United States Department of Agriculture

Forest Service

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Final Environmental Impact Statement

Site-Specific Invasive Plant Treatments for Mt. Hood National Forest and Columbia River Gorge National Scenic Area in Oregon, including Forest Plan Amendment #16

Mt. Hood National Forest and Columbia River Gorge National Scenic Area

Clackamas, Hood River, Multnomah, and Wasco Counties

Guiding Principles for Invasive Plant Treatment

Preamble

Invasive plants currently infest up to 13,000 acres of land on the Mt. Hood National Forest and the Columbia River Gorge National Scenic Area. These aggressive plants are spreading at the rate of 8 to 12 percent each year, and have the capacity to overwhelm and even wipe out native plant species.

The USDA Forest Service proposes to control, contain, or eradicate these invasive plants using a variety of treatment methods. We have developed the following Guiding Principles to provide an overall framework for applying these treatments.

Invasive plants are threatening healthy, native communities and function. Treatment of existing invasive plants and restoration of native plant communities are needed to meet the Forest and Scenic Area's land management goals and objectives. We will effectively treat invasive plants while minimizing adverse effects of treatment.

Guiding Principles

- In treating invasive plants, our highest priority will be to minimize risks to human health; drinking water; and botanical, wildlife or aquatic species.
- Herbicide treatments will be used when necessary and in combination with non-herbicide methods to increase treatment and cost effectiveness.
- We will notify the public prior to using herbicides through announcements in local newspapers and by posting treatment areas at all access points.
- This decision does not authorize aerial application of herbicides.
- Only herbicides analyzed in this environmental impact statement (EIS) will be used.
- We will employ rapid response to new invaders using treatment methods and guidelines established within this EIS.
- Site restoration will be considered in invasive plant treatment prescriptions.

Site-Specific Invasive Plant Treatments for Mt. Hood National Forest and Columbia River Gorge National Scenic Area in Oregon, Including Forest Plan Amendment #16

Final Environmental Impact Statement
Clackamas, Hood River, Multnomah and Wasco Counties

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Abstract

The Mt. Hood National Forest (Forest) and Columbia River Gorge National Scenic Area in Oregon (Scenic Area) are proposing invasive plant treatments on 208 sites (approximately 13,000 acres). The purpose of this project is to eradicate, contain and control invasive plant infestations, to reverse the negative impacts caused by invasive plants, and to restore healthy, native plant communities and functions at the impacted sites in a cost-effective manner that meets current management direction. The establishment and spread of invasive plants can be slowed, with timely action. The EIS tiers to the *Pacific Northwest Region Invasive Plant Program – Preventing and Managing Invasive Plants* Record of Decision (USDA Forest Service, 2005b) and Final Environmental Impact Statement (USDA Forest Service, 2005a).

Three alternatives are considered:

- No Action Alternative (Alternative 1),
- Proposed Action (Alternative 2), and
- Restricted Herbicide Use Alternative (Alternative 3).

The No Action Alternative would continue current invasive plant management occurring under existing NEPA documents on the Forest and Scenic Area. The Proposed Action would utilize integrated weed management treatments. The treatments include: 30 acres of herbicide only treatment; 50 acres of manual and mechanical treatments; 310 acres of herbicide plus mechanical treatments; 327 acres of herbicide plus manual treatments; 1510 acres of herbicide plus manual, mechanical, and cultural; 10,736 acres of herbicide plus manual and mechanical treatments. Additional acres would be added through an early detection / rapid response strategy (EDRR). All sites have an associated restoration strategy. The Restricted Herbicide Use Alternative reduces the amount of herbicide treatments, but retains manual, mechanical and cultural treatments on all 13,000 acres.

Implementation of the two action alternatives is expected to reduce the rate of spread of existing and future infestations of invasive plants on the Forest and Scenic Area. All of the action alternatives would increase the cost and effectiveness of invasive plant management. All of the action alternatives protect human health and the environment.

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ACRONYM LIST	
A-1	General Management Area Large Scale Agriculture (Scenic Area Designation)
ACHP	Advisory Council on Historic Preservation
Ag	Special Management Area Agriculture (Scenic Area Designation)
AIZ	Aquatic Influence Zone
APHIS	Agricultural Plant Health and Insect Service
AQ	Aquatic
ATSDR	Agency for Toxic Substances and Disease Registry
ATV	All Terrain Vehicle
AWA	Administratively Withdrawn Areas
BA	Biological Assessment
BCF	Bioconcentration Factor
BE	Biological Evaluation
BEE	Butoxyethyl Ester
BIA	U.S. Department of Interior, Bureau of Indian Affairs
BLM	U.S. Department of Interior, Bureau of Land Management
BMP	Best Management Practices
BO	Biological Opinion
BPA	Bonneville Power Administration
C	Candidate Wildlife Species
CAS	Chemical Abstract Service
CBI	Confidential Business Information
CE	Cumulative Effects
CFR	Code of Federal Regulations
CHU	Critical Habitat Unit
CRGNSA	Columbia River Gorge National Scenic Area
CTWS	Confederated Tribes of Warm Springs
CW	Coniferous Woodland (Scenic Area Designation)
CWA	Clean Water Act
DEQ	Department of Environmental Quality
DO	Dissolved Oxygen
DPS	Distinct Population Segment
E	Endangered Wildlife Species
EA	Environmental Assessment
EDRR	Early Detection / Rapid Response Strategy
EEC	Estimated Environmental Concentration
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionary Significant Unit
F	Special Management Area Forest (Scenic Area Designation)
FDA	U.S. Food and Drug Administration
FEIS	Final Environmental Impact Statement
FEMAT	Forest Ecosystem Management Assessment Team
FHP	Forest Health Protect

ACRONYM LIST	
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FR	Federal Register
FSH	USDA Forest Service Handbook
FSM	USDA Forest Service Manual
FWS	U.S. Department of Interior, Fish & Wildlife Services
FY	Fiscal Year
G	Grasslands (Scenic Area Designation)
GeoBOB	Geographic Biotic Observations Geodatabase
GIS	Geographic Information System
GLEAMS	Groundwater Loading Effects of Agricultural Management Systems
GMA	General Management Area (Scenic Area Designation)
GW	Gorge walls, Canyon Lands and Wildlands (Scenic Area Designation)
h	Herbicide treatment
HQ	Hazard Quotient
HRCH	Historic Columbia River Highway
ICBEMP	Interior Columbia Basin Ecosystem Management Project
IDT	Interdisciplinary Team
ISMS	Interagency Species Management System
IWM	Integrated Weed Management
KVA	Key Viewing Area
LAA	May Affect, Likely to Adversely Affect
LFL	Likely to Cause a Trend to Federal Listing or Loss of Viability
LMS	Larch Mountain Salamander
LOAEL	Lowest Observed Adverse Effect Level
LOC	Level of Concern
LRMP	Land & Resource Management Plan
LS	Landscape Setting (Scenic Area Designation)
LSR	Late-Successional Reserves
LUD	Land Use Designation
MIIH	May Impact Individuals or Habitat, but Will Not Likely Contribute towards Federal Listing or Lost of Viability to the Population or Species
MIS	Management Indicator Species
mm	Manual and mechanical treatments
mmh	Manual, mechanical and herbicide treatments
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSDS	Material Safety Data Sheet
MTH	Mt. Hood National Forest
N/A (or NA)	Not Available
NAA	Not Adversely Affected
NE	No Effect
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NHPA	National Historic Preservation Act
NI	No Impact
NIS	Non-Ionic Surfactants
NLAA	May Affect, Not Likely to Adversely Affect
NLFL	May Impact Individual, but Not Likely to Cause a Trend to Federal Listing or Loss of Viability

ACRONYM LIST	
NMFS	National Marine Fisheries Service
NOAA	U.S. Department of Commerce, National Oceanic & Atmospheric Administration.
NOAEL	No Observed Adverse Effect Level
NOEC	No Observable Effects Concentration
NOEL	No-Observed-Effect-Level
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPE	Nonylphenol Polyethoxylate
NRC	National Research Council
NRF	Nesting, Roosting and Foraging Habitat
NRIS	Natural Resource Information Systems
NTV	No Toxicity Value
NVE	Not Visually Evident (Retention)
NVUM	National Visitor Use Monitoring
NWFP	Northwest Forest Plan
NWPS	National Wilderness Preservation System
ODA	Oregon Department of Agriculture
OHD	Oregon Health Division
OHV	Off-Highway Vehicles
OPP	Office of Pesticide Programs
OR	Oregon
ORV	Outstandingly Remarkable Values
OS	Special Management Area – Open Space (Scenic Area Designation)
OS GMA	General Management Area – Open Space (Scenic Area Designation)
OSHA	Occupational Health and Safety Administration
OSS	Oregon Slender Salamander
OSU	Oregon State University
OW	Oak Woodlands (Scenic Area Designation)
P	Pastoral (Scenic Area Designation)
PAYCO	Payments to Counties
PCE	Primary Constituent Elements
PDC	Project Design Criteria
PETS	Proposed, Endangered, and Threatened Species
PIF	Partners in Flight
POEA	Polyethoxylated Tallow Amine
PPE	Personal Protective Equipment
PR	Public Recreation (Scenic Area Designation)
PVT	Potential Vegetation Type
R	General Management Area – Residential (Scenic Area Designation)
R6	USDA Forest Service, Pacific Northwest Region (Oregon and Washington)
RB	River Bottomlands (Scenic Area Designation)
RfD	Reference Dose
ROD	Record of Decision
RR	Riparian Reserve
RR in P	General Management Area – Rural Residential in Pastoral (Scenic Area Designation)
RTU	Ready to Use

ACRONYM LIST	
SC	Sensitive-Critical Wildlife Species
SERA	Syracuse Environmental Research Associates, Inc.
SHPO	State Historic Preservation Office
SMA	Special Management Area (Scenic Area Designation)
SMS	Scenery Management System
SOLI	Species of Local Interest
SRD	Sandy River Delta
SRI	Soil Resource Inventory
ssp	Species
SU	Sensitive-Undetermined Wildlife Species
SV	Sensitive-Vulnerable Wildlife Species
SWCD	Soil and Water Conservation District
SWDA	Safe Drinking Water Act
T	Threatened Wildlife Species
T,E,S&P	Threatened, Endangered, Sensitive, and Proposed Species
TCP	3,5,6-Trichloro-2-Pyridinol
TEA	Triethylamine
TES	Threatened, Endangered, or Sensitive
TMDL	Total Maximum Daily Loads
UA	Urban Area (Scenic Area Designation)
USDA	U.S. Department of Agriculture
USDI	U.S. Department of Interior
VQO	Visual Quality Objectives
VS	Visual Subordinance (Partial Retention)
WA	Washington
WQRP	Water Quality Restoration Plan

MEASUREMENT ABBREVIATIONS	
a.i.	Active Ingredient
ac	Acre
cfs	Cubic Feet per Second
cm	Centimeter
dB	Decibels
dbh	Diameter at Breast Height
g	Gram
kg	Kilogram
$K_{o/c}$	Organic Carbon Partition Coefficient
L	Litter
lb ai	Pounds of Active Ingredient
LC_{50}	Lethal Concentration, 50% Mortality
LD_{50}	Lethal Dose, 50% Mortality
LD_{95}	Lethal Dose, 95% Mortality
m	Meter
mg	Milligram
mg/kg/day	Milligrams of Agent per Kilogram of Body Weight per Day
mg/L	Milligrams per Liter
mi/mi^2	Miles per Square Mile
mL	Milliliter
mm	Millimeter
ppm	Parts per Million
RfD	Reference Dose

COMMON UNIT CONVERSIONS		
To convert . . .	**Into . . .**	**Multiply by . . .**
Acres (ac)	Hectares (ha)	0.4047
Acres (ac)	Square meters (m^2)	4,047
Atmospheres	Millimeters of Mercury	760
Centigrade (C^o)	Fahrenheit (F^o)	1.8C°+32
Centimeters (cm)	Inches (in)	0.3937
Cubic Meters (m^3)	liters (L)	1,000
Fahrenheit (F^o)	Centigrade (C^o)	0.556F°-17.8
Feet per Second (ft/sec)	Miles/Hour (mi/hr)	0.6818
Gallons (gal)	Liters (L)	3.785
Gallons per Acre (gal/acre)	Liters per Hectare (L/ha)	9.34
Grams (g)	Ounces (oz)	0.03527
Grams (g)	Pounds (oz)	0.002205
Hectares (ha)	Acres (ac)	2.471
Hectares (ha)	Square Meters (m^2)	10,000
Inches (in)	Centimeters (cm)	2.540
Kilograms (kg)	Ounces, (oz)	35.274
Kilograms (kg)	Pounds (lb)	2.2046
Kilograms per Hectare (hg/ha)	Pounds per Acre (lb/acre)	0.892
Kilometers (km)	Miles (mi)	0.6214
Liters (L)	Cubic Centimeters (cm^3)	1,000
Liters (L)	Gallons (gal)	0.2642
Liters (L)	Ounces, fluid (oz)	33.814
Meters (m)	Feet (ft)	3.281
Miles (mi)	Kilometers (km)	1.609
Miles per Hour (mi/hr)	Centimeter per Second (cm/sec)	44.70
Milligrams (mg)	Ounces (oz)	0.000035
Ounces (oz)	Grams (g)	28.3495
Ounces Fluid (oz)	Cubic Centimeters (cm^3)	29.5735
Ounces per Acre (oz/acre)	Grams per Hectare (g/ha)	70.1
Ounces per Acre (oz/acre)	Kilograms per Hectare (kg/ha)	0.0701
Pounds (lb)	Grams (g)	453.6
Pounds (lb)	Kilograms (kg)	0.4536
Pounds per Acre (lb/acre)	Kilograms per Hectare (kg/ha)	1.121
Pounds per Acre (lb/acre)	Milligrams per Square Meter (mg/m^2)	112.1
Pounds per Acre (lb/acre)	Grams per Square Centimeter (g/cm^2)	11.21
Pounds per Gallon (lb/gal)	Grams per Liter (g/L)	119.8
Square Centimeters (cm^2)	Square Inches (in^2)	0.155
Square Centimeters (cm^2)	Square Meters (m^2)	0.0001
Square Meters (m^2)	Square Centimeters (cm^2)	10,000
Yards (yds)	Meters (m)	0.9144

Note: All references to pounds and ounces refer to avoirdupois weights unless otherwise specified.

Source: Table taken from SERA Risk Assessments (1997a, 1997b, 1999a, 1999b, 2001a, 2001c, 2003a, 2003b, 2003c, 2003d, 2003e, 2003f).

CHAPTER 1
Purpose and Need for Action

CHAPTER 1: Purpose and Need

The USDA Forest Service has prepared this Environmental Impact Statement in compliance with the National Environmental Policy Act (NEPA), other relevant Federal and State laws and regulations, including the management direction provided by the *Pacific Northwest Region Invasive Plant Program, Preventing and Managing Invasive Plants* Record of Decision (USDA Forest Service, 2005b) and Final Environmental Impact Statement (USDA Forest Service, 2005a). Also, this Environmental Impact Statement (EIS) complies with the management direction contained in the Mt. Hood National Forest Land and Resource Management Plan (USDA Forest Service, 1990b) and the Columbia River Gorge National Scenic Area Management Plan (Columbia River Gorge Commission and USDA Forest Service, 1992; 2004).

This EIS discloses the direct, indirect, and cumulative environmental impacts that would result from the alternatives, including the Proposed Action. The document is organized into six chapters:

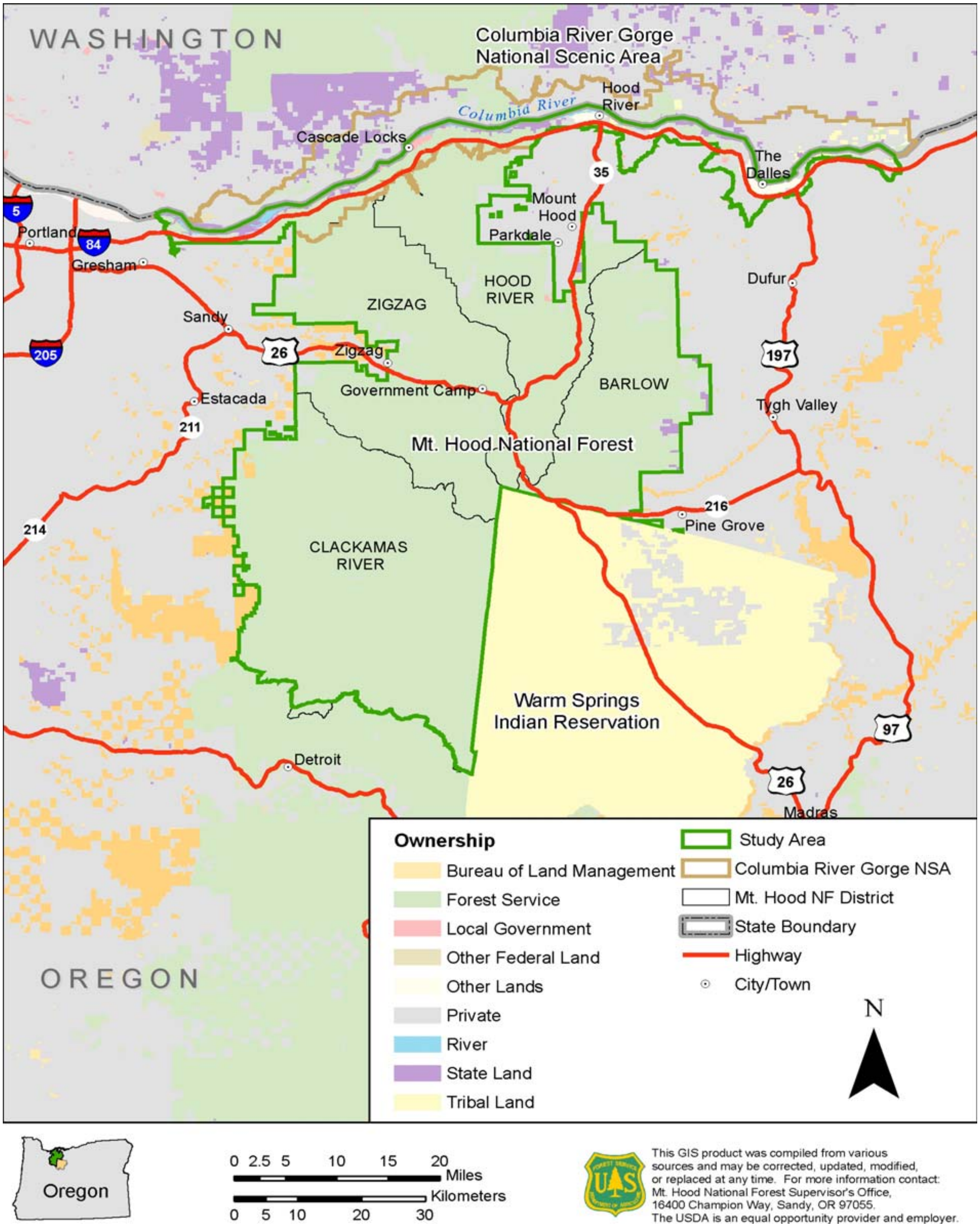
- *Chapter 1. Purpose and Need for Action:* This chapter includes information on the background of the project proposal, the purpose and need for action, the decision to be made, and a brief description of the Proposed Action. This section also details how the USDA Forest Service informed the public of the proposal and the issues identified.

- *Chapter 2. Alternatives, including the Proposed Action:* This chapter provides a more detailed description of the Proposed Action as well as No Action and Restricted Herbicide Use Alternatives. The Restricted Herbicide Use Alternative was developed based on significant issues raised by the public and other agencies. This chapter also includes Project Design Criteria (PDC), and provides a summary table of the environmental consequences associated with each alternative.

- *Chapter 3. Affected Environment and Environmental Consequences*: This chapter describes the existing conditions and environmental effects of implementing the Proposed Action or other alternatives, including the No Action Alterative. The following were analyzed to determine the effect of invasive plant treatment: 1) human health and safety; 2) effectiveness of treatment; 3) botany, including sensitive plants and native plant communities; 4) wildlife; 5) treatment costs; 6) water quality; and 7) aquatic organisms. Other areas considered include effects of jobs created; special forest products; spread to other ownerships; soil productivity; scenic integrity heritage resources; and tribal/treaty rights.

- *Chapter 4. Consultation and Coordination:* This chapter provides information on agencies consulted during the development of the environmental impact statement.

Figure 1-1. Vicinity Map of Mt. Hood National Forest and Columbia River Gorge National Scenic Area



- *Chapter 5. List of Preparers and Chapter 6. Distribution List of Draft EIS*: These chapters provide a list of preparers and reviewers as well as a mailing list for the final EIS.

- *Appendices:* The appendices provide information that supports the analyses presented in the EIS.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at Mt. Hood National Forest Headquarters in Sandy, Oregon.

1.1 Background

This site-specific invasive plant EIS applies to the entirety of the Mt. Hood National Forest (the Forest) and the Columbia River Gorge National Scenic Area in Oregon (the Scenic Area), as illustrated in the Vicinity Map (Figure 1-1). The majority of the project area is located in Multnomah, Clackamas, Hood River, and Wasco counties. Small portions adjacent to the Willamette National Forest are in Marion and Jefferson counties. The lands of the Forest total a little more than one million acres, with more acreage on the westside of the Cascade Mountain Range. The National Forest System lands within the Scenic Area total 71,000 acres, with approximately 39,000 acres in Oregon. This area comprises the Project Area for this project.

Invasive plants are defined as "non-native plants whose introduction does or is likely to cause economic or environmental harm or harm to human health," based on the definition provided in Executive Order 13112 (http://ceq.eh.doe.gov/nepa/regs/eos/eo13112.html). Invasive plants are compromising our ability to manage the Forest and Scenic Area for a healthy native ecosystem. Invasive plants can create a host of environmental and other effects, most of which are harmful to native ecosystem processes, including: displacement of native plants; reduction in functionality of habitat and forage for wildlife and livestock; increased potential for soil erosion and reduced water quality; alteration of physical and biological properties of soil; loss of long-term riparian area function; loss of habitat for culturally significant plants; high cost (dollars spent) of controlling invasive plants; and increased cost to maintaining transportation systems and recreational sites.

This EIS addresses inventoried invasive plant species as well as additional invasive plant species that may be treated under the Early Detection / Rapid Response strategy (discussed below). The invasive plant inventory on the Forest and Scenic Area analyzed in this EIS was completed in November 2004. The inventoried invasive plant species include:

- Butter and eggs (*Linaria vulgaris*)
- Canada thistle (*Cirsium arvense*)
- Common hawkweed (*Hieracium vulgatum*)
- Common tansy (*Tanacetum vulgare*)
- Diffuse knapweed (*Centaurea diffusa*)
- English ivy (*Hedera helix*)
- Himalayan blackberry (*Rubus discolor*)
- Houndstongue (*Cynoglossum officinale*)
- Knotweed species (*Polygonum spp.*)
- Meadow hawkweed (*Hieracium pratense*)
- Meadow knapweed (*Centaurea debeauxii (pratense)*)
- Orange hawkweed (*Hieracium aurantiacum*)
- Reed canarygrass (*Phalaris arundinacea*)
- Rush skeletonweed (*Chondrilla juncea*)
- Scotch broom (*Cytisus scoparius*)
- Spotted knapweed (*Centaurea biebersteinii*)
- St. Johnswort (*Hypericum perforatum*)
- Tansy ragwort (*Senecio jacobaea*)
- Yellow starthistle (*Centaurea solstitialis*)

All invasive plant treatments proposed in this EIS would be implemented in conjunction with on-going invasive plant management efforts, including biological control agents and prevention practices. The management efforts are summarized below and discussed in more detail in later sections.

- The Oregon Department of Agriculture releases biological control agents for all land ownerships across the State of Oregon. The agents as well as the targeted invasive plant species are listed at: http://www.oregon.gov/ODA/PLANT/WEEDS/bio_targetslist.shtml.

- *Pacific Northwest Region Invasive Plant Program – Preventing and Managing Invasive Plants* standards as listed in the Record of Decision (USDA Forest Service, 2005b) provide new prevention standards for the Forest and Scenic Area. These prevention practices include cleaning heavy equipment, using weed-free straw and mulch, using palletized or certified weed free feed, and inspecting active gravel, fill, sand stockpiles, quarry sites, and borrow material.

- In addition to the regional prevention standards, the Forest and Scenic Area have local practices to prevent the invasion and/or spread of invasive plants. These standards incorporating prevention into planning, contracts and permits; utilizing weed-free plant material; distributing information; preventing invasive in areas with soil disturbance; and inspecting stockpiled gravel or rock.

Despite current invasive plant management efforts, invasive plants continue to increase and occupy new areas, including designated Wilderness areas. Invasive plants spread between the Forest, Scenic Area and neighboring areas, affecting all land ownerships. Since the spread of invasive plants do not respect administrative boundaries, the problems associated with invasive plants can spread between ownerships. When the invasive plant spread to an adjacent ownership, the adjacent ownership has to assume the cost and impact of addressing the problem. This is a particular concern in the Scenic Area where the administrative unit boundary includes several different ownership types including state, federal, tribal, county and private lands.

1.2 Purpose and Need for Action

The purpose of this project is to eradicate, control and contain invasive plant infestations, to reverse the negative impacts caused by the invasive plants, and to restore healthy, native plant communities and function at the impacted sites in a cost-effective manner that meets current management direction. Currently, the majority of the invasive plant problem on the Forest and Scenic Area cannot be effectively treated. The establishment and spread of invasive plants could be slowed with timely action. Without action, however, the problem could get significantly worse as illustrated by the following examples.

- English ivy suffocates ground cover, smothers native plant seedlings, overwhelms shrubs and trees, and provides no food for native wildlife. Also, ivy is not a good ground cover for erosion control due to its shallow roots and waxy leaves. Forest Park in Portland, Oregon, the largest urban park, has become an “ivy desert.” From 1994 to 2004, the *No Ivy League* has been treating the infestations, including removing ivy from more than 25,000 trees and 200 acres. This effort involved more than 30,000 volunteers and project participants and over 120,000 hours of volunteer service (No Ivy League, 2004). Despite these efforts, invasive plant infestations continue to be listed as one of the threats and issues affecting the park and requiring action by the *Friends of the Forest Park* website (2006).

- “In 1993, Jackson county in southern Oregon, and Umatilla county in northeast Oregon both reported explosions of yellow starthistle with over 100,000 acres in Jackson county and 200,000 acres in Umatilla county. Now, a little over four years later both counties report that the populations have doubled! Similarly, in the U.S. Department of Interior, Bureau of Land Management (BLM) Cottonwood Resource Area in western Idaho, it is estimated that thirty percent of the BLM land is already infested with yellow starthistle” (Asher, 1998). Due to the spiny nature of yellow starthistle, livestock and wildlife avoid grazing in heavily infested areas (Weed Research Information Center, 2006). Also, the spiny nature can cause problems for recreationalists along trails and roads.

As the following Clackamas River Basin Watershed Council experience illustrates, timely treatment would prevent the formation of weed deserts, as described above, that are difficult to catch and nearly impossible to treat. In 2002, a team mapped over 500 patches of Japanese knotweed within 19 established reaches over 12 miles of river from River Mill Dam in Estacada downstream to the confluence of Clear Creek in Carver in the Clackamas River drainage. After unsuccessful invasive plant treatments on non-National Forest System lands, Metro regional government used a combination of stem injection and foliar herbicide application methods to treat over 19,000 individual knotweed stems, over 6 miles of treatment area. The evaluation of the injection/foliar method resulted in effective treatment of treated patches in 2003 and reduced the main stem knotweed by 70 percent (Clackamas River Basin Council, 2006). Successful treatment, such as this, is critical to reverse the negative impacts caused by the invasive plants and prevent the unabated spread across the Forest and Scenic Area, including 'special places' such as the Sandy River Delta, recreational residence tracts, portals to municipal watersheds (Bull Run, The Dalles, City of Estacada, Corbett, and Clackamas), Wilderness areas, Wild and Scenic River corridors, and the Rowena area.

If the invasive plants continue to spread they would displace native plants. Invasive plants often become near monocultures (deserts), displacing native plants which form the basic biological matrix of all communities and are an important component of plant community structure. These deserts do not have the matrix of vertical and horizontal structure or the variety of species commonly found in healthy plant communities (Asher, 1998). The displacement of native plants reduces functionality of habitat and forage for wildlife and livestock; increases potential for soil erosion and reduced water quality; alters physical and biological properties of soil; reduces long-term riparian area function; degrades habitat for culturally significant plants; and increases costs of controlling invasive plants. Since invasive plants know no boundaries, the spread of invasive plants also could displace native plants on adjacent lands. Overall, these impacts can impact the ability of the Forest and Scenic Area to manage for healthy native ecosystems.

In an effort to tackle the problem, an invasive plant inventory was completed in 2004, which surveyed about 50 percent of the areas of the Forest and Scenic Area likely to be infested with invasive plants (Stein, 2005). The inventory revealed that approximately 3,600 acres are infested with invasive plants. Realizing that some invasive plants or infested areas were missed during past surveys an uncertainty factor was applied to bring the estimated total infested area up to approximately 3,700 acres. In addition, evidence shows that the species present in the Forest and Scenic Area would likely expand their population at a rate of 8 to 12 percent each year (USDA Forest Service, 1999). To account for this growth over the life of the project (15 years), a "foreseeable" rate of spread of 10 percent per year was also applied to estimate the total foreseeable infested acres (Table 1-1), hereafter referred to as the treatment acres.

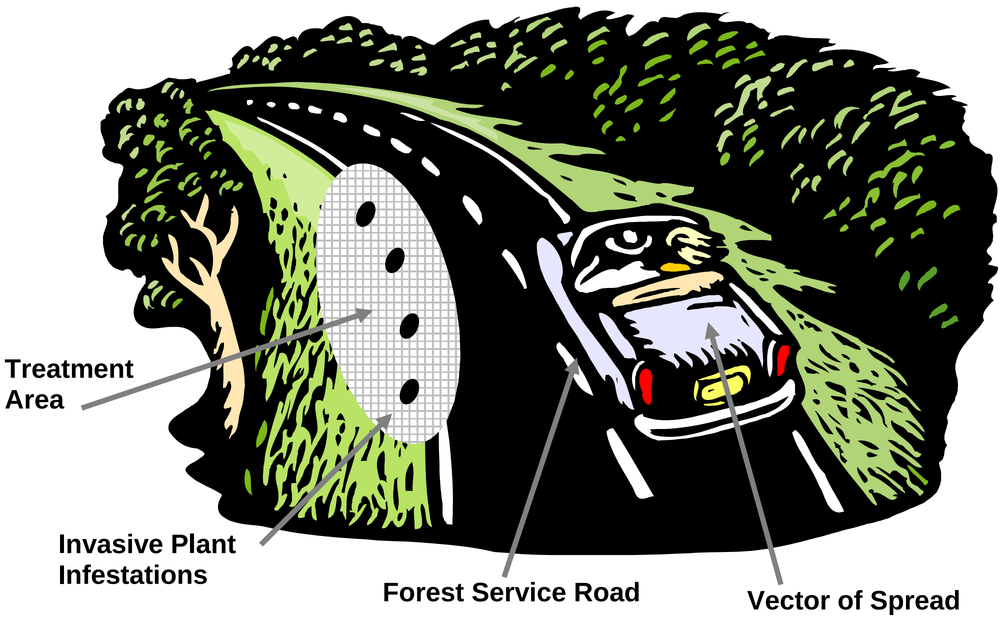
Table 1-1: **Rate of Spread for Inventoried Treatment Area Acres**

Year	Acres at Start of Year	10% Rate of Spread
1	3672	367
2	4039	404
3	4443	444
4	4887	489
5	5376	538
6	5914	594
7	6505	651
8	7156	716
9	7871	787
10	8658	866
11	9524	952
12	10477	1048
13	11524	1152
14	12676	1268
15	13000	

The total treatment acres were adjusted slightly to incorporate anecdotal evidence and expert knowledge, including delays in treatment, spread of invasive plants and other factors which spread plant seeds. The expansion in population size is due to plant growth as well as spread by a variety of vectors including wind, water, animals, and human activities where they are present. Also, due to the high cost of treatment, it is highly unlikely that we would be able to take action in all inventoried areas immediately. During the time between the inventory and treatment, plant populations would grow and spread. Invasive plant spread is unpredictable and over the life of the project, target species could spread, expanding the size of the populations and thus, the size of the area needing treatment. Therefore, these acres considered for treatment include the 208 treatment areas containing known populations analyzed in this document and cover approximately 13,000 acres, with 11,000 acres on the Forest and 2,000 acres on the Scenic Area. To account for the unpredictability of growth and spread, all 13,000 acres are analyzed for potential treatment; however, only the acres infested at the time of treatment would treated with manual, mechanical, cultural (goat grazing), and herbicide methods.

An example of an expanded treatment area is invasive plant infestations along road systems within the Forest and Scenic Area (Figure 1-2). The inventoried infestations are displayed as black circles. Since these infestations are along a road and are likely to spread via vehicular traffic, it is probable the infestations would continue to expand. In addition, given current budget levels and project timelines, the treatment area may not be treated for several years. As a result, individual infested areas adjacent to one another were combined to form one site, or treatment area, because they are likely to spread together.

Figure 1-2: Diagram of treatment areas.



In addition to the treatment areas known to be infested with invasive plants, additional infestations are likely to be found. These additional infestations may be newly inventoried infestations or areas containing newly established invasive plant species, such as garlic mustard or false broom. These additional infestations pose the same threats associated with currently known invasive plant infestations.

Without action, therefore, invasive plant populations would continue to spread on the Forest and Scenic Area, which would compromise our ability to manage the Forest and Scenic Area for healthy native plant communities and ecosystems and would contribute to the spread of invasive plants to neighboring lands. As a result, there is an underlying need on the Forest and Scenic Area for:

1. Reduction of invasive plant species at the 208 known sites on the Forest and Scenic Area by utilizing the treatment strategies of eradicate, control, contain, and suppress (defined below); and

2. Timely treatment of new/additional invasive plant sites that may be identified in the future through an Early Detection/Rapid Response strategy.

Restoration of healthy, native communities and functions at sites impacted by invasive plants would occur as a connected action.

The treatment strategies taken from the Invasive Plant FEIS (2005a) (page 3-78) are defined as:

- **Eradicate:** Attempt to totally eliminate an invasive plant species from the Forest and Scenic Area, recognizing that this may not actually be achieved in the short-term since re-establishment/re-invasion may take place initially.

- **Control:** Reduce the infestation over time; some level of infestation may be acceptable.

- **Contain:** Prevent the spread of the invasive plants beyond the perimeter of patches or infestation areas mapped from inventories as November 2004.

- **Suppress:** Prevent seed production throughout the target patch and reduce the area coverage. Prevent the invasive species from dominating the vegetation of the area; low levels may be acceptable.

Desired Future Condition

By meeting the purpose and need for this project, the Forest and Scenic Area should be able to achieve the desired future condition. The desired future condition is an adaptation from USDA Forest Service, Invasive Plant ROD (2005a), page Appendix 1-1.

- To retain healthy native plant communities that are diverse and resilient;
- To restore ecosystems that are being damaged; and
- To reduce the need for invasive plant treatment efforts.

For example, two years ago the orange hawkweed infestation in the Mt. Hood Wilderness area was discovered. Over the past two years, volunteer and USDA Forest Service employees have pulled individual plants; however, the infestation continues to grow and continues to displace native ground cover in the Burnt Lake trail area. By meeting the desired future condition, the orange hawkweed site would be eradicated and the native plants would be restored, which would improve Wilderness characteristics, wildlife habitat, soil productivity, and water quality. Another example is the Sandy River Delta (SRD). Over 1,000 acres of the 1,500 acre area is infested with a wide variety of invasive plants, including Canada thistle, scotch broom, reed canarygrass, Himalayan blackberry, and common tansy. Given the number and extent of invasive plants, treatment needs to be aggressive and the proper tools need to be used. Restoring the native plant community would increase wildlife and aquatic habitat, improve soil productivity and water quality, and maintain scenic integrity.

The desired future condition is illustrated in the following picture series (Figure 1-3) from the SRD. This small area in the SRD was treated using mechanical means. The new tools assessed in this EIS would allow the aggressive treatment of invasive plants throughout the SRD, rather than just within small, isolated pockets.

1.3 Proposed Action

The action proposed by the USDA Forest Service to meet the first part of the purpose and need is to treat the 208 treatment areas (13,000 acres) with integrated weed management (IWM) methods. All treatment areas are analyzed in Chapter 3. Only the area actually containing invasive plants would be treated in any given year. As a result, the area impacted by treatments is likely to be less than the total treatment acres. For example, in the SRD approximately 1000 acres are infested with invasive plants; however, the entire SRD (approximately 1500 acres) is being analyzed to allow for treatment if the invasive plants spread to new areas of the SRD.

The proposed treatment of these invasive plant sites would eradicate, control or contain invasive plants and restore native vegetation to discourage re-infestations. Treatment of invasive plants includes a combination of manual (e.g., hand pulling, cutting), mechanical (e.g., mowing, brushing, weed eating), cultural (goat grazing), and herbicide (e.g., broadcast spraying, spot spraying) treatment methods. Site-specific treatment prescriptions are based on the biology of particular invasive plant species, site location, size of the infestation, and proximity to water. Treatments would be designed to reduce the adverse effects to fish, wildlife, and sensitive plant species by implementing Project Design Criteria (PDC) (Section 2.2), while maximizing the reduction of the invasive plants targeted. PDC are a set of required, implementation measures 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 EIS.

Figure 1-3: Picture series illustrating desired future condition at Sandy River Delta.

1992 – USDA Forest Service acquired Sandy River Delta with invasive species

1995 – Sandy River Delta infested with invasive plants

Mowing invasive plants at Sandy River Delta

DESIRED FUTURE CONDITION!

In addition, the treatment prescriptions would follow IWM methods. This is a process by which one selects and applies a combination of management techniques (manual, mechanical, and herbicide for example) that, together, would control a particular invasive plant species or infestation efficiently and effectively, with minimum adverse impacts to non-target organisms. It is species-specific, site-specific and designed to be practical with minimal risk. Treatments may be repeated over several years and up to three times in a given year until site treatment strategies are met.

The following treatment methods are shown in order of preference, assuming the methods are effective and practical.

1. Non-herbicide, non-ground disturbing treatment methods , specifically manual, mechanical and cultural (goat grazing) treatment methods;

2. Application of herbicides via hand/selective treatment methods (e.g., stem injection or spot spraying);

    - Application of low toxicity herbicides, such as clopyralid, imazapic, metsulfuron methyl, aquatic triclopyr, or aquatic imazapyr;

    - Application of moderate toxicity herbicides, such as aquatic glyphosate, chlorsulfuron, imazapyr, sulfometuron methyl; and

    - Application of more toxic herbicides, such as glyphosate, triclopyr, picloram, and sethoxydim.

3. Application of herbicide via broadcast spraying treatment methods. Preference for herbicide choice would follow the same order as the hand/selective methods.

Although the first preference is non-herbicide, non-ground disturbing methods, this EIS focuses analysis on herbicide treatments. On the Forest for the past 13 years and on the Scenic Area for the last 10 years, the USDA Forest Service has had the ability to treat invasive plants with non-herbicide methods using existing NEPA documents. These treatment methods, however, have not effectively treated the invasive plant infestations on the Forest or Scenic Area. In addition, research and anecdotal evidence have demonstrated that herbicide treatments have been found to be the most effective treatment for many of the invasive plants proposed for treatment (see Section 3.6 – Botany and Treatment Effectiveness).

The treatments on a total of 12,963 acres are analyzed to include herbicide treatment methods in combination with non-herbicide treatment methods (manual, mechanical and cultural). In the Forest and Scenic Area, the proposed treatments (defined in Chapter 2) include:

- 30 acres of herbicide only treatment;
- 50 acres of manual and mechanical only treatment;
- 310 acres of herbicide plus mechanical treatment;
- 327 acres of herbicide plus manual treatment;
- 1,510 acres of herbicide plus manual, mechanical and cultural treatment, where cultural treatments refers to goat grazing; and
- 10,736 acres of herbicide plus manual and mechanical treatment.

The herbicides considered for use are: chlorsulfuron, clopyralid, glyphosate, imazapic, imazapyr, metsulfuron methyl, picloram, sethoxydim, sulfometuron methyl, and triclopyr. The herbicides are proposed for each treatment area based on the information provided in Invasive Plant FEIS (2005a), and *Common Control Measures for Invasive Plants of the Pacific Northwest Region* (Mazzu, 2005). The Common Control Measures serves as the basis for the IWM proposed treatments.

In addition to the treatment methods, each treatment area has a restoration objective, which is part of the long-term strategy to reduce invasive plants. The restoration objectives may either be passive or active restoration. Passive restoration assumes the treatment area would revegetate from existing non-invasive vegetation without mulching, planting, or seeding. Active restoration is site-specific and may include seeding, planting, and/or mulching (see Section 2.1.3).

The action proposed by the USDA Forest Service to meet the second part of the purpose and need includes an Early Detection / Rapid Response strategy (EDRR) that would be used to treat newly inventoried invasive plant sites that are unknown at this time and/or new infestations that become established in the future. Sites that are discovered subsequent to the last invasive plant inventory, completed in November 2004, would require evaluation to determine if the invasive plant treatments and environmental impacts are consistent with those analyzed in this EIS. If the sites and impacts are found to be consistent, then these new infestations could be treated without completing another NEPA document.

Overall, treatment would not exceed 30,000 acres of the project area over 15 years for both known and future infestations. It is estimated that 50 percent of the Forest likely to be infested with invasive plants had been inventoried (Stein, 2005). The inventoried areas include roads, campgrounds, quarries, and timber sales. The inventory includes only limited forested areas, designated Wilderness Areas and recreational trails. Assuming that the infestations on the remaining 50 percent of the likely infested areas (e.g., roads and quarries) follow a similar pattern and assuming that the Scenic Area mirrors the Forest, only an additional 13,000 acres would be infested with invasive plants in the future. In order to account for the uncertainty and unpredictability associated with invasive plants and their treatments, the treatments acres were expanded by an additional 15 percent (4,000 acres): 1 percent of unexpected infestations per year for the life of the project. Combining the known infestations (13,000 acres), future estimate (13,000 acres), and expansion acres (4,000), the total landscape assessed to be treated is 30,000 acres on the Forest and Scenic Area.

Within this overall cap of 30,000 acres over 15 years, there are several additional treatment caps (limitations) to ensure the treatment does not exceed the impacts analyzed in Chapter 3. These caps include annual, fifth-field watershed, and riparian reserve limitations.

- **Annual cap:** The annual treatments would not exceed 13,000 acres within the Forest and Scenic Area: these treatments would be a combination of known treatment sites and newly discovered newly inventoried treatment sites. This limitation was chosen because Chapter 3 analyzes the effects of treating 13,000 acres, so the effects are known.

- **Fifth field watershed cap:** Treatment would not exceed three percent per year in any one fifth-field watershed. If the areas of National Forest System lands within each fifth-field watershed are less than three percent, treatment would not exceed the amount of National Forest Service lands (see Table 2-9 for specifics for each watershed). This limitation was chosen because Chapter 3 analyzes the effects of treating three percent of some fifth-field watersheds, so the effects are known.

- **Riparian reserve cap:** Treatment would not exceed 5,000 acres in riparian reserves each year. Only 40 percent of the total area treated in each fifth-field watershed could be located in a riparian reserve for the life of the project.

***Note*:** The acres treated each year would be based on the infestations and invasive plant budget. Acres would not be treated if invasive plants are not present.

For each cap, each acre treated would only be counted once. For example, if a treatment area of 100 acres is treated 3 times annually, only 100 acres would be counted towards the 13,000 acre annual cap.

In addition to the caps, triggers and thresholds are designed to prescribe the potential treatment methods that would be effective and ensure that treatments would be consistent with those analyzed in this EIS. If the proposed treatments are outside these triggers and thresholds, new NEPA analysis and disclosure would be required. Examples include conducting invasive plant treatments that could not be fully mitigated using the PDC; aerial spraying herbicides; using prescribed burning, tilling, plowing, or cattle grazing as invasive plant treatment methods; treating more than the designated acres (e.g., 13,000 per year); applying herbicides not analyzed in EIS; or applying herbicides within Bull Run hydrologic unit. Annually, the Forest and Scenic Area would identify sites for potential treatment (both known and newly inventoried) and review the criteria for appropriateness of prescribed methods to ensure consistency and effectiveness for each site. All recommended treatment methods would be documented and approved by the appropriate responsible official(s). Section 2.1.3 and 2.1.4 contain more details on the EDRR.

Specific invasive plant treatments for each treatment area, including those identified through EDRR, would be determined using the decision key outlined in Figure 1-4. This decision key also would be used to determine if newly identified sites are consistent with those analyzed in this EIS.

Figure 1-4: Decision key for Invasive Plant Treatments, including Early Detection/Rapid ResponseStrategy. Modified from the Salmon-Challis National Forest Environmental Assessment, USDA Forest Service, 2003.

Decision Key

Step 1A: Determine the best treatment method based on the invasive plant species present and size of the infestation, using Common Control Measures (Mazzu, 2005). Determine the treatment strategy (eradicate, control, contain or suppress). Can the treatment strategy be achieved using non-herbicide, non-ground disturbing treatment methods, specially manual, mechanical and cultural (goat grazing) treatment methods?

Yes: Continue to Step 10.
No: Continue to Step 1B.

Step 1B: Determine the best herbicide treatment method to achieve the treatment strategy, using the Common Control Measures (Mazzu, 2005). Can the treatment strategy be achieved using treatment methods with least impacts, such as hand/selective treatment methods (e.g., stem injection or spot spaying)?

