer	Washington State Approved for Aquatic Areas	Risk Assessment ID (comment)
<i>Red-Top Mor-Act[®]</i>	Crop Oils and Crop Oil Concentrates	Wilbur-Ellis Company		
<i>Roundup[®] has 15% POEA in this formulation</i>	Ethoxylated fatty amines (Cationic)			
	aka POEA			
<i>Silwet L-77[®]</i>	Silicone-based wetter/spreaders	Loveland and Helena		
<i>Sinker</i>	Drift reduction agents	Helena Chemical Company	YES	Efficacy of drift reduction agents is unknown
<i>Sylgard[®] 309</i>	Silicone-based wetter/spreaders	Wilbur-Ellis Company		
<i>Syl-tac[™]</i>	Vegetables Oils and Silicone Blends	Brewer International		
<i>Tactic[™]</i>	Sticker/Spreaders	Loveland Products	YES	
<i>The surfactant in Pathfinder[™] II (a triclopyr formulation)</i>	Oils	Dow AgroSciences		
<i>Tri-fo[®]</i>	Acidifiers	Wilbur Ellis Company		
<i>X-77[®]</i>	Alkylphenol ethoxylate-based wetter/spreaders (non-ionic)	Loveland Industries		
	aka NPE			