Yes: Continue to Step 1C.
No: Document reasons for using treatment methods with more impacts, herbicides applied via broadcast spraying. Continue to Step 1C.

Step 1C: Determine the most appropriate herbicide to achieve the treatment strategy, using the Common Control Measures (Mazzu, 2005). Can low toxicity herbicides, such as clopyralid, imazapic, metsulfuron methyl, aquatic triclopyr, or aquatic imazapic, achieve the treatment strategy?

Yes: Continue to Step 2.
No: Continue to Step 1D.

Step 1D: Can moderate toxicity herbicides, such as aquatic glyphosate, chlorsulfuron, imazapyr, and sulfometuron methyl, achieve the treatment strategy?

Yes: Continue to Step 2.
No: Use one of the more toxic herbicides, such as glyphosate, triclopyr, picloram, or sethoxydim, for herbicide treatment. Continue to Step 2.

Step 2: If the treatment area was identified in the November 2004 inventory and analyzed in this EIS, have any site conditions changed? (See Appendices C and K)

If the treatment area was identified through the EDRR, continue to Step 3.

Yes: Continue to Step 3.
No: Continue to Step 8.

Step 3: Is the treatment method analyzed in this EIS?

Yes: Continue to Step 4.
No: Choose another treatment method OR conduct additional NEPA on treatment methods (e.g., prescribed burning, aerial applications).

Step 4: Is there an unforeseen combination of physical conditions (e.g., disturbance, distance to water, slope, and soils) that is not addressed in the PDC (Section 2.2 – Project Design Criteria)?

Yes: Conduct additional NEPA on proposed treatment area and treatment method OR abandon treatment.
No: Continue to Step 5A.

Step 5A: Is the site in a designated Wilderness Area?

Yes: Continue to Step 5B.
No: Continue to Step 6.

Step 5B: If action is not taken, would the natural processes of the Wilderness Area be adversely affected?

Yes: Continue to Step 6.
No: Continue to Step 5C.

Step 5C: Is there imminent risk of invasive plants spreading outside the Wilderness Area?

Yes: Continue to Step 6.
No: Monitor invasive plant infestation.

Step 6: Are special status fish, wildlife or plant species, designated critical and essential fish habitat, or heritage resources present? Special status species are threatened, endangered and proposed species; USDA Forest Service Pacific Northwest sensitive species; management indicator species; Survey and Manage species; and other rare or endemic species of concern. This is determined using maps and/or site conditions (See Appendices C and K)

Yes: Use treatment methods that pose low or negligible risk to fish, wildlife and plant species, water, and heritage resources. Examples include use of selected herbicides (e.g., clopyralid, imazapic, metsulfuron methyl, aquatic triclopyr, or aquatic imazapic), manual or mechanical treatments, in conjunction with PDC. Continue to Step 7.
No: Continue to Step 7.

Step 7: Are surveys required for special status species?

Yes: Conduct necessary surveys. Evaluate results of surveys. If surveys illustrate a risk to the species surveyed, use treatment methods that pose low or negligible risk to fish, wildlife and plant species. Examples include use of selected herbicides (e.g., clopyralid, imazapic, metsulfuron methyl, aquatic triclopyr, or aquatic imazapic), manual or mechanical treatments, in conjunction with PDC. Continue to Step 8.
No: Continue to Step 8.

Step 8: Is the proposed treatment area in a municipal watershed or designated irrigation district?

Yes: Notify the municipal watershed and irrigation districts of proposed treatments. Ensure all applicable, existing agreements are being implemented and followed.
No: Continue to Step 9.

Step 9A: Is the proposed treatment within the designated annual treatment caps of 13,000 acres per year?

Yes: Continue to Step 9B.
No: Conduct additional NEPA on additional treatment acres <u>OR</u> abandon treatment.

Step 9B: Is the proposed treatment within the allowable treatment acres in each fifth-field watershed? (See Table 2-9)

Yes: Continue to Step 9C.
No: Conduct additional NEPA on additional treatment acres <u>OR</u> abandon treatment.

Step 9C: Is the proposed treatment within the designated annual riparian reserve cap of 5,000 acres with only 40 percent of the total area treated in each fifth-field watershed being located in a riparian reserve? Is the proposed treatment within the overall cap of 40 percent of each fifth-field watershed for the life of the project?

Yes: Continue to Step 9D.
No: Conduct additional NEPA on additional treatment acres <u>OR</u> abandon treatment.

Step 9D: Is the proposed treatment within the overall project cap of 30,000 acres over 15 years?

Yes: Continue to Step 10.
No: Conduct additional NEPA on proposed treatment area and treatment method <u>OR</u> abandon treatment.

Step 10: Document treatment methods for each treatment area. If treatment area is identified using the EDRR, prepare a document demonstrating how the new treatment is within the scope of the original NEPA decision. Post treatment sites and consistency documentation on websites, as specified in PDC. Continue to Step 11.

Step 11: Implement invasive plant treatment and all appropriate PDC. Is active restoration necessary?

Yes: Implement appropriate restoration strategies as outline in Section 2.1.3, in conjunction with PDC. Continue to Step 12.
No: Allow passive restoration to revegetate treatment site. Continue to Step 12.

Step 12: Implement monitoring framework as outlined in Section 2.3. Are invasive plants present at the time the treatment area is monitored?

Yes: Continue to Step 1.
No: Continue to Step 13.

Step 13: Implement monitoring framework for restoration as outlined in Section 2.3. Is the restoration strategy effective?

Yes: Healthy, native plant communities and function have been restored.
No: Continue to Step 11.

1.4 Management Direction

This EIS process and documentation has been completed according to direction provided in the National Forest Management Act (NFMA), National Environmental Policy Act (NEPA), Council on Environmental Quality regulations, Wilderness Act, Columbia River Gorge National Scenic Area Act, Clean Water Act, and Endangered Species Act. The EIS is tiered to the Mt. Hood National Forest Land and Resource Management Plan Final Environmental Impact Statement and Record of Decision, and incorporates by reference the accompanying Land and Resource Management Plan (1990) (also called the Forest Plan), as amended by the Northwest Forest Plan (1994). The Forest Plan guides all natural resource management activities and establishes management standards and guidelines for the Forest. It describes resource management practices, levels of resource production and management, and the availability and suitability of lands for resource management. The Northwest Forest Plan identifies land allocations and management direction to respond to the underlying needs of managing substantial parts of these forests for late-successional and old-growth conditions, for a predictable and long-term supply of timber. Also, the EIS is tiered (where appropriate) to the Columbia River Gorge National Scenic Area Management Plan (1992, 2004). The Scenic Area Management Plan includes guidelines and land use designations for the General Management Areas and Scenic Management Areas for scenic, cultural, natural and recreational resources contained on the agricultural, forest, residential and commercial lands found with the Congressionally designated area. The project is consistent with all applicable Federal, state and local laws.

Invasive plant management direction on the Forest and Scenic Area is provided by the Invasive Plant ROD (2005b). This ROD releases the USDA Forest Service from direction provided by the 1988 Environmental Impact State and 1988 Record of Decision for Competing and Unwanted Vegetation, and the associated 1989 Mediated Agreement for invasive plant management. The portions of the 1988 Record of Decision and 1989 Mediated Agreement that apply to unwanted native vegetation are not impacted by the new decision or this project. The new invasive plant direction is provided in the form of desired future condition statement, standards for the prevention and management of invasive plants, and inventory and monitoring framework (Appendix 1, Invasive Plant ROD, 2005b). The management direction includes invasive plant prevention and treatment/restoration standards intended to help achieve the desired future conditions, goals and objectives. The management direction is expected to result in decreased rates of spread of invasive plants, while protecting human health and the environment from the adverse effects of invasive plant treatments. Through this management direction, new invasive plant treatment tools are provided for all National Forest System lands in Oregon and Washington. This site-specific EIS tiers to the Invasive Plant ROD (2005b) and Invasive Plant FEIS (2005a) in order “to eliminate repetitive discussions of the same issues and to focus on the actual issues ripe for decision at each level of environmental review” (40 CFR 1520.20).

A decision to implement Alternative 2 (the Proposed Action) or Alternative 3 (the Restricted Herbicide Use Alternative) would replace the management direction provided in the Environmental Assessment for the Management of Noxious Weeds, Mt. Hood National Forest (USDA Forest Service, 1993a) and the Environmental Assessment for the Application of Herbicides for the Control and Management of Noxious Weeds on the Barlow Ranger District, Mt. Hood National Forest (USDA Forest Service, 1998b). The Environmental Assessment for the Control and Management of Noxious Weeds and Blackberries on Selected Lands within the Columbia River Gorge National Scenic Area (USDA Forest Service, 1996c) and 1999 amendment remains in effect for the Washington lands in the Scenic Area. Also, this decision would replace direction for invasive plant treatment methods described in the Sandy River Delta EIS (USDA Forest Service, 1995e). Treatment methods not analyzed in this EIS (e.g., heavy machinery) that were analyzed in the Sandy River Delta EIS would remain in effect. Finally, the Environmental Impact Statement on the Transmission System Vegetation Management Program, Bonneville Power Administration (2001) would not be impacted by the decision resulting from this analysis; however, additional treatment methods, as analyzed in this EIS, could be used in this area. All these environmental documents are discussed in Section 2.1.2.

The recent court case Washington Toxics Coalition, et al. vs. U.S. Environmental Protection Agency (Case No. C01-0132C) regarding listed salmon species and the use of pesticides does not impact any of the actions proposed in this EIS. The order from January 22, 2004 specifically excludes noxious weed programs and allows the "use of pesticides for control of state-designated noxious weeds as administered by public entities, when such control program implements the following safeguards that NMFS (National Marine Fisheries Service) routinely requires for such programs:

1. Aerial application cannot occur within 100 yards of Salmon Supporting Waters;

2. Broadcast spraying cannot occur within 20 yards of Salmon Supporting Waters or when wind speeds are greater than five miles per hour;

3. Chemical spraying cannot occur within 15 feet of Salmon Supporting Waters or when wind speeds are greater than five miles per hour;

4. Only those Pesticides registered by EPA under the Federal Insecticide Fungicide, and Rodenticide Act ("FIFRA"), 7 U.S.C. §§ 136-136(y), for aquatic application can be used within 15 feet of Salmon Supporting Waters;

5. Pesticides cannot be used when precipitation is occurring or is forecast to occur within 24 hours;

6. All spraying operations must be overseen by a certified applicator; and

7. For 2,4-D and triclopyr, only the amine formulations of 2,4-D and triclopyr can be used."

Theses safeguards are incorporated into the PDC and through consultation with regulatory agencies, including NMFS and U.S. Fish and Wildlife Service (Page 9-10 of Court Order, January 22, 2004).

1.5 Management Standards and Guidelines

The Invasive Plant FEIS (2005a) defines pesticide as "any substance or mixture of substances intended to prevent, destroy, repel, or mitigate any pest; or any substance or mixture of substances intended for use as a plant regulator, defoliant, or desiccant." The Invasive Plant FEIS (2005a) defines an herbicide as "a chemical preparation designed to kill plants, especially weeds, or to otherwise inhibit their growth". Based on these definitions, six standards and guidelines in the Forest Plan (Table 1-2) currently discourage or prohibit the use of pesticides, including herbicides, on the Forest.

Table 1-2: Forest Plan Standards and Guidelines discouraging or prohibiting pesticide use.

Standard & Guideline [1]	Page #
Water (FW-076): Potentially detrimental materials associated with management activities (e.g. pesticides, fertilizers, and road surface treatments) shall be prevented from entering water or other areas not intended for treatment.	4-57
Wilderness (A2-082): Pesticides use shall be prohibited.	4-142
Outdoor Education Areas (A12-031): Herbicides should not be applied outside of roads rights-of-way.	4-200
Pileated Woodpecker/Pine Marten Habitat (B5-041): Herbicides should not be permitted outside of road rights-of-way.	4-244
General Riparian Area (B7-070): Application of herbicides shall be discouraged.	4-260
Vegetation Management (A1-WR-064): Chemicals shall not be used to control noxious weeds in riparian areas	Amendment #7

A Forest Plan amendment of these standards and guidelines are proposed for both the Proposed Action and Restricted Herbicide Use Alternatives to allow for careful and targeted herbicide use to treat the invasive plants identified, in conjunction with the required PDC and according to the standards from the Invasive Plant ROD (2005b) (see Appendix A – Standards from Preventing and Managing Invasive Plant Record of Decision, 2005)

[1] Shall is defined as: "Action is mandatory!" Should is defined as: "Action is required; however, case by case exceptions are acceptable if identified during interdisciplinary project planning environmental analyses. Exceptions are to de documents in environmental analysis (National Environmental Policy Act 1969) public documents." [Page Four – 45, Forest Plan.]

In addition, sixteen Forest Plan standard and guidelines discuss pest management. Based on the language of the standard and guideline, the context in the Forest Plan, and definitions provided by the Invasive Plant FEIS (2005a) these standards and guidelines do not apply to invasive plant management, but do apply to pest, insect and disease management. The standards include: FW-550/551, A2-112, A3-050, A3-051, A4-046, A5-040, A6-037, A7-029, A9-044, A10-030, B3-042, B4-053, B6-041, B7-068, and EA1. This EIS does not amend any of these standards.

The Columbia River Gorge National Scenic Area Management Plan states "County, State and Federal regulations . . . for pesticide use shall be followed" (page I-81). Since all actions being considered follow all applicable Federal, state and local laws, the EIS is consistent with the direction specific for the Scenic Area.

All of the applicable standards and guidelines from the Forest Plan and Northwest Forest Plan that pertain to this project are contained in Appendix B; all the applicable standards from the Scenic Area Management Plan are contained in Appendix C. These standards and guidelines cover all resource areas analyzed in this EIS. In addition, all watershed assessments prepared using the Northwest Forest Plan were reviewed and found to be consistent with the Proposed Action and alternatives.

1.6 Decision Framework

The Forest Supervisor for the Mt. Hood National Forest and the Area Manager of the Columbia River Gorge National Scenic Area are the responsible officials for this EIS. Given the purpose and need, the responsible officials review the Proposed Action, alternatives to the Proposed Action, and the environmental consequences in order to make the following decisions:

- Would this project be implemented as proposed, as modified by an alternative, or not at all?
- What PDC and monitoring requirements would the USDA Forest Service apply if this project is implemented?
- What amendments, if any, to the Forest Plan or the Scenic Area Management Plan as amended by the Invasive Plant ROD (2005b) are required to implement this project?

Factors influencing the decision on selection of an alternative include:

- How well the alternative meets the purpose and need for action;
- Potential effects of treatment to the environment; and
- Economic efficiency of treatments.

1.7 Public Involvement

Public involvement has occurred throughout the NEPA process. The project was included in the winter 2003 and spring 2005 Schedule of Proposed Actions distributed by the Forest. Two Notices of Intent (NOI) requesting public comment were published in the Federal Register on February 23, 2004 and updated on April 29, 2005. Information on the proposal was posted on a project website (http://www.fs.fed.us/r6/invasiveplant-eis/site-specific/MTH/), and provided via direct mailing to approximately 1,200 individuals, organizations, agencies, businesses, recreational residence owners, and local and Tribal governments.

Due to the complexity of the Proposed Action, additional public involvement steps were taken to solicit public input during the analysis phases. An update letter was mailed to approximately 150 addresses, including all respondents to both scoping letters and county noxious weed coordinators. Also, meetings were held with governmental agencies, tribes, and organizations to discuss the project in greater detail.

The DEIS was available for public comment from May 26 to July 13, 2006. The Notice of Available (NOA) initiating the 45-day comment period was published in the Federal Register on May 26, 2006. Approximately 22 hardcopies of the documents, 191 CDs, and 977 summaries were either mailed or delivered to individuals, organizations, interested Tribes, and government agencies. All recreational residence permitees, approximately 550 people, received a summary or CD announcing the project. In addition, the document was made available on the Mt. Hood National Forest website (http://www.fs.fed.us/r6/mthood/projects/) and the project website (http://www.fs.fed.us/r6/invasiveplant-eis/site-specific/MTH/). Hard copies of the document were made available for public viewing at six USDA Forest Service offices.

In addition, the USDA Forest Service hosted two open houses on June 8, 2006 in Hood River and June 19, 2006 in Sandy. Press releases announcing these meetings were distributed to local newspapers on May 26, June 6 and June 14, 2006. Announcements of the meetings appeared in the *Sandy Post, Hood River News* and *The Oregonian*.

During the pubic comment period 25 responses were received. Resource specialist reviewed and responded to the comments and, in many cases, made changes to the EIS as a result. The comments and responses as well as all governmental agency responses (Federal, State and local) can be found in Appendix Z – Response to Comments.

All mailing lists are available in the project file, located in the Mt. Hood National Forest Headquarters Office in Sandy, Oregon.

1.8 Issues

NEPA directs federal agencies to focus analysis and documentation of significant issues related to the Proposed Action. The scoping process resulted in the identification of some potential issues to be addressed in the EIS. An "issue" arises from the relationships between actions (proposed, connected, similar, cumulative) and environmental consequences (physical, biological, cultural, and socioeconomic). In this EIS, issues are defined as points of discussion, debate, or dispute about the environmental effects of the Proposed Action. The issues are divided into three groups: key, resolved and tracking issues.

Key issues are those that are within the scope of the Proposed Action and suggest the need to consider different actions or project design criteria. Key issues as used in this EIS are those that are used to formulate alternatives, affect the design of alternative components, prescribe PDC, or describe environmental effects. Key issues are identified as such due to their geographic distribution, duration of effects, intensity of interest by the public, or resource area conflict. Alternative 3 (Restricted Herbicide Use Alternative) was designed to address the key issues. Resolved issues are significant issues identified by the public that have been fully mitigated through the development of alternatives or PDC. As such, these issues do not have any measurable impacts or environmental consequences.

Tracking issues are those that have been determined to be relevant, but are not used to formulate alternatives. These issues often describe minor or consistent consequences among alternatives considered in detail. These issues usually are addressed through adherence to standards and guidelines, appropriate laws and regulations, consistency with decisions made in the Invasive Plant ROD (2005b), or as covered by the PDC. Tracking issues are generally of interest or concern to the public, and are tracked throughout the document.

In addition, issues outside the scope of this analysis were identified. The Council of Environmental Quality requires the USDA Forest Service to identify and eliminate from detailed study 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; are already decided by law, regulation, Forest Plan, or other higher level decision; are not clearly relevant to the decision to be made; or are conjectural and not supported by good scientific or factual evidence. These issues raised through the scoping process are discussed briefly.

The key, resolved and tracking issues as well as issues outside the scope are listed and summarized below.

Key Issues

Key Issue 1 – Treatment Effectiveness

Invasive plant treatments can vary in effectiveness, depending on the invasive species to be treated, size of the population/infestation, method of treatment, and a host of other factors including timing, weather, soils, and moisture. The choice of treatment methods in combination with other factors needs to reflect a balance between optimum effectiveness and protection of the desirable botanical resources. The proposed alternatives and treatment methods vary in how well they provide the tools to effectively treat invasive species and protect natural resources, including water quality, fish, wildlife, soil productivity, and native plant communities.

Further, the presence and spread of invasive plants within the Forest and Scenic Area may affect the presence and spread of invasive plants on neighboring ownerships. The effectiveness of treatments would influence if and to what degree invasive plants might spread to other ownerships.

Indicators for Comparing Alternatives

- Treatment methods proposed
- Acres of invasive plants treated using herbicides
- Effectiveness of invasive plant treatments and treatment method combinations
- Restoration potential for establishment of native plants to prevent future infestations
- Likelihood for invasive plants to spread to adjacent ownerships

Discussion of the issues can be found in Section 3.6 – Botany and Treatment Effectiveness.

Key Issue 2 – Economic Efficiency

Invasive plant treatments vary in cost, which affects the acreage that could be effectively treated each year given a set budget. The proposed treatments would be costly and fiscal resources are always limited. In addition to cost efficiency, the treatment methods vary in the amount of employment provided. Increasing the number of jobs could benefit local communities that are suffering from reduced employment levels.

Indicators for Comparing Alternatives

- Cost of treatments
- Number of full-time jobs created (measured as $20,000 per year)

Discussion of this issue can be found in Section 3.7 – Economic Efficiency.

Key Issue 3 – Water Quality and Aquatic Organisms

The application of herbicides in riparian areas has the potential to contaminate water and cause mortality to fish and other aquatic species. Herbicides that do not directly affect fish may affect their food chain through lethal effects to aquatic insects, plants, or algae. Sub-lethal effects, such as behavior changes, could result in increased vulnerability to predators. 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.

Indicators for Comparing Alternatives

- Acres of herbicide treatment in riparian reserves at known sites
- Acres of herbicide treatments within aquatic influence zone at known sites
  Aquatic influence zone is the 100 feet closest to a water source.
- Number of treatment sites with a higher risk of effects from herbicides to aquatic organisms

Discussion of this issue can be found in Section 3.9 – Water Quality and Section 3.10 – Aquatic Organisms and Habitat.

Resolved Issues

Human Health and Safety

Invasive plant treatments within the Forest and Scenic Area may result in health risks to forestry workers and the public, including contamination of special forest products and drinking water. The health and safety of forestry workers and the public may be at risk from exposure to herbicides. The public expressed particular concern about human health effects related to the toxicity of herbicides and drinking water contamination. Public concern for drinking water contamination is high for the Forest, since it serves as a drinking water source for a third of Oregonians. Implementing the PDC, as required by the alternatives, would mitigate any possible impacts to human health and safety.

Additional information is available in Section 3.5 – Human Health and Safety.

Accidental Herbicide Spills

Accidental spills may cause serious harm to human health and the environment. Accidental spills are an inherent risk of using herbicides. Herbicide spills are not an intended action associated with invasive plant management. The PDC discussed in Section 2.2 include measures to prevent accidental spills as well as response measures to reduce the impacts of a spill. The PDC require a pre-operation briefing, herbicide emergency spill response plan, mixing locations, transportation, and public notification. Examples include:

- A pre-operations briefing would be required annually and documented prior to treatment. The briefing would include safety issues, location, timing, treatment methods, herbicides approved for use, PDC, and other pertinent topics.

- Applicators would have an Herbicide Emergency Spill Response Plan, approved by the USDA Forest Service, on-site during operations.

- Spray tanks would not be washed or rinsed within 150 feet of any live water.

- No more than daily use quantities of herbicide would be transported to the project site.

- Signs notifying the public of herbicide treatments would be placed at access points to treatment areas prior to initiating treatment, a minimum of one week in advance of herbicide treatment.

Additional information is available in Section 2.2 – Project Design Criteria.

No Herbicide Treatment in Municipal Watersheds

Applying herbicides to invasive plants located within municipal watersheds, especially the Bull Run Watershed, may degrade drinking water. Existing Forest Plan standards and guidelines, and the Restricted Herbicide Use Alternative (Alternative 3) address this concern. Effects of proposed treatments to drinking water and water quality within municipal watershed are analyzed through the three alternatives considered.

- No treatment areas are proposed within the Bull Run watershed (physical drainage) where the drinking water source is located. The Forest Plan standard (D-021) stating that "chemical insecticides and herbicides shall be prohibited within the Bull Run physical drainage" would remain in effect without any changes.

- Six treatment areas are located in part of The Dalles Municipal Watershed. Five of these treatment areas are on the road system adjacent to the watershed and one site is located entirely within the watershed. None of these treatment areas are proposed for herbicide treatments under Alternative 3.

Additional information is available in Section 3.5 – Human Health and Safety and Section 3.9 – Water Quality.

Public Notification

The application of herbicides raises many public concerns; informing the public of invasive plant treatments would help alleviate some concerns. Information regarding location, time, and treatment method/type should be provided before treatments begin. Public notification is a required component of the PDC.

Additional information is available in Section 2.2 – Project Design Criteria.

Tracking Issues

Native Plant Communities

Invasive plant treatments, especially herbicides may harm non-target plants, including culturally significant and special status species (USDA Forest Service Pacific Northwest sensitive plants, Survey and Manage plant species, federally listed plant species, and plants endemic to the Forest and Scenic Area). Different herbicides have varying degrees of potency and selectivity (e.g., some herbicides affect certain plant families more readily than others), and application methods vary in the potential for off-site drift. As invasive plants decrease, native plants are expected to benefit through increased habitat.

Discussion of this issue can be found in Section 3.6 – Botany and Treatment Effectiveness.

Wildlife Species

The use of herbicides to treat invasive plants, if used in the certain habitats, could harm a variety of wildlife species. Late successional, wetland, talus, and aquatic habitats have special status species that may be affected by herbicides. 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. Wildlife, especially birds and mammals, may ingest vegetation or insects that have been sprayed with some herbicides and potentially experience these types of effects. Amphibians have semi-permeable skin that can absorb chemicals that affect them, but herbicide effects to amphibians have not been thoroughly tested. Aquatic life stages of amphibians are susceptible to chemicals, but very little information has been documented on the effects of herbicides.

Discussion of this issue can be found in Section 3.11 – Wildlife.

Soil Productivity

Healthy soil organisms are fundamental to the ability of soil to provide water and nutrients to plants. All herbicides potentially can affect soil microorganisms. Manual and mechanical treatments may cause soil disturbance and/or erosion. Due to these potential impacts and the removal of vegetation, slope stability may be impacted.

Discussion of this issue can be found in Section 3.8 – Soils Productivity.

Tribal/Treaty Rights and Environmental Justice

Protecting and maintaining traditional uses of plants, animals, fish, and water rights on tribal reservation lands and the treaty rights of American Indian Tribes is a trust responsibility of the Federal Government. The Confederated Tribes of Warm Springs have rights outside the bounds of their Indian reservation on ceded as well as usual and accustomed sites on the Forest. Invasive plant treatments have varying impacts to culturally significant plants, which include huckleberries (*Vaccinium membranaceum*), blue camas (*Camassia* species), and possibly bitterroot (*Lewisia rediviva*) for the Confederated Tribes of Warm Springs, Yakama Nation, Confederated Tribes of the Grand Ronde, Nez Perce Tribe, and Confederate Tribes of the Umatilla Indian Reservation.

Executive Order 12898 (1994) requires federal agencies to identify and address adverse effects to human health and the environment that may disproportionately impact minority and low-income people. Also, the Executive Order directs agencies to consider patterns of subsistence hunting and fishing when an agency action may affect fish and wildlife. Asian, Hispanic, and Native American communities may be impacted by invasive plant treatments.

Discussion of this issue can be found in Section 3.14 – Tribal Relations, Civil Rights and Environmental Justice.

Issues Outside the Scope

No Invasive Plant Treatments

Some members of the public stated that the USDA Forest Service should not treat invasive plants. The best approach for addressing invasive plant infestations is to eliminate human disturbance, including logging, grazing and the related road building, ground disturbance and increased vehicular traffic. To address the problem, the members of the public suggested suspending logging projects until a comprehensive EIS is completed that fully addresses the existing problem and ‘root causes.’

This issue is outside the scope because prevention was an alternative considered, but eliminated from detailed study (see Section 2.5). Prevention is an important component of invasive plant management and an integral part to implementing successful treatments. Both the Forest and Scenic Area are implementing new prevention standards and guidelines through the adoption of the Invasive Plant ROD (2005b), which took effect in March 2006. Also, both the Forest and Scenic Area have local prevention standards contained in Appendix D. Despite the importance of prevention, prevention alone does not meet the purpose and need of timely treatment of known infestations or timely treatment of new/additional invasive plant sites, and therefore is outside the scope of this EIS.

Further, suspending or discontinuing other land management activities, such as timber harvest, grazing allotments, and related activities, is outside the scope of this Proposed Action, which focuses exclusively on invasive plant management. These activities are analyzed in other NEPA documents, which are available at: http://www.fs.fed.us/r6/mthood/projects/ and http://www.fs.fed.us/r6/columbia/forest/projects/.

Working on Other Ownerships

Some members of the public suggested that the USDA Forest Service obtain the ability to coordinate with and assist in funding invasive plant management on private adjacent lands.

While cooperating with adjacent landowners on mutual interest actions and/or sharing information is valuable, this issue is outside the scope of this project because the purpose of the project is to reverse the negative impacts caused by invasive plants and restore healthy, native communities and function at the impacted treatment sites in a cost-effective manner that meets current management direction. In order to achieve this purpose, the EIS analyzes and addresses the underlying need for action on the Forest and Scenic Area. Working on other ownerships, therefore, does not meet the purpose and need, and is outside the scope of the Proposed Action.

Implementing Invasive Plant Management

Some members of the public suggested that the USDA Forest Service have a budget adequate to control the spread of invasive plants. The budget would be supplemented by developing partnerships and using volunteers or other workforces. Partners and volunteer groups would provide assistance and expertise in the management and treatment of invasive plants.

This issue is outside the scope of this project because funding and implementation methods for invasive plant management on the Forest and Scenic Area would vary each year as budget levels change, information and knowledge concerning invasive plants improves, and invasive plant infestations are reduced. The specifics of implementation would be decided through regular management practices at the Forest and Scenic Area, with annual recommendations developed by appropriately trained and skilled staff. Often, these recommendations and considerations include the establishment of partnerships. The specific details of funding and implementation practices, therefore, are not addressed through NEPA and are outside the scope of this EIS.

1.9 What is Not Included

This action addresses the treatment of invasive plants on the Forest and Scenic Area. It does not address the prevention of invasive plant infestations. Prevention is addressed through the adoption of the standards and guidelines presented in the Invasive Plant FEIS (2005a), national and regional direction, best management practices for invasive plants developed by the Forest and Scenic Area, and provisions in separate environmental documents and contracts. See Appendix A – Standards from Preventing and Managing Invasive Plant Record of Decision, 2005. Also, see Appendix D – Prevention of Invasive Plants - A Strategic Collaborative Effort for Mt. Hood National Forest and the Columbia Gorge National Scenic Area in Oregon.

Additionally, this action does not include the following.

- Invasive plants floating or submerged in water: Aquatic invasive plant species are currently being addressed through other federal actions in cooperation with the states.

- Biological control agents: These agents have already been analyzed by the U.S. Department of Agriculture, Agricultural Plant Health and Insect Service (APHIS). The environmental documents are available at: http://www.aphis.usda.gov/ppq/weeds/enviro2.html The Oregon Department of Agriculture releases biological control agents for all land ownerships across the State of Oregon.

- Experimental trials of herbicides conducted by the U.S. Environmental Protection Agency (EPA) to test new products.

- Aerial herbicide applications or prescribed fire treatment methods.

CHAPTER 2
Alternatives, Including the Proposed Action

CHAPTER 2: Alternatives, Including the Proposed Action

Chapter 2 describes and compares the alternatives considered for invasive plant treatment within the Mt. Hood National Forest (the Forest) and the Columbia River Gorge National Scenic Area in Oregon (the Scenic Area). A description and map are provided for each. Also, this section presents the alternatives in comparative form, defining the differences between each alternative and providing a basis for choice among options for the Responsible Officials and the public.

The alternatives described in Chapter 2 are derived from a detailed project database, based on invasive plant inventories from November 2004. The proposed treatment areas cover approximately 13,000 acres in Multnomah, Hood River, Wasco, Clackamas, Jefferson, and Marion counties (See Figure 2-1). This represents 1.1 percent of the National Forest System lands within the Forest and Scenic Area. Approximately 11,000 acres are located within the Forest and 2,000 acres within the Scenic Area. The Forest acres are distributed on all four ranger districts, including 2,444 acres on Barlow Ranger District, 5,596 acres on Hood River Ranger District; 1,270 acres on Clackamas River Ranger District; and 1,868 acres on the Zigzag Ranger District (See Figures 2-2 to 2-6: Maps of Proposed Treatment Areas for the Proposed Action on the Scenic Area and each District). The treatment areas are located in a variety of site types: 63 percent in disturbed areas (roads, quarries, utility corridors), 20 percent in recreational sites (developed campgrounds, permit areas, recreational residences), 17 percent in forested/natural areas (clearings, flood plains, meadows, forested sites, plantations), and less than 1 percent in administrative sites.

Treatment methods (herbicide and non-herbicide) and site treatment strategies are identified based on the location, extent and biology of existing invasive plant species. Treatment methods were developed using *Common Control Measures Invasive Plants of the Pacific Northwest Region* (Mazzu, 2005) and in accordance with USDA Forest Service Handbook (FSH) 2109.14 – Pesticide-Use Management and Coordination Handbook (USDA Forest Service, 1994c). Treatment priorities, methods, and strategies are tiered to the *Pacific Northwest Region Invasive Plant Program – Preventing and Managing Invasive Plants* Final Environmental Impact Statement (Invasive Plant FEIS) (USDA Forest Service, 2005a). A primary focus of the site-specific analysis is development of treatment prescriptions that comply with the invasive plant treatment standards adopted by the Pacific Northwest Region of the USDA Forest Service. All herbicide treatments require the completion of the Pesticide-Use Proposal Form FS-2100-2 (Appendix E) to document decisions to use pesticides on National Forest System lands. All recommended treatment methods would be documented and approved by the appropriate responsible official(s). More information on how the treatments methods were chosen and the required steps to treat invasive plants each year is contained in the following sections.

Figure 2-1. Map of Proposed Treatment Areas for the Proposed Action.

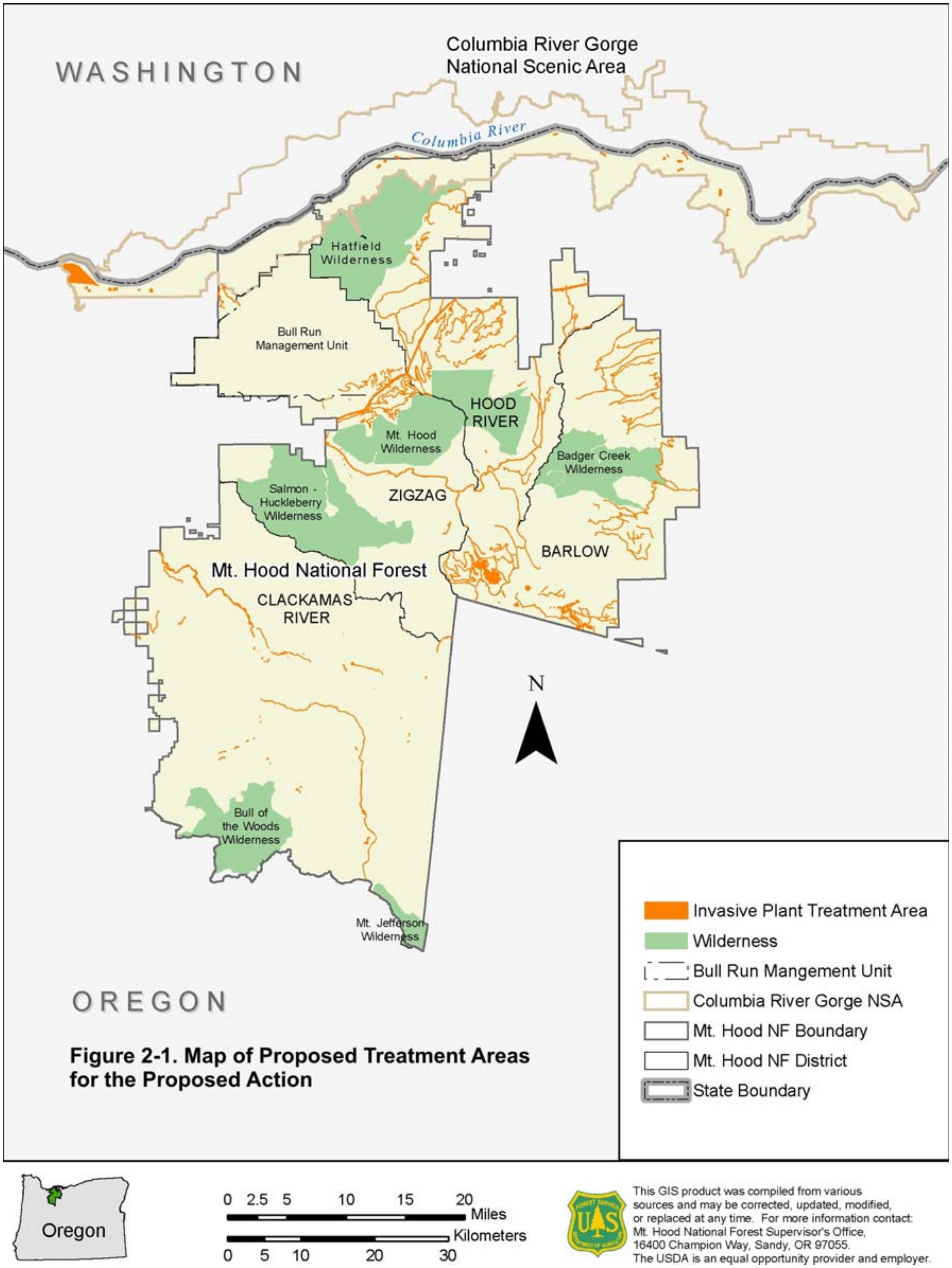


Figure 2-1. Map of Proposed Treatment Areas for the Proposed Action

2.1 Alternatives Considered in Detail

2.1.1 Alternative Development Process

The interdisciplinary team (IDT), including the Responsible Officials, followed the USDA Forest Service handbook (1909.15) for developing and considering alternatives. Alternatives were developed to meet the purpose and need and to respond to public issues, while effectively treating invasive plants and restoring native ecosystems.

The USDA Forest Service developed three alternatives: No Action (Alternative 1), Proposed Action (Alternative 2), and Restricted Herbicide Use (Alternative 3) alternatives. The No Action (Alternative 1), defined as treatments that are currently approved under existing NEPA decisions, was compared to the need for action as documented in the database. Within both the Forest and Scenic Area, existing treatment methods, specifically manual and mechanical methods, have not effectively treated the invasive plant infestations within the Forest and Scenic Area. For this reason, the focus of this EIS is on the use of new herbicides and treatment methods that became available through the *Pacific Northwest Region Invasive Plant Program – Preventing and Managing Invasive Plants* Record of Decision (Invasive Plant ROD) in 2005 (USDA Forest Service, 2005b).

Public and interagency issues centered on treatment effectiveness, cost efficiency, herbicide toxicity, and potential adverse effects of using herbicides. The Restricted Herbicide Use Alternative varies in the amount of herbicide used and the amount of herbicide applied using broadcast application methods, based on the following concepts:

1. Invasive plants would be treated by manual, mechanical, cultural (goat grazing), or herbicide methods. The effectiveness of the treatment would vary based on the invasive plant species present and the treatment method chosen. Herbicide treatment may be the only cost effective way of effectively treating large, continuous infestations. Additionally, herbicide treatment may be the most effective for some species.

2. Herbicide treatments, particularly broadcast application methods, have greater inherent risk of adverse effects from herbicide drift or delivery to water.

The IDT identified six potential discrepancies between the effective treatment options needed to address the existing infestations and existing management direction in the Forest Plan (see Section 1.5 – Forest Plan Standards and Guidelines).

Some alternatives that would resolve public concerns were eliminated from detailed study because they do not meet the purpose and need for action. The eliminated alternatives include: prevention only and no herbicide use. These are discussed in Chapter 2, Section 2.5.

Figure 2.2 Proposed Action Map for Columbia River Gorge National Scenic Area

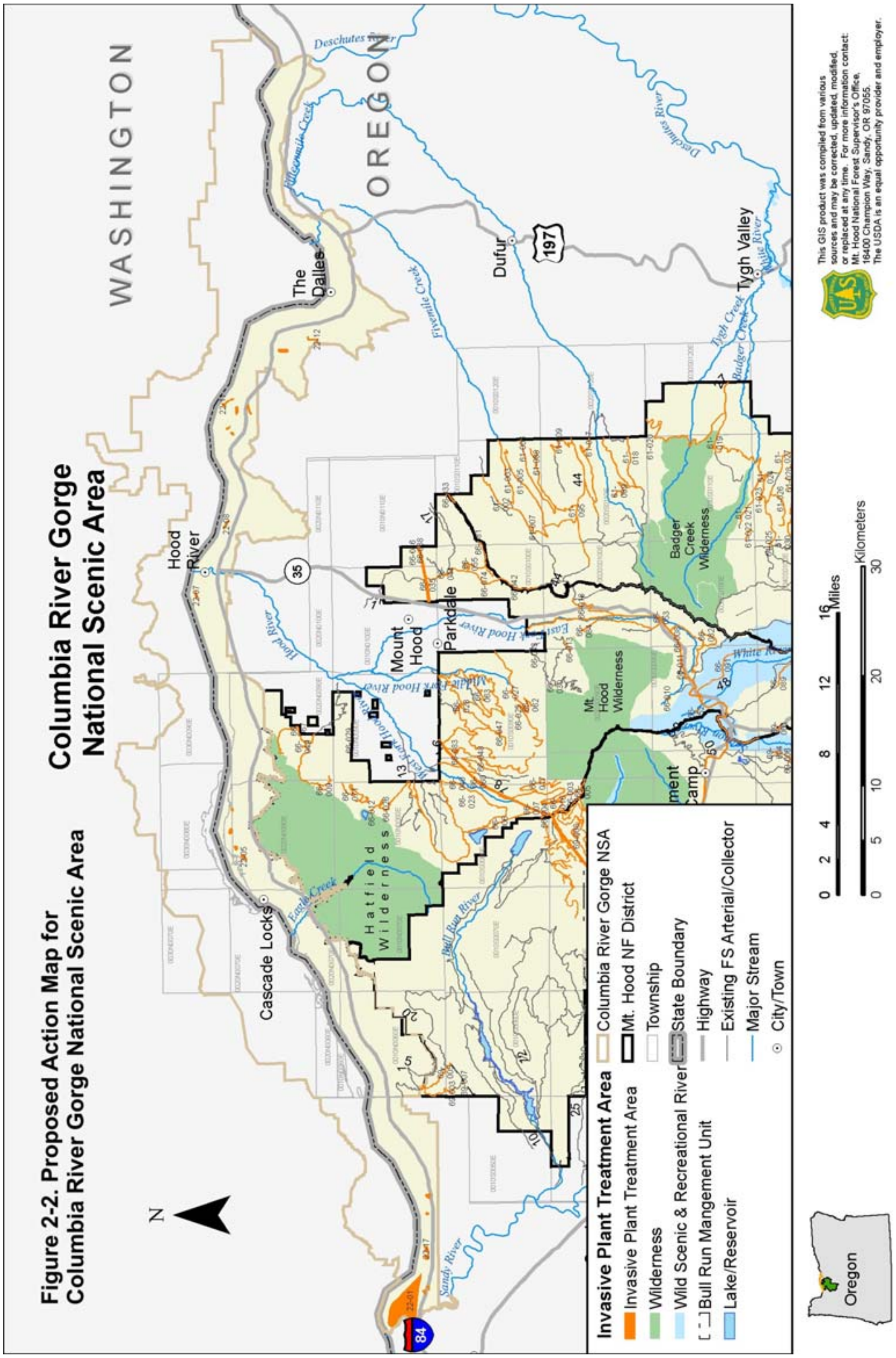


Figure 2-3. Proposed Action Map for Barlow Ranger District, Mt. Hood National Forest

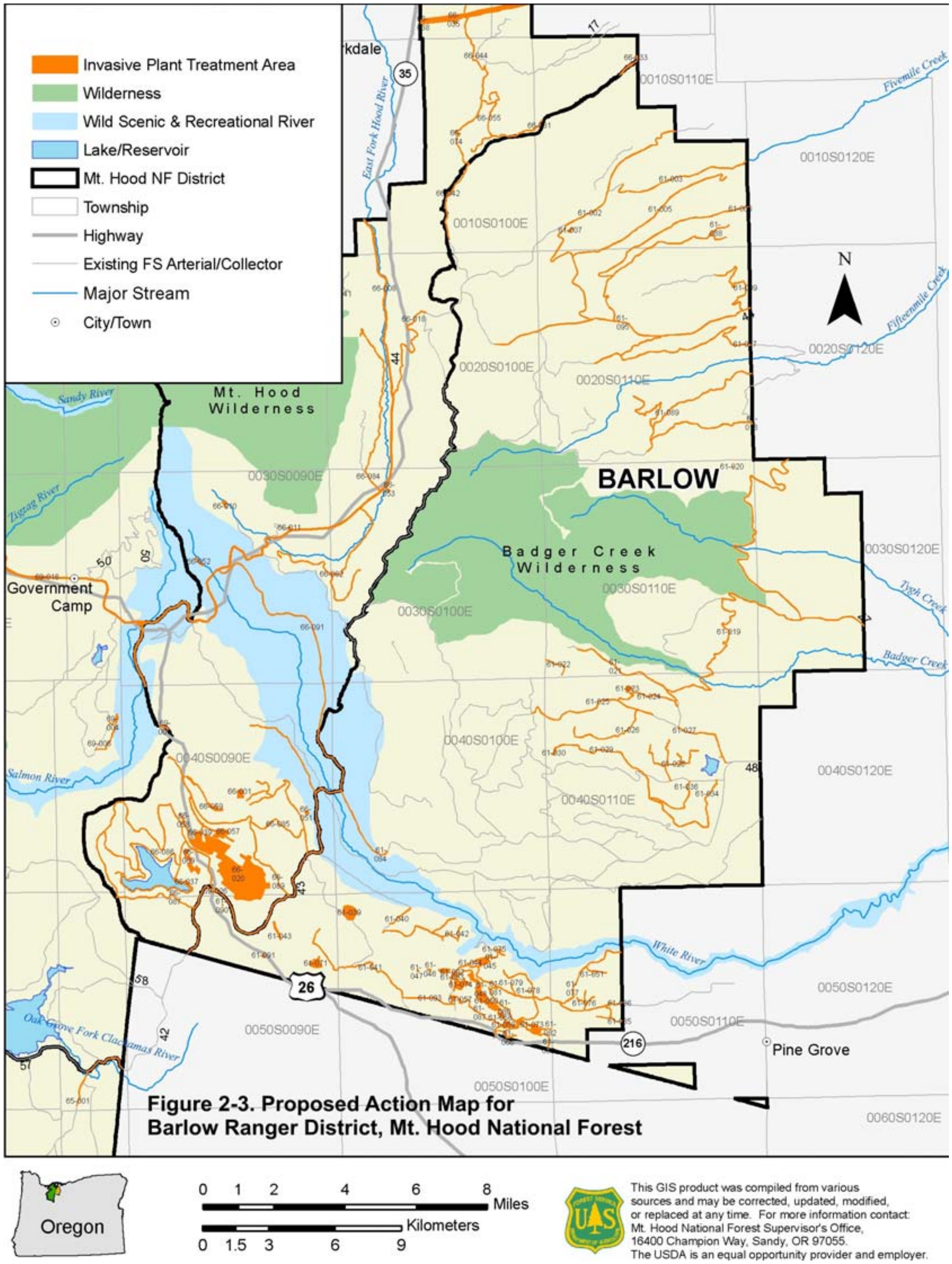


Figure 2-4. Proposed Action Map for Clackamas River Ranger District, Mt. Hood National Forest

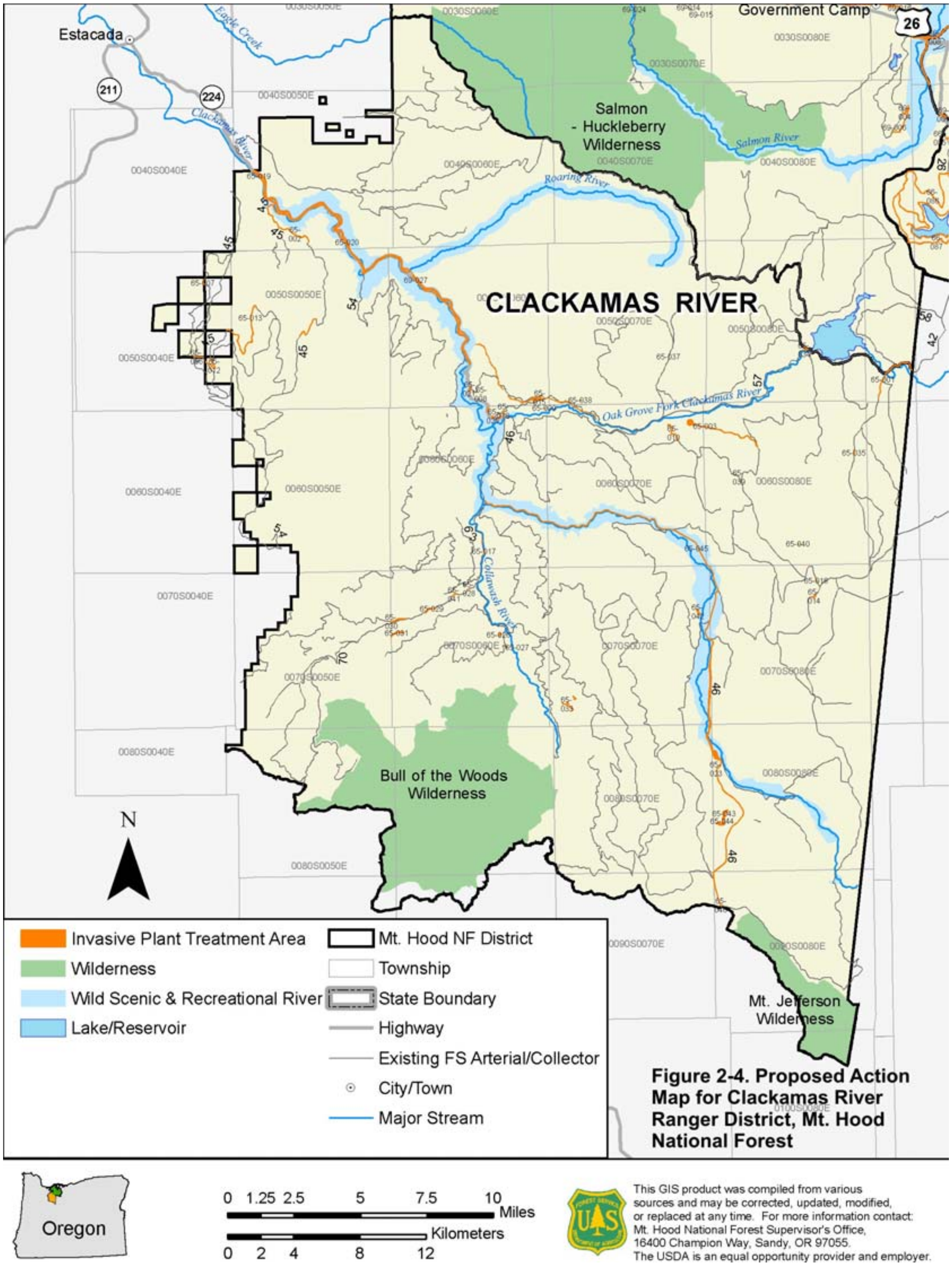


Figure 2-5. Proposed Action Map for Hood River Ranger District, Mt. Hood National Forest

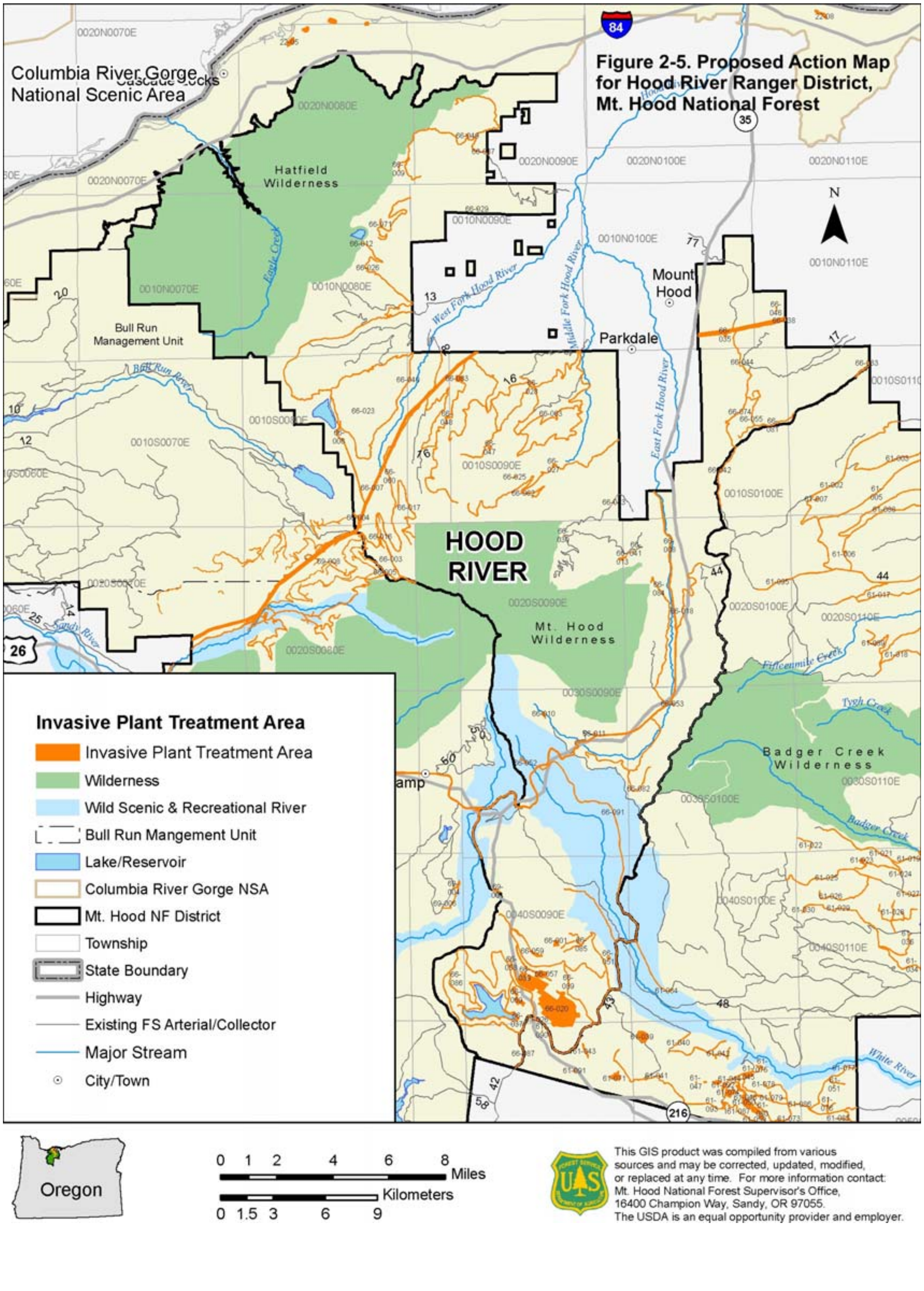
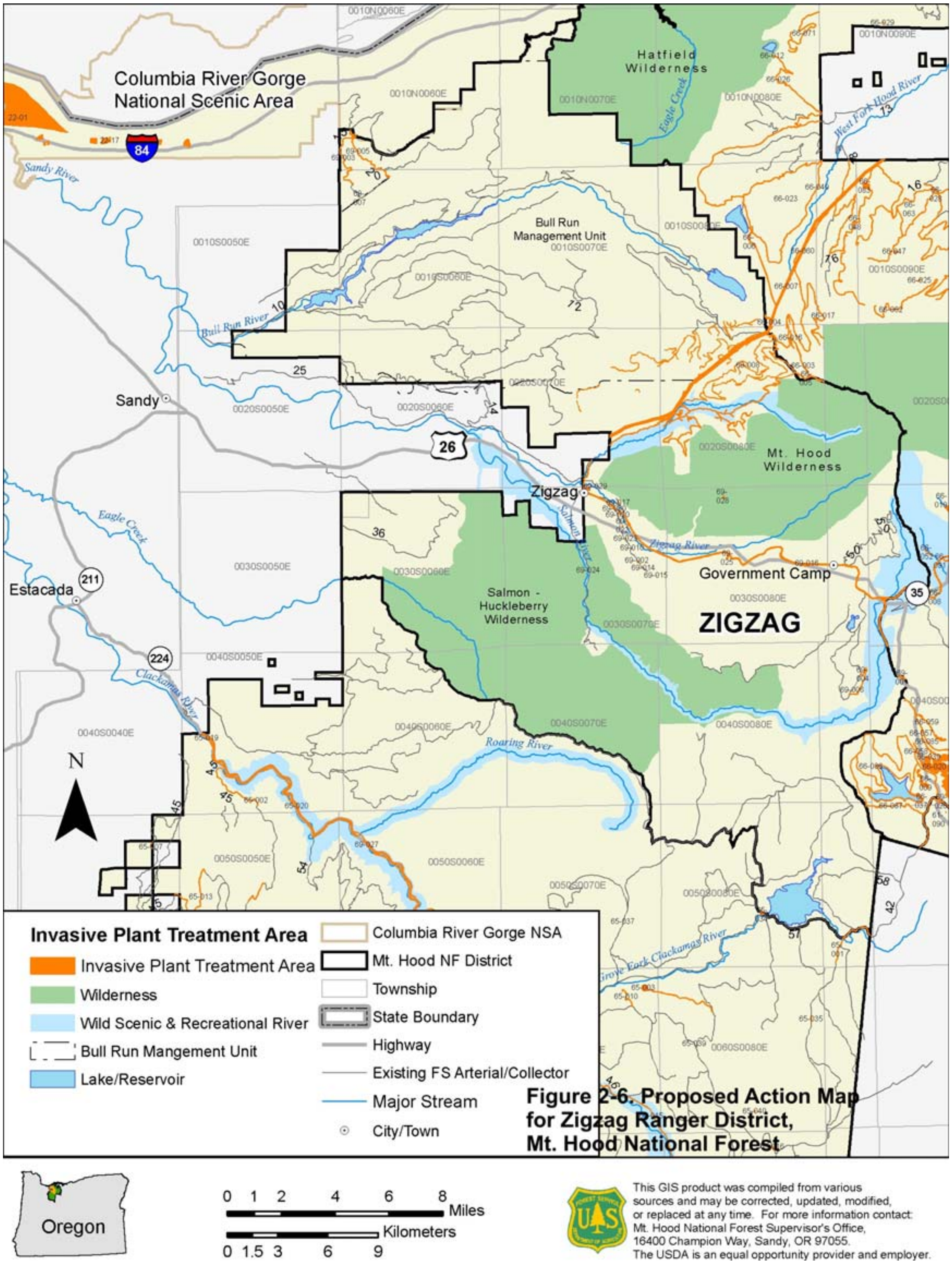


Figure 2-6. Proposed Action Map for Zigzag Ranger District, Mt. Hood National Forest



2.1.2. Alternative 1 – No Action Alternative

Current direction for the management of invasive plants occurs through individual NEPA documents tiered to the 1988 Environmental Impact Statement and 1988 Record of Decision for Competing and Unwanted Vegetation and the associated 1989 Mediated Agreement. These individual NEPA documents include: the Environmental Assessment (EA) for the Management of Noxious Weeds, Mt. Hood National Forest (1993); the Environmental Assessment for the Control and Management of Noxious Weeds and Blackberries on Selected Lands within the Columbia River Gorge National Scenic Area (1996); the Environmental Assessment for the Application of Herbicides for the Control and Management of Noxious Weeds on the Barlow Ranger District, Mt. Hood National Forest (1998); and the Big Eddy-Ostrander Transmission Corridor Supplemental Analysis to Transmission System Vegetation Management Program, Final Environmental Impact Statement Bonneville Power Administration (BPA) (2001).

- The Management of Noxious Weeds EA (USDA Forest Service, 1993a) allows the Forest to manage noxious weeds using a full range of treatment methods, including herbicide use in combination with other treatment methods. Herbicides are used only as a last resort when other methods are ineffective. This EA allows treatment of nine diffuse knapweed, spotted knapweed, and tansy ragwort sites on the Barlow, Bear Springs, Clackamas, Estacada, and Zigzag Ranger Districts using an integrated weed management program. Three herbicides are approved for use: picloram (Tordon 22K), glyphosate (Rodeo), and triclopyr (Garlon 3A). Herbicide application is applied directly to target plants only, using backpack or motorized sprayers with hand-held nozzles or hand wiping. Herbicide treatments can occur on approximately 5 acres. Other treatment methods include manual controls and re-vegetation.

- The EA for the Control and Management of Noxious Weeds and Blackberries on Selected Lands within the Columbia River Gorge National Scenic Area (USDA Forest Service, 1996c) and a 1999 amendment permits invasive plant control of 324 acres targeting 42 specific sites within the Scenic Area. Target invasive plant species include knapweed, Canada thistle, bull thistle, reed canarygrass, Himalayan blackberry, houndstongue, and others. Approximately 100 acres are on the Oregon side of the Columbia River. In addition to this EA, other NEPA documents incorporate invasive plant management and permit additional acres to be treated. On the Oregon side of the Scenic Area, this includes 1500 acres in the Sandy River Delta (SRD), which is an active restoration site heavily infested with reed canarygrass, thistles, blackberry, and tansy. On all these sites, triclopyr (Garlon 3A), glyphosate (Roundup), and picloram (except at SRD) can be used. Four sites are treated mechanically with mowing, and two sites are treated by hand pulling. Through these decisions, the Scenic Area can treat up to 1,600 acres with herbicide treatments.

- The Application of Herbicides for the Control and Management of Noxious Weeds EA on the Barlow Ranger District (USDA Forest Service, 1998b) allows the use of herbicides as part of the integrated noxious weed management program. The herbicides are picloram and triclopyr in the formulations Tordon 22K and Garlon 3A. The invasive plant species targeted for treatment are houndstongue, diffuse knapweed, spotted knapweed, meadow knapweed, tansy ragwort, yellow toadflax, and Dalmatian toadflax. Ground-based herbicide treatments are used to augment manual, mechanical and biological treatment methods where these methods have proven ineffective or uneconomical. Herbicide applications are done using spot spray or broadcast (boom) spray methods. All proposed treatment sites are disturbed areas, such as roads, roadsides, administrative sites, old clearcuts, and power line corridors, along with some sites occurring in riparian reserves within the White River watershed. The District treats up to 350 acres annually.

- Big Eddy-Ostrander Transmission Corridor supplemental analysis to Transmission System Vegetation Management Program EIS prepared by BPA (2001) in cooperation with the USDA Forest Service addresses remedial vegetation maintenance of the Big Eddy-Ostrander transmission line right-of-way on the Forest[1]. The project removes unwanted vegetation within the transmission line right-of-way. Unwanted vegetation is defined as trees or shrubs that could impede operation and maintenance of the transmission line, or plant species occurring within the right-of-way that are designated as noxious by the State of Oregon. Unwanted vegetation is removed by manual, mechanical and herbicide means. Herbicide use is limited to picloram, triclopyr, glyphosate, dicamba, or a combination of these herbicides, and all applications are ground-based (non-aerial herbicide applications). Through this decision, the Forest can treat approximately 295 acres with herbicide treatments.

As approved by these NEPA decisions, invasive plants can be treated through a variety of methods on a total of 2,250 acres; 650 acres on the Forest and 1,600 acres on the Scenic Area. In the Forest and Scenic Area, most of the invasive plant treatments currently using herbicides are carried out through agreements with the county noxious weed control boards (Hood River and Wasco Counties) or Oregon Department of Agriculture. For larger restoration projects in the Scenic Area, such as the Sandy River Delta, invasive plant infestations are treated with herbicides by contractors with licensed pesticide applicators. Treatments within the Big Eddy-Ostrander transmission line right-of-way on the Forest are administered by BPA. Manual and mechanical treatments on both units are completed by USDA Forest Service crews, through the above referenced agreements, or through partnerships and volunteers.

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[1] In June 2005, additional supplemental analysis was completed for the Big-Eddy Ostrander Transmission Corridor by BPA. This expanded the described project from Multnomah County (Zigzag Ranger District) to Hood River County (Hood River Ranger District) in order to include the entire transmission corridor. To date, no invasive plant treatments have occurred to include the entire transmission corridor. To date, no invasive plant treatments have occurred on National Forest System lands in the Hood River portion of the transmission corridor. Since no treatments have been completed to date, the No Action Alternative remains unchanged.

Under the No Action Alternative, the Forest and Scenic Area would continue to treat invasive plant species as authorized under these existing NEPA documents. Approximately 1,235 acres (Table 2-1) were treated in fiscal year 2003, including 600 acres of herbicide treatments; 450 acres on the Forest and 150 acres on the Scenic Area. The remaining 635 acres were treated with manual and mechanical treatment methods. On the Forest, approximately 40 acres in the BPA utility corridor received multiple herbicide treatments; the remaining 410 acres of herbicide treatments were treated only once. In the Scenic Area, approximately 130 acres in the Sandy River Delta received multiple herbicide treatments; the remaining acres of herbicide treatments were treated only once. The No Action Alternative map shows the Forest and Scenic Area lands that have been treated with herbicides since 1999 (Figure 2-7 – Map of No Action Alternative). Treatment areas on the Scenic Area and each District are displayed on Figures 2-8 through 2-12; these maps illustrate all areas that have been treated with herbicides from 1999 to 2003 by District. As illustrated by the maps, herbicide treatments for invasive plants have occurred within the Scenic Area as well as the Barlow, Clackamas River and Zigzag Ranger Districts: no herbicide treatments have occurred within the Hood River Ranger District. Details on the areas treated each year are available from the Forest and Scenic Area staff responsible for overseeing invasive plant management.

Treatment effectiveness varies based on the species treated and treatment method. The herbicide treatments are estimated to be 75 to 80 percent effective, and the manual and mechanical +number of infested acres and available funding. Although the number of acres varies, these acres are indicative of the number of acres and types of treatments applied each year on the Forest and Scenic Area. The fiscal year 2003 acres are used in Chapter 3 for analysis of the No Action Alternative.

Table 2-1: Acres of Treatment from October 2003 to October 2004 (Fiscal Year 2003). These acres are approved for treatment under current NEPA documents on the Forest and Scenic Area.

	Mt. Hood National Forest (acres)	Columbia River Gorge National Scenic Area (acres)	Total (acres)
Herbicide Treatments	450	150	600
Broadcast Spraying	285	130	415
Spot Spraying	165	20	185
Mechanical Treatments	10	500	510
Manual Treatments	100	25	125
TOTAL	**560**	**675**	**1,235**

Figure 2-7. Map of Proposed Treatment Areas for the No Action Alternative

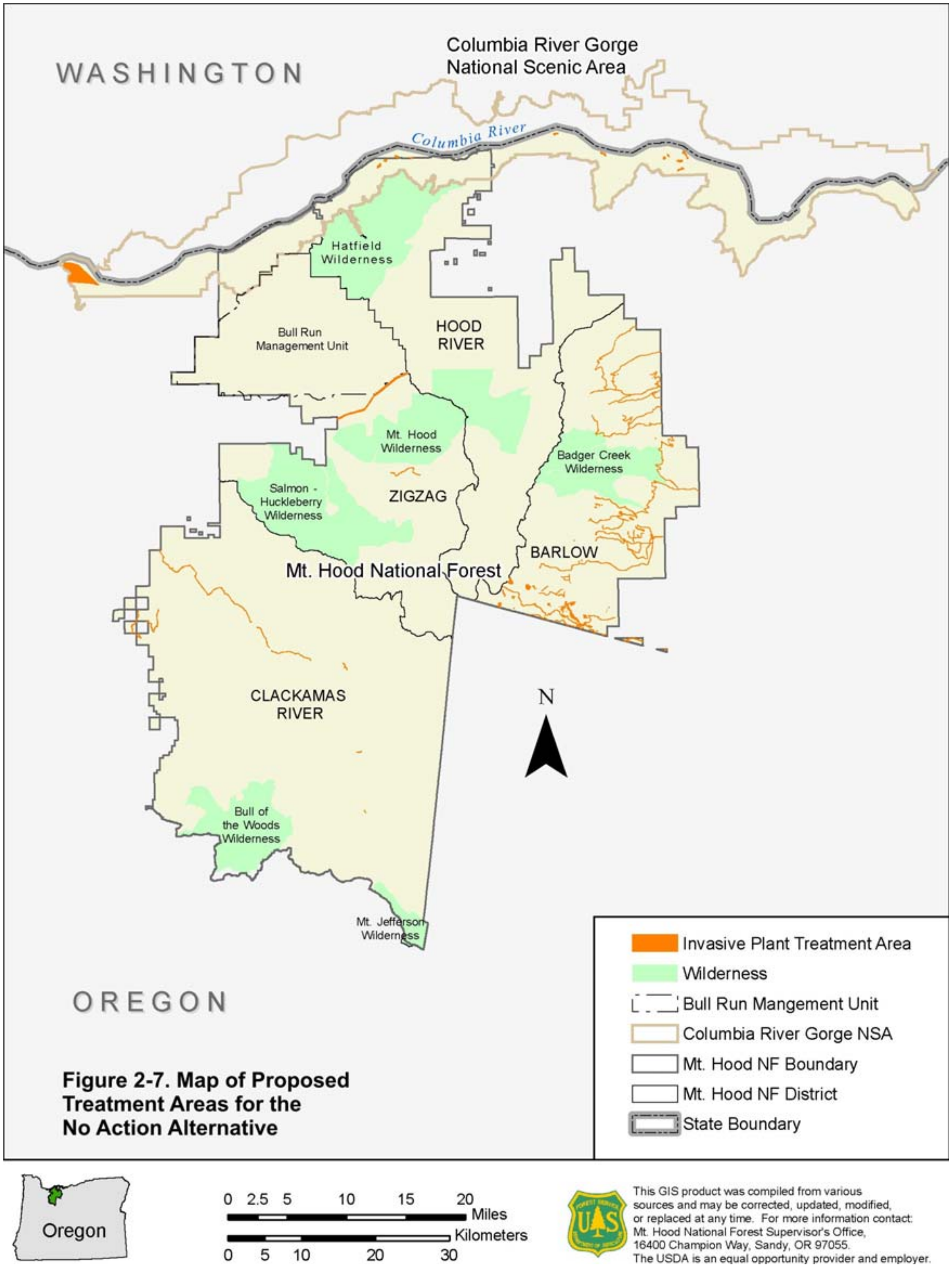


Figure 2-7. Map of Proposed Treatment Areas for the No Action Alternative

Figure 2-8. No Action Alternative Map for Columbia River Gorge National Scenic Area

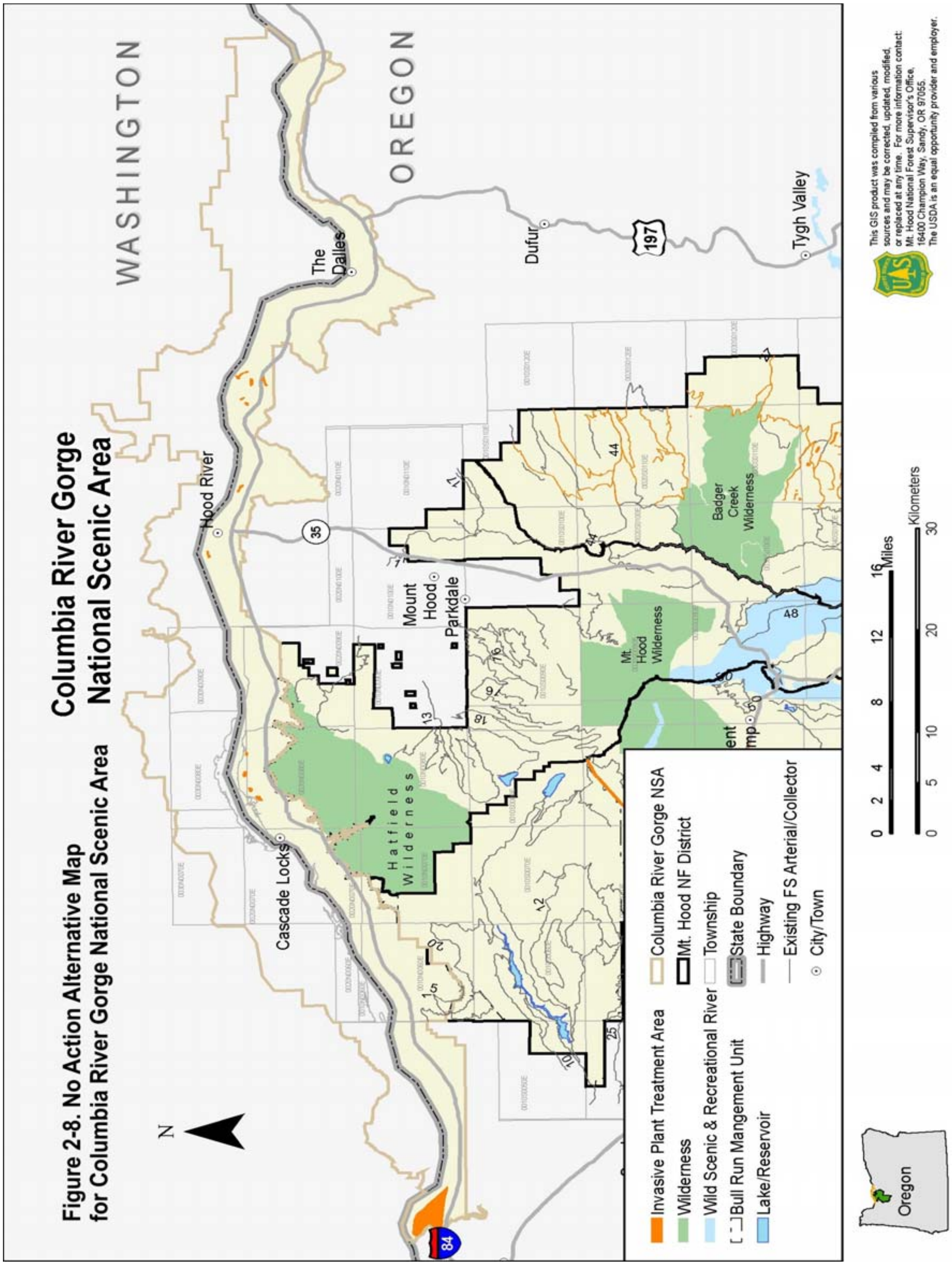


Figure 2-9. No Action Alternative Map for Barlow Ranger District, Mt. Hood National Forest

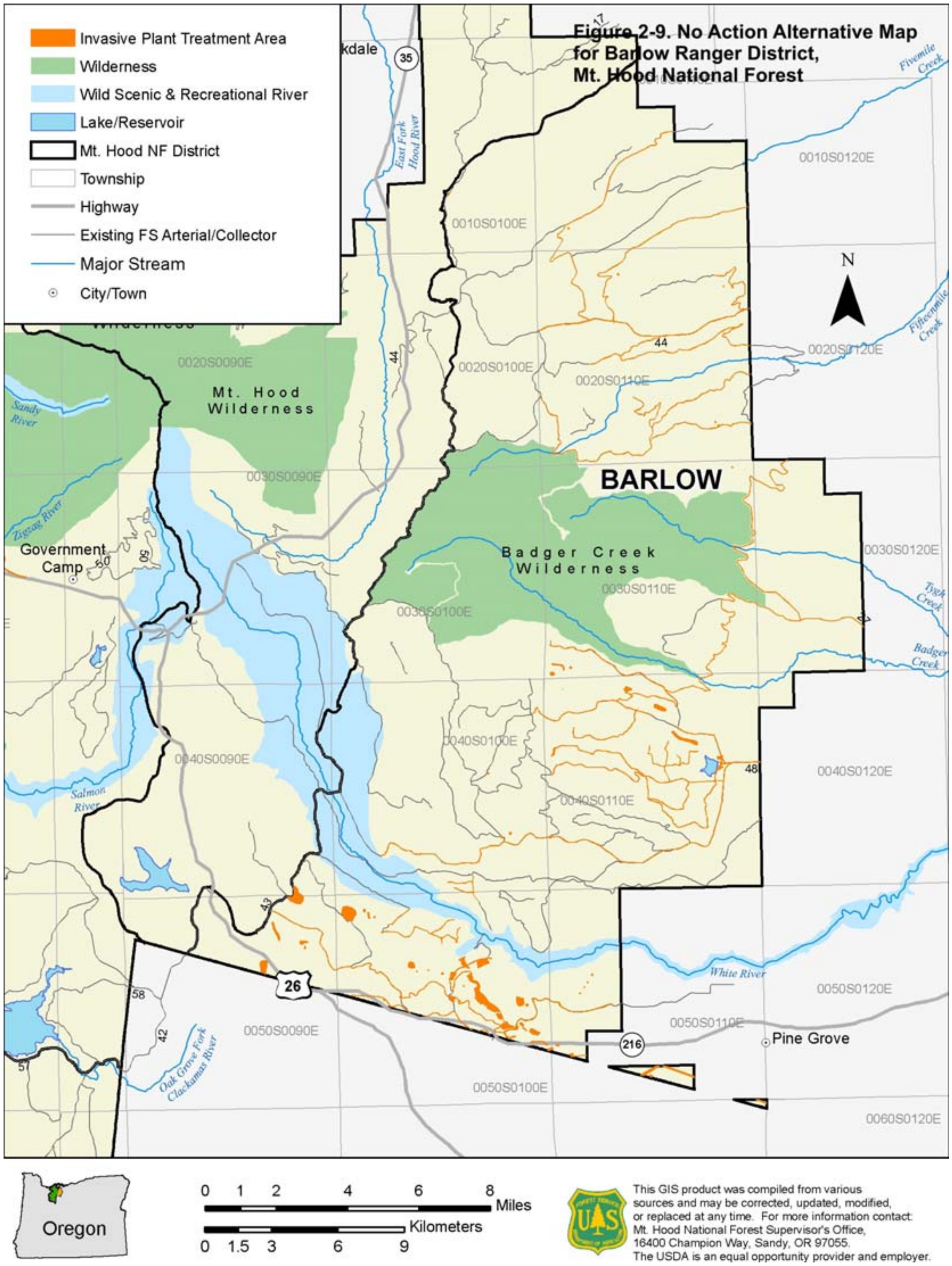


Figure 2-10. No Action Alternative Map for Clackamas River Ranger District, Mt. Hood National Forest

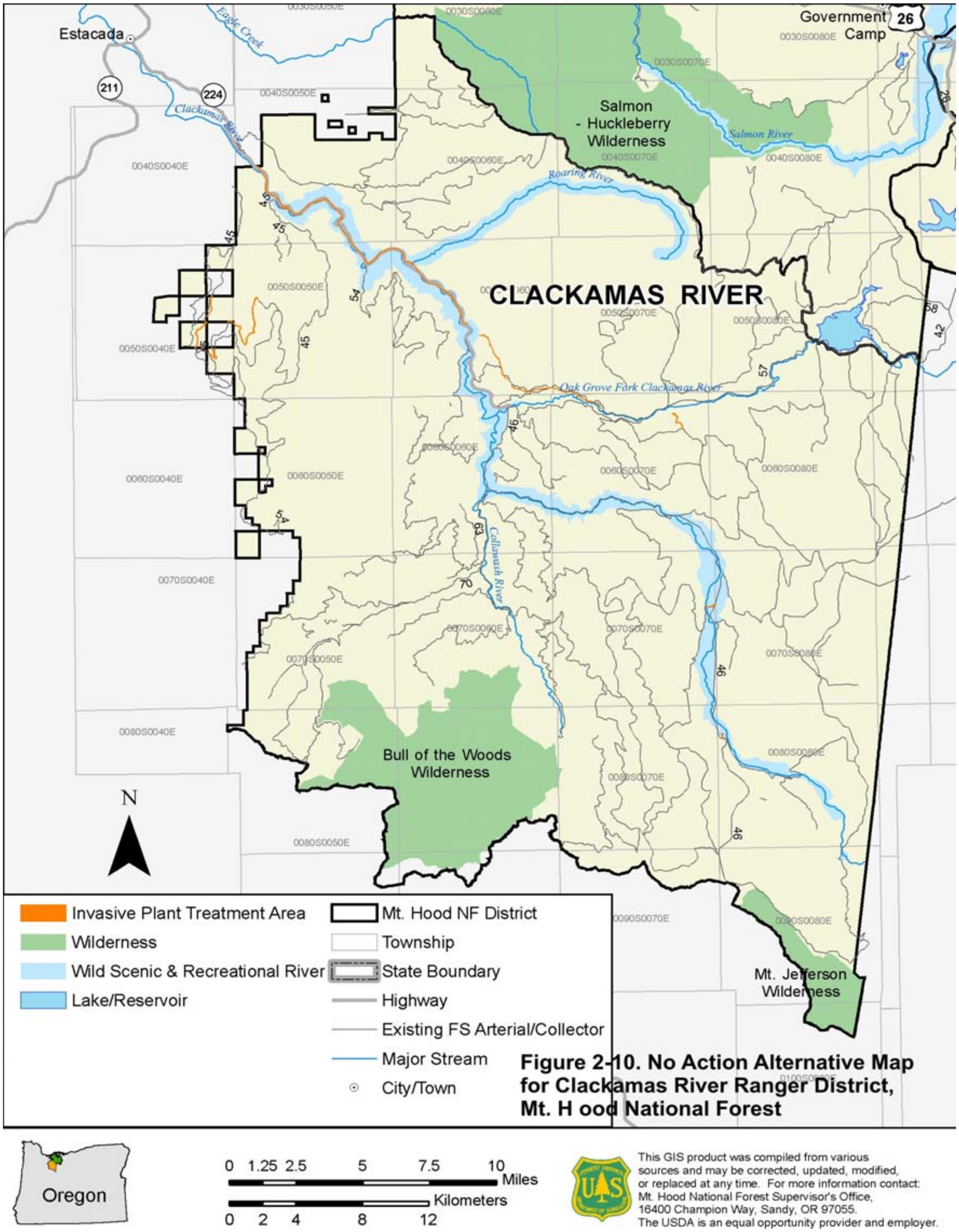


Figure 2-11. No Action Alternative Map for Hood River Ranger District, Mt. Hood National Forest

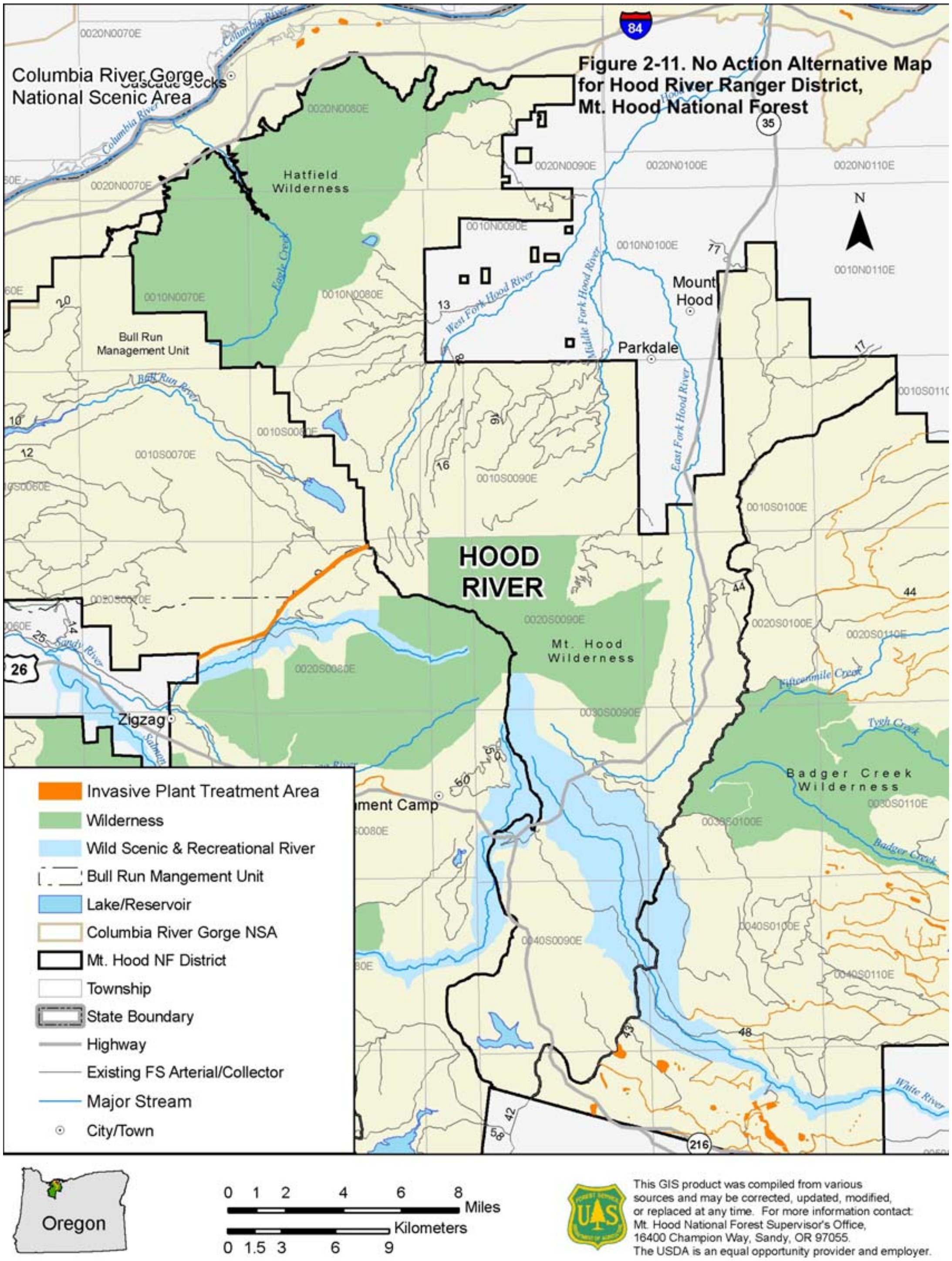
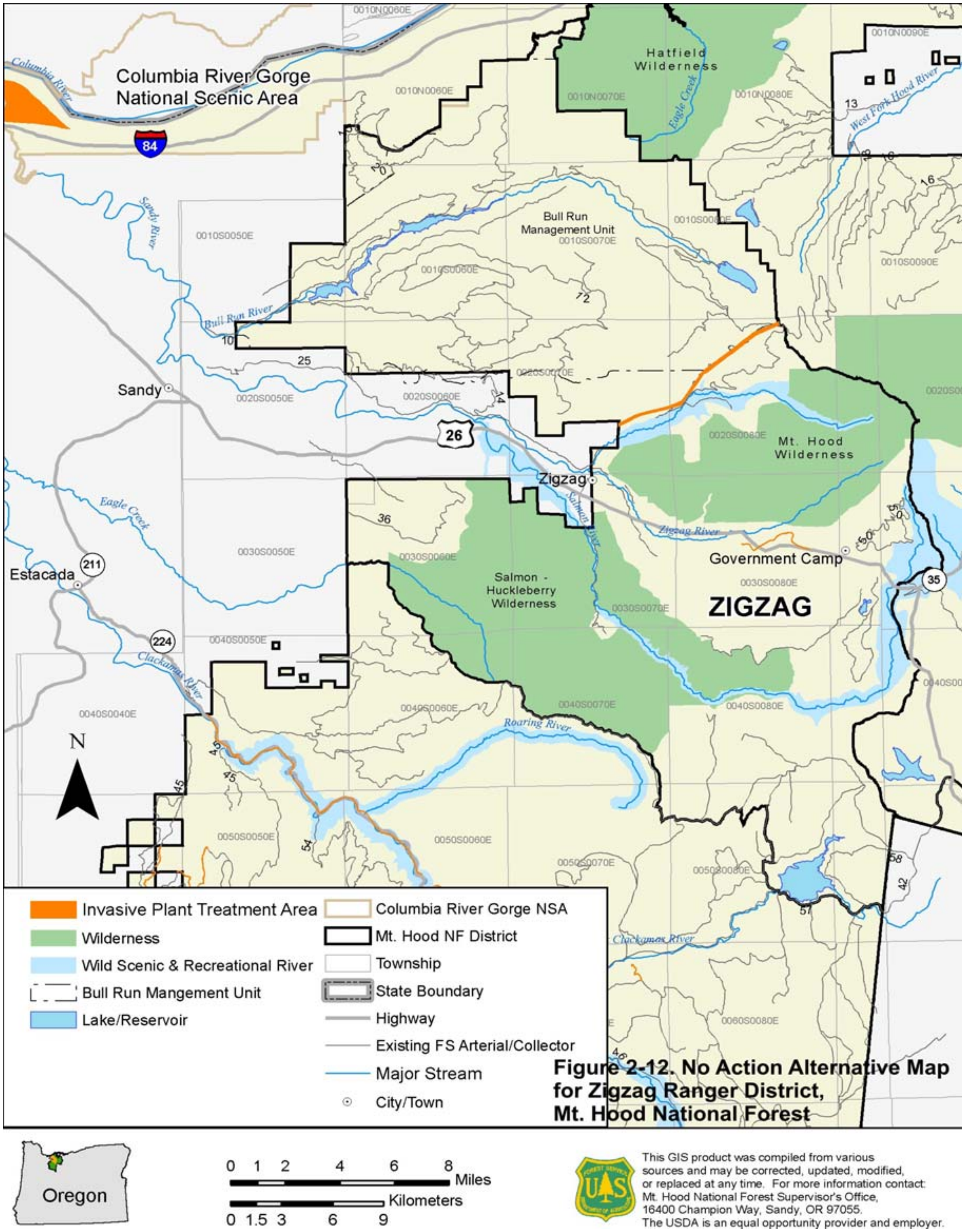


Figure 2-12. No Action Alternative Map for Zigzag Ranger District, Mt. Hood National Forest



2.1.3. Alternative 2 – The Proposed Action

The Proposed Action would implement invasive plant treatments across approximately 13,000 acres within the Forest and Scenic Area over approximately the next 10 to 15 years (See Figure 2-1 – Map of Proposed Treatment Areas for the Proposed Action). An invasive plant inventory was completed in 2004, which surveyed about 50 percent of the areas within the Forest and Scenic Area likely to be infested with invasive plants (Stein, 2005). The inventory revealed that approximately 3,600 acres are infested with invasive plants (1,700 acres on the Forest and 1,900 acres on the Scenic Area). With the realization that some invasive plants or infested areas were missed during past surveys, an uncertainty factor was applied to bring the estimated total infested area up to approximately 3,700.

The total treatment acres were adjusted slightly to incorporate anecdotal evidence and expert knowledge, including delays in treatment, spread of invasive plants and other factors that spread plant seeds. Evidence shows that the invasive plant species present in the Forest and Scenic Area would likely expand their populations at a rate of 8 to 12 percent each year (USDA Forest Service, 1999). The expansion in population size includes plant growth as well as spread by a variety of vectors including wind, water, animals, and human activities where they are present. Also, due to the high cost of treatment, it is highly unlikely that we would be able to take action in all inventoried areas immediately. During the time between the inventory and treatment, plant populations would grow and spread. To account for this growth over the life of the project (15 years), a "foreseeable" rate of spread of 10 percent per year was also applied to estimate the total foreseeable infested acres 15 years from now (Table 1-1), hereafter referred to as the treatment acres.

Many treatment areas contain an aquatic influence zone. An aquatic influence zone is the land adjacent to perennial and intermittent streams, rivers, ponds, lakes, springs, and wetlands that has a direct or potentially direct influence on the water body and its function where herbicides may enter surface waters. This zone has a default width of 100 feet, given the understanding that in some areas it may be wider pending a site-specific review. The aquatic influence zone is illustrated in Figure 2-13.

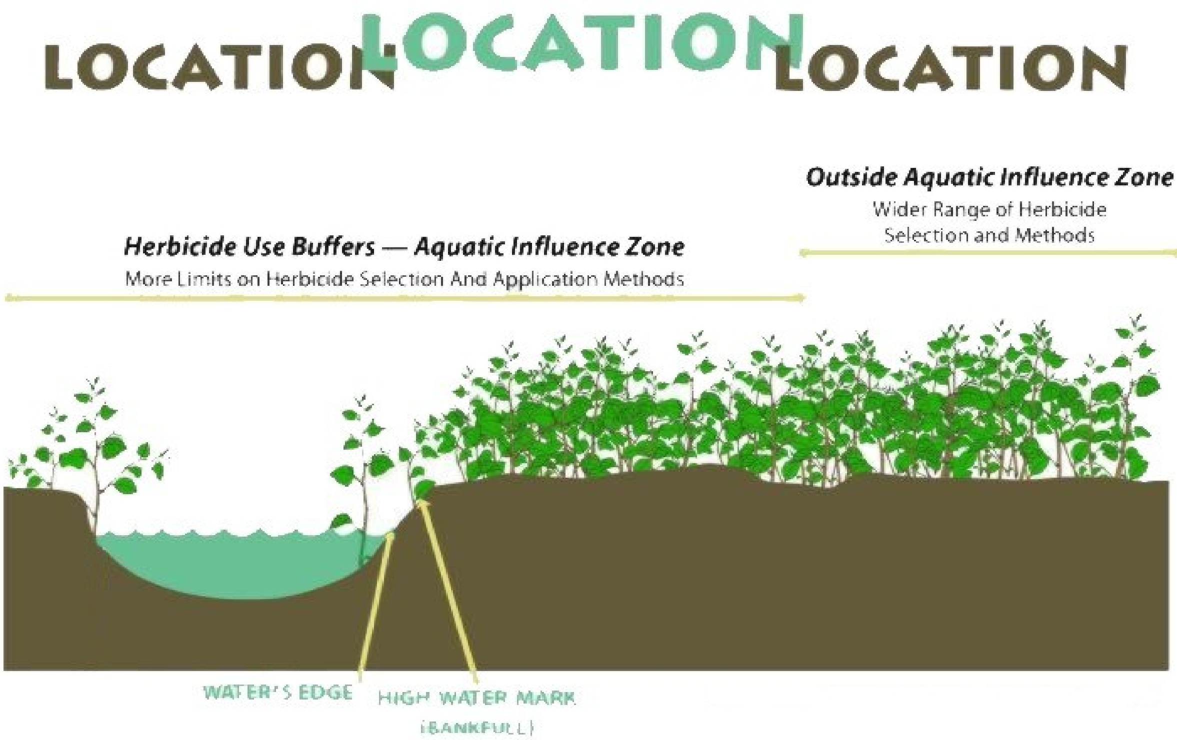
The treatments would be adjusted to meet specific Project Design Criteria (PDC), the purpose of which is to reduce or eliminate the potential impacts (Detailed in Section 2.2). PDC are a set of required implementation design criteria applied to projects to ensure that the project is done according to environmental standards and adverse effects are within the scope of those predicted in this EIS.

Although all treatment areas are analyzed by resource area in Chapter 3 – Affected Environment and Environmental Consequences, only areas actually containing invasive plants would be treated in any given year. As a result, the area impacted is likely to be less than the estimated treatment acres (13,000 acres). The estimated treatment areas represent the worse-case scenario of invasive plants spreading rapidly without treatment; the worse-case scenario is described in the Invasive Plant Treatment Prescription Assumptions sections. For example, in the Sandy River Delta (SRD) approximately 1000 acres are infested with invasive plants. Treatment area #22-01, however, contains the entire SRD (approximately 1500 acres), and the effects of treatment methods are analyzed by each resource area over the entire treatment area. This approach would allow treatment across the entire SRD if the spread of invasive plants to new, uninfested areas of the SRD or if new invasive plant species infest the SRD. Regardless of the area analyzed, only the infested acres within the SRD would be treated.

The treatment methods, species, treatment strategies, treatment prescriptions, assumptions, site restoration strategies, Forest Plan amendments, and Early Detection / Rapid Response strategy (EDRR) components of the Proposed Action are each described more completely below.

Figure 2-13. Illustration of Aquatic Influence Zone

Figure 2-13. Illustration of Aquatic Influence Zone



Treatment Methods

Proposed treatment methods include hand pulling, cutting, mowing, hand/selective herbicide applications, stem injection, spot herbicide spraying, broadcast herbicide spraying, and goat grazing. These treatment methods are summarized in Table 2-2. The timing for herbicide treatments would be dependent on the species as well as wind and rain restrictions, which vary by herbicide.

Table 2-2: Summary of Proposed Treatment Methods. The effectiveness of these treatment methods are discussed in Section 3.6 – Botany and Treatment Effectiveness.

Method	Description
Manual Methods	
Hand pulling	Pulling or uprooting plants can be effective against some shrubs, tree saplings, and herbaceous invasive plants. Annuals and tap-rooted plants are particularly susceptible to control by hand pulling. It is not as effective against many perennial invasive plants with deep underground stems and roots that are often left behind to re-sprout. The advantages of pulling include its small ecological impact, minimal damage to neighboring plants, and low (or no) cost for equipment or supplies. The key to effective hand pulling is to remove as much of the root as possible while minimizing soil disturbance. For many species, any root fragments left behind have the potential to re-sprout, and pulling is not effective on plants with deep and/or easily broken roots.
Pulling Using Tools	Most plant-pulling tools are designed to grip the plant stem and provide the leverage necessary to pull its roots out. Tools vary in their size, weight, and the size of the invasive plant they can extract. The Root Talon is inexpensive and lightweight, but may not be as durable or effective as the all-steel Weed Wrench, which is available in a variety of sizes. Both tools can be cumbersome and difficult to carry to remote sites. Both work best on firm ground as opposed to soft, sandy, or muddy substrates.
Clipping	“Clipping” means to cut or remove seed heads and/or fruiting bodies to prevent germination. This method is labor-intensive and effective for small and spotty infestations.
Clipping and pulling	“Clipping and pulling” means cutting a portion of the invasive plant stem and pulling it from its substrate, generally the bole of a tree. This method is labor-intensive, but can be effective for larger infestations.
Stabbing	Some plants can be killed by severing or injuring (stabbing) the carbohydrate storage structure at the base of the plant. Depending on the species, this structure may be a root corm, storage rhizome (tuber), or taproot. These organs are generally located at the base of the stem and under the soil. Cutting off access to these storage structures can help “starve” or greatly weaken some species.

Method	Description
Mechanical Methods	
Mowing, cutting, brushing, trimming, weed eating	Mowing and cutting can reduce seed production and restrict invasive plant growth, especially in annuals cut before they flower and set seed. Some species however, re-sprout vigorously when cut, replacing one or a few stems with many that can quickly flower and set seed. These treatments are used as primary treatments to remove aboveground biomass in combination with herbicide treatments to prevent resprouting, or as follow up treatments to treat target plants missed by initial herbicide use. Also, mowing and cutting can be used, in conjunction with herbicide treatments, to reduce vegetative materials and to promote vigorous growth in order to decrease the amount of herbicide application needed, and to increase herbicide effectiveness.
Cultural Methods	
Grazing goats	Grazing could either promote or reduce invasive plant abundance at a particular site. When grazing treatments are combined with other control techniques, such as herbicides, severe infestations could be reduced and small infestations may be eliminated. Grazing animals may be particularly useful in areas where herbicides cannot be applied (e.g., near water) or are prohibitively expensive (e.g., large infestations). Animals also could be used as part of a restoration program by breaking up the soil and incorporating in seeds of desirable native plants. Goats prefer broadleaf herbs and have been used to control leafy spurge (Euphorbia esula), Russian knapweed (Acroptilon repens), and toadflax (Linaria spp.). These animals appear to be able to neutralize the phytochemicals toxic to other animals that are present in these and other forbs. Goats could control woody species because they climb and stand on their hind legs, and browse on vegetation other animals cannot reach. (Tu et al., 2001)
Herbicide Methods	
Hand/Selective	Treatment of individual plants to avoid spraying other desirable plants. There is a low likelihood of drift or delivery of herbicides away from treatment sites. This method is used in sensitive areas, such as near water, to avoid getting any herbicide on the soil or in the water. Hand/Selective methods could be done under more variable conditions than spot spraying or broadcast spraying (Tu et al., 2001). Specific methods include: a. Wicking and Wiping - Involves using a sponge or wick on a long handle to wipe herbicide onto foliage and stems. Use of a wick eliminates the possibility of spray drift or droplets falling on non-target plants. Herbicide can drip or dribble from some wicks. b. Foliar Application - These methods apply herbicide directly to the leaves and stems of a plant. An adjuvant or surfactant is often needed to enable the herbicide to penetrate the plant cuticle, a thick, waxy layer present on leaves and stems of most plants. There are several types of foliar application tools available.

Method	Description
	c. Basal Bark - This method applies a 6 to 12 inch band of herbicide around the circumference of the trunk of the target plant, approximately one foot above ground. The width of the sprayed band depends on the size of the plant and the species' susceptibility to the herbicide. The herbicide can be applied with a backpack sprayer, hand-held bottle, or wick. d. Frill or Hack and Squirt - The frill method, also called the "hack and squirt" treatment, is often used to treat woody species with large, thick trunks. The tree is cut using a sharp knife, saw, or ax, or drilled with a power drill or other device. Herbicide is then immediately applied to the cut with a backpack sprayer, squirt bottle, syringe, or similar equipment. e. Stem Injection - Herbicides can be injected into herbaceous stems using a needle and syringe. Herbicide pellets can also be injected into the trunk of a tree using a specialized tool. f. Cut-stump - This method is often used on woody species that normally re-sprout after being cut. Cut down the tree or shrub, and immediately spray or squirt herbicide on the exposed cambium (living inner bark) of the stump. The herbicide must be applied to the entire inner bark (cambium) within minutes after the trunk is cut. The outer bark and heartwood do not need to be treated since these tissues are not alive, although they support and protect the tree's living tissues. The cut stump treatment allows for a great deal of control over the site of herbicide application, and therefore, has a low probability of affecting non-target species or contaminating the environment. It also requires only a small amount of herbicide to be effective.
Spot Spraying	Spot applicators spray herbicide directly onto small patches or individual target plants only and avoid spraying other desirable plants. These applicators range from motorized rigs with spray hoses to backpack sprayers, to hand-pumped spray or squirt bottles, which can target very small plants or parts of plants.
Broadcast (Boom) Spraying	A boom, a long horizontal tube with multiple spray heads, may be mounted or attached to a tractor, ATV (all terrain vehicle) or other vehicle. The boom is then carried above the invasive plants while spraying herbicide, allowing large areas to be treated rapidly with each sweep of the boom. Offsite movement due to vaporization or drift and possible treatment of non-target plants can be of concern when using this method. The herbicide is carried in a tank and reaches the nozzles via tubing. All herbicides are metered out from the nozzles in a controlled manner. The nozzle controls the droplet size, the area (or cone) being covered by the herbicide and it could be turned on/off with ease. Some nozzles could rotate. All this flexibility permits the operator to carefully apply herbicide at specific rates over specific areas. Many of the new boom spray operations have very sophisticated electronic monitoring that delivers exact amounts of herbicides and keeps records on rates and areas covered. Offsite movement due to drift and possible treatment of non-target plants could be of concern when using this method. Not all broadcast methods include a boom; boom-less nozzles are currently in use that can reduce the risk of non-target effects. Backpacks may also be used as a broadcast tool, if not directed at individual plants.

Herbicide treatments would be limited to the ten herbicides that were approved for use under the Invasive Plant ROD (2005b). These herbicides are chlorsulfuron, clopyralid, glyphosate, imazapic, imazapyr, metsulfuron methyl, picloram, sethoxydim, sulfometuron methyl, and triclopyr. The following treatment methods are shown in order of preference, assuming the methods are effective, practical and cost-effective.

1. Non-herbicide, non-ground disturbing treatment methods, specifically manual, mechanical and cultural (goat grazing) treatment methods;

2. Application of herbicides via hand/selective treatment methods (e.g., stem injection or spot spraying);

    - Application of low toxicity herbicides, such as clopyralid, imazapic, metsulfuron methyl, aquatic triclopyr, or aquatic imazapyr;

    - Application of moderate toxicity herbicides, such as aquatic glyphosate, chlorsulfuron, imazapyr, sulfometuron methyl; and

    - Application of more toxic herbicides, such as glyphosate, triclopyr, picloram, and sethoxydim.

3. Application of herbicide via broadcast spraying treatment methods. Preference for herbicide choice would follow the same order as the hand/selective methods.

Although the first preference is non-herbicide, non-ground disturbing methods, this EIS focuses on herbicide treatments. On the Forest for the past 13 years and on the Scenic Area for the last 10 years, the USDA Forest Service has had the ability to treat invasive plants with non-herbicide methods using existing NEPA documents. These treatment methods, however, have not effectively treated the invasive plant infestations on the Forest or Scenic Area. In addition, research and anecdotal evidence have demonstrated that herbicide treatments have been found to be the most effective treatment for many of the invasive plants proposed for treatment (see Section 3.6 – Botany and Treatment Effectiveness). The treatment preferences would be followed in the Early Detection / Rapid Response strategy (EDRR) (discussed below).

Prescriptions follow these preferences and integrated weed management (IWM) approach to achieve effective and practical treatment methods for each site. No single management technique is perfect for all invasive plant control situations. Multiple management actions are required for effective control. The strategy of using an integrated selection of management techniques has been developed for use in a variety of “pest” control situations, including plant pests or invasive plants. IWM is an approach for selecting methods for preventing, containing, and controlling invasive plant in coordination with other resource management activities to achieve optimum management goals and objectives. This approach uses a combination of treatment methods that, taken together, would control a particular invasive plant species or infestation efficiently and effectively, with minimum adverse impacts to non-target organisms. IWM seeks to combine two or more treatment methods that would interact to provide better control than any one of the actions might provide alone. The IWM approach contrasts with the traditional approach of using a single control action, such as applying herbicides, to treat all invasive plant problems. Herbicides are one useful technique, but they are not the only method to control invasive plants and may not always be the most effective. IWM is species-specific, tailored to exploit the weaknesses of a particular invasive plant species, site-specific, and designed to be practical with minimal risk to the organisms and their habitats (Colorado Natural Areas Program, 2000).

IWM requires an ecologically based, interdisciplinary approach. Selection of treatment methods is based on information such as the biology of particular invasive plant species, site location, proximity to water, and size of the infestation. Multiple entries (up to three times per year) may be required to appropriately treat the invasive plant species and meet the treatment strategies for each treatment area (discussed below). Additionally, the prescription combinations often have a temporal aspect: invasive target species may be treated with herbicide initially, then with manual or mechanical follow-up as needed. Treatments may be repeated as needed on an annual basis. Similarly, the herbicide used at a treatment area may change over time as the mixture of invasive plants present and/or site conditions change.

Species to be Treated

A total of 19 invasive plant species are proposed for treatment based on current inventories (November 2004). Additional species are known to be present on lands adjacent to or near the Forest and Scenic Area: some of these species are listed in Table 2-3. Several of these species may already be present within the Forest or Scenic Area, but were not identified during the last inventory. More invasive plant species may be detected on the Forest and Scenic Area in the future. Any invasive plant species may be treated under the EDRR and is not limited to these species.

Table 2-3: Invasive Plants Proposed for Treatment. Invasive plants proposed for treatment based on current inventory (November 2004), and other invasive plant species likely to be present or in close proximity to the Forest or Scenic Area. The species not yet present may be treated under the EDRR.

Common Name	Scientific Name	Symbol	Inventoried Species (November 2004)
Butter and eggs	*Linaria vulgaris*	LIVU2	Yes
Canada thistle	*Cirsium arvense*	CIAR4	Yes
Common hawkweed	*Hieracium vulgatum*	HIVU	Yes
Common tansy	*Tanacetum vulgare*	TAVU	Yes
Diffuse knapweed	*Centaurea diffusa*	CEDI3	Yes
English ivy	*Hedera helix*	HEHE	Yes
Himalayan blackberry	*Rubus discolor*	RUDI2	Yes
Houndstongue	*Cynoglossum officinale*	CYOF	Yes
Japanese knotweed	*Polygonum cuspidatum*	POCU6	Yes
Meadow hawkweed	*Hieracium pratense*	HIPR	Yes
Meadow knapweed	*Centaurea debeauxii (pratense)*	CEPR2	Yes

Common Name	Scientific Name	Symbol	Inventoried Species (November 2004)
Orange hawkweed	*Hieracium aurantiacum*	HIAU	Yes
Reed canarygrass	*Phalaris arundinacea*	PHAR3	Yes
Rush skeletonweed	*Chondrilla juncea*	CHJU	Yes
Scotch broom	*Cytisus scoparius*	CYSC4	Yes
Spotted knapweed	*Centaurea biebersteinii*	CEBI2	Yes
St. Johnswort	*Hypericum perforatum*	HYPE	Yes
Tansy ragwort	*Senecio jacobaea*	SEJA	Yes
Yellow starthistle	*Centaurea solstitialis*	CESO3	Yes
Bohemian knotweed	*Polygonum bohemicum*	POBO10	No
Cutleaf blackberry	*Rubus laciniatus*	RULA	No
Dyer's woad	*Isatis tinctoria*	ISTI	No
False broom	*Brachypodium sylvaticum*	BRSY	No
Garlic mustard	*Alliaria petiolata*	ALPE4	No
Giant knotweed	*Polygonum sachalinense*	POSA4	No
Herb Robert	*Geranium robertianum*	GERO	No
Himalayan knotweed	*Polygonum polystachyum*	POPO5	No
Leafy spurge	*Euphorbia esula*	EUES	No
Mediterranean sage	*Salvia aethiopis*	SAAE	No
Medusahead rye	*Taeniatherum caput-medusae*	TACA8	No
Musk thistle	*Carduus nutans*	CANU4	No
Perennial peavine	*Lathyrus latifolius*	LALA4	No
Perennial pepperweed	*Lepidium latifolium*	LELA2	No
Policeman's helmet	*Impatiens glandulifera*	IMGL	No
Puncturevine	*Tribulus terrestris*	TRTE	No
Purple loosestrife	*Lythrum salicaria*	LYSA2	No
Russian knapweed	*Acroptilon repens*	ACRE	No
Scotch thistle	*Onopordum acanthium*	ONAC	No
Shining geranium	*Geranium lucidum*	GELU	No
Squarrosa knapweed	*Centaurea virgata*	CEVI8	No
Water hemlock	*Cicuta maculata*	CIMA2	No
Whitetop	*Cardaria draba*	CADR	No

Treatment Strategies

Based on the species present as well as site-specific conditions, such as ease of access, land allocation, location near special areas, restrictions due to other sensitive resources, or invasiveness of the plant in a specific habitat, each species in a treatment area is assigned a treatment strategy. The treatment strategies are defined in Section 1.2 – Purpose and Need for Action.

Treatment areas containing species with defined treatment strategies of eradicate and control would receive more intensive treatments than the other treatment strategies. Table 2-4 summarizes the acres under each treatment strategy for the Forest and Scenic Area. This EIS focuses on eliminating and controlling invasive plant species in order to stop the spread of invasive plants and restore healthy, native plant communities. The contain and suppress strategies focus on large areas infested with invasive plants; these areas are likely to never be completely “weed-free”. Since this EIS focuses on significantly reducing or eliminating invasive plants at the treatments sites, the strategies of contain and suppress are not prevalent. The treatment strategy can be dependent on either the site-specific objectives or the invasive plant species present.

Table 2-4: Acres by Treatment Strategies. Treatment strategies vary by species, so one treatment area may have multiple treatment strategies based on the invasive plant species present. The calculations use the primary treatment strategy for each treatment area. Treat strategies were developed by the noxious weed coordinators in conjunction with other specialists on the IDT.

Unit	Eradicate	Control	Contain	Suppress
Scenic Area	85	1682	20	0
Forest	5349	5828	0	0
Total	**5434**	**7510**	**20**	**0**

Invasive Plant Treatment Prescriptions

After determining the appropriate treatment strategy, a prescription for the treatment is developed for each treatment area. The treatments would occur over approximately 10 to 15 years. The invasive plant treatment prescriptions follow the IWM approach described in the previous section. All herbicide treatments require the completion of the Pesticide-Use Proposal Form FS-2100-2 (Appendix E) to document decision to use pesticides on National Forest System lands. All recommended treatment methods would be documented and approved by the appropriate responsible official(s) (see Figure 1-4).

The overall treatment methods (e.g., manual, mechanical, cultural (goat grazing), or herbicide) and specific treatment methods by treatment type (e.g., hand pulling, mowing) are identified by treatment area in Appendix F –Site and Treatment Information. The treatment area locations are illustrated in Figures 2-2 to 2-6: Maps of Proposed Treatment Areas for the Proposed Action on the Scenic Area and each District. The proposed invasive plant prescriptions in Appendix G follow those described in *Common Control Measures for Invasive Plants of the Pacific Northwest Region* (Mazzu, 2005). Appendix G summarizes the treatment prescriptions proposed for the target invasive plant species in, or in close proximity to, the Forest and Scenic Area. The complete document, including more detailed descriptions of the prescriptions and prescriptions for additional species is available as Appendix N in the Invasive Plant FEIS (2005a) at http://www.fs.fed.us/r6/invasiveplant-eis/FEIS.htm. Table 2-5 displays the acres to be treated and treatment methods within the Forest and Scenic Area.

Table 2-5: Proposed Action Summary of Treatment Methods. *Note*: Only infested acres would be treated with herbicides, rather than the entire area being analyzed.

Overall Treatment	Acres	Percent of Total
Herbicide	30	0.2%
Herbicide plus Manual	327	2.5%
Herbicide plus Manual & Mechanical	10736	82.8%
Herbicide plus Manual, Mechanical & Cultural (Goat Grazing)	1,510	11.6%
Herbicide plus Mechanical	310	2.4%
Manual and Mechanical	50	0.4%
Total	**12,963**	**100.0%**

Again, although the first preference is non-herbicide, non-ground disturbing methods, this EIS focuses on herbicide treatments. On the Forest for the past 13 years and on the Scenic Area for the last 10 years, the USDA Forest Service has had the ability to treat invasive plants with single or a combination of non-herbicide methods (manual and mechanical primarily) using existing NEPA documents. These treatment methods, however, have not effectively treated the invasive plant infestations within the Forest or Scenic Area.

The remaining discussion in this section focuses on new herbicides and herbicide methods that became available through the Invasive Plant FEIS (2005a). Section 3.4 – Basis for Effects Analysis contains more information on the properties and effects of herbicides. The prescriptions contain ten herbicides as approved in the Invasive Plant ROD (2005b) and analyzed in the Invasive Plant FEIS (2005a). The active ingredients and commercial names of the herbicides are summarized in Table 2-6.

Table 2-6: Active Ingredients and Commercial Herbicide Names. Active ingredient analyzed in Invasive Plant FEIS (2005a) and commercial herbicide names analyzed in the USDA Forest Service risk assessments (http://www.fs.fed.us/foresthealth/pesticide/risk.shtml). These herbicides are included in this EIS and analyzed in Chapter 3. [2]

Herbicide/Selected Brand Names/Action	Properties	General Uses/Known to be Effective on:
Chlorsulfuron (Telar, Glean, Corsair) Interferes with enzyme acetolactate synthase with rapid cessation of cell division and plant growth in shoots and roots.	*Glean* – Selective pre-emergent or early post-emergent *Telar* – Selective pre- and post-emergent. Both are for many annual, biennial and perennial broadleaf species. Safe for most perennial grasses and conifers. Some soil residue.	Use at very low rates on annual, biennial and perennial species; especially dalmatian toadflax, houndstongue and perennial pepperweed.
Clopyralid (Transline) Mimics natural plant hormones.	A highly translocated, selective herbicide active primarily through foliage of broadleaf species. Little effect on grasses.	Particularly effective on *Asteraceae*, *Fabaceae*, *Polygonaceae*, and *Solanaceae* plant species. Some species include knapweeds, yellow starthistle, Canada thistle, and hawkweeds. Provides control of new germinants for one to two growing seasons.
Glyphosate (35 formulations, including RoundUp, Rodeo, Accord, Aquamaster) Herbicide use restricted. Inhibits three amino acids and protein synthesis.	A broad-spectrum, non-selective, translocated herbicide with no apparent soil activity. Adheres to soil, which lessens or retards leaching or uptake by non-targets.	Low-volume applications are most effective. Translocates to roots and rhizomes of perennials. While considered non-selective, sensitivities do vary depending on species. Main control for purple loosestrife, herb Robert, English ivy, and reed canarygrass. Aquatic labeled formulations could be used near water.

• [2] The USDA Forest Service is not endorsing any commercial herbicides for use on National Forest System lands. These are the products analyzed in the risk assessment prepared by SERA.

Herbicide/Selected Brand Names/Action	**Properties**	**General Uses/Known to be Effective on:**
Imazapic (Plateau) Inhibits the plant enzyme acetolactate, which prevents protein synthesis.	Used for the control of some broadleaf plants and some grasses.	Use at low rates could control leafy spurge, cheatgrass, medusa head rye, toadflaxes, and houndstongue
Imazapyr [3] (Arsenal, Chopper, Stalker, Habitat) Herbicide use restricted. Inhibits the plant enzyme acetolactate, which prevents protein synthesis.	Broad-spectrum, non-selective, pre- and post-emergent for annual and perennial grasses and broadleaved species.	Most effective as a post-emergent. Has been used on cheatgrass, whitetop, perennial pepperweed, knotweed species, dyers woad, tamarisk, woody species, and spartina. Aquatic labeled formulations could be used near water.
Metsulfuron methyl (Escort) Inhibits acetolactate synthesis, protein synthesis inhibitor, blocking the formation of amino acids.	Used for the control of many broadleaf and woody species. Most susceptible crop species in the Lily family (i.e., onions, *Allium*). Safest sulfonylurea around non-target grasses.	Use at low rates to control such species as houndstongue, sulfur cinquefoil and perennial pepperweed.
Picloram (Tordon K, Tordon 22K) Herbicide use restricted. Mimics natural plant hormones.	Selective, systemic for many annual and perennial broadleaf herbs and woody plants.	Use at low rates to control such species as knapweeds, Canada thistle, yellow starthistle, houndstongue, toadflaxes, sulfur cinquefoil, and hawkweeds. Provides control of new germinants for two to three growing seasons.
Sethoxydim (Poast, Poast Plus) Herbicide use restricted. Inhibits acetyl co-enzyme, a key step for synthesis of fatty acids.	A selective, post-emergent grass herbicide.	Controls many annual and perennial grasses such as cheatgrass.

- [3] Herbicide has formulations registered by EPA for aquatic use, meaning it is approved for application to emerged, submerged or floating aquatic vegetation, including invasive plants and brush in standing water or on backs and shores of these aquatic sites.

Herbicide/Selected Brand Names/Action	Properties	General Uses/Known to be Effective on:
Sulfometuron methyl (Oust, Oust XP) Herbicide use restricted. Inhibits acetolactate synthase, a key step in branch chain amino acid synthesis.	Broad-spectrum, pre- and post-emergent herbicide for both broadleaf species and grasses.	Used at low rates as a pre-emergent along roadsides. Known to be effective on reed canarygrass. (but not labeled for aquatic use) cheatgrass, medusahead.
Triclopyr (Garlon 3A, Garlon 4, Forestry Garlon 4, Pathfinder II, Remedy, Remedy RTU, Redeem R&P) Herbicide use restricted. Mimics natural plant hormones.	A growth regulating, selective, systemic herbicide for control of woody and broadleaf perennial invasive plants. Little or no impact on grasses.	Not proposed for broadcast application under the Proposed Action. Effective for many woody species such as, scotch broom and blackberry. Also, effective on English ivy and knotweed species. Amine formulation may be used near water

Information adapted from the Invasive Plant FEIS (2005a), Table 3-13, Page 3-91 to 3-92. Risk information found in SERA Herbicide Risk Assessments (2001b, 2003a, 2003b, 2003c, 2004a, 2004b, 2004c, 2004d, 2004e, 2004f) for each active ingredient. Information on species effectiveness in Tu et al. (2001) or from product labels.

Several herbicides have restrictions based on the known impacts; these restrictions are detailed in the PDC (Section 2.2) and Invasive Plant ROD (2005b) standards contained in Appendix A. The prescribed herbicide treatments are required to be applied at typical application rates (Table 2-7).

Table 2-7: Typical Application Rates of Various Herbicides Used in Oregon and Washington (*Taken from Invasive Plant FEIS (2005a), page 4-2*). Clackamas, Multnomah, Hood River, and Wasco counties, and Oregon Department of Agriculture use these application rates in all cases, except Imazapyr. Hood River county typical application rate for Imazapyr is 0.7 lb ai/ac. (lb ai = pounds of active ingredient; ac = acre).

Herbicide	Rate-Typical lb ai/ac
Chlorsulfuron	0.056
Clopyralid	0.35
Glyphosate	2
Imazapic	0.1
Imazapyr	0.45 (0.70)
Metsulfuron methyl	0.03
Picloram	0.35
Sethozydim	0.3
Sulfometuron methyl	0.045
Triclopyr	1.0
Nonylphenol polyethoxylate (NPE)	1.67

Source: The National Center for Food and Agricultural Policy Agricultural Pesticide Use Database for 1997. Washington DC. 1998.

Many of the prescriptions listed in Appendix G – Common Control Measures Summary have more than one effective herbicide listed. Risk assessments for these herbicides are available on-line at http://www.fs.fed.us/foresthealth/pesticide/risk.shtml and some herbicide labels are available at http://www.fs.fed.us/foresthealth/pesticide/labels.shtml. The herbicide or mixture of herbicides used would depend on the invasive plants present, the biology and ecology of particular invasive plant species, site location, proximity to water, and size of the infestation. Since these factors may change over time, the effects analysis described in Chapter 3 analyzes the impacts of using all possible herbicides that are effective in each treatment area. Appendix H – Proposed Herbicide Use at Sites in the Proposed Action lists the potential herbicides by treatment site for the Proposed Action.

Site Restoration Strategies

Each treatment area has a site restoration strategy, which is part of the long-term objective to reduce invasive plants. The restoration strategy may either be passive or active restoration. Passive restoration assumes the treatment area would re-vegetate from existing vegetation without mulching, planting, or seeding. Passive restoration may be appropriate where treated sites leave only small gaps of bare ground and native vegetation on site would provide an adequate seed source to fill in such gaps. Active restoration is site-specific and may include seeding, planting, and/or mulching. It is assumed that all priority 1 and 2 (discussed below) treatment areas would need active restoration to meet the treatment strategies (e.g., eradicate or control); it is assumed that passive restoration would be acceptable at all other treatment areas to meet the treatment strategy (e.g., contain or suppress). These assumptions would be validated and specific restoration needs would be decided after the initial treatment occurs and the effectiveness would be determined. Each treatment area has an associated restoration strategy, which is listed in Appendix F.

Promoting the establishment of desirable plant communities through the manipulation of species composition, plant density, and growth rate is a critical component of invasive plant management (Masters et al., 1996; Masters and Shelly, 2001; Brooks et al., 2004). Three components of succession could be manipulated: site availability, species availability, and species performance (Cox and Anderson, 2004). Although single control tactics, such as treatment with herbicides, may eliminate or suppress invasive species in the short-term, the resulting gaps and bare soil create niches that are conducive to further invasion by the same or other undesirable plant species. On degraded sites where desirable species are absent or in low abundance, re-vegetation with competitive grasses, forbs and legumes may be necessary to direct and accelerate plant community recovery, and achieve site-management objectives in a reasonable timeframe (USDA Forest Service, 2005a).

The selection of appropriate species for re-vegetation is dependent on a number of factors, including treatment strategies and site characteristics such as soil texture, precipitation/temperature regimes and shade conditions. Seed availability and cost, ease of establishment, seed production, and competitive ability are also important considerations (USDA Forest Service, 2005a).

For this project, active restoration would include minimum site preparation with a hand rake (or similar tool that would not penetrate the ground more than 1 to 2 inches) and hand shovel. Native grass seeds (or other species identified for the restoration) would be broadcast or applied with mulch (hydro-seeding). Weed-free straw or other mulching may be applied. If any shrubs or trees are identified as part of the restoration, these would be planted using a hand shovel with minimum soil disturbance (using bare-rooted 12 inch stock). Each of these components of active restoration would be applied as necessary based on the site conditions at the treatment area.

Early Detection/Rapid Response Strategy

EDRR refers to treatments of newly inventoried invasive plant infestations, including previously undiscovered invasive plant infestations or new infestations that would occur over the next 15 years. Treatments may occur in all land allocations within the Forest and Scenic Area, and may include invasive species that are not analyzed in this EIS. Although species may not be analyzed in the EIS, the site and environmental impacts from treatment methods have been analyzed.

The EDRR is based on the premise that the impacts of similar treatments are predictable, even though the precise location or timing of the treatment may be unpredictable. This strategy is needed because: 1) the precise location of individual target plants is subject to rapid and/or unpredictable change; and 2) infestations may grow during the time it typically takes to prepare NEPA documentation from start to finish (6 to 12 months). Invasive plant sites that are discovered subsequent to the last invasive plant inventory, completed in November 2004, would require evaluation to determine that the invasive plants treatments and environmental impacts are consistent with those analyzed in this EIS. If the sites and impacts are found to be consistent, then these new infestations could be treated under this NEPA document. Consistency would be determined using the model presented in Figure 1-4, and approved by the appropriate responsible official (Forest Supervisor or Area Manager). All herbicide treatments require the completion of the Pesticide-Use Proposal Form FS-2100-2 (Appendix E) to document decision to use pesticides on National Forest System lands.

The EDRR would enable smaller invasive plant populations to be treated, increasing treatment effectiveness and success because more treatment options exist for smaller target populations, and the cost and adverse impacts of treatments are less if invasive plant populations are treated when small. Also, the EDRR would allow rapid response when newly inventoried populations are discovered to prevent the further spread of the invasive plant and reduce the impacts from the invasive plant.

Triggers and thresholds are designed to prescribe the potential treatment methods that would be effective and ensure that treatments would be consistent with those analyzed in this EIS, as detailed in Figure 1-4. If the proposed treatments are outside these triggers and thresholds, new NEPA analysis and disclosure would be required. Examples of when new NEPA would be required include: conducting invasive plant treatments that could not be fully mitigated using the PDC; aerial spraying herbicides; using prescribed burning, tilling, plowing, or cattle grazing as invasive plant treatment methods; treating more than the designated acres (e.g., 13,000 per year); applying herbicides not analyzed in EIS; or applying herbicides within Bull Run hydrologic unit.

Annually, the Forest and Scenic Area would identify sites for potential treatment (both known and univentoried) and review the criteria for appropriateness of prescribed methods to ensure consistency and effectiveness for each site. All recommended treatment methods would be documented and approved by the appropriate responsible official(s).

Treatments would be developed for new infestations based on the size of the invasive plant infestations, their priority for treatment and proximity to other infestations. Priorities would be evaluated and established each year, based on the criteria discussed in Table 2-8. The priorities are adapted from the Invasive Plant FEIS (2005a). The treatment methods/choices are changed to reflect those analyzed in this EIS and roadsides are a higher priority because these areas are the most frequently impacted on the Forest and Scenic Area. New invasive plant infestations may have a higher treatment priority than currently known sites. The Forest and Scenic Area would screen the new sites and prepare a file document demonstrating how the new treatment is within the scope of the original NEPA decision and demonstrating how the EDRR is being met and followed. All PDC must be applied to any invasive plant treatment, including the public notification process.

Table 2-8: Priorities for Treatment and Selection of Treatment Methods for invasive plant treatment areas. This prioritization system was adapted from Table 3-12 (page 3-79) of the Invasive Plant FEIS (2005a).

Priority	Description	Treatment – Choice Based on Site-Specific Conditions
Highest Priority for Treatment	• Eradication of new species (focus on aggressive species with potential for significant ecological impact including but not limited to State-listed high priority invasive plants (noxious weeds); See Appendix I) • New infestations (e.g., populations in areas not yet infested; "spot fires"; any State, Forest or Scenic Area priority species). • Active restoration sites where invasive plant control is essential for successful restoration.	• Manual/mechanical treatment on isolated plants or small populations. • Remove seed heads. This is an interim measure if cost/staff is an issue. • Herbicide treatment if manual/mechanical is known to be ineffective or population too large. • Seed and/or mulch to restore treated areas; use native species when possible. • If active restoration is necessary, seed to restore treated areas; use native species when possible.

Priority	Description	Treatment – Choice Based on Site-Specific Conditions
Second Priority of Treatment	• Areas of concern such as: – Areas of high traffic and sources of infestation (e.g., parking lots, trailheads, horse camps, gravel pits) – Areas of special concerns: (e.g., botanical areas, wilderness, research natural areas, adjacent boundaries/access with national parks). – Riparian corridors where high threat species such as knotweeds occur.	• Manual/mechanical treatment on isolated plants or small populations in spread zones. • Herbicide treatment if manual/mechanical is known to be ineffective or population too large. • Seed and/or mulch to restore treated areas; use native species when possible.
Third Priority of Treatment	• Containment of existing large infestations (e.g., focusing on State-listed highest priority species or Forest/Scenic Area priority species). Focus on boundaries of infestation. • Roadsides; focus first on access points leading to areas of concern.	• Mechanical treatment • Goat grazing, cultural treatment • Herbicide treatments
Fourth Priority of Treatment	• Control of existing large infestations (e.g., State-listed and Forest/Scenic Area second priority species)	• Mechanical treatment • Goat grazing, cultural treatment • Herbicide treatments along perimeters
Fifth Priority of Treatment	• Suppression of existing large infestations when eradication/control or containment is not possible.	• Mechanical treatment • Goat grazing, cultural treatment • Herbicide treatments along perimeters

Overall, treatment would not exceed 30,000 acres of the project area landscape over 15 years for both known and future infestations. It is estimated that 50 percent of the Forest likely to be infested with invasive plants had been inventoried (Stein, 2005). The inventoried areas include roads, campgrounds, quarries, and timber sales. The inventory includes only limited forested areas, designated Wilderness Areas, and recreational trails. Assuming that the infestations on the remaining 50 percent of the likely infested areas (e.g., roads and quarries) follow a similar pattern, and assuming that the Scenic Area mirrors the Forest, only an additional 13,000 acres would be infested with invasive plants in the future. In order to account for the uncertainty and unpredictability associated with invasive plants and their treatments, the treatments acres were expanded by an additional 15 percent (4,000 acres): 1 percent of unexpected infestations per year for the life of the project. Combining the known infestations (13,000 acres), future estimate (13,000 acres), and expansion acres (4,000), the total area assessed to be treated is 30,000 acres on the Forest and Scenic Area.

Within this overall cap of 30,000 acres over 15 years, there are several additional treatment caps (limitations) to ensure the treatment does not exceed the impacts analyzed in Chapter 3. These limitations include annual, fifth-field watershed, and riparian reserve caps.

- <u>Annual cap</u>: The annual treatments would not exceed 13,000 acres within the Forest and Scenic Area. These treatments would be a combination of known treatment sites and newly inventoried treatment sites. This limitation was chosen because Chapter 3 analyzes the effects of treating 13,000 acres, so the effects are known and inform the decision.

- <u>Fifth field watershed cap</u>: Treatment could not exceed three percent per year in any one fifth-field watershed. If the areas of National Forest System lands within each fifth-field watershed are less than three percent, treatment would not exceed the amount of National Forest Service lands (see Table 2-9 for specifics for each watershed).

- <u>Riparian reserve cap</u>: Treatment would not exceed 5,000 acres in riparian reserves each year. Only 40 percent of the total area treated in each fifth-field watershed could be located in a riparian reserve for the life of the project.

Appendix J details treatment acres by fifth-field watershed and riparian reserve acres. Also, the applicable watershed assessments (Table 2-9) contain applicable management direction that is considered when developing treatments.

For each cap, each acre treated would only be counted once. For example, if a treatment area of 100 acres is treated 3 times annually, only 100 acres would be counted towards the 13,000 acre annual cap. The acres treated each year would be based on the infestations and invasive plant budget. Acres would not be treated if invasive plants are not present.

Table 2-9: Total allowable amount of invasive plant treatments under the EDRR by fifth-field watershed and riparian reserves.

Fifth-field Number	Fifth-field Watershed Name	Applicable Watershed Assessment(s) *	Total Acres	Forest Service Lands in Watershed	Maximum Acres Treated per Year ***	Maximum Riparian Reserve Acres Treated ****
1707010502	Fifteenmile Creek	Mile Creeks (USDA Forest Service, 1994b)	157,238	17,580	4,717	1,887
1707010503	Fivemile Creek	Mile Creeks (USDA Forest Service, 1994b)	78,191	18,557	2,346	938
1707010504	Middle Columbia/ Mill Creek	Mill Creek (USDA Forest Service, 2000a)	130,698	15,965	3,921	1,568
1707010505	Mosier Creek	Mosier (Wasco County SWCD, 2002) **	42,424	1,446	1,273	509
1707010506	East Fork Hood River	East Fork Hood River & Middle Fork Hood River (USDA Forest Service, 1996b)	100,953	68,419	3,029	1,211
1707010507	West Fork Hood River	West Fork of Hood River (USDA Forest Service, 1996h)	65,466	42,863	1,964	786
1707010508	Lower Hood River	Hood River (Hood River SWCD, 1999)	51,289	3,274	1,539	615
1707010512	Middle Columbia/ Grays Creek	Hood River (Hood River SWCD, 1999)	92,723	27,924	2,782	1,113
1707010513	Middle Columbia/ Eagle Creek	Columbia River Tributaries East (USDA Forest Service, 1998a)	84,495	46,506	2,535	1,014
1707030603	Upper Deschutes River		144,429	716	716	286
1707030604	Mill Creek	Olallie Lake (USDA Forest Service, 1997b)	69,023	3,181	2,071	828
1707030605	Beaver Creek		106,742	1,312	1,312	525
1707030606	Warm Springs River		170,502	10,135	5,115	304
1707030607	Middle Deschutes River	White River (USDA Forest Service, 1995g)	195,385	2,874	2,874	1,150
1707030609	Tygh Creek	White River (USDA Forest Service, 1995g)	81,558	41,637	2,447	979
1707030610	White River	White River (USDA Forest Service, 1995g)	176,272	105,185	5,288	2,115
1708000101	Salmon River	Salmon River (USDA Forest Service, 1995d)	73,716	67,920	2,211	885
1708000102	Zigzag River	Zigzag (USDA Forest Service, 1995h)	37,764	36,502	1,133	453
1708000103	Upper Sandy River	Upper Sandy (USDA Forest Service, 1996g)	34,201	30,722	1,026	410
1708000104	Middle Sandy River	Upper Sandy (USDA Forest Service, 1996g)	40,957	6,572	1,229	491
1708000105	Bull Run River	Bull Run River (USDA Forest Service, 1997a)	88,985	78,651	2,670	1,068
1708000107	Columbia Gorge Tributaries	Columbia River Tributaries East (USDA Forest Service, 1998a)	103,926	40,404	3,118	1,247

Fifth-field Number	Fifth-field Watershed Name	Applicable Watershed Assessment(s) *	Total Acres	Forest Service Lands in Watershed	Maximum Acres Treated per Year ***	Maximum Riparian Reserve Acres Treated ****
1708000108	Lower Sandy River	Oregon Columbia River Tributaries West (USDA Forest Service, 1999a)	47,155	3,188	1,415	566
1709000502	North Fork Breitenbush River		69,418	68,509	2,083	833
1709000505	Little North Santiam River	Collawash/Hot Springs (USDA Forest Service, 1995a)	72,408	36,189	1,086	434
1709000905	Upper Molalla River	South Fork Clackamas River (USDA Forest Service, 1997c)	129,260	2,520	2,520	1,008
1709000906	Lower Molalla River		92,582	231	231	93
1709001101	Collawash River	Collawash/Hot Springs (USDA Forest Service, 1995a)	97,421	96,559	2,923	1,169
1709001102	Upper Clackamas River	Upper Clackamas River (USDA Forest Service, 1995f)	100,497	94,781	3,015	1,206
1709001103	Oak Grove Fork Clackamas River	Clackamas River - Oak Grove Fork (USDA Forest Service, 1996a)	90,542	79,256	2,716	1,087
1709001104	Middle Clackamas River	Fish Creek (USDA Forest Service, 1994a), Lower Clackamas River (USDA Forest Service, 1996d), North Fork Clackamas River (USDA Forest Service, 1996e), Roaring River (USDA Forest Service, 1996f), South Fork Clackamas River (USDA Forest Service, 1997c)	138,507	124,903	4,155	1,662
1709001105	Eagle Creek	Eagle Creek (USDA Forest Service, 1995b)	57,611	16,912	1,728	691
1709001106	Lower Clackamas River	Lower Clackamas River (USDA Forest Service, 1996d)	117,661	1,623	1,623	649

Note: Fifth-field watersheds shaded in gray do not have any known invasive plant treatment areas.
* Watershed Assessments prepared by the Mt. Hood National Forest are available at: http://www.fs.fed.us/r6/mthood/publications/. Not all the watershed assessments, however, were prepared by Mt. Hood National Forest.
* Mosier Watershed Assessment is available at: http://www.wasco.oacd.org/MosierWatershedAssessment.pdf
*** Maximum acres treated per year are 3% of the total fifth-field watershed acres or all Forest Service lands within the fifth-field watershed, if this amount is less than 3%.
**** Maximum riparian reserve acres treated for the life of the project is 40% of the annual area that could be treated each year for each fifth-field watershed.

Invasive Plant Treatment Prescriptions Assumptions

The analysis of the Proposed Action in Chapter 3 is based on the assumption that none of the treatments would be considered 100 percent effective after the initial entry. While initial entries in year one are estimated to eliminate up to 80 percent of the invasive plants, maintenance entries would be required in either year one or in subsequent years. The effectiveness estimate is based on the species proposed for treatment in conjunction with the treatment methods proposed; the effectiveness is not based on the specific areas being proposed for treatment. The Forest and Scenic Area botanists made this estimate using information for noxious weed program managers at the State and County agencies.

The number of invasive plants would decrease with each maintenance entry; however, the remaining invasive plants may be spread over the entire treatment area. This would require the entire treatment area to be treated again, but significantly less herbicides and/or non-herbicide treatments would be needed on the maintenance entries. The number and timing of maintenance entries would be dependent on the treatment strategies, treatment priority, invasive plant species present, site-specific conditions, and success of initial and subsequent treatments. The priority 1 and 2 treatment areas may receive up to three herbicide treatments per year for three years. Based on the PDC detailed in Section 2-2, broadcast spraying would occur once per year; triclopyr can never be broadcast sprayed; and picloram and clopyralid would only be used once per year at any site regardless of the treatment prescription or strategy.

Given the variability of IWM and treatment effectiveness, several assumptions were made about the treatment prescriptions for analysis purposes. These assumptions follow.

- PDC are a mandatory component of each alternative. PDC would be applied effectively and would accomplish the necessary and desired outcome.

- 80 percent effectiveness is assumed at each treatment area after each year. For example, if 1000 acres are treated in year 1 and the treatment is 80 percent effective, only 20 percent of the invasive plants would remain in year 2. The remaining invasive plants in year 2, however, may be spread over the entire treatment area. As a result, the entire treatment area would be treated again in year 2, but significantly less herbicides and/or non-herbicide treatments would be needed.

- Treatments would be required for a minimum of 5 years. Although the invasive plants may be removed from the sites prior to 5 years, the worse-case scenario is analyzed.

- All potential herbicides would be analyzed at each treatment area. Herbicides would be applied at the typical application rate (see Table 2-7).

- Priority 1 and 2 sites with treatment strategies of eradicate and contain receive the most intense treatments. This includes up to three herbicide treatments per year for three years as considered appropriate based on factors, such as species, location, and length of growing season. Priority 3, 4 and 5 sites would only receive one herbicide treatment per year, but this may require more years of treatments.

- No herbicides would be applied directly to water.

- Treatments would not be carried out if they are not needed. Only infested areas would be treated.

These assumptions allow the analysis to identify the impacts and effects under the worse-case scenario.

Forest Plan Amendment

The Invasive Plant FEIS (2005a) and Invasive Plant ROD (2005b) provide new Forest Plan direction designed to make new practices, technologies, and chemical formulations of herbicides available for use to facilitate the reduction in the extent and rate of spread of invasive plants, and to help prevent new infestations. The new direction includes desired future condition statement; goals and objectives statements; standards for preventing the introduction, establishment, and spread of invasive plants; standards for invasive plant treatment and site restoration; and an inventory and monitoring framework. This direction is detailed in Appendix 1 of the Invasive Plant ROD (2005b). In addition, the Invasive Plant FEIS (2005a) and Invasive Plant ROD (2005b) update all standards referencing previous regional management direction.

Under the existing Forest Plan, six standards and guidelines discourage or prohibit the use of pesticides, including herbicides, on the Forest. These standards and guidelines were not amended under the new management direction provided by the Invasive Plant ROD (2005b). As a result, this EIS proposes to amend these six standards and guidelines (See Table 2-10) to allow, where appropriate, careful and targeted herbicide use to treat invasive plants according to the standards in the Invasive Plant ROD (USDA Forest Service, 2005b). This would be Amendment #16 to the Mt. Hood Land and Resource Management Plan (Forest Plan).

Table 2-10: Proposed Amendment to the Forest Plan under the Proposed Action.
Suggested changes are *italic* or ~~strikethrough~~ print.

Standard & Guideline	Page # in Forest Plan
Water (FW-076*a*): Potentially detrimental materials associated with management activities (e.g., pesticides, fertilizers, and road surface treatments) shall be prevented from entering water or other areas not intended for treatment, *except for invasive plant treatments as specified in Standard FW-076b*.	4-57
Water (FW-076*b*): Potentially detrimental materials associated with *invasive plant treatments should* ~~management activities (e.g., pesticides, fertilizers, and road surface treatments) shall~~ be prevented from entering water or other areas not intended for treatment, *according to standards in the Pacific Northwest Region: Preventing and Managing Invasive Plants Record of Decision (2005).*	4-57
Wilderness (A2-082): Pesticides use shall be prohibited*, except for herbicides used to treat invasive plants according to standards in the Pacific Northwest Region: Preventing and Managing Invasive Plants Record of Decision (2005).*	4-142
Outdoor Education Areas (A12-031): Herbicides should not be applied outside of roads rights-of-way*, except for herbicides used to treat invasive plants according to standards in the Pacific Northwest Region: Preventing and Managing Invasive Plants Record of Decision (2005).*	4-200
Pileated Woodpecker/Pine Marten Habitat (B5-041): Herbicides should not be permitted outside of road rights-of-way*, except for herbicides used to treat invasive plants according to standards in the Pacific Northwest Region: Preventing and Managing Invasive Plants Record of Decision (2005).*	4-244
General Riparian Area (B7-070): Application of herbicides shall be discouraged*, except for herbicides used to treat invasive plants according to standards in the Pacific Northwest Region: Preventing and Managing Invasive Plants Record of Decision (2005).*	4-260
Vegetation Management (A1-WR-064): Chemicals shall not be used to control noxious weeds in riparian areas*, except for herbicides used to treat invasive plants according to standards in the Pacific Northwest Region: Preventing and Managing Invasive Plants Record of Decision (2005)*.	Amendment #7

2.1.4. Alternative 3 – Restricted Herbicide Use Alternative

The Restricted Herbicide Use Alternative (Alternative 3) modifies the Proposed Action to reduce the amount of herbicides applied. Only 4,047 acres would be treated using herbicide treatments under this alternative, compared to 13,000 acres under Alternative 2. These treatment areas were chosen because they are the highest priority sites, as defined by Table 2-8. Highest priority sites emphasis the eradication of new species, new infestations, or active restoration sites. Currently, the Forest and Scenic Area are focusing on the eradication of 5 new species: orange hawkweed (HIAU), common hawkweed (HIVU), meadow hawkweed (HIPR), butter and eggs (LIVU2), and Japanese knotweed (POCU6). Often these high priority species are only most effectively treated with herbicides, as discussed in Section 3.6 – Botany and Treatment Effectiveness. The new infestations may be very common invasive plants species threatening to invade new areas or forested areas. Lastly, two active restoration sites are included in this project.

Alternative 3 was designed to address the public concern related to the quantity of herbicides used while treating the highest priority species. Also, this alternative allows the responsible officials to evaluate the impacts that the quantity of herbicides has on human health and the environment in the Forest and Scenic Area.

Invasive Plant Treatment Prescriptions

The same 13,000 acres within the Forest and Scenic Area would be treated under Alternative 3 using IWM treatment methods. Only the highest priority sites (defined in Table 2-8) would be treated with herbicide treatments. The map of proposed treatment areas for the Restricted Herbicide Use Alternative illustrates the high priority sites (See Figure 2-14). Forty-three treatment areas (4,047 acres) have been identified for herbicide treatments: see Table 2-11 for a brief description of the highest priority sites. The invasive plant treatment prescriptions for the remaining 165 treatment areas would follow those listed under Alternative 2 for manual, mechanical and cultural (goat grazing) treatments (See Appendix F – Site and Treatment Information). Table 2-12 displays the total acres to be treated and treatment methods within the Forest and Scenic Area. Figures 2-15 through 2-19 illustrate the proposed treatment areas on the Scenic Area and each District under Alternative 3.

Table 2-11: Description of Highest Priority Sites. All these sites are priority 1 sites, as defined by Table 2-8. These sites would be treated with herbicide treatments under Alternative 3.

Treatment ID	Priority Description	Acres	# Treatment Areas
69-006	Eradication of new species – Meadow hawkweed (HIPR) sites	0.1	1
66-047	Eradication of new species – Yellow star thistle (CESO3) sites	7	1
61-050	Spot infestation in new geographic area – Houndstongue (CYOF) on Barlow Ranger District	112	1
69-026	Spot infestation in New Area – Scotch broom (CYSC4) on Zigzag Ranger District	1	1
65-002, 69-008	Eradication of new species – Several hawkweed species at site	1129	2
65-046, 69-003	Eradication of new species – Common hawkweed (HIVU) sites	53	2
22-01, 22-08	Active Restoration Site – Sandy River Delta and East Pit Quarry Restoration	1524	2
61-022, 65-016, 66-041, 66-059, 66-081, 66-082, 66-083, 66-084	Eradication of new species – Butter and eggs (LIVU2) sites	272	8
66-001, 66-003, 66-004, 66-005, 66-006, 66-007, 66-016, 69-027, 69-028, 69-030	Eradication of new species – Orange hawkweed (HIAU) sites	936	10
65-005, 65-006, 65-008, 65-009, 65-011, 65-019, 65-021, 69-002, 69-010, 69-011, 69-012, 69-013, 69-014, 69-015, 69-029	Eradication of new species – Japanese knotweed (POCU6) sites	12	15
	Total	**4046**	**43**

Table 2-12: Summary of Treatment Methods for Alternative 3 – Restricted Herbicide Use.

Overall Treatment	Acres	Percent of Total
Herbicide *	12	0.1%
Herbicide plus Manual *	112	0.9%
Herbicide plus Manual and Mechanical *	2,207	17.1%
Herbicide plus Manual, Mechanical and Cultural (Goat Grazing) *	1,500	11.6%
Herbicide plus Mechanical *	217	1.7%
Manual	242	1.9%
Manual and Mechanical	8,572	66.1%
Manual, Mechanical, and Cultural (Goat Grazing)	10	
Mechanical	93	0.7%
Total	**12,965**	**100.0%**

* High priority treatment areas only.

Figure 2-14. Map of Proposed Treatment Areas for the Restricted Herbicide Use Alternative

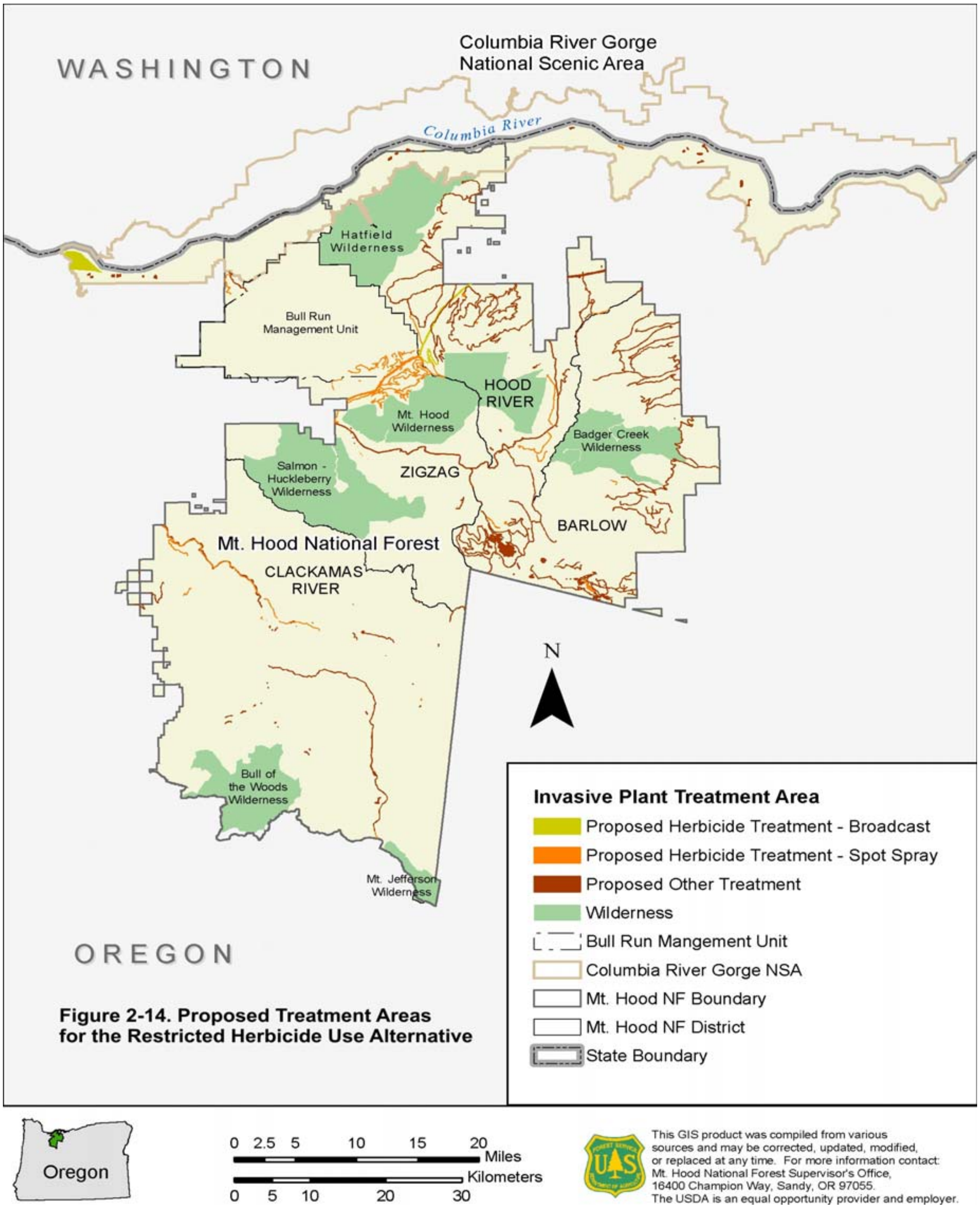


Figure 2-15. Restricted Herbicide Use Alternative Map for Columbia River Gorge National Scenic Area

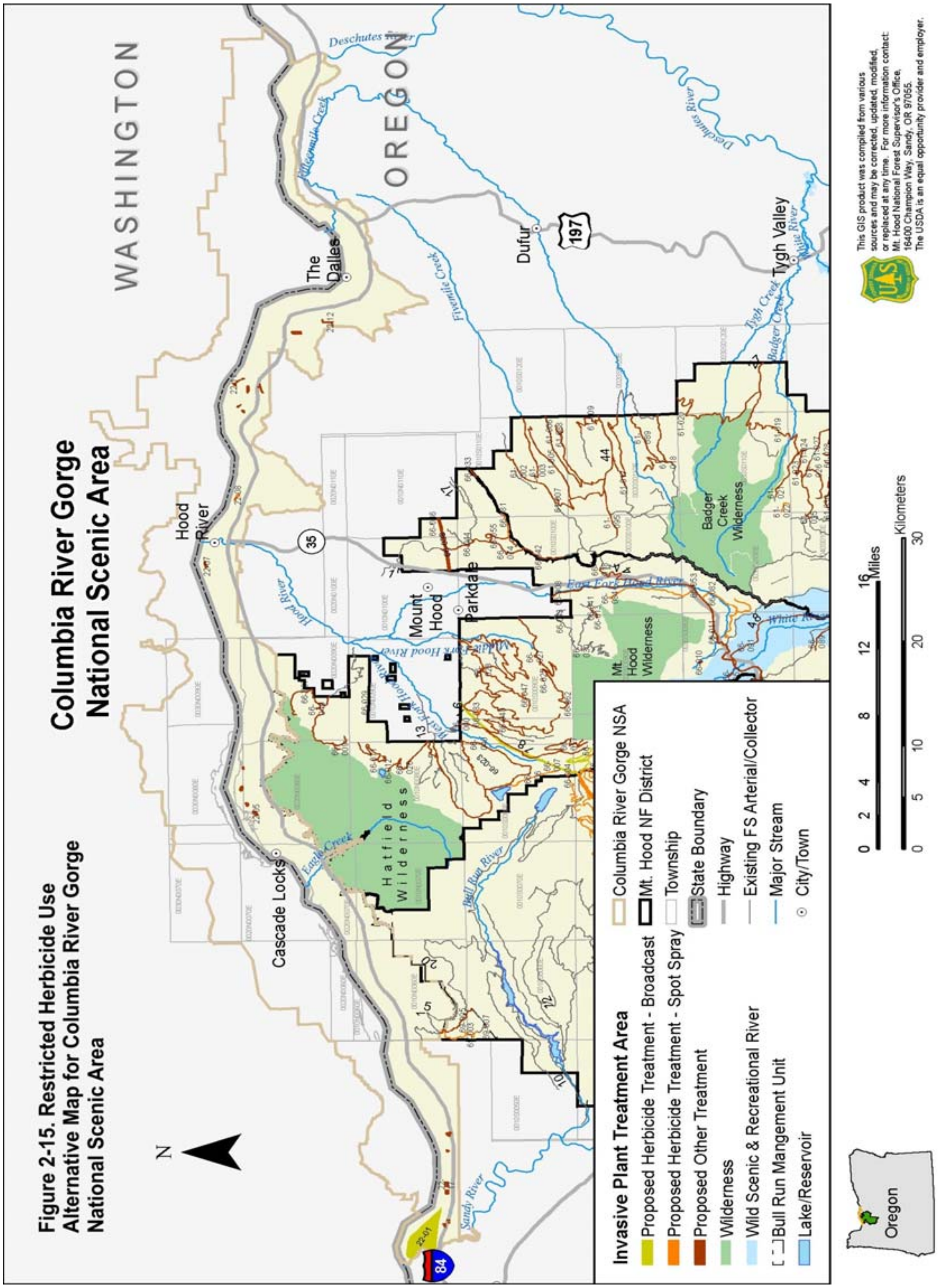


Figure 2-16. Restricted Herbicide Use Alternative Map for Barlow Ranger District, Mt. Hood National Forest

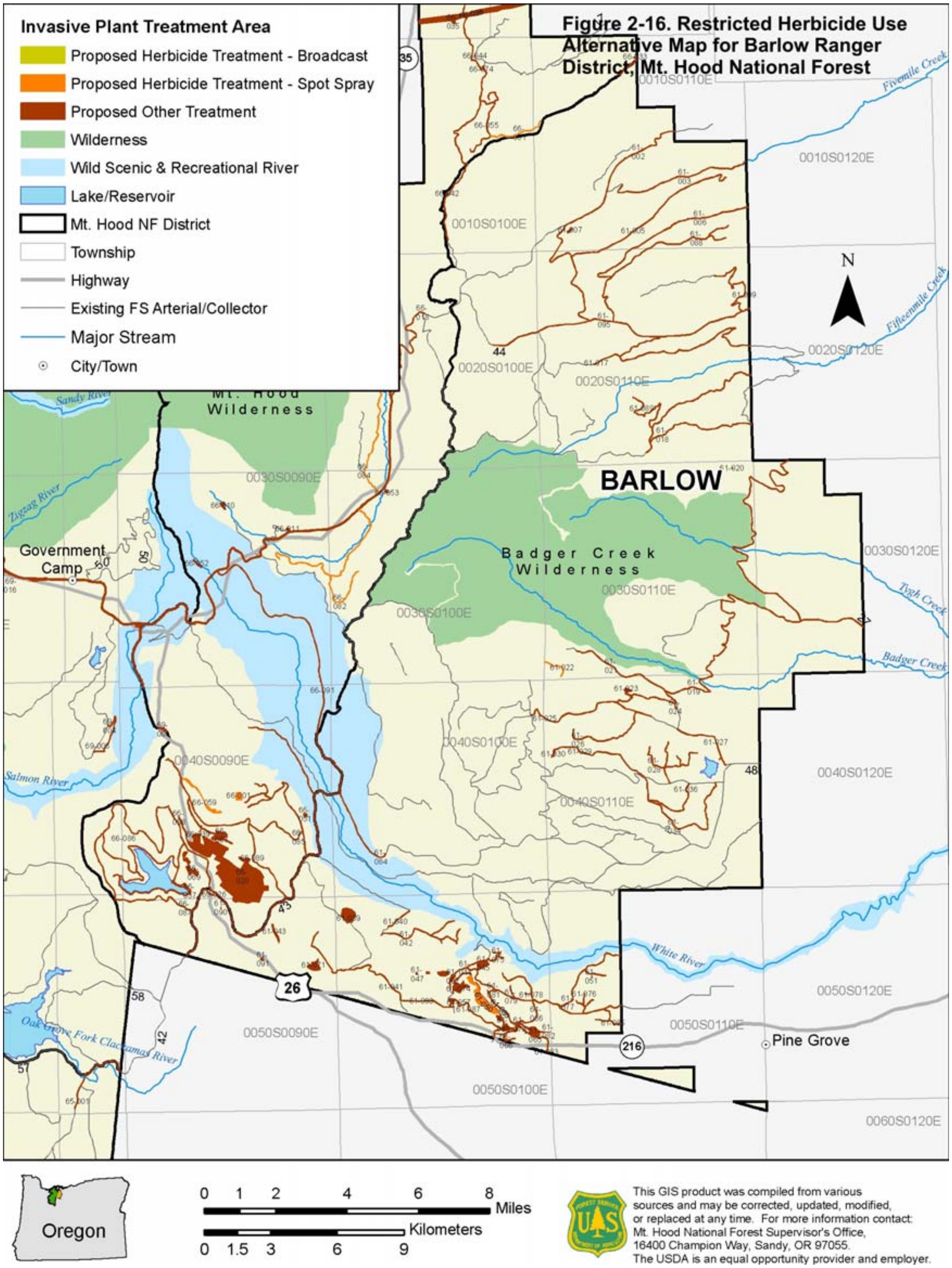


Figure 2-17. Restricted Herbicide Use Alternative Map for Clackamas River Ranger District, Mt. Hood National Forest

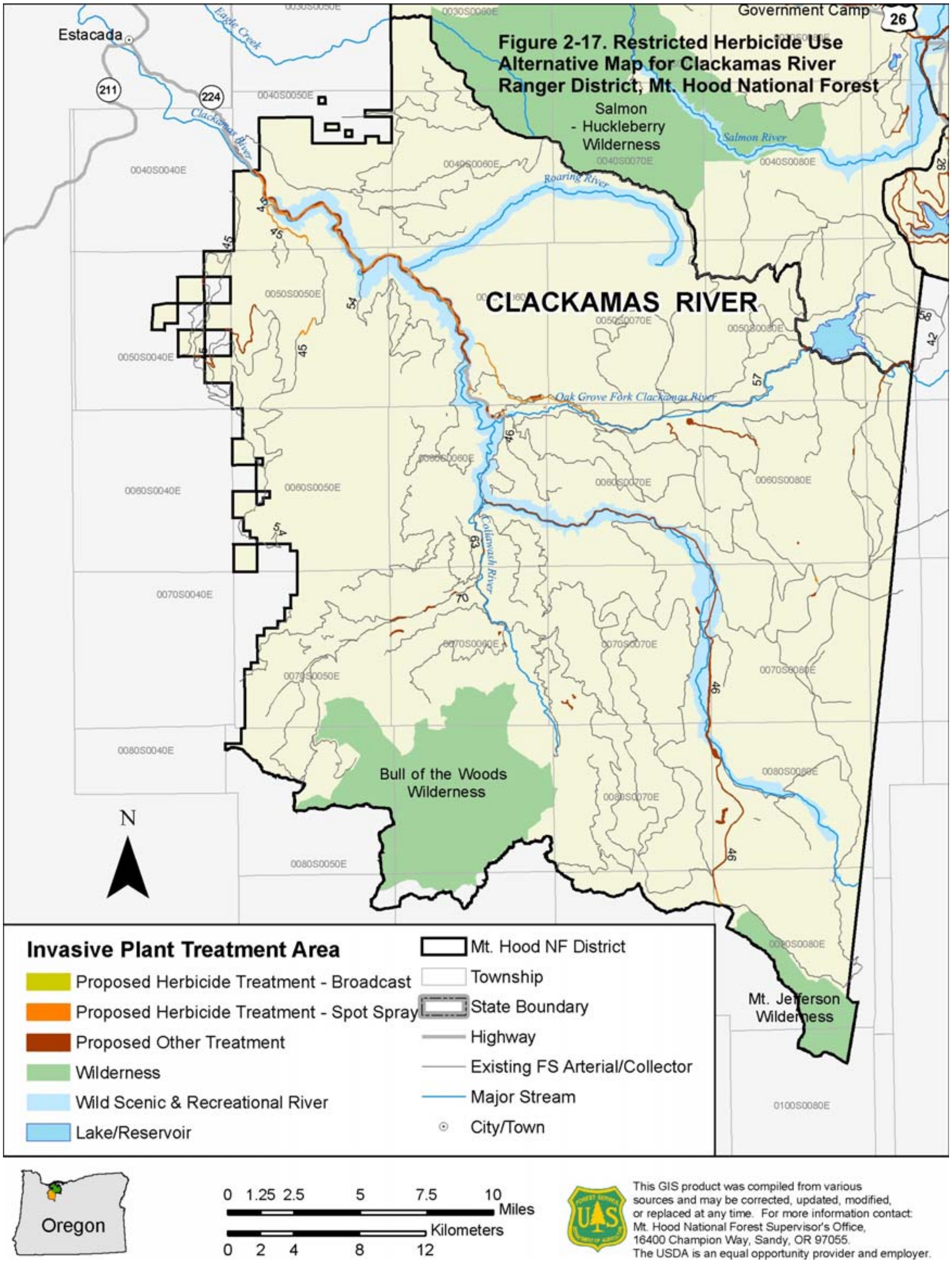


Figure 2-18. Restricted Herbicide Use Alternative Map for Hood River Ranger District, Mt. Hood National Forest

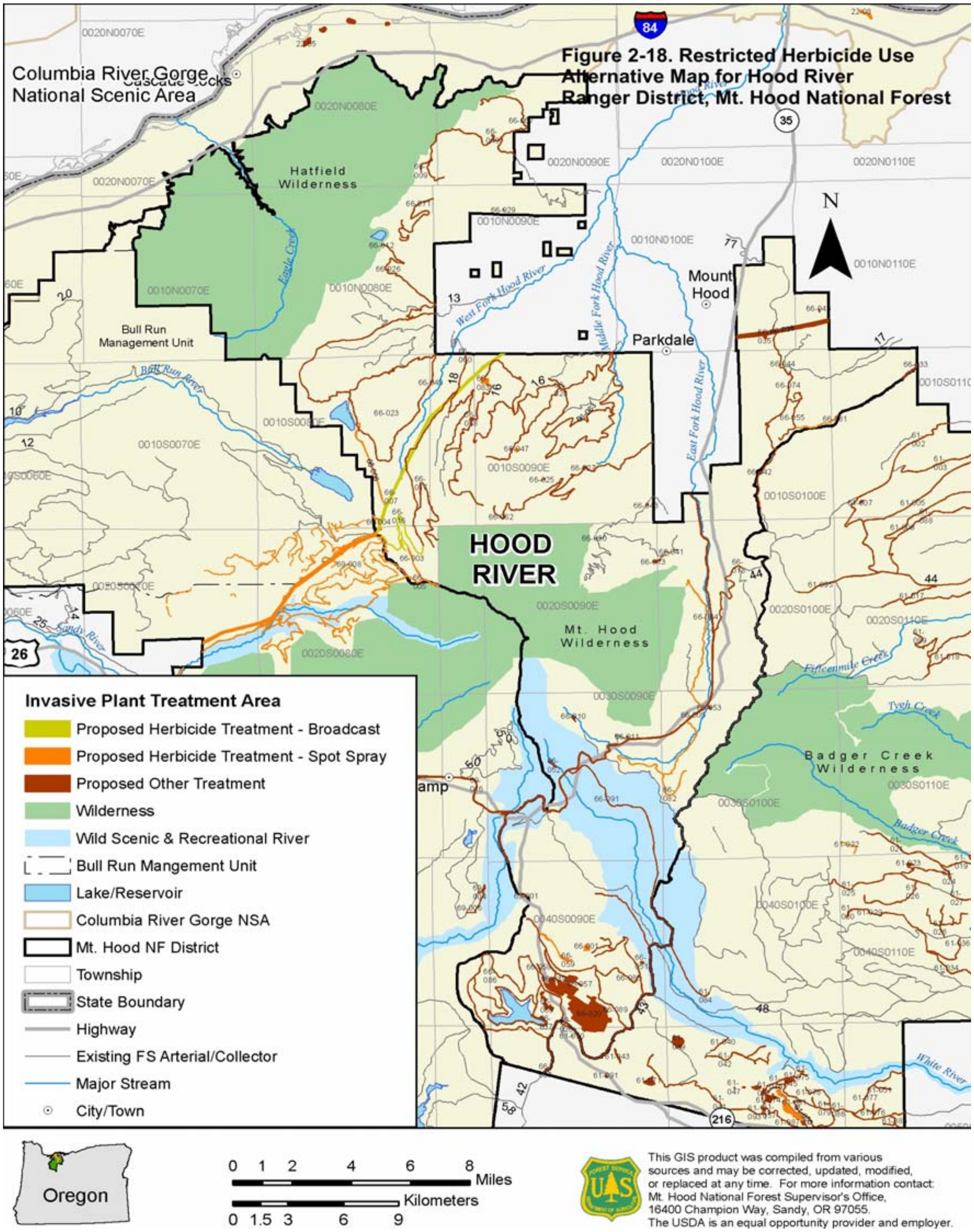
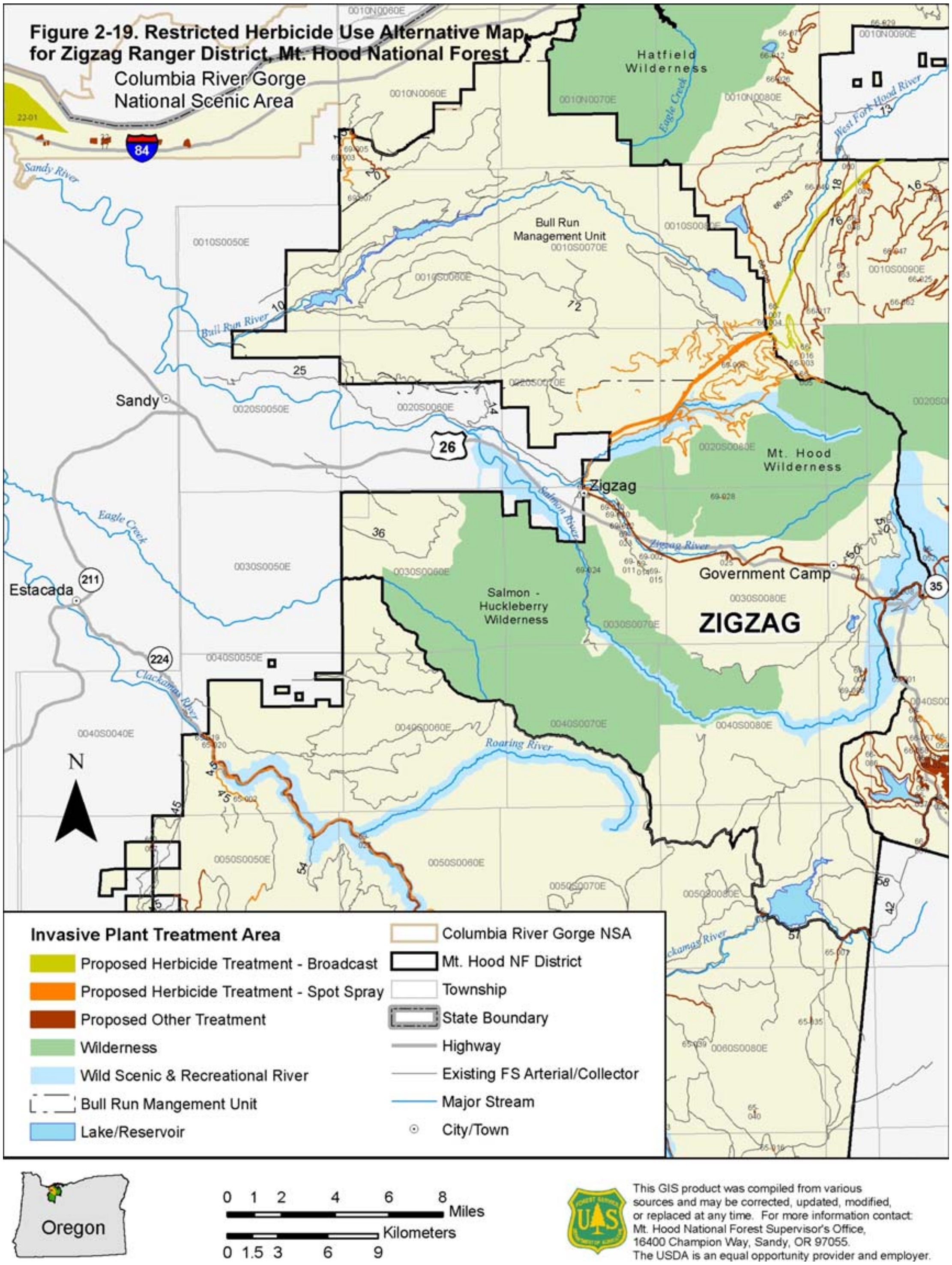


Figure 2-19. Restricted Herbicide Use Alternative Map for Zigzag Ranger District, Mt. Hood National Forest



Only three treatment areas have broadcast herbicide application methods prescribed: Sandy River Delta restoration site (#22-01), Lolo Pass utility corridor and road (#66-016), and westside of the BPA power line (#66-007); see Figure 2-14 for locations. Broadcast spraying is being proposed to meet the purpose and need at these sites, given the size of the infestation and the treatment strategy.

- Sandy River Delta restoration site (#22-01). The primary focus of this treatment area is to restore native vegetation. The infestation occurs within a 1,500-acre area and includes at least 5 invasive plant species. The treatment strategies for this site vary from contain to suppress given its size.

- Lolo Pass utility corridor (#66-016). The primary focus of this treatment area is to stop the spread of orange hawkweed from spreading into the adjacent forested areas or non-federal lands. The infestation occurs within a 79-acre area. The treatment area contains three species with treatment strategies of eradicate or control.

- BPA power line (#66-077). Similarly to the Lolo Pass utility corridor, the primary focus of this treatment area is to stop the spread of orange hawkweed from spreading into the adjacent forested areas or non-federal lands. The infestation occurs within a 449-acre area and is currently being treated on the Zigzag Ranger District. Treatment is not occurring on the Hood River Ranger District. The treatment area contains only orange hawkweed, which has a treatment strategy of eradicate.

These three sites total 2,028 acres. PDC F.1. limits the area next to a stream that can be treated using broadcast application methods. This PDC decreases the treatment area of these three sites to 1,866 acres. This represents 46 percent of the acres proposed for treatment under this alternative. The remaining 2,181 acres would be treated using selective/hand, stem injection or spot spraying herbicide treatment methods. The potential herbicides by treatment sites for this alternative are listed in Appendix K – Treatment and Proposed Herbicide Information for Alternative 3.

All other components of Alternative 2 apply to this alternative as well, including invasive plant species, treatment strategies, common control measures, herbicide active ingredients and application rates, and site restoration techniques. The same proposed Forest Plan amendment would apply to Alternative 3, regardless of whether herbicide use is currently being proposed in these areas in order to allow action under the EDRR.

The premise and intent of the EDRR remains the same under Alternative 3. The annual treatments would not exceed 13,000 acres within the Forest and Scenic Area: these treatments would be a combination of known treatment sites and newly inventoried treatment sites. Within these 13,000 acres that would be treated annually, the treatments areas located in riparian reserves would not exceed 5,000 acres. Further, the acres of treatment would be capped within each fifth-field watershed and riparian reserve: treatment would not exceed three percent per year in any one fifth-field watershed per year, and treatment in riparian reserves would not exceed 40 percent of the potential treatment in each fifth field watershed for the life of the project (see Table 2-9).

If the acres of National Forest System lands within each fifth-field watershed are less than three percent, the amount of National Forest System lands would not be exceeded. All acres treated under this EIS would not exceed 30,000 acres. Under Alternative 3, herbicide treatments would be limited to the highest priority sites as outlined in Table 2-8. As a result, significantly less herbicide would be used under the EDRR for Alternative 3. All other sites would be treated using manual, mechanical and cultural (goat gazing) methods as proposed in the description of this alternative.

Invasive Plant Treatment Prescriptions Assumptions

Similar to Alternative 2, the assumption is that none of the treatments would be a 100 percent effective after the initial entry. The initial treatments on the highest priority sites are estimated to eliminate up to 80 percent of the invasive plants. It is estimated, however, that the initial treatments on the remaining 8,917 acres would be less effective. The effectiveness would drop because these acres would be treated by mechanical, manual, and/or cultural (goat grazing) treatments which are less effective than herbicide applications for many of the invasive plants present within the Forest and Scenic Area. These methods are less effective for a variety of reasons including the following.

- Hand pulling often does not remove the roots of plants which could then resprout;
- Mechanical treatments only cut the plants down and do not kill or remove any plants; and
- Areas have to be repeatedly treated because more plants are missed using manual and mechanical methods, compared to herbicide methods.

More information on treatment effectiveness is available in Section 3.6 – Botany and Treatment Effectiveness. For these reasons, it is estimated that the effectiveness for these acres would only be 50 percent and that more maintenance entries would be required over subsequent years. Regardless of the effectiveness, maintenance entries would be required, and the number and timing of the entries would be dependent on the treatment strategies, treatment priority, invasive plant species present, and site-specific conditions. The overall effectiveness for this alternative is estimated to be 60 percent.

The effectiveness estimates are based on the species proposed for treatment in conjunction with the treatment methods proposed; the effectiveness is not based on the specific areas being proposed for treatment. The Forest and Scenic Area botanists made this estimate using information for noxious weed program managers at the State and County agencies, as well as their experience treating invasive plants on the Forest and Scenic Area.

All other assumptions related to timing, herbicides, priorities, treatments, and PDC presented in the Alternative 2 discussion apply to this alternative as well.

2.2 Project Design Criteria for Alternatives 2 and 3

Project design criteria (PDC) were developed to reduce or eliminate potential impacts the various treatments may cause. PDC define a set of conditions or requirements that an activity must meet to avoid or minimize potential effects on sensitive resources. All PDC are required for both Alternatives 2 and 3. PDC are <u>not</u> optional and are incorporated in the effects analysis.[4]

A. Herbicide Applications

A.1. Herbicides would be used in accordance with label instructions, except where more restrictive measures are required as described below.

A.2. Herbicide use would comply with standards in the *Pacific Northwest Regional Invasive Plant Program – Preventing and Managing Invasive Plants* FEIS (2005a), including standards on herbicide selection, broadcast use of some herbicides, tank mixing, licensed applicators, and use of adjuvants, surfactants and other additives. All the standards are included in Appendix A.

A.3. Spray equipment would be calibrated prior to seasonal start-up and periodically throughout the season to assure accuracy in applications. Spray tanks would not be washed or rinsed within 150-feet of any live water. All herbicide containers and rinse water would be disposed of in a manner that would not cause contamination of waters.

A.4. No more than daily use quantities of herbicides would be transported to the project site.

A.5. Equipment used for transportation, storage, or application of herbicides would be maintained in a leak-proof condition.

A.6. Favor transportation routes with less traffic and are not adjacent to water.

A.7. Mixtures of herbicide formulations containing 3 or less active ingredients may be applied where the sum of all individual Hazard Quotients (HQ) for the relevant application scenarios is less than 1.0. No herbicide mixing would be allowed within 150-feet of any live waters. Impervious material, such as a bucket, would be placed beneath mixing areas in such a manner as to contain any spills associated with mixing/refilling.

[4] Some of the requirements from the herbicide labels and standards in the Invasive Plant ROD (2005b) are repeated in the PDC for emphasize. All labels and Invasive Plant ROD standards need to be consulted before invasive plant treatments occur.

A.8. Herbicide applications would not exceed the typical application rates specified in Table 2-7.

A.9. Broadcast spray with NPE surfactant would be applied at a rate not to exceed 0.5 lb ai/acre.

B. Field Operations

B.1. A pre-operations briefing would be required annually prior to treatment between a USDA Forest Service project coordinator knowledgeable about invasive plant treatments and the lead contractor or employee who would be implementing the treatment. This session would be documented, and would serve to brief spray personnel on the location of sensitive resources (streams, lakes, wetlands, sensitive plants) and to review all operational details. The briefing would include safety issues, location, timing, treatment method, herbicides approved for use, PDC, and other pertinent topics. More briefings would be conducted as necessary to ensure that the invasive plant treatments and all PDC are implemented correctly.

B.2. Applicators would have an Herbicide Transportation, Handling, and Emergency Spill Response Plan, approved by the USDA Forest Service, on-site during treatments. The plan would identify reporting procedures, project safety planning, methods to clean up accidental spills, including reporting spills to the appropriate regulatory agency, and information regarding a spill kit contents and location.

B.3. Off-road vehicles used for treatment of invasive plants would remain on roadways, trails, parking areas, or authorized areas to prevent damage to vegetation and/or soil, and potential degradation of water quality and aquatic habitat.

B.4. No motor vehicles, motorized equipment, or any form of mechanical transport would be used in a designated Wilderness area to treat or monitor invasive plants. No equipment would be cached within a designated Wilderness area.

B.5. Equipment used in off-road operations for invasive plant treatment activities would be properly cleaned prior to entering National Forest System land and upon leaving infested sites.

B.6. For small quantities (5 gallons or less) fueling of gas-powered machinery would not occur within 25-feet of any live waters to maintain water quality. All other fueling must occur a minimum of 150-feet from any live waters. All specific details regarding this item would be contained in a spill plan that would be approved by the USDA Forest Service prior to yearly herbicide application.

B.7. Spray tanks would not be washed or rinsed within 150-feet of any running or standing water. All herbicide containers and rinse water would be disposed of in a manner that would not cause contamination to water.

B.8. Some sites may only be reached by water travel. Typically, an inflatable kayak would be used, but rubber rafts or drift boats may occasionally be used. The following measures would be used to prevent a spill during water transport.

B.8.a. No more than 2.5 gallons of herbicide would be transported per kayak, and typically it would be one gallon or less. If a raft is used, no more than 5 gallons would be transported on the raft.

B.8.b. Herbicide would be carried in 1 gallon or smaller plastic containers. The containers would be wrapped in plastic bags and then sealed in a dry bag. The dry bag would be secured to the watercraft.

B.9. Personnel applying herbicide by hand or with a backpack sprayer or personnel manually pulling or grubbing invasive plants would avoid, to the extent possible, standing or walking in wetted streams or other areas of running water.

C. Requirements for Wind Speeds, Drift and Precipitation

C.1. No herbicide applications would occur when wind velocity is greater than 10 mph. Broadcast application would not occur at wind speeds less than 2 mph. For picloram, the maximum wind velocity is 8 mph.

C.2. To minimize herbicide application drift, use low nozzle pressure, apply as a coarse spray, and use nozzles designed for herbicide application that do not produce a fine droplet spray.

C.3. No herbicide application would occur if precipitation is occurring or is imminent within 24 hours.

D. Public Health and Safety

D.1. Workers would use appropriate personal protective clothing and equipment at all times during application. Traffic control and signing during invasive plant treatment operations would be used as necessary to ensure safety of workers and the public.

D.2. Signs notifying the public of herbicide treatments would be placed at access points to treatment areas prior to initiating treatment, a minimum of one week in advance of herbicide treatment. Signs would be removed no sooner than two weeks following application. Signs would list herbicides to be used, application dates, and name and phone number of a local contact.

D.3. Public announcement of proposed annual program of herbicide applications would be published in the local papers at least one month in advance of herbicide application (See Appendix L – Sample Public Notifications). Notifications would categorize treatment sites by those identified in this analysis and those identified under the Early Detection / Rapid Response strategy (EDRR).

D.4. All treatment sites would be posted on the Mt. Hood National Forest (http://www.fs.fed.us/r6/mthood/) and Columbia River Gorge National Scenic Area (http://www.fs.fed.us/r6/columbia/forest/) websites. The treatment sites would be categorized by those identified in this analysis and those identified under the EDRR. The websites also would include the consistency review documentation for sites identified under EDRR or information on how to obtain the documentation

D.5. Applicants of special forest products would receive notification of areas to be treated with triclopyr at the time of permit issuance.

D.6. Pertinent administrative sites and developed campgrounds would be posted, barricaded with use caution tape, or closed in advance of herbicide application (normally 15 days) to ensure that no inadvertent public contact with herbicide occurs.

D.7. Avoid any herbicide application within 600-feet of a drinking water intake on surface water. Notification of a landowner or other pertinent water district personnel would take place when herbicides are used within 1000-feet (slope distance) of a known water intake. Herbicides would not be applied within 100-feet of the eight mapped springs that are used for drinking water on the Clackamas River Ranger District.

E. Special Status Plants (federally listed or proposed species, USDA Forest Service Pacific Northwest Region sensitive species, Survey and Manage species, and endemic species, including vascular plants, bryophytes, lichens, and fungi)

E.1. Protection buffer widths for special status plant species are given below in Table 2-13. Treatments would be stipulated as shown in the table. Whenever possible herbicide would be applied that are selective for invasive plants in treatment areas containing special status species.

Table 2-13. Protection Buffer Widths for Special Status Plant Species

Greater than 100 ft.	100 ft to 10 ft.	Less than 10 ft.
• All treatments are permitted	• All treatments, except broadcast spraying, are permitted. • Broadcast spraying is permitted when special status plant species are shielded with a protective barrier.	• No broadcast spraying • Spot treatment is permitted when special status plant species are shielded with protective barrier. Spot treatment includes backpack spray and hand application of herbicides. • Hand application of herbicide and/or manual treatment permitted without protective shielding. • Under saturated or wet soil conditions are present at the time of treatment, only hand application of herbicide is permitted.

Note: For treatment sites with the epiphytic special-status species, such as the lichen Methuselah's Beard, within 10-feet of an invasive plant, application of herbicides by hand/selective treatment methods is advised, unless invasive plant populations in the area are simply too large to treat effectively by hand. Epiphytic lichen and bryophyte species cannot be shielded from herbicide spray or mist as can terrestrial species. Also, these species are more vulnerable since they absorb moisture and nutrients directly from the atmosphere.

E.2. For Areas where broadcast application of herbicides is to occur, surveys would be completed for the area within 100-feet from the treatment area prior to broadcast application, if (1) the area has not already been surveyed for special status plant species and (2) the area contains likely habitat for any of these species.

E.3. For all other treatments (e.g., spot spray, manual, mechanical) surveys would be completed to identify all special status plant species within 10-feet of the treatment areas.

E.4. Adaptive management would be used to refine (extend or reduce) buffer sizes in order to adequately protect special status plant species from herbicide treatments.

E.5. When applying herbicides, reduce further invasive plant infestation at the treated site by protecting non-target vegetation, whenever possible, in order to minimize the creation of exposed ground and the potential for re-infestation.

E.6. Only a portion (e.g., less than one third) of each of the seven identified treatment areas containing pale blue-eyed grass, adder's-tongue, Watson's desert-parsley and Methuselah's Beard should be treated each year during the first one to three treatment years in order to assess treatment effectiveness and survival of these special status plant species. If it is determined that these special status plant species are harmed or killed resulting in concerns about the survival of the population, then treatments would need to be reassessed and modified or an alternate treatment plan devised.

F. Water Quality and Aquatic Organisms

F.1. Comply with herbicide application buffers in Table 2-14. For road ditch lines hydrologically connected (ditch line flows directly into surface water) to water bodies:

F.1.a. Spot or hand application is required in sections of wet ditch lines (water is present in ditch line or ditch line is moist).

F.1.b. For dry ditch lines, use only clopyralid, metsulfuron methyl, aquatic glyphosate, aquatic triclopyr, and aquatic imazapyr.

Table 2-14. Water Protection Measures. Aquatic influence zones for all related herbicide applications. Distances shown in the table represent the closest horizontal distance in feet (measured from bankfull flow for streams and waters edge for lakes, ponds, and wetlands) that a particular herbicide or application method can be used next to specific water bodies.

	Perennial Stream or "Live Stream"			Intermittent Stream or "Dry Stream"			Lake, Pond or Wetland		
Herbicide	**Broadcast Spray (feet)**	**Spot Spray (feet)**	**Hand Application (feet)**	**Broadcast Spray (feet)**	**Spot Spray (feet)**	**Hand Application (feet)**	**Broadcast Spray (feet)**	**Spot Spray (feet)**	**Hand Application (feet)**
Clopyralid	100	15	BF	50	BF	BF	100	15	WE
Chlorsulfuron	100	15	BF	50	15	BF	100	15	WE
Aquatic glyphosate	100	BF	0* WE	50	BF	0* BF	100	WE	0* WE
Glyphosate	100	50	50	100	50	50	100	50	50
Imazapic	100	15	BF	50	15	BF	100	15	WE
Aquatic imazapyr	100	BF	0*,WE	50	BF	0* BF	100	WE	0* WE
Imazapyr	100	15	BF	50	15	BF	100	15	WE
Metsulfuron methyl	100	15	BF	50	BF	BF	100	WE	WE
Picloram	100	50	50	100	50	50	100	50	50
Sethoxydim	100	50	50	100	50	50	100	50	50
Sulfometuron methyl	100	15	BF	50	15	BF	100	15	WE
Aquatic triclopyr-TEA[2]	N/A[3]	15	0*,WE	N/A[3]	15	0* BF	N/A[3]	15	0* WE
Triclopyr-BEE[2]	N/A[3]	150	150	N/A[3]	150	150	N/A[3]	150	150

[1] BF = Bankfull, WE = Water's edge, 0* = Hand application of this herbicide is allowed within the wetted perimeter for treatment of knotweed species only

[2] Triclopyr-TEA in active ingredient in Garlon 3A. Triclopyr-BEE is active ingredient in Garlon 4.

[3] Broadcast spraying of Triclopyr is not being considered in this EIS as a result of the impacts detailed in the Regional Invasive Plant EIS

F.2. Do not use NPE surfactant types within 25-feet of perennial streams, wetlands, lakes, ponds or in road ditches that are hydrologically connected to water bodies. The NPE surfactant ‘R-11’ is not permitted in any circumstances.

F.3. All wetland treatments (manual, mechanical, cultural, and/or herbicide) should occur during times of the year when soils are driest. If herbicide treatment is necessary when soils are wet, use aquatic formulations or low aquatic risk herbicides (clopyralid, imazapic, metsulfuron methyl, aquatic triclopyr, aquatic imazapyr, aquatic glyphosate, chlorsulfuron, imazapyr, or sulfometuron methyl).

F.4. Follow Oregon Department of Fish and Wildlife Guidelines for Timing of In-Water Work Periods (Appendix M) that applies to portions of the project that falls below the ordinary high water mark (e.g., bankfull).

G. Soils

G.1. Use only aquatic formulations or low aquatic risk herbicides where there is a high water table.

G.2. Do not use chlorsulfuron on soils with high clay content.

G.3. Do not use picloram or sulfometuron methyl on soils with high clay content (pH greater than 6.9), or coarse (texture coarser than loam and/or coarse fragment content greater than 20 percent) on shallow, unproductive or acidic soils.

G.4. No more than one application of picloram or sulfometuron methyl would occur on a given area in a calendar year to reduce potential for accumulation in soil, except to treat areas missed during the initial application.

G.5. Ground-based mechanized equipment would not be allowed within 25-feet of streams, ponds, or wetlands, except where existing trails/roads cross streams and the trail/roadside is the treatment area.

G.6. Use erosion control measures (e.g., silt fence, native grass seeding) where de-vegetation may result in delivery of sediment to adjacent surface water. The Forest and Scenic Area would utilize appropriately skilled and knowledgeable individuals to assist in evaluation of sites to determine if erosion control treatment is necessary and the type of treatment needed to stabilize soils.

H. Wildlife

H.1. Treatment of areas within 0.25-mile, or 0.50-mile line-of-sight of a bald eagle nest site would be timed to occur outside the nesting season of January 1 to August 31, unless treatment activity is within ambient noise levels and levels of human presence. Ambient noise levels would be defined as less than 92 decibels measured from the noise source to a quarter mile.

H.2. No areas within 100-feet of a spring or seep would be sprayed with an herbicide without appropriate surveys conducted for sensitive salamanders or mollusks by qualified, knowledgeable individuals.

H.3. No broadcast spraying within 100-yards of rocky or talus areas from June 1 to September 30 without surveying for Larch Mountain Salamanders (LMS). During unusually dry periods, this season may be extended if a specialist knowledgeable of LMS requirements feels that it is too dry for LMS to be above ground. During dry periods, LMS live underground and would not come into direct contact with herbicides.

I. Site Restoration

I.1. Treatment areas would be assessed to determine if restoration is necessary and by what materials. Restoration would be considered for any site within the treatment area with soil disturbance or vegetative density low enough to allow re-infestation or introduction of other invasive plants, to control erosion, and/or to provide rooting strength for slope stability.

I.2. Revegetation seed mixes would be designed on a site-specific basis to consider objectives and conditions at each potential revegetation site. Native species would be used in seed mixes, unless unavailable, and shall be in compliance with Regional, Forest, and Scenic Area native plant policies. Desirable non-native species may be used when: 1) needed in emergency conditions to protect basic resource values (e.g., soil stability, water quality and to help prevent the establishment of invasive species); and 2) as an interim, non-persistent measure designed to aid in the re-establishment of native plants. All plant species used on the National Forest System lands would comply with USDA Forest Service policy regarding source and type of plant materials used in seeding projects. Under no circumstances would undesirable plants be used.

J. Implementation

J.1. Develop an annual treatment and restoration plan that identifies treatment sites. The treatment sites would include known and undiscovered invasive plant infestations. The plan would be developed through an interdisciplinary approach by individuals skilled in natural resource sciences and approved by the appropriate responsible official(s).

J.2. The annual treatment and restoration plan would be reviewed for heritage resources interests, including but not limited to review by appropriate Tribal Governments depending on the treatment site locations. The review would determine if there is any new information that should be considered prior to application to protect heritage resources and culturally significant sites. The Forest and Scenic Area would ensure that archaeological sites are not impacted by any proposal to utilize a weed wrench.

J.3. Should any historic or prehistoric cultural resources be uncovered during project activities, the applicant shall cease work and immediately notify the Forest Service. The Forest Service will follow-up with the appropriate federal, state, local, and tribal government offices.

J.4. The Forest and Scenic Area would screen the new sites identified under the EDRR and prepare a document demonstrating how the new treatment is within the scope of the original NEPA decision. These documents would be available to the public.

J.5. The total acreage treated annually would not exceed 13,000 acres. Treatment would not exceed three percent per year in any one fifth-field watershed, as defined by Table 2-9. Treatment would not exceed 40 percent of riparian reserve in each fifth-field watershed for the life of the project. Treatment would not exceed 5,000 acres per year in riparian reserves.

J.6. Acres treated would not exceed 30,000 acres over 15 years.

2.3 Monitoring Framework for Alternatives 2 and 3

The monitoring framework for the Proposed Action (Alternative 2) and Restricted Herbicide Use Alternative (Alternative 3) is comprised of the framework presented in the Invasive Plant ROD (2005b) in combination with the Forest Plan monitoring strategy. The Forest and Scenic Area are required to implement the Inventory and Monitoring Framework as amended by the Regional Forester this is presented in the Invasive Plant ROD (2005b) and included as Appendix N in this document. This framework describes the monitoring needed to assure the desired future condition and treatment strategies are achieved. The framework includes implementation / compliance and effectiveness monitoring components. Some components of the framework are outlined below.

Implementation/Compliance Monitoring

- Develop a project work plan for herbicide use.

- Ensure contracts and agreements include appropriate prescriptions and that herbicide ingredients and application rates meet label requirements, Invasive Plant ROD Standards (2005b), and PDC (Section 2.2).

- Document and report herbicide use and certified applicator information in the pesticide use database, as required by USDA Forest Service regulations (Appendix E; Appendix N).

Effectiveness Monitoring

- Implementation monitoring would occur to ensure PDC are implemented as planned. Post-treatment reviews would occur on a sample basis to determine whether treatments were effective and whether or not passive/active restoration occurred as expected.

- Post-treatment monitoring would be used to detect whether PDC were appropriately applied.

- Contract administration and other existing mechanisms would be used to correct deficiencies.

- Herbicide use would be reported as required by USDA Forest Service regulations (Appendix E; Appendix N).

- Re-treatment and active restoration prescriptions would be developed based on post-treatment results. Changes in treatment methods would occur based on effectiveness of treating the invasive plant infestations. For example, an invasive plant population treated with a broadcast herbicide may be retreated with a spot spray or hand pulled, once the size of the infestation is reduced.

This monitoring requirements would be accomplished using skilled USDA Forest Service employees or through partnership with the herbicide applicators, such as the counties and/or Oregon Department of Agriculture. Currently, the herbicide applicators complete an herbicide treatment and monitoring record that documents the site treated, treatment methods, herbicide used, and method of application as well as a monitoring record. The monitoring records require a follow-up visit and an assessment of effects on non-target species. Similar records may be developed in the future to meet the monitoring needs.

Additional monitoring would be completed as part of the Forest Plan Monitoring strategy and other required monitoring processes. The annual Mt. Hood Forest Plan Monitoring Report addresses the following questions related to invasive plants:

- Are known untreated invasive plant sites continuing to spread? Are new infestations occurring?

- Are prevention standards to reduce the risk of invasive plant establishment being implemented for all ground-disturbing activities?

- Do herbicide treatments for invasive plants follow standards and guidelines set in the Invasive Plant FEIS (2005a)?

Monitoring identified as “essential” would occur if the project is implemented. The essential monitoring would be identified during the implementation phase. Other monitoring would be completed as funding permits. Monitoring requirements would be increased if implementation or effectiveness problems result.

2.4 Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in the tables focuses on treatment activities and effects where different levels of effects could be distinguished quantitatively or qualitatively among alternatives. Table 2-15 summarizes the alternatives by treatment methods. Table 2-16 compares the environmental effects of implementing the alternatives by key and tracking issues.

Table 2-15: Comparison of Treatment Methods by Alternative. The Proposed Action includes primarily broadcast spraying herbicide treatment methods. In contrast, the Restricted Herbicide Use Alternative includes primarily non-herbicide treatment methods, and favors hand/selective herbicide.

	Broadcast (Boom) Herbicide Treatments		Hand/Selective Herbicide Treatments Only		Non-Herbicide Treatment Methods		Total Acres
	Acres	Percent	Acres	Percent	Acres	Percent	Acres
No Action	415	33%	185	15%	635	51%	1235
Proposed Action (Alternative 2)	10,220	79%	2,694	21%	50	1%	12,964
Restricted Herbicide Use (Alternative 3)	1,460	11%	2,586	20%	8,917	69%	12,964

Table 2-16: Comparison of Environmental Effects of Implementing the Alternatives in Relation to Purpose and Need/Desired Future Condition, and Key and Tracking Issues.

Component	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Reduced Herbicide Use Alternative
Purpose and Need/Desired Future Condition Component			
Overall acres treated (Acres of herbicide treatments)	1,235 acres per year (600 acres per year)	12,964 acres per year (12,914 acres per year)	12,964 acres per year (4,047 acres per year)
Ability to restore healthy, native communities and function at existing sites	The Forest and Scenic Area treated 1,235 acres in fiscal year 2003. NEPA decisions enable the Forest and Scenic Area to treat 2,250 acres each year. Invasive plants continue to spread at a rate of 10 percent per year, which degrades native communities and function.	Most likely to restore healthy, native communities and functions through the reduction of invasive plants and through site-specific restoration. Most effective and timely at reducing the infestations and presence of invasive plants. Implements the most effective treatments as prescribed by the Common Control Measures (Appendix G).	Less likely to restore healthy, native communities and functions. Less effective at reducing the infestations and presence of invasive plants due to decreased use of the most effective treatments, as prescribed by the Common Control Measures (Appendix G).
Ability to treat new/ additional invasive plant sites that may be identified in the future	No EDRR	EDRR allows for the treatment of 30,000 acres. Treated acres would be a mixture of inventoried (November 2004) and currently unknown sites.	EDRR allows for the treatment of 30,000 acres. Only priority 1 sites as defined in Table 2-8 would be treated with herbicides. Treated acres would be a mixture of inventoried (November 2004) and currently unknown sites.
Annual treatment caps under EDRR	N/A	13,000 acres within the Forest and Scenic Area 3 percent per year in any one fifth-field watershed 5,000 acres in riparian reserve	13,000 acres within the Forest and Scenic Area 3 percent per year in any one fifth-field watershed 5,000 acres in riparian reserve
Overall treatment cap under EDRR	N/A	30,000 acres over 15 years 40 percent of riparian reserves in each fifth-field watershed	30,000 acres over 15 years 40 percent of riparian reserves in each fifth-field watershed

Component	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Reduced Herbicide Use Alternative
Acres of Restoration	Unknown. Restoration occurs at selective sites, including Sandy River Delta and East Pit Quarry on the Scenic Area.	Active: 7,277 acres Passive: 5,687 acres Active restoration is planned for all priority 1 and 2 sites. Restoration would not begin until the invasive plants have been significantly reduced at the sites.	Active: 7,227 acres Passive: 5,737 acres Active restoration is planned for all priority 1 and 2 sites Restoration would not begin until the invasive plants have been significantly reduced at the sites.
Key Issues 1 – Treatment Effectiveness			
Treatment methods proposed	Manual, mechanical, and herbicide treatments	Manual, mechanical, cultural (goat grazing), and herbicide treatments	Manual, mechanical, cultural (goat grazing), and herbicide treatments
Acres of invasive plants treated using herbicides	1,235 acres	12,914 acres	4,047 acres
Effectiveness of invasive plant treatments and treatment method combinations	Estimated 60 percent overall effectiveness for 1,235 acres, which covers 0.1 percent of the Forest and Scenic Area.	Estimated 80 percent overall effectiveness for 13,000 acres, which covers 1.1 percent of the Forest and Scenic Area.	Estimated 60 percent overall effectiveness for 13,000 acres, which covers 1.1 percent of the Forest and Scenic Area.
Likelihood for invasive plants to spread to adjacent ownerships	Most likely to spread to adjacent lands because treats the fewest acres (1,235 acres) effectively (60 percent).	Least likely to spread to adjacent lands because treats 13,000 acres effectively (80 percent).	Less likely to spread to adjacent lands because treats 13,000 acres relatively effectively (60 percent).
Key Issue 2 –Economic Efficiency			
Cost of treatments	$1.3 million	$4.3 million	$7.3 million
Number of full-time jobs created ($20,000 per year)	38 jobs	94 jobs	159 jobs
Key Issue 3 – Aquatic Organisms and Water Quality			
Acres of herbicide treatment in riparian reserves at known sites	287 acres (2003)	5,026 acres	2,450 acres
Acres of herbicide treatment within aquatic influence zone at known sites	130 acres (2003)	2,114 acres	919 acres
Number of treatment sites with higher risk of effects from herbicides to aquatic organisms	Unknown	19 sites	8 sites
Tracking Issues			
Risk to native plant communities	Loss of non-target plants and habitat through the continual spread of invasive plants.	Short-term loss of non-target plants through treatments. Long-term gain of additional habitat and restored healthy, native function.	Short-term loss of non-target plants through treatments. Long-term gain of additional habitat and restored healthy, native function.

Component	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3 Reduced Herbicide Use Alternative
Herbicide risk on special status plant species	Unknown sites PDC inconsistent across existing NEPA documents.	13 treatment areas containing special status species. PDC reduce risk to special status plant species.	13 treatment areas containing special status species. PDC reduce risk to special status plant species.
Acres of treatment that bisect or traverse areas of late successional habitat where potential exposure to herbicides could occur for special status wildlife species	1,235 acres	2,373 acres	528 acres
Total number of acres of wildlife habitat benefited by removal of invasive plants to restore native vegetation	1,235 acres	13,000 acres	13,000 acres
Effects of treatment methods on soil organisms and soils productivity	1,235 acres impacted; 600 acres of herbicide treatment	13,000 acres impacted; 12,914 acres of herbicide treatment	13,000 acres impacted; 4,047 acres of herbicide treatment
Herbicide risk on culturally significant plants	Unknown PDC inconsistent across existing NEPA documents.	8 culturally significant plant sites PDC reduce risk to plants.	8 culturally significant plant sites PDC reduce risk to plants.
Effects of treatments on tribal communities	Reduce culturally significant plants because invasive plant occupying potential habitat	Long-term gain for culturally significant plants by treating invasive plants and restoring native plants	Long-term gain for culturally significant plants by treating invasive plants and restoring native plants
Effects of treatments on special forest products	No change to current special forest products collection practices.	Herbicides may cause a short-term loss of special forest products, which would impact the Hispanic and Asian communities the most.	Herbicides may cause a short-term loss of special forest products, which would impact the Hispanic and Asian communities the most
Acres of herbicide treatment in designated wilderness areas	0 acres	15.3 acres in Mt. Hood Wilderness Area	15.3 acres in Mt. Hood Wilderness Area
Acres of herbicide treatment in Wild and Scenic River corridor	0 acres	1465,3 acres in Clackamas, Roaring, Salmon, Sandy and White River Wild and Scenic River corridors	330.7 acres in Clackamas, Roaring, and Sandy River Wild and Scenic River corridors

2.5 Alternatives Considered, But Dropped from Further Analysis

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received in response to the Proposed Action provided suggestions for alternative methods for achieving the purpose and need. Some of these alternatives may have been outside the scope of this EIS, not met the purpose and need for action, not reasonably feasible or viable, duplicative of the alternatives considered in detail, or were determined to cause unnecessary environmental harm. Five alternatives were considered, but eliminated from detailed consideration for reasons summarized below.

2.5.1 Prevention

Some public comments suggested that the Forest and Scenic Area take no or limited action to treat invasive plants, but rather increase efforts to prevent the introduction of invasive plants and prevent the further spread of invasive plants.

This approach would not meet the purpose and underlying need for action. The purpose and need for this EIS includes timely treatment of specific invasive plants species identified at sites to meet the site treatment strategies (eradicate, control, contain, or suppress) and of new/additional invasive plant sites that may be identified in the future. Scientific literature supports timely and appropriate treatment of invasive plants and active restoration of native plant communities as important tools for effective IWM (See Invasive Plant FEIS (2005a) and Chapter 3). Many of the invasive plants proposed for treatment are most effectively controlled with herbicide methods, making non-herbicide methods ineffective and unsuccessful (see discussion under No Herbicide Alternative below and Section 3.6 – Botany and Treatment Effectiveness). Since the purpose and need for action focus on the treatment components of IWM, prevention is outside the scope of this EIS.

Although prevention does not meet the purpose and need, it is an important component of invasive plant management and integral to implementing successful treatments. The Forest and Scenic Area have a set of prevention standards that are incorporated into management activities on both units (See Appendix D). In addition, both the Forest and Scenic Area are implementing new prevention standards and guidelines through the adoption of the Invasive Plant ROD (2005b), which includes goals, objectives, and standards emphasizing prevention and early detection. Goal 1 (Appendix 1-1) in the Invasive Plant ROD (2005b) states: “Protect ecosystems from the impacts of invasive plants through an integrated approach that emphasizes prevention, early detection, and early treatment.” Goal 2 states: “Minimize the creation of conditions that favor invasive plant introduction, establishment and spread during land management actions and land use activities. Continually review and adjust land management practices to help reduce the creation of conditions that favor invasive plant communities.” See Appendix 1-1 to 1-6 of the Invasive Plant ROD (2005b) for specifics.

The prevention standards for the Forest and Scenic Area address the risk of ground-disturbing management activities spreading invasive plants within the administrative boundaries of the National Forest System as well as to adjacent landowners. These standards include the following.

- Conduct a risk assessment for invasive plants in NEPA planning as well as routine maintenance activities, documenting occurrence where it exists and incorporating appropriate prevention and/or treatment measures for the activity proposed

- Require appropriate contracts and permits to specify the cleaning of ‘off-road’ equipment prior to the arrival at a job site, and/or before leaving a invasive plant infested area to reduce the risk of carrying and spreading weeds and seeds of invasive plants (e.g., timber sales, road decommissioning or maintenance, natural resource restoration activities, etc.)

- Where feasible and available, utilize weed-free plant materials (such as weed-free straw, etc.) for re-vegetation activities, erosion control, and/or wildlife forage enhancement. Communicate with state and county agencies and plant growers re: availability of weed-free plant material sources

- Ensure that areas of soil disturbance re-vegetate promptly to minimize the risk of invasion of undesirable plants

- Inspect stockpiled gravel or rock, and on-Forest rock quarries and borrow pits for invasive plants, and if special status species are present, treat area before material from the area is used on the Forest

- In range administration annual operating plans, specify appropriate actions and practices to minimize the invasion and/or spread of invasive plants

Currently, these standards are incorporated into the NEPA and other planning processes, timber contacts and grazing permits on the Forest and Scenic Area. In addition, per the Invasive Plant ROD (2005b) Standard 1, “Prevention of invasive plant introduction, establishment and spread will be addressed in watershed analysis; roads analysis; fire and fuels management plans, Burned Area Emergency Recovery Plans; emergency wildland fire situation analysis; wildland fire implementation plans; grazing allotment management plans, recreation management plans, vegetation management plans, and other land management assessments.” The Invasive Plant ROD (2005b) standards also direct the Forest and Scenic Area to consider invasive plants in the implementation of ground-disturbing management activities, including timber harvests, fuels treatments, fire suppression, fire rehabilitation, grazing, road maintenance, quarry sites, and recreational activities. Therefore, site-specific consideration of prevention standards are considered and analyzed through other projects and processes.

2.5.2 No Herbicide Use

Additional public comments suggested that the Forest and Scenic Area consider a no herbicide use alternative. This approach would not meet the purpose and underlying need for action. The purpose and need for this EIS includes timely treatment of specific invasive plants species identified at sites to meet the site treatment strategies (eradicate, control, contain, or suppress) and of new/additional invasive plant sites that may be identified in the future. Scientific literature supports timely and appropriate treatment of invasive plants, including herbicide treatments and active restoration of native plant communities as important tools for effective IWM (See Invasive Plant FEIS (2005a) and Section 3.6 – Botany and Treatment Effectiveness). Many of the invasive plants proposed for treatment are most effectively controlled with herbicide methods, making non-herbicide methods ineffective and unsuccessful.

The issue of scale needs to be considered when planning treatments of invasive species. Populations of certain invasive species would only be effectively controlled with herbicides. At present, the only method to control large populations of knotweed species is with repeated application of herbicides (Seiger, 1991). Additionally, large-scale infestations of invasive plants threatening to invade the Forest and Scenic Area would only be treated effectively using herbicides. For example, the potential for large-scale restoration of wildlands infested with quackgrass is probably low to moderately low, unless the infested area is tilled, treated with herbicide, and reseeded, or unless large-scale, resource-intensive prescribed burn programs, coupled with herbicide and other restoration programs are implemented (Batcher, 2002).

The best control of perennial pepperweed seems to be from the use of herbicides (Morisawa, 1999). Renz (2000) states that many control methods are ineffective against perennial pepperweed or would only be used in specific areas. The only non-herbicide control method effective against large populations is long-term flooding, but it is not known if plants would re-establish if the flooding regime is removed from these areas. Lyons (1998) states that the most successful control efforts for whitetop combine several management practices, such as herbicide application and physical removal by hoeing or tilling followed by competitive species plantings (USDA Forest Service, 2005a).

For many invasive plants, manual and mechanical treatment is difficult and often ineffective regardless of the size of the population. Examples include knotweed species (Japanese, Bohemian, Giant, and Himalayan), hawkweed species (orange, meadow or yellow, and common), yellow star thistle, and knapweed species (meadow and diffuse). Manual treatment is not recommended for knotweed species because digging out rhizomes, in addition to being extremely labor-intensive, tends to spread rhizome fragments, which would product new plants. Some authorities do not recommend manual or mechanical treatment of hawkweeds because disturbance to the plant would stimulate the growth of new plants from fragmented roots, stolons, and rhizomes and redistribute the plants, increasing their rate of spread (Montana State University, 2006). Although manual and mechanical treatments may be effective for yellow star thistle, plants would survive if leaves and buds are still attached at the base of the plant, even if a fragment of a stem less than 2 inches in length is left behind. Further, yellow star thistle plants are capable of producing 50 to 100 million seeds per acre and the seeds are spread through wind dispersal, which makes manual and mechanical treatments more difficult. Manual treatment for meadow knapweed is difficult due to the species' tough perennial root crown, and repeated mechanical treatment of diffuse knapweed may increase populations by spreading seeds (See Section 3.6 – Botany and Treatment Effectiveness for more details).

The most effective treatment for each of these invasive plant species as well as the other species analyzed in this EIS is IWM, which includes manual, mechanical, cultural (goat grazing), and herbicide treatments. IWM allows for appropriate tool and methods to be used based on the size and location of the invasive plant population as well as the surrounding conditions. Through this EIS, the Forest and Scenic Area would be able to consider different treatment methods and herbicides with distinct properties that better address the balance of effective control of invasive plants and protection of the environment. The most effective IWM methods are summarized in Appendix G – Common Control Measures Summary.

2.5.3 No Amendment to the Mt. Hood Forest Plan

Based on comments, the interdisciplinary team considered an alternative that would not amend the Forest Plan. Current Forest Plan standards and guidelines do not allow or discourage herbicide treatments in general riparian areas, the White River Wild & Scenic River corridor, designated Wilderness Areas, Northern Spotted Owl habitat, and Pileated Woodpecker/Pine Martine habitat. No herbicide treatments in these areas were considered in the No Action Alternative (Alternative 1) or Restricted Herbicide Use (Alternative 3), alternatives or no treatment was determined to cause unnecessary environmental harm. The reasons for eliminating this alternative from detailed analysis are discussed by Forest Plan standard:

- Forest Plan Standard FW-076 prohibits detrimental materials associated with management activities, including herbicides, from entering water or other areas not intended for treatment. Invasive plant treatments are meeting this standard under the No Action Alternative (Alternative 1). Additionally, invasive plants may decrease water quality because invasive plants are often less effective for stream bank stabilization and provides less stream shading (See Section 3.9 – Water Quality). As a result, invasive plants may cause unnecessary environmental harm to the water resources.

- Forest Plan Standard A2-082 prohibits pesticide use in designated Wilderness Areas. This standard is addressed through the No Action Alternative (Alternative 1). Additionally, ecosystem level impacts of invasive plants may put wilderness characteristics at risk if the infestations are not treated quickly and effectively. Currently, three hawkweed sites are located in the Mt. Hood Wilderness. As discussed under the no herbicide use alternative that was eliminated, hawkweed species are most effectively treated using herbicides. To maintain wilderness character and prevent the further spread of invasive plants within Wilderness Areas herbicide treatments should be considered (see Section 3.12 – Congressionally Designated Areas and Scenery Management). Eliminating herbicide use in designated Wilderness Areas may cause unnecessary environmental harm to the natural conditions.

- Forest Plan Standards B5-041 does not permit herbicides to be used outside road rights-of-way in Pileated Woodpecker/Pine Martin habitat. These standards are addressed under the No Action Alternative (Alternative 1) under which invasive plant treatments are meeting this standard. Fifty percent of the treatment areas are within road prisms or adjacent disturbed areas, as permitted by this standard. Of the remaining 50 percent, invasive plants may alter the ecosystem character upon which these species depend, causing unnecessary environmental harm to habitat conditions (see Section 3-11 – Wildlife). Further, the PDC are designed to minimize the effects to wildlife species and their habitat.

- Forest Plan Standard A12-031 does not permit herbicides to be used outside road rights-of – way in Outdoor Education Area. This standard is addressed under the No Action Alternative (Alternative 1) under which invasive plant treatments are meeting this standard. This standard covers one small portion of the Forest, where no treatments are currently proposed. If a future infestation was discovered, it would need to be determined to be consistent with the analysis using the EDRR. As such, the potential effects would be considered through this process.

- Forest Plan Standard B7-070 discourages the application of herbicides in general riparian areas. This standard is addressed through the No Action Alternative (Alternative 1). Herbicide treatments are part of IWM approach which considers a combination of manual, mechanical, cultural (goat grazing), and herbicide treatments. Herbicide treatments are never considered in isolation and precautions are taken to ensure that uninfested riparian areas are protected and infested riparian areas are restored. Also, the PDC and aquatic influence zone are designed to discourage herbicide use in the general riparian areas.

- Forest Plan Amendment #7 prohibits herbicides in the White River Wild & Scenic River Corridor. This standard is addressed through the No Action Alternative (Alternative 1) under which invasive plant treatments are meeting this standard. The White River was designated as a Wild & Scenic River to preserve the outstanding remarkable values or opportunities in the river corridor, including the botany/ecology values. Invasive plants and their potential spread threaten the outstanding remarkable values; therefore, no herbicide treatments may cause unnecessary environmental harm to the corridor. Further, the PDC offer protection to special status botanical, wildlife, and aquatic species as well as other ecological values associated with these corridors. Further, the aquatic influence zones are designed to discourage herbicide use in the general riparian areas and protect water quality.

2.5.4 Maximize Cost Efficiency

Public comments suggested that invasive plant treatments should be designed to maximize cost efficiency. Assuming that herbicide treatments are the least expensive, compared to the mechanical and manual treatment methods, this alternative is duplicative of the Proposed Action (Alternative 2). Alternative 2 only includes six sites that do not include an herbicide treatment method in the treatment area prescription (See Section 3.7 – Economic Efficiency).

2.5.5 Maximize Worker Jobs

Additional public comments suggested that the invasive plant treatments should be designed to maximize worker jobs. Assuming that manual and mechanical treatments create more jobs than herbicide treatments, this alternative is duplicative of the Restricted Herbicide Use Alternative (Alternative 3). Under Alternative 3, only high priority treatment areas are treated with herbicides (43 sites). The remaining 165 treatment areas are treated using manual and mechanical treatments, which may maximize worker jobs (See Section 3.7 – Economic Efficiency).

CHAPTER 3
Affected Environment and Environmental Consequences

CHAPTER 3: Affected Environment and Environmental Consequences

Chapter 3 of this EIS summarizes the physical, biological, social, and economic environments of the affected project area (existing conditions) and the potential changes to those environments due to implementation of the alternatives discussed in Chapter 2 (alternatives). It also presents the scientific and analytical basis for the comparison of alternatives presented. For ease in presentation and comparison, discussions are separated into individual resource areas, including human health and safety, botany, economic efficiency, soil productivity, water quality, aquatic organisms and habitat, wildlife, congressionally designated areas, and heritage resources.

The focus of the analysis disclosed in each section is on the effects of the No Action and action alternatives on the issues described in Section 1.8. Effects are defined as:

- **Effects:** Adverse and/or beneficial direct effects occur at the same time and in the same general location as the activity causing the effects. Adverse and beneficial indirect effects are those that occur at a different time or location from the activity causing the effects. Both types of effects are described in terms of magnitude, intensity, duration, and timing.

- **Cumulative Effects:** These 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 Scenic Area as well as other adjacent federal, state, or private lands.

Effects include ecological (i.e., 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).

3.1. Life of the Project

This project would be implemented over five to 15 years as funding allows. Site-specific conditions are expected to change within this timeframe: treated infestations would be reduced in size, untreated infestations are likely to spread, specific non-target plant or animal species of local interest may change, and/or new invasive plants may become established within the project area. The effects analysis considers a range of possible treatments at each treatment site based on the invasive plant species present as well as a range of site conditions in order to accommodate the uncertainty associated with the project implementation scheduled, including the Early Detection/Rapid Response strategy (EDRR).

Three variables would contribute to the effectiveness of the invasive plant treatments and reductions in infested acres: treatment prescriptions and strategies; the effectiveness of invasive plant management on neighboring lands; and available funding. The treatment prescriptions at each site are not intended to be binding, but treatments would be selected from the range analyzed in order to most effectively treat the invasive plants based on the variables influencing the effectiveness. Annual treatment prescriptions would be based on information gathered through inventory and monitoring. The highest priority areas would be treated first, and newly discovered infestations may be prioritized over existing sites. Treatment methods would be chosen using the process described in Figure 1-4.

3.2. General Existing Conditions

The project area encompasses 1.1 million acres of the Mt. Hood National Forest (Forest) and 292,500 acres of the Columbia River Gorge National Scenic Area (Scenic Area). The treatment sites represent one percent of the total acreage on the Forest and Scenic Area. Seven sites (1,787 acres) are located on the Scenic Area and the remaining sites are located on the Forest. Sixty-two percent of these sites are located on the eastside of the Forest on the Barlow (2,444 acres) and Hood River (5,596 acres) ranger districts, and twenty-four percent of the sites are on the westside on the Clackamas River (1,270 acres) and Zigzag (1,868 acres) ranger districts. These sites are located in Hood River, Clackamas, Multnomah, and Wasco counties.

3.2.1. Treatment Area Site Descriptions

The treatment sites are located in a variety of land allocations and land types. Some infestations are located in congressionally designated areas, including the Mt. Hood Wilderness Area (three sites) and all Wild and Scenic River Corridors. The Scenic Area contains some sites that were previously cultivated for agriculture which are being restored. Approximately 122 acres in seven treatment areas are located within inventoried roadless areas. This includes 33 acres in Big Bend Lake, 77 acres in Mt. Hood Additions, and 12 acres in Wind Creek. The invasive plant treatments do not propose changing any road conditions within the project area.

The majority of treatment sites are located along roads and adjacent to disturbed areas (50 percent). Other dominant treatment sites are located at or along restoration sites (13 percent), recreation residences (nine percent), utility corridors (seven percent) and quarries (five percent) (Table 3-1). The remaining treatment sites include administrative sites, campgrounds, clearings, corrals, hiking trails, harvest units, lakes, landings, ski areas, meadows, and stream-sides. The restoration sites are all located on the Scenic Area. As these site descriptions indicate, the human contributions to invasive plant infestations can be significant. In addition, many of these treatment areas are located within the aquatic influence zone or riparian reserves (see Sections 3.9 and 3.10). The aquatic influence zone is land adjacent to perennial and intermittent streams, rivers, ponds, lakes, springs, and wetlands that has a direct or potentially direct influence on the water body and its function where herbicides may enter surface waters. Riparian reserves are areas along live and intermittent streams, wetlands, ponds, lakes, and unstable and potentially unstable areas where riparian-dependent resources receive primary emphasis. Also, special forest products and culturally significant plants could potentially be harvested and collected at these sites as well.

Table 3–1: Acres by Site Description. Approximately 62% of the sites are disturbed areas (roads, quarries, utility corridors), 20% are recreational sites (developed campgrounds, permit areas, recreational residences), 17% are natural/forested areas (clearing, flood plains, meadows, forested sites, plantations), and <1% are administrative sites.

Site Description	Acres	Percent
Developed Campground	168.8	1%
Major Resort/Permit Site	363.3	3%
Quarry	624.7	5%
Utility Corridors	863.2	7%
Recreational trails	963.1	7%
Recreational Residence & Adjacent Areas, including Roads	1,163.6	9%
Scenic Area Restoration Sites	1,640.0	13%
Road and Adjacent Disturbed Area	6,526.8	50%
Total	**12,313.5**	**95%**

Since treatment sites are located across the Forest as well as the Scenic Area, site conditions vary greatly. Annual precipitation varies from 10 to 120 inches per year across at the treatment sites, primarily in the winter months. The minimum distance to water ranges from zero to over 2,000 feet, with the majority of sites ranging from zero to 100 feet (66 percent). The categories of water located within 100 feet of these sites include streams, ponds, wetlands, ditches, springs, and rivers. The average percent slope ranges from zero to 62 percent. The average elevation ranges from 25 to 5,400 feet. The general vegetation type, flora, and fauna present at the treatment sites vary across the sites. More information about the existing conditions at each site can be found in Appendix O.

3.2.2. Invasive Plant Species and Infestations

Each of the treatment sites has invasive plants present that threaten healthy, native communities and function. At least 19 species have been inventoried by USDA Forest Service botanist and noxious weed specialists on the Forest and Scenic Area using inventory and mapping protocols established by the USDA Forest Service under the NRIS Terra Invasive Plant database (USDA Forest Service, 2002). It is likely additional species are present on the Forest and Scenic Area, but have not yet been discovered.

The invasive plants found most frequently in the treatment sites are: diffuse knapweed (33 percent), orange hawkweed (15 percent), spotted knapweed (14 percent), tansy ragwort (13 percent), Himalayan blackberry (12 percent), houndstongue (seven percent), and butter and eggs (two percent).

The most common invasive plants are not necessarily the species of most concern, which have significant ecological consequences and often are difficult to eradicate or control (see Section 3.6 for more details). The species of most concern are: butter and eggs, knotweed species, common hawkweed, meadow hawkweed, orange hawkweed, and yellow star thistle. These species are starting to spread within the Forest and Scenic Area; however, these species are present only in small infestations at the present so they can be treated and eradicated from the Forest and Scenic Area if prompt action is taken. Description of species of most concern follows.

- **Butter and eggs (*Linaria vulgaris*)**: This perennial species, also commonly known as yellow toadflax, typically becomes established in disturbed areas, such as along roads, in quarries, in floodplains, and in overgrazed rangelands. This species is a native of Eurasia and was introduced as an ornamental. Its bright yellow flowers with orange throat and spur is attractive. With its extensive root system, this plant could become very aggressive displacing native plants and could be difficult to control.

  This invasive plant is spread along road-sides, presumably by seed mixed with gravel. The predominant method of dispersal is by wind; the seeds are adapted for wind dispersal with papery circular wings. The other important dispersal mechanism is through underground rhizomes which leads to large, dense populations which tend to take over a site. Typically, one finds a single plant initially, followed by an increasing number of plants nearby rapidly forming a dense population. As the seed heads increase, new outlying populations begin to appear down-wind. A mature plant could produce over half million seeds.

  A similar species, Dalmatian toadflax (*Linaria dalmatica*), is similar and equally problematic.

- **Knotweed species**: Japanese knotweed (*Polygonum cuspidatum*) is currently reported on only five National Forests in the Pacific Northwest Region. The difficulty of control and the high potential for spread is of concern. Similar species of concern that have the potential to invade the Forest and Scenic Area include giant knotweed (*Polygonum sachalinense*) and Himalayan knotweed (*Polygonum polystachyum*).

  Japanese knotweed is native to eastern Asia and was introduced from Japan as an ornamental garden plant in the late 1800s. It is now widely distributed in much of the eastern United States, and occurs in coastal areas of Oregon and Washington. Japanese knotweed is a riparian species that spreads quickly to form dense tall thickets that shade out other species and prevent regeneration of native plants. It reduces species diversity and damages wildlife habitat (Seiger, 1991). Japanese knotweed poses a significant threat to riparian areas where it could survive severe floods and is able to rapidly colonize scoured shores and islands (Alien Plant Working Group, 2004). Once established, populations are extremely persistent.

Rhizomes could regenerate from small fragments. Dispersal could occur naturally when rhizome fragments are washed downstream and deposited on banks, or more commonly, when humans transport soil as fill dirt. Monitoring for the introduction of Japanese knotweed and manually removing the entire plant could prevent establishment. Repeated cutting may control a few individual plants, but the only known method to control larger stands is with repeated application of herbicides (Seiger, 1991). Innovative herbicide applications such as stem injection are being used with success and could mitigate effects to non-target species (Soll, 2004; USDA Forest Service, 2005a).

- **Common hawkweed (*Hieracium vulgatum*), Meadow hawkweed (*Hieracium pratense*) and Orange hawkweed (*Hieracium aurantiacum*)**: The hawkweeds resemble some of our native species, but they come from Eurasia. These invasive species are found along road-sides, trails, meadows, and other disturbed sites. The hawkweeds are perennial with a fibrous root system, milky juice, and the leaves are largely basal. The flowers are variously colored in yellow and red-orange on stems about 12 inches tall. They tend to colonize moist meadow sites or are found in areas with higher rainfall.

  While these species had been rather local in distribution, they have expanded their range dramatically in recent years, infesting some sensitive habitats. One population is known in the Mt. Hood Wilderness Area where it has begun to displace native grasses. Early detection and control of new infestations is important in keeping these species from infesting additional sensitive habitats. At lower elevations, these species have become increasingly widespread along highways and other roads where control is becoming more difficult.

  The hawkweeds reproduce by seeds, stolons, and rhizomes. Extensive stolons create dense mats of hawkweed plants that could eliminate other native flora. It is this tendency that makes this plant very difficult to control and of great concern.

- **Yellow starthistle (*Centaurea solstitialis*)**: Occurrence of yellow starthistle is reported on eight forests in the region, and is rapidly expanding in eastern Oregon. Yellow starthistle is a winter annual that could form dense impenetrable stands that displace desirable vegetation. This species was introduced into North America as a seed contaminant in Chilean-grown alfalfa seed sometime after 1849 (DiTomaso, 2001). In the past 40 years it has spread exponentially throughout the west.

  Yellow starthistle is best adapted to open grasslands with deep well-drained soils and annual precipitation between 10 and 60 inches, but competes successfully in a wide range of habitats (DiTomaso, 2001). It favors sites originally dominated by perennial grasses, primarily bluebunch wheatgrass (*Psuedoroegneria spicata*), Idaho fescue (*Festuca idahoensis*), and Sandberg bluegrass (*Poa secunda*) (Sheley and Petroff, 1999).

  Yellow starthistle displaces native plant communities and reduces plant diversity. It forms solid stands that dramatically reduce forage production for livestock and wildlife. This species causes a fatal neurological disorder when ingested by horses called "chewing disease" (Sheley and Petroff, 1999; USDA Forest Service, 2005a).

3.2.3. Rate of Spread and Mechanism of Invasion

Invasive plant populations increase in acreage at an estimated rate of eight to 12 percent per year on National Forest System lands in the United States (USDA Forest Service, 1999b), which means the invasive plant infestations could continue to spread on the Forest and Scenic Area and on adjacent federal, tribal, county, and state lands. Most of the invasive plant infestations (94 percent of inventoried acreage) are in disturbed areas. The presence of invasive plants is not a new phenomenon. The geographic scope, frequency, and the number of species involved, however, have grown enormously as a direct consequence of expanding transport and commerce, especially in the past 200 years. Invasion occurs when invasive plant species are transported to new, often distant places where they proliferate, spread, and persist. For example, some invasive plants have been accidentally introduced to this country as contaminants among crop seed, ballast in cargo ships, or on other vessels (Mack et al., 2000). The rapid rate of human expansion accounts for a majority of the long-distance dispersal of newly invading species (Grime, 2001; USDA Forest Service, 2005a).

Purposeful and accidental introductions have occurred for centuries, but major introductions have occurred most rapidly over the past century. Introductions of invasive plants for forage (i.e., contaminated livestock feed), ornamental landscaping, road and dune stabilization, and erosion control have occurred throughout National Forest System lands and adjacent lands in Oregon and Washington. Most invasive plants have been introduced for horticultural use by nurseries, botanical gardens, and individuals (Reichard and White, 2001). Commercial landscape nurseries in Oregon and Washington sell, or once sold, exotic species for domestic landscaping that later were found to be invasive (e.g., English ivy, butterfly bush, pampas grass, purple loosestrife). These have spread to federal lands (Whitson, 2001). Invasive plant species have been used in seed mixes on National Forest System lands for erosion control, bank stabilization, and burned area rehabilitation (USDA Forest Service, 2005a).

The mechanisms of spread for invasive plants include natural vectors such as birds, insects, or wildlife, and natural forces, such as water and wind. Wind and water in particular, are major natural dispersal agents. Disturbance-based vectors are also mechanisms of spread for invasive plants. Invasion and dominance by invasive plants is highly correlated with soil disturbance, but are not limited to disturbed areas (Cox, 1999). Invasive plants readily invade, occupy and dominate conifer plantations, road prisms, trails and trailheads, mined sites, gravel pits, river corridors, wildlife wallows and bedding areas, and rangelands. Many invasive species could also establish in naturally occurring small openings. Natural and human induced small-scale and large-scale disturbance create safe sites for invasive plant establishment, and in areas where desirable species are not available to occupy these sites, invasive species could dominate (USDA Forest Service, 2005a).

Ground-disturbing activities on the Forest and Scenic Area include timber harvesting, recreational uses, road building and maintenance, fire suppression activities, grazing, and mining. All of these management activities can alter native plant communities and function, and provide the opportunity for invasive plants to become established and spread, as described in Section 3.1 of the Invasive Plant FEIS (2005a). Many of these activities have contributed to the current invasive plant infestations present on the Forest and Scenic Area, and would continue to contribute to the spread of invasive plants. Prevention standards, specifically the Invasive Plant ROD (2005b) standards (Appendix A) and local prevention standards (Appendix D) are an integral component to reduce the spread and establishment of invasive plant species.

In order to acknowledge the role of management activities, rate of spread was incorporated into the treatment areas (see Table 1-1) as well as in the treatment caps (see Section 1.3 – Proposed Action).The overall treatment cap is 30,000 acres. This includes the known infested treatment areas (13,000 acres), newly inventoried suspected infested areas (13,000 acres), and a one percent rate of unexpected infestations per year for the life of the project, which includes spreading invasive plants through management activities (4,000 acres). For more details, see Section 2.1.3, Subsection Early Detection/Rapid Response strategy.

3.2.4. Ownership Patterns and Herbicide Use on Other Lands

Ownership patterns within the boundaries of the Forest and Scenic Area are predominately National Forest System lands (90 percent). All fifth-field watersheds containing treatment areas have mixed ownership patterns (Appendix P). The Beaver Creek, Lower Clackamas River, Middle Deschutes River, Lower Hood River, and Lower Sandy River watersheds have the highest percentage of other ownerships within watersheds on the Forest and Scenic Area (See Figure 3-1 Map of Ownership Patterns). Two of these watersheds are located on both the Forest and Scenic Area – Lower Hood River and Lower Sandy.

Limited information on invasive plant treatments and herbicide use are known on the other ownership lands in all watersheds. As the mixed ownership indicates, invasive plants could spread from the Forest and Scenic Area to other ownerships and vice versa very easily, which would continue to contribute to the problem of invasive plants. This is the predominant concern in the watersheds located on the Scenic Area, where the ownership is the most mixed: these include the Lower Sandy River, Columbia River Gorge Tributaries, Middle Columbia/Eagle Creek, Middle Columbia/Grays Creek, and Middle Columbia/Mill Creek watersheds.

Five fifth-field watersheds (Upper Clackamas River, Oak Grove Fork Clackamas River, White River, Beaver Creek, and Middle Deschutes River watersheds) contain tribal lands on the Warm Springs Reservation. The Confederated Tribes of Warm Springs and Bureau of Indian Affairs released a Vegetation Management Noxious Weed Control Plan and Assessment (2005) that proposes manual, mechanical, biological, prescribed burning, and herbicide treatments. The plan is designed to treat and control invasive plants on the reservation over the next five years. Estimated amount of herbicide use and acres of invasive plant treatments on the tribal lands are not available.

Figure 3-1. Ownership Patterns in Vicinity of Mt. Hood National Forest and Columbia River Gorge National Scenic Area.

In addition to the tribal lands, the Oregon Department of Agriculture (ODA) and counties have active invasive plant programs. In 2005, ODA applied 15 gallons and 49 pounds of active ingredient of herbicides proposed for use in Multnomah and Clackamas counties; Multnomah County applied 439 gallons; Clackamas County applied 1,010 gallons and 119 pounds of active ingredients; and Hood River County applied 182 gallons. In addition to herbicide treatments, ODA and the counties use approximately one pint of surfactant per gallon of concentrate herbicide (Forney, 2006). Finally, ODA and the counties apply manual, mechanical and cultural treatments on their lands. Also, an orchardist estimated the herbicide use in Hood River County on private orchards to be 3,000 gallons per year. The estimate is based on the assumption that there are two applications of herbicide on orchards per year and that 1 to 1.5 gallons of herbicide are applied per acre over 15,000 acres.

3.3. Herbicides, Adjuvants, Surfactants and Inert Ingredients

The effects from the use of any herbicide or additive depends on the toxic properties (hazards) of that chemical, the level of exposure to that chemical at any given time, and the duration of that exposure. The Invasive Plant FEIS (2005a) used the herbicide risk assessments displayed in Table 3-2 to evaluate the potential for harm to non-target plants, wildlife, human health, soils and aquatic organisms from the herbicides considered for use in this EIS. This section summarizes the known information about herbicides and additives; discusses the risk reduction approach incorporated in the action alternatives and applied in the analysis of environmental impacts; and discloses the uncertainties associated with herbicides and additives. Appendix Q – Herbicide Information Summary and PDC Crosswalk summarizes herbicide characteristics, basic hazard identification, risk characterization, label restrictions and information, and PDC.

3.3.1. Herbicide Risk Assessments

Risk assessments were completed by Syracuse Environmental Research Associates, Inc (SERA) using peer-reviewed articles from the open scientific literature and current U.S. Environmental Protection Agency (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.

The risk assessments considered worst-case scenarios including accidental exposures and application at maximum label rates. The risk assessments represent the best science available. The Invasive Plant FEIS (2005a) added a margin of safety to the SERA Risk Assessments (2001b, 2003a, 2003b, 2003c, 2004a, 2004b, 2004c, 2004d, 2004e, 2004f) by making the thresholds of concern substantially smaller to account for increased caution to federally listed wildlife and fish species. The adjustments varied based on the herbicide and species being analyzed. These adjustments followed the Environmental Protection Agency protocol (EPA, 2004) described in the Invasive Plant FEIS (2005a).

Table 3-2: Risk Assessments for Herbicides Considered in this EIS, including formulations and manufacturers. These risk assessments are available at: http://www.fs.fed.us/r6/invasiveplant-eis/Risk-Assessments/Herbicides-Analyzed-InvPlant-EIS.htm.

Herbicide Name	Formulations	Manufacturer	Date Final	Risk Assessment ID
Chlorsulfuron	Telar® DF	Dupont	November 21, 2004	SERA TR 04-43-18-01c
	Glean	Dupont		
	Corsair ™	Riverdale		
Clopyralid	Transline	Dow AgroSciences	December 5, 2004	SERA TR 04 43-17-03c
Glyphosate	Accord SP	Dow AgroSciences	March 1, 2003	SERA TR 02-43-09-04a
	Aqua Neat	Riverdale		
	Aquamaster	Monsanto		
	Cornerstone Labeled for aquatic use	Agrilliance		
	Credit	Nufarm		
	Credit Systemic	Nufarm		
	Debit TMF	Nufarm		
	Eagre *Aquatic herbicide*	Griffin		
	Foresters *Non-Selective Herbicide* *Labeled for aquatic use*	Riverdale		
	Glyfos	Cheminova		
	Glyfos *Aquatic herbicide*	Cheminova		
	Glyfos Pro *No Surfactant Needed* *Labeled for aquatic use*	Cheminova		
	Glyfos X-TRA	Cheminova		
	Glyphomax	Dow AgroSciences		
	Glyphomax Plus	Dow AgroSciences		
	Glyphosate	DuPont		
	Glyphosate Original	Griffin		
	Glyphosate VMF	DuPont		
	Glypro	Dow AgroSciences		
	Glypro Plus	Dow AgroSciences		
	Honcho	Monsanto		

Herbicide Name	Formulations	Manufacturer	Date Final	Risk Assessment ID
	Mirage	UAP		
	Prosecutor	Lesco		
	Prosecutor Plus Tracker	Lesco		
	Rattler	Helena Chemical Co.		
	Razor	Riverdale		
	Razor SPI	Riverdale		
	Rodeo	Dow AgroSciences		
	Roundup CUSTOM *Labeled for aquatic use*	Monsanto		
	Roundup ORIGINAL	Monsanto		
	Roundup PRO	Monsanto		
	Roundup PRO *Concentrate*	Monsanto		
	Roundup ProDry	Monsanto		
	Roundup UltraDry	Monsanto		
	Roundup ULTRA MAX	Monsanto		
Imazapic	Plateau	Registration transferred to: BASF (C&P Press 2003; BASF 2000, 2001) (Developed by: American Cyanamid (1998c, 2000))	December 23, 2004	SERA TR 04-43-17-04b
	Plateau DG.	Registration transferred to: BASF (C&P Press 2003; BASF 2000, 2001) (Developed by: American Cyanamid (1998c, 2000))		
Imazapyr	Arsenal	Supplied by: BASF (Produced by: American Cyanamid)	December 18, 2004	*SERA TR 04-43-17-05b*
	Arsenal AC	Supplied by: BASF (Produced by: American Cyanamid)		

Herbicide Name	Formulations	Manufacturer	Date Final	Risk Assessment ID
	Chopper	Supplied by: BASF (Produced by: American Cyanamid)		
	Stalker	Supplied by: BASF (Produced by: American Cyanamid)		
	Habitat	BASF		
Metsulfuron methyl	Escort XP	DuPont	December 9, 2004	SERA TR 03-43-17-01b
Picloram	Tordon K	Dow AgroSciences	June 30, 2003	SERA TR 03-43-16-01b
	Tordon 22K	Dow AgroSciences		
Sethoxydim	Poast	BASF	October 31, 2001	SERA TR 01-43-01-01c
Sulfometuron methyl	Oust	DuPont	December 14, 2004	SERA TR 03-43-17-02c
	Oust XP ®	DuPont		
Triclopyr	Forestry Garlon 4 *Specialty Herbicide*	Dow AgroSciences	March 15, 2003	SERA TR 02-43-13-03b
	Garlon 4 *Specialty Herbicide*	Dow AgroSciences		
	Garlon 3A	Dow AgroSciences		
	Pathfinder II *Specialty Herbicide* *Labeled for aquatic use*	Dow AgroSciences		
	Remedy RTU.	Dow AgroSciences		
	Renovate 3 (a.k.a. Triclopyr TEA)	*SePRO Corporation* (Appears to be identical to Garlon 3A)		
NPE (nonylphenol polyethoxylate)	*R-11®*	Wilbur-Ellis Company	May 2003 (October 2003)	USDA Forest Service, R-5

In addition to the analysis of potential hazards to human health from the active ingredients in herbicides, the SERA Risk Assessments (2001b, 2003a, 2003b, 2003c, 2004a, 2004b, 2004c, 2004d, 2004e, 2004f) 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 active ingredients) because they are not subject to the extensive testing that is required for the active ingredients under FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act).

3.3.2. Herbicide Toxicology Terminology

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

- **Aquatic Label:** Some herbicides are labeled for direct application in water. While no direct application would occur in any alternative for this project, treatment of emergent invasives in standing water or dry stream beds may involve use of such formulations to meet label requirements. Aquatic labeled herbicides are not necessarily less hazardous to aquatic organisms than other herbicides, but have been more extensively tested. Aquatic labeled herbicides would not be favored over effective non-aquatic labeled herbicides that pose lower risk to aquatic organisms, assuming compliance with label advisories (see Section 3.10).

- **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.)

- **Exposure Scenario:** The mechanism (e.g., dermal, ingestion) by which an organism (e.g., person, animal, fish) may be exposed to herbicides or additives. The application rate and method influences the amount of herbicide to which an organism may be exposed.

- **Hazard Quotient (HQ):** The HQ is the amount of herbicide or additives to which an organism may be exposed divided by the Threshold of Concern. An HQ less than or equal to 1 indicates an extremely low level of risk.

- **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.

- **No Observable 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 Concentration (NOEC):** Synonymous with NOEL.

- **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.

- **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.

- **Threshold of Concern:** A level of exposure below which there is a low potential for adverse effects to an organism. This level was made more conservative in the Invasive Plant FEIS (2005a) to add a margin of safety to the risk assessment process.

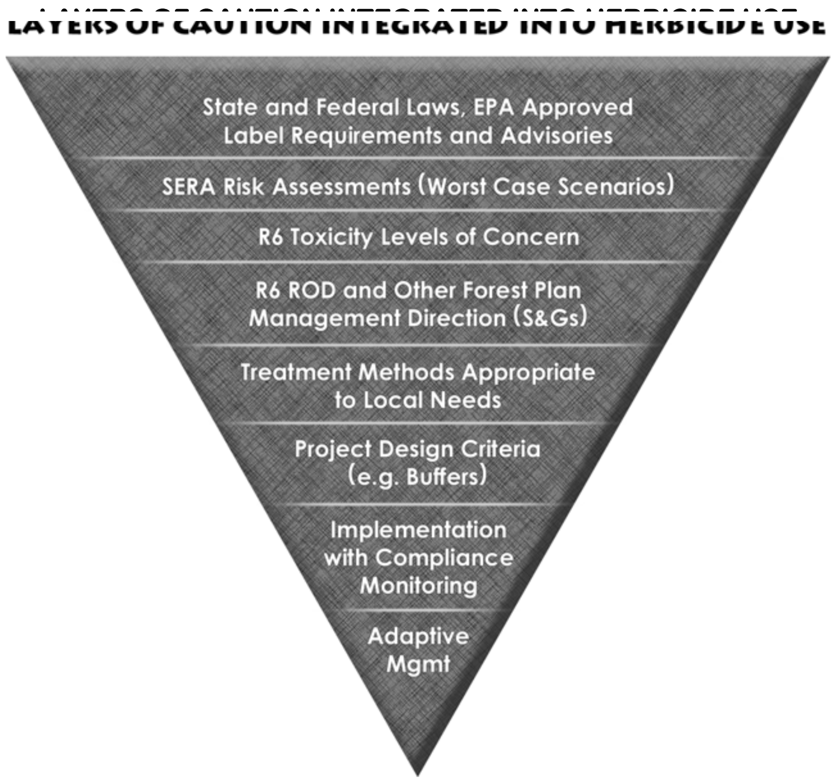
3.3.3. Risk Reduction Framework

Figure 3-2 displays the layers of caution that are integrated into herbicide use in the USDA Forest Service, Pacific Northwest Region. First, label requirements, federal and state laws, and the EPA approval process provide an initial level of caution regarding herbicide use. Next, the SERA Risk Assessments (2001b, 2003a, 2003b, 2003c, 2004a, 2004b, 2004c, 2004d, 2004e, 2004f) disclosed hazards associated with worst-case herbicide conditions (maximum exposure allowed by the label). The Invasive Plant FEIS (2005a) included an additional margin of safety by reducing the level herbicide exposure considered to be of concern to fish and wildlife. These adjustments followed the Environmental Protection Agency protocol (EPA, 2004) described in the Invasive Plant FEIS (2005a). The Invasive Plant ROD (2005b) adopted standards to minimize or eliminate risks to people and the environment. This EIS is designed to comply with the Invasive Plant ROD standards (2005b). Finally, the PDC further reduce the risks associated with herbicide treatments by eliminating or minimizing as much as possible the impacts to the environment.

Figure 3-2: Layers of Caution Integrated into Herbicide Use

Figure 3-2: Risk Reduction Framework

REGION SIX RISK REDUCTION METHODS —



Adjuvants, Surfactants and Inert Ingredients

Information on adjuvants and surfactants is taken from Analysis of Issues Surrounding the Use of Spray Adjuvants with Herbicides (Bakke, 2003a), Human and Ecological Risk Assessment of Nonylphenol Polyethoxylate-based (NPE) Surfactants in Forest Service Herbicide Applications (Bakke, 2003b), and Invasive Plant FEIS (2005a). Refer to Appendix R for a list of adjuvants, and surfactants addressed by Bakke (2003a).

3.3.5. Definitions of Chemical Types

- **Adjuvants:** Adjuvants are spraying solution additives that are mixed with an herbicide solution to improve performance of the spray mixture. Adjuvants could either enhance activity of an herbicide's active ingredient (activator adjuvant) or offset any problems associated with spray application, such as adverse water quality or wind (special purpose or utility modifiers). Activator adjuvants include surfactants, wetting agents, sticker-spreaders, and penetrants (Bakke, 2003a).

  Adjuvants are not under the same registration guidelines as pesticides. The EPA does not register or approve the labeling of spray adjuvants. All adjuvants are generally field tested by the manufacturer with several different herbicides against many invasive plants and under different environments (Bakke, 2003a).

- **Surfactants:** Surfactants, or "surface-acting agents", are a broad category of chemicals that are added to herbicides in order to facilitate and enhance their absorbing, emulsifying, dispersing, spreading, sticking, wetting, or penetrating properties. Surfactants are most often used with herbicides to help it spread over and penetrate the waxy cuticle (outer layer) of a leaf or to penetrate through the small hairs present on the leaf surface.

  Most surfactants used with herbicides are "non-ionic", which means they have no electrical charge and are compatible with most pesticides. There are cationic (positive charge) and anionic (negative charge) surfactants, but they are not as commonly used, with the exception of the cationic surfactant in the Roundup formulation of glyphosate. Surfactants have the physical characteristics of both oil and water.

- **Inert Ingredients:** Identified inert ingredients found in herbicide formulations include some relatively innocuous substances, such as distilled water. Effects of inert ingredients are included in the risk assessment for specific herbicide formulations (Invasive Plant FEIS, 2005a).

3.3.6. Nonylphenol Polyethoxylate (NPE)

The primary ingredient in many of the non-ionic surfactants used by the USDA Forest Service when applying herbicides is a compound known as nonylphenol polyethoxylate (NPE). A separate risk assessment (Bakke, 2003b) for NPE surfactants was completed because concerns have been expressed about toxicity of the chemical components and breakdown products of NPE surfactants.

NPE surfactants are appropriate for some applications where the herbicide label requires the addition of a surfactant. NPE surfactants may also improve efficacy in other herbicide applications where addition of a surfactant is optional. In some, but not all of these situations, there are alternative surfactants that would be effective that do not contain NPE (Invasive Plant FEIS, 2005a).

The typical application rate of NPE for USDA Forest Service, Pacific Northwest Region is 1.67 pounds per acre (Invasive Plant FEIS, 2005a). It is estimated that Oregon Department of Agriculture as well as Multnomah, Clackamas, Hood River, and Wasco counties use approximately one pint of surfactant per gallon of concentrate herbicide (Forney, 2006).

3.3.7. Analysis of Adjuvants, Surfactants and Inert Ingredients

The EIS does not estimate the number of acres treated with surfactants, adjuvants or inert ingredients for each alternative because only limited information is available on these chemicals. Additionally, various herbicides potentially could be used at any treatment area, so the adjuvant, surfactants and inert ingredients used may vary. Each resource area evaluated the effects of these chemicals using the information available (see following sections).

Standard #18 from the Invasive Plant ROD (2005b) is designed to avoid, eliminate, or minimize potential effects from implementing herbicide-related treatments. Standard 18 states: “Use only adjuvants (e.g. surfactants, dyes) and inert ingredients reviewed in Forest Service hazard and risk assessment documents such as SERA, 1997a, 1997b; Bakke, 2003b.” Also, PDC F.2. restricts the use of NPE near perennial streams, wetlands, lakes, ponds or in road ditches that are hydrologically connected to water bodies, and PDC A.9. limits broadcast spraying of NPE surfactant to less than 0.5 lb a.i./acre.

Surfactants that meet Standard 18 are addressed in various risk assessments by SERA and others (Bakke, 2003b; SERA 1997a, 1997b, 2003b, 2003d) and include NPE-based surfactants, POEA (polyethoxylated tallow amine), Agri-Dex, LI-700, R-11, Latron AG-98, AG surfactants in Glyphosate, and Polyglycol 26-2 in Picloram. Other adjuvants/surfactants addressed by Bakke (2003a) are listed in Appendix R.

3.3.8. Incomplete and Unavailable Information

Risk assessments have a high degree of uncertainty in interpretation and extrapolation of data. Uncertainty may result from a study design, questions asked (and questions avoided), data collection, data interpretation, and extreme variability associated with aggregate effects of natural and synthesized chemicals on organisms, including humans, and with ecological relationships. Due to data gaps, assessments rely heavily on extrapolation from laboratory animal tests (2005a). Regardless of disadvantages and limitations of ecological and human health risk assessments, risk assessments can determine (given a particular set of assumptions) whether there is a basis for asserting that a particular adverse effect is possible. The bottom line for all risk analyses is that absolute safety can never be proven and the absence of risk can never be guaranteed (SERA, 2001).

Further, a risk assessment has only been completed on one surfactant type (NPE) (Bakke, 2003b). Limited information on other surfactants, adjuvants, and inert ingredients is available in Bakke (2003a) and various risk assessments. Since risk assessments have not been completed for the surfactants, adjuvants and inert ingredients, information regarding the toxicity and effects of these chemicals is largely unavailable.

For risk assessments considering adjuvants, surfactants and inert ingredients in herbicide mixtures, the information within the risk assessment may not be complete. 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 reviewed the assumptions, methodologies and analysis of significance of any such missing information. SERA addresses and incorporates the findings of this peer review in its final herbicide risk assessment.

3.4. Basis of Cumulative Effects Analysis

Cumulative effects result from the incremental impacts of any alternative when added to other past, present and reasonably foreseeable actions, both on the Forest and Scenic Area and other adjacent federal, state or private lands (40 CFR 1508.7). The cumulative effects considered in this EIS are related to the risks to the environment and human health associated with herbicides or other invasive plant treatments. Table 3-3 defines the baseline, spatial scale, temportal scale, applicable PDC, and desired condition that serve as the basis for cumulative effects analysis for each resource area.

Additionally, where appropriate, the potential for synergistic effects (where exposure to a combination of two or more chemicals could result in impacts that are greater than the sum of the effects of each chemical alone) were considered. Combinations of herbicides in low doses (less than one-tenth of the reference dose (RfD) have rarely demonstrated synergistic effects. Review of the scientific literature on toxicological effects and toxicological interactions of agricultural herbicides indicate that exposure to a mixture of pesticides is more likely to lead to additive rather than synergistic effects (ATSDR, 2004). Based on the limited data available on herbicide combinations involving the 10 herbicides considered in this EIS, it is possible, but unlikely, that synergistic effects could occur as a result of exposure to the herbicides considered in this analysis. Synergistic or additive effects, if any, are expected to be insignificant. More information on this topic is included in Section 3.5 – Human Health and Safety.

Table 3-3: Cumulative Effects Information. Includes baseline conditions, spatial scale and temporal scale, for human health; botany and treatment effectiveness; economic efficiency; soil productivity; water quality; aquatic organisms and habitat; and wildlife resource areas.

Resource Area	Baseline (Existing Condition)	Spatial Scale	Temporal Scale	Applicable Project Design Criteria	Summary of Effects	Desired Condition
Human Health Section 3.5	No known threats to human health from current and past invasive plant treatments, including herbicide use.	Direct and indirect effects are limited to the immediate area (within 100-feet) from application site.	People may be exposed to herbicides in a chronic manner (e.g., applicators) or through multiple exposure mechanisms, such as breath, skin, and ingestion of contaminated meat, mushrooms or fruit.	D.1 – Personal Protective Equipment D.2 thru D.6 – Notification D.7 – Drinking water Intake	No acute or chronic exposures of concern. PDC increase the margin of safety to reduce potential exposures.	No increased risk to human health, as indicated by risk assessments.
Botany Section 3.6	No known threats from current or past invasive plant treatments, including herbicide use, to special status botanical species. Invasive plants threaten native plant communities and special status species.	Direct and indirect effects to native plant communities are analyzed at regional scale, which includes Oregon and Washington States. Direct and indirect effects to special status species are analyzed at the treatment area scale.	The life of the project is 5 to 15 years; the analysis assumes 15 years.	E.1 thru E.4 – Botanical Buffers E.5. – Preventing Reinfestation E.6. – Sample Sites	PDC, including the botanical buffers, reduce the risk to non-target vegetation. Buffers would be increase or other changes made if non-target effects are noted beyond the expected area.	No adverse effects from proposed treatments to special status species. No tend in plants towards becoming a special status species.

Resource Area	Baseline (Existing Condition)	Spatial Scale	Temporal Scale	Applicable Project Design Criteria	Summary of Effects	Desired Condition
Economic Efficiency Section 3.7	Some cost-effective treatment options (primarily herbicide treatments) are not available under the No Action Alternative. Invasive plants have an enormous economic impact on Oregon's economy and natural resources.	Direct and indirect effects are analyzed at regional scale, which includes Oregon and Washington States.	The life of the project is 5 to 15 years; the analysis assumes 15 years.	No specific PDC.	The treatment cost per acre varies from $194 for the No Action Alternative to $541 for the Restricted Herbicide Use Alternative. The Proposed Action would cost $324 per acre.	Implement economically efficient invasive plant treatments.
Soil Productivity Section 3.8	The soils in the proposed treatment areas are of relatively low fertility and once disturbed tend to be invaded by invasive plant species. No evidence that invasive plant treatments have resulted in loss of soil productivity. Invasive plant threaten to change soil characteristics over time, including erosion hazard and soil organisms.	Direct and indirect effects are analyzed at the treatment area scale within the Forest and Scenic Area.	The life of the project is 5 to 15 years; the analysis assumes 15 years.	G.1 thru G.4 – Herbicide Application G.5 – Equipment G.6 – Erosion Control Devices I.1 and I.2 – Site Restoration	PDC minimize or eliminate risk to soil productivity. The project would not contribute to significant cumulative effects at any scale.	No loss of soil productivity proposed invasive plant treatments.

Resource Area	Baseline (Existing Condition)	Spatial Scale	Temporal Scale	Applicable Project Design Criteria	Summary of Effects	Desired Condition
Water Quality Section 3.9	No evidence that pat or existing invasive plant treatment, including herbicide use, has resulted in a loss of water quality. Invasive plants may result in loss of functional riparian communities, loss of rooting strength and protection against erosion, decreasing slope stability and increasing sediment introduction into streams, and impacts on water quality.	Direct and indirect effects are analyzed at 5th field watershed scale. Additional considerations are discussed within the aquatic influence zone and riparian reserves. An aquatic influence zone is land adjacent to perennial and intermittent streams, rivers, ponds, lakes, springs, and wetlands that have a direct or potentially direct influence on the water body and its function where herbicides may enter surface waters; this zone has a default width of 100 feet.	The life of the project is 5 to 15 years; the analysis assumes 15 years.	B.6, B.7 and B.9 – Treatments near Water B.8 – Water Travel F.1 – Buffers F.2 – Surfactants F.3 – Wetlands F.4 – In-Water Guidelines	PDC, including aquatic buffers, minimize or eliminate risk to water quality, including drinking water and beneficial uses, at any scale.	No adverse effects from proposed invasive plant treatments on streams and water. No streams within analysis area becoming listed for chemical contamination under Section 303(d) of the Clean Water Act on the Department of Environmental Quality (DEQ) 2002 303(d) list.

Resource Area	Baseline (Existing Condition)	Spatial Scale	Temporal Scale	Applicable Project Design Criteria	Summary of Effects	Desired Condition
Aquatic Organisms and Habitat Section 3.10	There are over 1,600 miles of fish-bearing streams on the Forest, with approximately 300 miles supporting anadromous populations of salmon and steelhead. In the Scenic Area, there are 60 miles of fish bearing stream, with 17 miles supporting anadromous species. All these miles of streams have riparian habitat that might be impacted by invasive plants. No evidence that past invasive plant treatments, including herbicides, have harmed aquatic ecosystem.	Direct and indirect effects are analyzed at 5^{th} field watershed scale. Additional considerations are discussed within the aquatic influence zone and riparian reserves. An aquatic influence zone is land adjacent to perennial and intermittent streams, rivers, ponds, lakes, springs, and wetlands that have a direct or potentially direct influence on the water body and its function where herbicides may enter surface waters; this zone has a default width of 100 feet.	The life of the project is 5 to 15 years; the analysis assumes 15 years.	F.1 – Buffers F.2 – Surfactants F.4 – In-Water Guidelines	Persistent herbicides posing risks to aquatic organisms would not be used in the aquatic influence zone. PDC, including the aquatic buffers, minimize or eliminate risk to aquatic organisms and habitat at any scale.	No adverse effects from proposed invasive plants treatments on aquatic organisms or habitats. No trend towards listing special status fish species.

Resource Area	Baseline (Existing Condition)	Spatial Scale	Temporal Scale	Applicable Project Design Criteria	Summary of Effects	Desired Condition
Wildlife Section 3.11	Wildlife specials status species, including Pacific Northwest Regional Forester's sensitive species, survey and manage species, Forest Plan management indicator species, and landbirds listed as Partners in Flight focal species, occur within or travel through the proposed treatment areas. Northern Spotted Owl and Northern Bald Eagle are threatened wildlife species. No evidence that past invasive plant treatments, including herbicides, have harmed wildlife species.	Direct and indirect effects are analyzed at the Forest and Scenic Area scale.	The life of the project is 5 to 15 years; the analysis assumes 15 years.	H.1 – Bald Eagle H.2 – Salamanders and mollusks H.3 – Larch Mountain Salamanders	PDC minimize or eliminate risk to wildlife species at all scales.	No adverse effects from proposed invasive plant treatments on individual animals or habitat. No trend towards listing of special status wildlife species.

The risk of adverse effects of invasive plant treatments in all action alternatives has been minimized or eliminated by the PDC described in Section 2.2. This limits, but does not exclude, the likelihood of cumulative adverse effects from treatment. The proposed use of herbicides on and off the Forest and Scenic Area could result in additive doses of herbicides to workers, the general public, non-target plant species, aquatic species, and/or wildlife species. For additive doses to occur, the two exposures would have to occur closely together in time, since the herbicides proposed for use are rapidly eliminated from humans and do not significantly bioaccumulate (Invasive Plant FEIS, 2005a). 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 Invasive Plant FEIS (2005a). The Invasive Plant FEIS (2005a), in return, served as the basis for the site-specific effects analysis discussed in this EIS.

Herbicides are commonly applied on lands other than the Forest and Scenic Area 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. No central source exists for compiling invasive plant management information off National Forests System lands within Oregon. There is no requirement for private or corporate land owners, or counties to report invasive plant treatment information, thus an accurate accounting of the total acreage of invasive plant treatment for all land ownerships is unavailable.

Only the land and roads within the National Forest System would be treated in the action alternatives. The Forest and especially Scenic Area, however, are intermingled with other federal, state, county, and private ownerships as discussed in Section 3.2.4 and Appendix M. Management activities and actions on neighboring lands may contribute to spread or containment of invasive plants on the Forest and Scenic Area and vice versa. The effectiveness of the proposed invasive plant treatments would be increased if adjacent landowners were also treating invasive plant infestations. Many adjacent land owners are taking action to decrease the spread of invasive plants (see Section 3.2.4 – Ownership Patterns and Herbicide Use on Other Lands). The cumulative effects analysis assumes that adjacent lands are effectively treated in cooperation with this project, which would decrease the spread of invasive plants on adjacent lands. In addition, the cumulative effects analysis assumes the release of biological control agents on the Forest and Scenic Area and adjacent lands by the Oregon Department of Agriculture, as analyzed by APHIS, would continue to reduce the invasive plant infestations in Oregon and decrease the spread of invasive plants.

Although it is difficult to estimate, the Invasive Plant FEIS (2005a) estimated that invasive plant control occurs on over 1.25 million acres in Oregon and Washington and greater than 90 percent of this control is through the use of herbicides. Even the highest use estimates of herbicide use on the National Forest System lands would amount to less than three percent of the estimated total acres treated with herbicides in Oregon and Washington (page 4-1, Invasive Plant FEIS, 2005a). Although limited information is available, complete information is not available to estimates for the area adjacent to the Forest and Scenic Area. This information is considered in the cumulative effects analysis for each resource area in conjunction with the herbicide use information presented in Section 3.2.4 – Ownership Patters and Herbicide Use on Other Lands.

Further, the cumulative effects analysis assumes that the Invasive Plant ROD (2005b) prevention standards (Appendix A) and the Forest and Scenic Area prevention standards (Appendix D) are properly implemented and effective. The prevention standards will be monitored as required by the Invasive Plant ROD (2005b). This analysis assumes that the monitoring would effectively identify where the prevention standards are not working, and the prevention standards would be adapted as needed.

Finally, the analysis assumes other planning projects, as required by Invasive Plant ROD (2005b) Standard 1, are considering the impacts on the establishment and spread of invasive plants. Specifically, Standard 1 requires all watershed analysis, roads analysis, fire and fuels management plans, Burned Area Emergency Recovery Plans, emergency wildland fire situation analysis, wildland fire implementation plans, grazing allotment management plans, recreation management plans, vegetation management plans, and other land management assessments to consider invasive plant prevention.

3.5. Human Health and Safety

3.5.1. Introduction

This section focuses on the health effects to workers and the public if herbicides are used as proposed in the alternatives. The Invasive Plant FEIS (2005a) and its 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 Invasive Plant ROD (2005b) 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.

Site-specific PDC were developed to further minimize or eliminate exposures of concern to workers and the public plausible given the regional standards. The PDC ensure that herbicides and surfactants are used in rates low enough, or methods selective enough, to avoid exposures of concern.

The Invasive Plant FEIS (2005a) 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 during herbicide and non-herbicide invasive plant treatment operations. Such hazards are mitigated through worker compliance with occupational health and safety standards and, as such, are not analyzed again here.

Many people express concern about the effects of herbicides on human heath. 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 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. More information on municipal watershed is available in Section 3.9 – Water Quality and more information on special forest products is available in Section 3.14 – Tribal Relations, Civil Rights and Environmental Justice.

3.5.2. Existing Conditions

Many people live near, spend time, work in, drink water from, or depend on forest products from the Forest and Scenic Area. Municipal watersheds, dispersed and developed recreation areas (trailheads, campgrounds, picnic areas, recreation sites, boat ramps, ski areas, work centers, etc) and special forest product collection areas currently occur in the vicinity of invasive plant sites.

3.5.3. Methodology

The following section tiers to the Invasive Plant FEIS (2005a), which relied on professional risk assessments completed by Syracuse Environmental Research Associates, Inc (SERA 2001b, 2003a, 2003b, 2003c, 2004a, 2004b, 2004c, 2004d, 2004e, 2004f). SERA based the assessments on peer-reviewed articles from the open scientific literature and current EPA documents, including Confidential Business Information. The risk assessments were done according to protocols that are accepted by the scientific community (NRC, 1983; EPA, 1987).

The basis for risk assessments consists of the following parts:

- **Hazard Characterization:** What are the dangers inherent with the chemical?
- **Exposure Assessment:** Who gets what and how much?
- **Dose Response Assessment:** How much is too much?
- **Risk Characterization:** Indicates whether or not there is a plausible basis for concern.

The integration of the exposure rate and dose response assessments characterize the risk for a particular herbicide. For example, the inherent hazard of the chemical (known to cause liver damage) may be discounted if the exposure and dose are below a no observable adverse effect level (NOAEL) and no liver damage results.

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, 2004). See Section 3.3 – Herbicides, Adjuvants, Surfactants and Inert Ingredients for more information on these chemicals.

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

- **Exposure Scenario:** The mechanism by which a person may be exposed to herbicides active ingredients or additives. The application rate and method influences the amount of herbicide to which an organism may be exposed.

- **Threshold of Concern:** A level of exposure below which there is a low potential for adverse effects to an organism. This level was made more conservative in the Invasive Plant FEIS (2005a) to add a margin of safety to the risk assessment process.

- **Hazard Quotient (HQ):** The Hazard Quotient (HQ) is the amount of herbicide or additives to which an organism may be exposed divided by the exposure threshold of concern. An HQ less than or equal to 1 is indicates an extremely low level of risk. A HQ below 1 indicates a level below a threshold of concern. Invasive plant treatments pose potential risks to human health. This section focuses on plausible effects to people from herbicide exposure through direct contact, drinking contaminated water, and/or eating contaminated food (fish, berries, and mushrooms).

3.5.4. Direct and Indirect Effects

3.5.4.1. Worker Herbicide Exposure Analysis

Herbicide applicators are more likely than the general public to be exposed to herbicides. Worker exposure 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. Appendix Q: Human Health Risk Assessment in the Invasive Plant FEIS (2005a) displayed HQ values 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).

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.

The ten herbicides proposed for use under Alternatives 2 and 3, used at rates and methods consistent with PDC, have little potential to harm a human being. Appendix Q of the Invasive Plant FEIS (2005a) lists the HQ values for all herbicides considered for this project. In most cases, even when maximum rates and exposures are considered, HQ values were below the threshold of concern (HQ values ranged from 0.01 to 1).

Risk assessments indicate concern for worker exposure to triclopyr, especially the Garlon 4 formulation. This is one reason why broadcast application of triclopyr is not allowed under Invasive Plant ROD (2005b) Standard 16. Despite this limitation, a potential worst-case scenario exists exceeding a level of concern for workers given a backpack (spot) application of the Garlon 4 formulation of triclopyr. PDC eliminate this scenario by favoring use of Garlon 3A, minimizing application rates of all triclopyr formulations, and following safe work practices and label advisories.

For all other herbicides and surfactants, the amount of plausible worker exposure is below levels of concern for all application methods, including broadcast. PDC for all action alternatives reduce both the application rate and the quantity of drift if triclopyr and/or NPE are used. Broadcast of triclopyr is not permitted in any situation (as per the Invasive Plant ROD (2006b), and non-NPE surfactants would always be favored where effective.

Chronic (daily over a period of time) worker exposure also was considered in SERA Risk Assessments (2001b, 2003a, 2003b, 2003c, 2004a, 2004b, 2004c, 2004d, 2004e, 2004f). Chronic exposures do not amount to levels of concern because the herbicide ingredients are water-soluble and are not retained in the body (they are rapidly eliminated).

3.5.4.2. Public Herbicide Exposure Analysis – Direct Contact, Special Forest Products, Drinking Water, and Endocrine Disruption

The general public would not be exposed to substantial levels of any herbicides used in the implementation of this project. Appendix Q of the Invasive Plant FEIS (2005a) considered plausible direct, acute and chronic exposures from herbicide ingredients. Few plausible scenarios exist that exceed even the most conservative threshold of concern for public health and safety. Appendix Q shows Risk Assessment results assuming a human being contacts sprayed vegetation or herbicide or consumes sprayed vegetation, contaminated water, and/or fish.

Direct Contact

There is virtually no chance of a person being directly sprayed given broadcast, spot and hand/select methods considered for this project. A person could brush up against sprayed vegetation soon after herbicide is applied. Such contact is unlikely because public exposure would be discouraged during and after herbicide application. For all herbicides, except triclopyr, even if a person were directly sprayed with herbicide applied at typical broadcast rates, chemical exposure would not exceed a level of concern.

Exposures exceeding a conservative level of concern could occur if a person accidentally contacts vegetation spot-sprayed with triclopyr (especially Garlon 4). Such contact, however, is implausible because no broadcast spraying with triclopyr would occur under any alternative, as per Standard 16 in the Invasive Plant ROD (2005b).

The use of Garlon 4 is further limited by the PDC (for instance, no use of Garlon 4 would be 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). Gathering areas, campgrounds and administrative sites may be closed immediately after triclopyr application to eliminate accidental exposures.

Eating Contaminated Special Forest Products

The public may be exposed to herbicide if they eat contaminated fish, berries or mushrooms, etc. Members of the public could eat invasive blackberries that have been sprayed; however, the target vegetation would quickly be browned and unappetizing. Non-target, native berries or mushrooms may be affected by drift or runoff. 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 PDC that reduce potential herbicide delivery to water.

The Invasive Plant FEIS (2005a) considered exposure scenarios for both short term and chronic consumption of contaminated berries. The herbicide dose from eating a quantity of mushrooms would be greater than for the same quantity of berries (Durkin and Durkin, 2005). The dose, however, would be less than the dose from a dermal contact with sprayed vegetation scenario and thus, below the threshold of concern (HQ <1).

Appendix Q (USDA Forest Service, 2005a) displayed the exposure scenarios and HQ values associated with eating berries or other herbicide contact. Of the ten herbicides considered in this project, triclopyr remains the single herbicide with exposure scenarios exceeding a level of concern if berries or mushrooms containing herbicide residue are consumed. The PDC limit the application methods and rate of application for triclopyr, especially Garlon 4, addresses this concern. In addition, under worst-case scenarios and maximum label rates, exposure to NPE surfactant also may exceed a level of concern. Thus PDC limit the rate of NPE that may be applied. Special forest product gathering areas may be closed to public use immediately after triclopyr application to avoid inadvertent exposure.

People who both harvest and consume special forest products may be exposed both through handling contaminated plant material and chewing or eating it. Chewing and eating contaminated plant material cause different exposure and dose patterns. Such doses would be additive, but are unlikely to exceed a threshold of concern (see cumulative effects discussion below).

Drinking Contaminated Water

Acute exposures and longer-term or chronic exposures from direct contact or consumption of water, fruit or fish following herbicide application were evaluated in the Invasive Plant FEIS (2005a). Risks from two hypothetical drinking water sources were evaluated: 1) a stream, into which herbicide residues have contaminated 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 PDC 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.

Endocrine Disruption

In 2007, the Environmental Protection Agency released a draft list of 73 pesticides, based on the high potential for human exposure that will be tested for potential to cause endocrine disruption. Glyphosate is the only herbicide considered for use on the Forest and Scenic Area that is included in the EPA testing. Endocrine disruption and glyphosate was studied by SERA in 2002 (SERA 2002), and considered in the Invasive Plant FEIS (2005a) and Appendix Q of that document.

SERA reported: "Three specific tests on the potential effects of glyphosate on the endocrine system have been conducted and all of these tests reported no effects. The conclusion that glyphosate is not an endocrine disruptor is reinforced by epidemiological studies that have examined relationships between occupational farm exposures to glyphosate formulations and risk of spontaneous miscarriage, fecundity, sperm quality, and serum reproductive hormone concentrations… the approach taken in the SERA risk assessment used by the Forest Service is highly conservative and no recent information has been encountered suggesting that this risk assessment is not adequately protective of any reproductive effects that might be associated with glyphosate exposure."

3.5.5. Comparison of Risks of Human Health Effects among Alternatives Considered In Detail

The expected array of potential treatment methods for every site is displayed in Appendices G – Site and Treatment Information and H – Proposed Herbicide Use at Sites in the Proposed Action.

Alternative 1 – No Action Alternative

The No Action Alternative (Alternative 1) continues current invasive plant management programs occurring under existing NEPA. The amount and proportion of invasive plant treatments by manual, mechanical, cultural, and herbicide treatment methods would remain approximately constant to recent historic practices. All herbicide applications for invasive plant treatments considered in No Action were previously analyzed and found to pose no significant potential risks to health for workers or the public as proposed, including relevant PDC identified in the associated Environmental Assessments and Environmental Impact Statement.

Alternative 2 – Proposed Action

No individual worker or public exposures of concern are predicted in Alternative 2. PDC, including limitations on herbicide use in Aquatic Influence Zones and limitations on application rate of some herbicide ingredients, eliminate plausible exposures of concern. No adverse effects to public drinking water supplies or health and safety are predicted. Table 3-4 below summarizes how PDC minimize exposures of concern.

Since the EDRR would apply PDC as appropriate, the effects would be similar to those discussed here for Alternative 2.

Alternative 3 – Restricted Herbicide Use

No individual worker or public exposures of concern are predicted in Alternative 3. As in Alternative 2, PDC eliminate any plausible herbicide exposures of concern. No adverse effects to public drinking water supplies or health and safety are predicted. Since the EDRR would apply PDC as appropriate, the effects would be similar to those discussed here for Alternative 3.

Table 3-4: Project Design Criteria to Minimize Exposures of Concern.

	Project Design Criteria to Minimize Exposures of Concern
Workers	Typical application rates of herbicides (PDC A.8. and A.9); limitations on broadcast of triclopyr as per Invasive Plant ROD Standard 16 (2005b). Wearing personal protective equipment (PDC D.1.).
Public	Typical application rates of herbicides (PDC A.8. and A.9); limitations on broadcast of triclopyr as per Invasive Plant ROD Standard 16 (2005b). These limitations reduce risks to the general public, even considering multiple exposures.
Special Forest Projects	Typical application rates of herbicides (PDC A.8. and A.9); posting areas (PDC D.2.), supplying information to public (PDC D.3.); Using flagging to mark treated areas (PDC D.6). 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.
Drinking Water	Typical application rates of herbicides (PDC A.8. and A.9); Transportation and Handling Safety Plan and Spill Plan (PDC B.3.). Detectable impacts are implausible except in the event of a spill.

3.5.6. Cumulative Effects

While workers, and the public, may be exposed to herbicides within and outside the Forest and Scenic Area, multiple exposures do not necessarily equate to cumulative adverse effects. The herbicides proposed for use are water-soluble, are rapidly eliminated from humans and do not concentrate in fatty tissues and do not significantly bioaccumulate (2005a). Further, the PDC limit the mechanisms by which workers and the public may be exposed to herbicides. The PDC were developed considering the risks and properties of the herbicides proposed for use. The PDC ensure that chronic (long-term) and acute (short-term) herbicide exposures would not exceed thresholds of concern and sufficiently minimize risks to compensate for uncertainty about the impacts of herbicide use on neighboring lands.

Cumulative effects were analyzed in the Invasive Plant FEIS (2005a) and are briefly summarized below.

A person could be exposed to herbicide repeatedly over the course of their lifetime and exposure may occur any place that herbicides are used. Appendix Q (USDA Forest Service, 2005a) evaluated chronic exposure scenarios, including repeated drinking of contaminated water, repeated consumption of contaminated berries, and repeated consumption of contaminated fish over a 90 day period. The HQ values for chronic exposures of all herbicides considered for this project are below 1.

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 HQ values for each individual exposure scenario. An example of this scenario was considered for this cumulative effects analysis: the scenario assumes glyphosate contacts a person's bare skin (HQ for dermal exposure is less than 0.01)[1], and that person immediately eats contaminated berries and fish (HQ values for oral exposure are less than 0.01). Even if these three exposures occurred simultaneously, the combined HQ values are still far below a threshold of concern (HQ < 1).

Some of the herbicides considered for use in this project have HQ values greater than glyphosate; however, the combined HQ values for dermal and oral exposure are still likely to be very low. The body would metabolize some of the initial dose before receiving the second dose, thus reducing the cumulative dose. The risk of adverse effects to human health is low because the herbicides proposed for this project are water-soluble, are quickly eliminated from the body, and do not bioaccumulate. All alternatives comply with standards, policies and laws aimed at protecting worker safety and public health.

3.5.7. Management Standards and Guidelines

Relevant standards and guidelines contained in the Forest Plan and the Northwest Forest Plan are displayed in Appendix B of this document; relevant standards contained in the Scenic Area Management Plan are displayed in Appendix C. This analysis exhibits that the Proposed Action and Restricted Herbicide Use Alternatives are consistent with all relevant standards and guidelines, when the proposed amendments are incorporated. The Forest Plan amendments are discussed in Section 3.16.

[1] See Appendix Q of the Invasive Plant FEIS (2005a) for details about each scenario.

3.5.8. Incomplete or Unavailable Information

SERA Risk Assessments (2001b, 2003a, 2003b, 2003c, 2004a, 2004b, 2004c, 2004d, 2004e, 2004f) identify and evaluate incomplete and unavailable information that is potentially relevant to human health effects resulting from herbicide use in the alternatives. Information is necessarily incomplete on potential toxic doses of most herbicides in human, and on the variation in dose-response among individuals in the human population. *Preparation of Environmental Documentation of Risk Assessments* (SERA, 2001a) discusses the generally accepted scientific and regulatory methodologies to encompass these uncertainties in predictions of risk.

3.6. Botany and Treatment Effectiveness

3.6.1. Existing Conditions

An invasive plant can be defined as "a species that demonstrates rapid growth and spread, invades habitats, and displaces other species. Species that are prolific seed producers, have high seed germination rates, [are] easily propagated asexually by root or stem fragments, and/or rapidly mature predispose a plant to being an invasive…Alien species that are predisposed to invasiveness have the added advantage of being relatively free from predators (herbivores, parasites, and disease) and can, therefore, expend more energy for growth and reproduction" (NCRS, 1999). "Invasive weeds are plants that have been introduced into an environment outside of their native range. In their new environment, they have few or no natural enemies to limit their reproduction and spread (Anonymous, 2002). Invasive weeds affect us all—farmers, homeowners, taxpayers, consumers, and tourists" (OSU Extension Service, 2003). Usually, invasive plants are non-native (exotic) species although in some instances even native species may become invasive or expansive due to changes (e.g., fire suppression, nutrient enrichment/pollution) introduced in their environment. From a broad ecological standpoint, invasive plants alter native plant communities and ecosystems, cause a loss in biological diversity of plants and animals (loss of habitat and food), lead to ecosystem-level changes that affect soil and water, and at the landscape scale can even displace entire native communities with monocultures (e.g., yellow star thistle, gorse, cheatgrass, medusahead rye).

Invasive plants affect a variety of native plant communities that occur within the Forest and Scenic Area. Native plant communities on the west side of the crest of the Cascade Range, for the most part, consist of dense, moist forests of western hemlock (*Tsuga heterophylla*), Douglas-fir (*Pseudotsuga menziesii*), Pacific silver fir (*Abies amabilis*), western red cedar (*Thuja plicata*), and mountain hemlock (*Tsuga mertensiana*). On a broad scale, the diversity of forested plant communities in the western and eastern Cascade Range can be grouped into a handful of major vegetation zones that are determined largely by environmental gradients in temperature and moisture (i.e., climate) resulting from elevation change and maritime influence. Each vegetation zone is named after the dominant reproducing tree species for that zone. On the westside, for example, the western hemlock zone dominates lower elevations--less than 2,000 to 3,000 feet.

Above roughly 3,000 to 4,500 feet in elevation, occupying a cooler and moister climate, lies the Pacific silver fir zone. Above this zone at still higher elevations, roughly 4,500 to 6,000 feet, lies the mountain hemlock zone. And above this zone lies the subalpine and alpine zones with subalpine fir (*Abies lasiocarpa*), whitebark pine (*Pinus albicaulis*), and treeless environments above timberline.

The same dominant vegetation zones occur as well on the east side of the crest of the Cascade Range within the Forest and Scenic Area, but because annual precipitation declines dramatically on the east side due to a strong rain-shadow effect, and temperature variation increases due to the greater influence of continental climatic patterns, a drier and cooler climate results in the replacement of Pacific silver fir with lodgepole pine (*Pinus contorta*), western larch (*Larix occidentalis*), and Engelmann spruce (*Picea engelmannii*) at higher elevations and vegetation zones at lower elevations being dominated by grand fir (*Abies grandis*) and ponderosa pine (*Pinus ponderosa*) instead of western hemlock (Halverson et al., 1986; Topik et al., 1988). Vegetation on the east side varies more than that on the west side ranging from dry, open ponderosa pine-Oregon white oak (*Quercus garryana*) savannahs to dense mixed stands of grand fir, Douglas-fir, Engelmann spruce, western larch, lodgepole pine, and other conifers.

Invasive plants tend to colonize disturbed ground, including roadsides, utility (powerline) corridors, quarries, landings, recreational residences, trails, and campgrounds where vegetation has been removed and growing space for plants adapted to disturbance has been created, but also can invade undisturbed habitats. Eastside forests are more susceptible to invasive plants. A major conclusion of the ICBEMP (Interior Columbia Basin Ecosystem Management Project) analysis (2000) was that, in general, grasslands, riparian areas, and relatively dry, open forests are more susceptible to invasion than dense moist forests and high montane areas since the former have frequent gaps in plant cover, which favor invasive plant establishment, whereas the latter have relatively closed plant cover or have extreme climate or soils, which are tolerated by fewer invasive plant species (USDA Forest Service, 2005a).

Invasive plants are present within the Forest and Scenic Area and pose a threat to native plant communities and rare plant species included on the Pacific Northwest Sensitive Species List (USDA Forest Service), Survey and Manage plant species (Northwest Forest Plan), federally listed plant species (U.S. Fish and Wildlife Service), local endemic plant species and species defined as sensitive by the Scenic Area Management Plan. In this document, all are referred to simply as special status plants. Roads are conduits for the spread of invasive plants, providing vectors for dispersal (e.g., seeds and vegetative reproductive parts of plants attached to vehicles) and disturbed ground for invasive plant colonization and establishment. Timber harvest, livestock grazing, road building, and other ground-disturbing management activities occurring on the Forest and Scenic Area all contribute to the establishment and spread of invasive plants.

3.6.2. Direct/Indirect Effects

The impacts of this project on special status plants and non-target plants are discussed below. Additional information is available in Botany Biological Evaluation and Specialist Report.

Alternative 1 – No Action Alternative

Under the No Action Alternative, the Forest treats 100 acres manually and 10 acres mechanically and the Scenic Area treats 25 acres manually and 500 acres mechanically on an annual basis. These 635 acres comprise only a fraction of the estimated number of acres of land containing invasive plants within the Forest and Scenic Area. Small infestations of some invasive plants could be treated effectively by manual or mechanical methods [See Mazzu (2005)]. Moderate to large infestations of invasive plants, however, are difficult to treat manually or mechanically because of treatments needing to be repeated over many years, the high likelihood of plants reproducing from vegetative parts (e.g., rhizomes, root fragments, stolons), and dormant seeds remaining viable in soils for many years (e.g., 75 to 80 years for Scotch broom). Also, treating moderate to large infestations requires labor-intensive efforts of large workforces.

Examples of small infestations that could be treated effectively by manual or mechanical methods include the following with important caveats:

- Canada thistle (perennial) can be killed by smothering plants with boards, sheet metal, tar paper, black plastic, or other means; however, the plant produces rhizomes (underground stems) that persist despite smothering or conscientious hand pulling, making even small populations (a few plants) of Canada thistle difficult to treat effectively except with herbicides.

- Small patches of yellow starthistle (annual) could be hand pulled, if all aboveground stem material and roots are removed. New plants can sprout, however, from seeds stored in the seedbank.

- As with yellow starthistle, small populations of spotted knapweed (biennial or short-lived perennial) can be removed by digging up plants, as long as the entire root crown is completely removed.

- Diffuse knapweed (biennial or short-lived perennial) can be hand pulled successfully if done before seed set, and if done several times in one year during its growing season treating the rosette, immature, and mature plant stages.

- Populations of houndstongue (biennial or short-lived perennial) can be reduced up to 85 percent with hand pulling, if roots are completely removed. Severing the root crown 1 to 2 inches below the soil surface and removing top growth could be effective with small populations when done before flowering. New plants can sprout, however, from seeds stored in the seedbank.

- Small infestations of invasive hawkweeds (fibrous-rooted perennial) can be effectively treated by digging out all of the rosette, rhizomes, and roots of the plant. Some authorities, however, consider manual treatment to be ineffective and do not recommend it because hawkweeds can reproduce from root or rhizome fragments.

- Small populations of St. Johnswort (taprooted perennial) may be treated effectively by hand pulling or digging of young plants, but repeated treatments are necessary because new plants can grow from the "runner" root system (lateral roots). Plants can also sprout from seed. Biocontrol agents (introduced beetles) may be the best way to treat St. Johnswort.

- Tansy ragwort (biennial or short-lived perennial) can be treated effectively by hand pulling or mowing small populations. The perennial form of this plant often has large woody rootstocks and more than one flowering stem, complicating removal. Seeds could also remain viable in the soil for many years.

Generally, species that are annuals or biennials can be effectively treated manually if the populations are small and/or if there are not too many populations. It is important to remove most of the root and not break off the plant at the soil surface since it can resprout and still flower later in the season (e.g., dandelions). Herbicide treatment is recommended for perennial species, especially those with rhizomes and/or creeping root systems like Canada thistle and leafy spurge. For many invasive plants, including those listed above, effective manual or mechanical treatment is difficult regardless of the size of the population. For example, manual treatment is not recommended for invasive knotweed species because digging out its rhizomes, in addition to being extremely labor-intensive, tends to spread rhizome fragments, which could produce new plants. Meadow knapweed is difficult to pull out because of its tough perennial root crown. Himalayan blackberry could be dug out but requires removal of the massive root crown and a large workforce to do it.

Treatment Effectiveness

Under the No Action Alternative, it is highly likely that the majority of invasive plant populations within the Forest and Scenic Area would continue to expand, spread, and become increasingly more difficult and costly to control in the future. As one example, highly invasive species such as Japanese, giant, and Himalayan knotweed threaten riparian areas within the Forest and Scenic Area. Knotweed species tend to grow in moist sites, such as stream sides, riverbanks, wetlands, river deltas, and ditches along roads. Species reproduce by extensive rhizomes, which could reach 50 to 65 feet in length, and disperse when rhizome fragments are washed downstream. Rhizomes could regenerate even if buried up to 3 feet deep and have been observed growing through two inches of asphalt (Mazzu, 2005). Knotweeds, if unchecked, could rapidly take over stream and river corridors, resulting in a loss of native riparian vegetation, such as willows (*Salix* spp.) and red alder (*Alnus rubra*), and biological diversity.

Dramatic takeovers of native plant communities along stream and river corridors by knotweed species have already occurred in northwestern Oregon (Soll, 2004b). Knotweed canes (woody stems) could be cut by hand (manually) or with a machine (mechanically) to set the plant back and curtail the spread of individuals and populations; however, these resilient plants grow back quickly after cutting (within weeks). To eliminate knotweed plants manually or mechanically, the entire plant must be carefully dug up and removed without leaving any rhizome fragments. Otherwise, the plant could survive, regenerate, and eventually reproduce. Large populations of knotweed species have invaded reaches along the Sandy River and its tributaries and are being treated by The Nature Conservancy outside the Forest and Scenic Area.

Manual or mechanical treatment of knotweeds, except perhaps for a few individual plants, is a losing proposition because of their ability to reproduce from root fragments left in the soil or washed downstream. Thus far, the most practical and effective way to treat knotweed species is with aquatic glyphosate, an herbicide designed for use in streamside and riverside habitats because it strongly adsorbs to soil particles and has a low potential of leaching into groundwater systems (USDA Forest Service, 2005a). The Nature Conservancy has been treating knotweeds with aquatic glyphosate, to which a small amount of triclopyr has been added, along river corridors in northwest Oregon with some proven success for several years now (Soll, 2004b). Some foliar spraying is done as follow-up treatment, but for the most part the herbicide is not sprayed on the plants but injected by hand with heavy-duty syringes into the plants' cane-like stems. Successive years of treatment are needed to kill the plants. Under the No Action Alternative, knotweed populations would continue to increase and become more difficult to treat.

Also, highly invasive are the non-native hawkweeds (orange, meadow or yellow, and common) in the genus *Hieracium*. They could rapidly colonize and spread across upland landscapes, especially disturbed areas. Hawkweeds are found in the BPA powerline transmission corridor along USDA Forest Service Road 18 and Lolo Pass on the Zigzag Ranger District, and they threaten to spread beyond the power corridor. Recently, scattered populations of orange hawkweed were found in a meadow complex along a trail in the Mt. Hood Wilderness Area. The population is about two acres in size. A field crew of three to five people worked for several days in the area this past summer (2005) digging out plants and removing them from the site. The consensus of the crew, after surveying the area that they had treated, was that they were only able to make small inroads on the population and that more time than they had available would be needed to manually control and contain the population. Since orange hawkweed can reproduce vegetatively by stolons and rhizomes as well as from seed, even a small piece of root or rhizome left in the soil after manual or mechanical treatment may develop into a new plant.

Some authorities do not recommend manual or mechanical treatment of hawkweeds because disturbance to the plant could stimulate the growth of new plants from fragmented roots, stolons, and rhizomes and redistribute the plants, increasing their rate of spread (Montana State University Extension Service, 2006). Herbicide application is currently the most effective way to treat orange hawkweed and other invasive non-native hawkweeds, control populations, and contain their spread. Under the No Action Alternative, hawkweeds would be difficult to control and contain without herbicides because of their ability to reproduce by seed or vegetatively (by rhizomes and stolons), effective manual treatment is difficult for moderate to large populations, and both manual and mechanical treatment may stimulate the growth of new plants from fragments of roots, stolons, and rhizomes.

Knapweeds are also highly invasive, but unlike knotweeds and hawkweeds reproduce entirely by seed. Knapweeds within the Forest and Scenic Area include spotted, diffuse, and meadow knapweed. They produce abundant seed that can remain viable for many years in the soil. Seeds can be dispersed up to three feet from plants and much farther when attached to vehicles and trains (Mazzu, 2005). Manual treatment (hand pulling) could be effective for small populations of spotted and diffuse knapweed, but manual treatment for meadow knapweed is difficult due to the species' tough perennial root crown. Repeated mechanical treatment (mowing) of spotted knapweed and meadow knapweed could be moderately effective, but mechanical treatment may actually increase populations of diffuse knapweed. Cultural treatments have been effective in controlling knapweeds: for example, grazing and plowing have proven to be effective in controlling spotted knapweed, but grazing is not an effective control method for diffuse knapweed because it is unpalatable and its spines could injure livestock.

Under the No Action Alternative, manual treatment may control small populations of spotted and diffuse knapweed, but mechanical treatment is not effective for diffuse knapweed and could have the unintended effect of spreading the plant. Herbicides are not permitted to be used on hawkweeds within the Forest or Scenic Area. Herbicides are being used to treat hawkweeds on private land adjacent to the Forest (Lolo Pass and nearby BPA power transmission corridor). The hawkweed populations on private land have spread from about one-quarter acre in size to about 1,000 acres that include national forest land in the last 10 to 15 years (Forney, 2006). Without the option of herbicides, moderate to large populations of hawkweeds, such as those at Lolo Pass, would be difficult to control and contain. As a result, the likelihood is high that populations of hawkweed would increase in number and size across the landscape over time under the No Action Alternative.

Butter and eggs, or yellow toad flax, tends to occur sporadically within the Forest and Scenic Area in disturbed habitat (e.g., roadsides) and drier habitats such as eastside forests and rangeland. Plants can produce a taproot as deep as three feet in the soil, and horizontal roots may grow to several feet long and develop adventitious buds that can form independent plants. Once established, the species can suppress other vegetation by intense competition for limited soil moisture. Seeds can remain dormant in the soil for up to ten years. According to some authorities, repeated manual treatments (hand pulling) could be effective and cutting the plant in the spring or early summer is proposed as an effective way to eliminate plant reproduction; however, others discourage manual treatment because of the ability of the plant to reproduce vegetatively and spread from rhizomes (Fissell, 2006). Mechanical treatment (mowing) could reduce plant populations but is only a temporary solution because it does not reduce rhizome growth (Mazzu, 2005). Herbicides are not permitted for the control and containment of butter and eggs under the No Action Alternative. Under the No Action Alternative, small populations of this plant (containing only a few individuals) may be possible to control or contain by manual or mechanical treatment; but moderate to large populations of butter and eggs would be difficult to control or contain without herbicide treatment and, therefore, could be expected to persist. Without effective treatment, populations of butter and eggs would likely increase in number and size across the landscape over time.

Infestations of yellow starthistle, another highly invasive plant species, are capable of producing 50 to 100 million seeds per acre. Manual removal is effective for small populations of yellow starthistle; however, plants could survive even if a fragment of stem less than 2 inches in length is left behind if leaves and buds are still attached at the base of the plant. Mechanical treatment (tillage or mowing) could control yellow starthistle but timing is important (Mazzu, 2005). Early summer tillage would control yellow starthistle provided that shoots are detached from the roots. Mowing, if done before viable seed production, could be effective, but mowing during the early growth stages of yellow starthistle could result in increased light penetration and rapid regrowth of the plant. Under the No Action Alternative, yellow starthistle may be controllable manually or mechanically at the present time because of the small number and size of known populations within the Forest and Scenic Area, and if new populations are detected and treated early.

Effects on Native Plant Communities

Invasive plant infestations could displace native plants, including special status plants (USDA Forest Service, Pacific Northwest Sensitive species; Survey and Manage species; federally listed or proposed endangered, threatened, and sensitive species; local endemic species; and plants listed as sensitive by the Scenic Area Management Plant) as well as alter or even displace native plant communities. Displacement of native plant communities by non-native plants results in alterations to the structure and function of ecosystems (MacDonald et al., 1991), and constitutes a principal mechanism for loss of native biological diversity at regional and global scales (Lacey and Olsen, 1991; Johnson et al., 1994; USDA Forest Service, 2005a). A healthy native plant community, which consists of a diverse assemblage of plant species that have evolved together in place over thousands of years (probably 4,000 to 5,000 years since the mid-Holocene), provides important ecosystem functions or services: for example, creation of habitats and microenvironments to which native plants, including special status plants, are adapted; creation and maintenance of important structural components in forests (e.g., downed wood, decaying logs, and snags); maintenance of critical soil flora and fauna for important belowground processes such as decomposition, nutrient cycling, and symbioses (e.g., mycorrhizal associations between the fine roots of trees and fungi); maintenance of hydrologic functions such as the interception of atmospheric moisture and its storage; and prevention of erosion through the stabilization of soils. For more information on mycorrhizal fungi, see page 3-30 in the Invasive Plant FEIS (2005a).

Invasive plant infestations upset ecosystem balances that have evolved over time in native plant communities and set in motion changes that compromise and degrade healthy native ecosystems. As stated in the Invasive Plant FEIS (2005a), “invasive plants have cascading effects on ecosystems and affect significant chemical, physical, and biological components and processes (e.g., nutrient cycling, erosion, species competition)” (page 3-27). Table 3-5 in Invasive Plant FEIS (2005a) provides a more substantial list of effects of invasive plants on ecosystems. A severe invasive plant infestation could displace an entire native plant community (e.g., a westside riparian plant community replaced by knotweed or an eastside sagebrush and bunchgrass community replaced by yellow starthistle) with dramatic negative repercussions for native plant and wildlife species that are dependent on the environment created by a community of native plants. A major conclusion of the ICBEMP analysis was that grasslands, riparian areas, and relatively dry, open forests are more susceptible to invasion than are dense moist forests and high montane areas since the former have frequent gaps in plant cover, which favor invasive plant establishment, whereas the latter have relatively closed plant cover or have extreme climate or soils, which are tolerated by fewer invasive plant species (USDA Forest Service, 2005a). Alterations of native plant communities in such environments by an invasive plant infestation could affect an ecosystem at all levels of organization, producing dramatic changes in vegetation across the landscape with repercussions for natural resource uses such as watershed management, timber harvest, livestock grazing, and recreation.

Although there is a need to treat invasive plants in order to maintain native plant communities, likewise the treatments have the potential to shift species composition and reduce diversity of native plant communities as less herbicide-tolerant species are replaced by more herbicide-tolerant species. For example, certain herbicides and the methods by which they are applied could also harm plant pollinators. If a reduction or shift in pollinator species occurs, changes to plant species composition or diversity could follow (USDA Forest Service, 2005a). There is also the risk, however minimized by PDC, that individuals within populations of special status plants may be harmed, weakened, or killed from herbicide application (e.g., from overspray, drift, surface runoff, root translocation, or applicator error). Manual or mechanical treatment likewise could result in changes in the composition, structure, and diversity of a plant community by creating available growing space or opportunities for those native plant species that are better adapted to exploit ground disturbance and could outcompete other native species.

Summary of Effects

Effects under the No Action Alternative can be summarized as follows:

- Manual and mechanical treatment of invasive plants is allowed and would continue within the Forest and Scenic Area. These treatment methods could be limited in their effectiveness as far as controlling or containing invasive plant populations, especially large populations and those species that could reproduce vegetatively from rhizomes, stolons, or root fragments (e.g., hawkweeds, knotweeds, butter and eggs). All invasive plant species are expected to expand and spread with the limited use of herbicides.

- Limited use of herbicides would continue within the Forest and Scenic Area, resulting in limited effectiveness in the treatment of existing and new invasive plant populations.

- With limited use of herbicides under the No Action Alternative, it could be expected that existing, especially difficult-to-control, invasive plant populations would continue to expand and spread.

- New sites of invasive plants are likely to expand unchecked, potentially threatening native plants and plant communities. The current limited treatment options of invasive plants within the Forest and Scenic Area would likely lead to biologically significant negative effects on native plants and plant communities.

- The No Action Alternative provides for ***no*** EDRR to treat newly inventoried infestations of invasive plants that were not identified or specified in existing NEPA documents (e.g., knotweed species, garlic mustard, policeman's helmet, herb Robert). At least 24 invasive plant species (Table 2-3) are suspected to have the potential to occur or spread within the Forest and Scenic Area, which could not be treated under this alternative. The absence of an EDRR mechanism in the No Action Alternative would greatly increase the potential for new invasive plant infestations to establish and spread, which in the case of highly invasive plant species (e.g., knotweeds, hawkweeds, garlic mustard) could be ecologically far-reaching because of their potential to radically alter native plant communities and ecosystem structure and functions (e.g., energy flow, distribution of biomass, plant-animal interactions, decomposition, nutrient cycling, mycorrhizal associations, hydrology, etc.).

Under the No Action Alternative, which precludes the option of expanding the current limited use of herbicides within the Forest and Scenic Area to treat invasive plants, existing populations of invasive species that are difficult to treat manually or mechanically would likely continue to persist, expand, and spread. Additionally, new populations would establish, expand, and spread. Infestations of invasive plants would continue to displace native plant species, including special status plants, and thereby lower native biological diversity; alter the composition and structure of native plant communities; reduce wildlife habitat, forage quality, substrates for nonvascular plants (bryophytes and lichens), and hosts for beneficial mycorrhizal fungi; and lead to increased soil erosion and changes in hydrology (water uptake, storage, and regulation). Invasive plants also alter natural fire regimes by effecting changes in the composition and structure of native plant communities, in many cases thereby increasing fire frequency and intensity in eastside forests and rangelands, resulting in a loss of recreational and economic opportunities as native vegetation is altered or lost.

Alternative 2 – The Proposed Action

The Proposed Action proposes to treat 208 areas (about 13,000 acres) containing invasive plants with a combination of manual, mechanical, cultural, and herbicide treatments. Table 3-5 lists the number of treatment areas for each invasive plant species analyzed in the EIS. Sites have been prioritized following Table 2-8. Priority 1 sites include: (1) sites currently occupied by knotweed species, hawkweed species, butter and eggs, and yellow starthistle; (2) new infestations of invasive plant species (e.g., new populations in areas not yet infested); and (3) active restoration sites where invasive plant control is essential. Within the Forest and Scenic Area, knotweed species are present in 15 of the proposed treatment areas; hawkweed species in 20 of the proposed treatment areas (12 orange hawkweed, five common hawkweed, and three meadow hawkweed); butter and eggs in nine of the proposed treatment areas; and yellow starthistle in one of the proposed treatment areas. Although knapweed sites are not considered a high priority for treatment under the Proposed Action (in earlier management plans they were considered a priority west of the Cascade Range), knapweeds are present in 156 of the proposed treatment areas within the Forest and Scenic Area (105 diffuse knapweed, 37 spotted knapweed, and 14 meadow knapweed).

Table 3-5: Number of Treatment Areas by Invasive Plant Species. Many treatment areas contain more than one invasive plant species, so the total number of sites adds up to more than 208 treatment areas.

Invasive Plant Species	Treatment Areas	Estimated Acres	High Priority Species/Site?
Butter and eggs (LIVU2)	9	232.5	Yes
Canada thistle (CIAR4)	5	5.4	
Common hawkweed (HIVU)	5	95.9	Yes
Common tansy (TAVU)	1	---	
Diffuse knapweed (CEDI3)	105	4,416	
English ivy (HEHE)	12	7.1	
Himalayan blackberry (RUDI2)	6	1,613	
Houndstongue (CYOF)	43	853.8	
Japanese knotweed (POCU6)	15	12	Yes
Orange hawkweed (HIAU)	12	1,709	Yes
Meadow hawkweed (HIPR)	3	61.6	Yes
Meadow knapweed (CEPR2)	14	79	
Reed canarygrass (PHAR3)	3	18.7	
Rush skeletonweed (CHJU)	1	---	
Scotch broom (CYSC4)	13	237.1	
Spotted knapweed (CEBI2)	37	1,918	
St. Johnswort (HYPE)	1	---	
Tansy ragwort (SEJA)	32	1,699	
Yellow starthistle (CESO3)	1	7.1	Yes

Note: Acreage estimates for common tansy, rush skeletonweed, and St. Johnswort are not available.

Under the Proposed Action, ten herbicides analyzed in the Invasive Plant FEIS (2005a) would be available to more effectively control invasive plant infestations, as discussed under treatment effectiveness for the No Action Alternative.

Treatment Effectiveness

As advanced through integrated weed management, a combination of invasive plant treatments, including herbicides, is considered more effective for moderate to large populations than using a single method. Repeated manual treatments may be effective for controlling and containing some invasive species, but for highly invasive species and for larger populations, herbicide treatment may be the most effective and practical means. Manual or mechanical treatments are ineffective and often highly difficult for moderate to large populations of invasive plants that could reproduce by seed or vegetatively by stolons (e.g., hawkweed species), rhizomes (e.g., hawkweed species), or root fragments (e.g., invasive knotweed species).

Anecdotal evidence and experience quickly demonstrates how challenging and time-consuming it could be to dig entire plants out of the ground without disturbing the plants in the process. Disturbing the plants or failing to remove the entire plant could leave stolons, rhizomes, or root fragments behind from which the plants could reproduce. These challenges increase when dealing with moderate to large populations.

Herbicides are often the only known effective way to control, contain, or eradicate invasive plant species that could reproduce from vegetative fragments. For example, herbicide treatment with aquatic glyphosate is the only effective way to treat all but small populations of knotweed species due to their ability to produce extensive rhizomes that could reach 50 to 65 feet in length and to reproduce from root fragments. Without the option to treat infestations of invasive plants with a combination of techniques that include herbicide treatment, existing populations of highly invasive plant species are difficult to treat manually, mechanically or culturally. As a result, infestations would continue to expand and new populations would become established across the landscape, reducing or displacing native vegetation, habitat for wildlife, and forage for native ungulates and grazing livestock.

Special Status Plants

Special status is an umbrella term referring to all plant species that have recognized legal or administrative status because of conservation concerns. They include plants on the Regional Forester's Sensitive Species List (USDA Forest Service Pacific Northwest, Region 6), Survey and Manage species (Northwest Forest Plan), federally listed and proposed species (U.S. Fish and Wildlife Service), local endemics (plants that occur only within the Forest or Scenic Area), and species defined as sensitive by the Scenic Area Management Plan. In 2004, 80 fungi, lichens, and bryophytes were added to the Regional Forester's Sensitive Species list. Seventy plant species on the Regional Forester's Sensitive Species list are documented or suspected to occur within the Forest and Scenic Area (32 vascular plants, 19 fungi, 15 lichens, and 4 bryophytes). Eight of those species have been identified in 13 of the 208 areas proposed for treatment in the Proposed Action (See Table 3-6). Six of the 13 areas are on the Clackamas River Ranger District containing 1 coldwater corydalis (*Corydalis aquae-gelidae*) site; 1 pale blue-eyed grass (*Sisyrinchium sarmentosum*) site; 2 adder's-tongue (*Ophioglossum pusillum*) sites; and 3 Methuselah's Beard (*Usnea longissima*) sites. Five of the 13 areas are on the Hood River Ranger District containing 4 elegant rockcress (*Arabis sparsiflora* var. *sparsiflor*a) sites and 2 Watson's desert-parsley (*Lomatium watsonii*) sites. And two of the 13 areas are in the Scenic Area containing 1 white fairypoppy (*Meconella oregana*) site and 1 Barrett's beardtongue (*Penstemon barrettiae*) site. Finally, one treatment area in the Scenic Area contains a local endemic plant species (i.e., known only to occur in the Scenic Area): Hood River milkvetch (*Astragagalus hoodinanus*). Coldwater corydalis and Methuselah's Beard are both USDA Forest Service, Pacific Northwest Sensitive species and Survey and Manage species. No federally listed plant species are in any of the treatment areas.

Table 3-6: Treatment Areas with Special Status Plants.

Treatment ID	Site Description	District	Acres	Special Status Plants Present	Invasive Plant Threats
66-074	Road	Hood River	109.0	Elegant rockcress (*Arabis sparsiflora* var. *sparsiflora*)	Knapweeds and tansy ragwort
66-042	Quarry	Hood River	2.8	Elegant rockcress (*Arabis sparsiflora* var. *sparsiflora*)	Knapweeds and tansy ragwort
65-038	Utility corridor	Hood River	262.0	Elegant rockcress (*Arabis sparsiflora* var. *sparsiflora*), Watson's desert-parsley (*Lomatium watsonii*)	Knapweeds and tansy ragwort
65-035	Utility corridor	Hood River	6.9	Watson's desert-parsley (*Lomatium watsonii*)	Knapweeds
65-033	Opening	Hood River	17.3	Elegant rockcress (*Arabis sparsiflora* var. *sparsiflora*)	Knapweeds and tansy ragwort
65-027	Small basin with seasonal pond along road	Clackamas River	0.7	Adder's tongue (*Ophioglossum pusillum*)	Canada thistle
69-027	Road	Clackamas River	31.5	Methuselah's Beard (*Usnea longissima*)	Scotch broom, blackberry, hawkweed, knapweed, and ivy
65-026	Meadow	Clackamas River	4.7	Pale blue-eyed grass (*Sisyrinchium sarmentosum*), Adder's tongue (*Ophioglossum pusillum*)	Canada thistle
65-023	Road	Clackamas River	416.0	Coldwater corydalis (*Corydalis aquae-gelidae*)	Knapweeds
65-020	Road	Clackamas River	69.2	Methuselah's Beard (*Usnea longissima*)	Scotch broom, blackberry, hawkweed, knapweed, and ivy
65-002	Road	Clackamas River	41.9	Methuselah's Beard (*Usnea longissima*)	Scotch broom, blackberry, hawkweed, knapweed, and ivy
22-11	Forested Site	Scenic Area	85.0	White fairypoppy (*Meconella oregana*), Hood River milkvetch (*Astragalus hoodianus*)	diffuse knapweed and houndstongue
22-08	Quarry	Scenic Area	24.0	Barrett's beardtongue (*Penstemon barrettiae*)	diffuse knapweed and Himalayan blackberry

The number of individuals for each of these plant species of concern in a treatment area varies from few (<20) to many (several hundred). Both diffuse and spotted knapweeds are proposed for treatment in the area containing coldwater corydalis. Canada thistle threatens the pale blue-eyed grass and adder's-tongue populations. Spotted, diffuse, and meadow knapweed and tansy ragwort threaten the elegant rockcress plants. Spotted and diffuse knapweeds threaten the Watson's desert-parsley plants. The treatment areas with Methuselah's Beard contain numerous invasive species: Scotch broom, Himalayan blackberry, orange hawkweed, meadow hawkweed, diffuse knapweed, spotted knapweed, and English ivy. Diffuse knapweed and houndstongue threaten the white fairypoppy and Hood River milkvetch populations. And diffuse knapweed and Himalayan blackberry threaten the Barrett's beardtongue-site. In many cases, invasive plant species are interspersed with the special status plants. For example, Canada thistle plants are scattered throughout the proposed treatment areas containing pale blue-eyed grass and adder's-tongue, encroaching on and threatening to displace each special status plant species. Because Canada thistle is rhizomatous, hand pulling it may harm pale blue-eyed grass and adder's-tongue. Additionally, hand pulling is usually ineffective when treating rhizomatous plants such as Canada thistle.

Repeated manual treatments may be effective for controlling or containing small populations of certain invasive plants in treatment areas and may pose less risk to special status plants compared to herbicide treatments. Associated labor, time, and cost may make manual treatments less practical and effective, especially when treating large infestations of invasive plants. Use of herbicides may occasionally harm, weaken, or kill individual special status plants in the short term, but it is expected that populations would not be jeopardized and would make a full recovery from inadvertent damage caused by herbicide use. Despite the risk of harming, weakening, or killing individual special status plants with herbicide treatments, "invasive plant treatments are more likely to benefit listed plant species" (USDA Forest Service, 2005a) than cause them harm in the long term because, without the availability of herbicides as a treatment option, invasive plants have the potential to overrun and displace special status plants.

Concerns have been raised about drift from triclopyr and glyphosate decreasing the sustainability, relative long-term abundance, and diversity of lichens and bryophytes (Newmaster et al., 1999; USDA Forest Service, 2005a). Lichens and bryophytes lack roots and instead obtain moisture and nutrients directly from the atmosphere; therefore, they are particularly sensitive and vulnerable to aerosols and contaminants in the atmosphere such as herbicide mist. The lichen, Methuselah's Beard (*Usnea longissima*), on both the USDA Forest Service, Pacific Northwest Region Sensitive Species and Survey & Manage lists, would be highly vulnerable to direct herbicide spray or to the fine mist drift from herbicides applied in its vicinity because of its large surface area. It is an extremely long pendant lichen (up to several feet in length) that hangs from tree branches reminiscent of tinsel on a Christmas tree. Epiphytes (plants that grow on other plants), such as Methuselah's Beard, would be especially vulnerable to direct application or drift from broadcast herbicide applications. Terrestrial (ground-dwelling) special status plants, on the other hand, would be protected through selective herbicide treatments and shielding. To prevent exposure of Methuselah's Beard to herbicide overspray and drift in identified treatment areas along Highway 224 near Lazy Bend Campground (Clackamas River Ranger District) and any future treated areas, invasive plants would be manually or mechanically treated first followed by manual application (hand wiping, painting, or wicking) of herbicides. Low-to-the-ground spot spraying of herbicides would be permitted if invasive plant populations are too large to treat effectively with hand application of herbicides.

Recommended treatments (manual, mechanical, or herbicide, or a combination thereof) have been made for all of the identified 208 treatment areas (See Appendices B and D). Herbicides could harm, weaken, or kill special status plants as well as invasive plants. A number of measures would be taken to protect special status plants in the 13 identified treatment areas; these are listed under the PDC in Section 2.1, Subsection E, Special Status Plants. Even with these PDC, there is some risk that special status plants may be harmed, weakened, or killed by herbicides (e.g., through root translocation or surface runoff); however, this risk can be minimized by following the precautionary methods described in the PDC.

Manual, mechanical, cultural, and herbicide treatments entail some risk to native plants and plant communities. Any species along roadsides or where activities occur that disturb native plant communities would be threatened by not only invasive plants, but by invasive plant treatments (USDA Forest Service, 2005a). Are populations of special status plants more at risk by treating or not treating invasive plants with herbicides? The risk of harming, weakening, or killing special status plants through the application of herbicides must be weighed against the risk of special status plants, native plants, and native plant communities being lost in areas because invasive plants have been left untreated or treated ineffectively. Not having the option of using herbicides to treat areas containing both invasive plants and special status plants would likely result in a reduction or loss of those special status plant populations as they are likely to eventually be overrun and displaced by invasive species. For example, treatments sites with pal blue-eyed grass and adder's-tongue may be overrun by Canada thistle.

Effects on Native Plant Communities

Some of the herbicides proposed for treating invasive plants are selective for particular kinds of plants (e.g., dicots versus monocots). See Table 3-13, page 3-91 in the Invasive Plant FEIS (2005a) for more details. Dicots include broadleaved and woody plant species. Broadleaved refers to plants having broad leaves as opposed to those having needle-like or scale-like leaves (e.g., conifers). Monocots include grasses, sedges, rushes, lilies, irises, and orchids. The ability to damage or kill only certain plant species or families but not others makes an herbicide selective. Selective herbicides analyzed in the Invasive Plant FEIS (2005a) include chlorsulfuron, clopyralid, picloram, and sethoxydim (Table 3-7). The other six proposed herbicides analyzed in the Invasive Plant FEIS (2005a) are non-selective. The ability to damage a broad spectrum of plant species, families, or groups makes an herbicide non-selective (USDA Forest Service, 2005a). Since herbicides are designed to kill plants, native (non-target) plants and special status plants are vulnerable. Picloram, one of the more persistent herbicides, could move readily to non-target native plants through root translocation (movement of an herbicide from one plant to another across root surfaces) or surface runoff (Invasive Plant FEIS, 2005a). Due to its toxic persistence in soils and potential to spread to non-target plants, the potential impacts of picloram should be considered thoroughly before prescribing its application.

Table 3-7: Selective Herbicides Proposed for Treatment and Analyzed in EIS.

Selective Herbicides	Targeted Plant Groups/Families	Targeted Invasive Species
Chlorsulfuron	Broadleaved Plants	many species
Clopyralid	*Asteraceae*, *Fabaceae*, *Polygonaceae*	hawkweeds, knapweeds, knotweeds, tansy ragwort, yellow starthistle
Picloram	Broadleaved and Woody Plants	many species
Sethoxydim	Annual and Perennial Grasses	many species

NOTE: Information from *Pacific Northwest Weed Management Handbook* (William et al., 2004).

PDC included in the Proposed Action would reduce risks to special status plants (e.g., spot rather than broadcast spraying of invasive plant species, hand application of herbicides, shielding of special status plants with plastic or some other protective sheet). Many native plants in treatment areas, however, could be killed with the potential for short-term or even longer-term changes in the composition of native plant communities. It is expected, however, that native plants would return to occupy growing space released by killed plants. Active restoration in priority 1 (high priority) and priority 2 sites, such as seeding with native or non-native, non-invasive grass species or planting with native trees, shrubs, or herbs, would insure that the released growing space is occupied by native species and not allowed to be re-colonized by invasive plants. Active restoration for such sites is critical for success in managing and preventing invasive plant infestations; otherwise, released growing space following treatment is likely to be re-invaded by invasive plants.

Some species of fungi, lichens, and bryophytes and their communities could be negatively affected by at least two herbicides (triclopyr and glyphosate). Fungi could be negatively affected by herbicides known to affect soil mycorrhizae (sulfometuron methyl, picloram, glyphosate, triclopyr), but studies are laboratory-based and their results are difficult to extrapolate to field situations. Species of fungi associated with late-successional forest ecosystems are not highly susceptible to invasion and would not contain the vegetation communities most likely to be treated by broadcast application of herbicides (USDA Forest Service, 2005a). For a more detailed discussion, see Chapter 4.3 in the Invasive Plant FEIS (2005a) or Section 3.8 – Soil Productivity. Since fungi bioaccumulate heavy metals and other contaminants/toxins in the soil, the public, including mushroom gatherers, would be alerted before areas are treated through public notices (e.g., newspapers, posted signs). For a detailed discussion of effects of herbicide treatment on fungi and associated human health concerns, see 3.5 – Human Health and Safety.

Manual or mechanical treatment of invasive plant infestations could also negatively affect native plants and plant communities. Direct effects would be unintentional removal or trampling of flowers, fruits, or root systems of native plants (USDA Forest Service, 2005a). Other direct effects would be reduced plant vigor due to plants being damaged, reduced native seed production, soil disturbance, and canopy removal (understory, shrub layer, or overstory depending on the species). Indirect effects brought about by these direct effects could include microsite shifts such as reduction in productivity, reduction in soil moisture, disruption of mycorrhizal connections, and increase in soil temperature (USDA Forest Service, 2005a). These effects could produce a shift in species composition further away from a native community, and the removal of one invasive species could encourage another invasive species to take its place via windborne seeds or human transport (USDA Forest Service, 2005a). The best way to counter against such direct and indirect effects is active restoration. Passive restoration is a reasonable expectation for some sites, such as those with small populations of invasive plants in less disturbed habitat, such as moist, westside forests with largely intact native plant communities; however, active restoration provides the best means for preventing re-invasion (re-infestation) by an invasive plant. Active restoration is particularly effective at sites with large populations of invasive plants, highly disturbed ground, and drier eastside habitats where there is more rangeland, forests are more open, and more unoccupied growing space is available for plants to colonize.

Despite the potential for negative effects from manual or mechanical treatment described above, the consensus is that the effects of not treating invasive plants far outweigh the potential adverse effects of these treatments on native plants and plant communities. Without treatment, invasive plant infestations would increase and spread, displacing native plants and plant communities.

Early Detection/Rapid Response Strategy

The Proposed Action includes an EDRR (Section 2.1.3) for promptly treating newly inventoried infestations of invasive plant species. Candidate species that are currently known in the Portland area and may occur within the Forest and Scenic Area, now or in the future, would include such species as garlic mustard, false brome, shining geranium, herb Robert, and policeman's helmet. See Table 2-3 for a list of the 24 invasive plant species, including those above, that could be treated under the EDRR. The reproductive ecology and the effectiveness of treatment/management options, including recommended herbicides, for each of the 23 candidate species are summarized in Appendix G – Common Control Measures Summary.

The EDRR would allow effective treatment if nearby invasive plants infest the Forest or Scenic Area. As an example, policeman's helmet has been found growing along Bear Creek along Highway 26 near the Zigzag Ranger District office and in a stream/drainage channel at The Resort at The Mountain golf course in the nearby community of Welches. If these infestations spread to the Forest or Scenic Area, they could be treated promptly using this mechanism.

Under the Proposed Action, new infestations would be treated and, most likely, many with herbicides. The Proposed Action poses a greater risk of harming, weakening, or killing special status plants in the short term than does the No Action Alternative, which under current EA direction allows for the continuation of limited herbicide treatment; however, in the long term special status plants have a better chance of survival under the Proposed Action because without effective treatment, as under the No Action Alternative, special status plants in identified treatment as well as future EDRR areas are expected to be overrun and displaced by invasive plant species. The likelihood of harming, weakening, or killing special status plants, however, should be low to very low under the Proposed Action. The reasons are that (1) the majority of invasive plant populations are found where moderate to severe ground disturbance has occurred (e.g., road corridors, quarries, trails, clearcuts, human residences); (2) generally, special status plants are not found in areas where moderate to severe ground disturbance has occurred; and (3) the PDC designed for the Proposed Action (e.g., spot spraying, hand application of herbicides, shielding) would protect special status plants, if found in a treatment area. Translocation of herbicides (e.g., glyphosate, picloram) across root systems in the soil from target to non-target plants, including special status plants, and runoff from rain (e.g., a thunderstorm) carrying herbicide from target to non-target plants are risks associated with successive herbicide treatments over a five-year period, as proposed under the Proposed Action. Again, for reasons stated above, however, the risk of harming, weakening, or killing special status plants should be reasonably low.

Summary of Effects

Effects under Alternative 2 – The Proposed Action can be summarized as follows:

- A toolbox of ten herbicides, which have been analyzed in the Invasive Plant FEIS (2005a), would be available to more effectively control invasive plant infestations that potentially threaten native plants and plant communities, including special status plants.
- The ten herbicides analyzed for use have been determined to pose a low risk to all fauna and four of the herbicides are more selective as to which plants they target.
- The size and rate of spread of invasive plant populations on 13,000 acres within the Forest and Scenic Area in the 208 identified treatment areas would be controlled or contained with treatments rather than left ineffectively treated or to spread under the No Action Alternative.

- The expanded use of herbicides under the Proposed Action would increase the potential for negative effects on non-target plant species, including special status plants: there may be inadvertent harming, weakening, or killing of individual special status plants in the short term with herbicide treatment. In the long term, however, affected populations of special status plants would benefit from treatment in not being overrun or displaced by invasive plants. Without treatment, conversely, special status plants can be expected to be overrun and displaced by invasive plants over time. PDC would reduce the potential for short-term adverse effects on native plants and plant communities, including special status plants. For example, where an invasive plant species is to be treated within 5 feet of a special status plant, the invasive plant should be either manually treated or herbicide application would be applied by hand (e.g., wiping, wicking, painting, injection).

- Only 13 of the 208 areas identified for treatment contain special status plants.

- The inclusion of EDRR would provide for prompt treatment of new sites of invasive plant species not included in the current EIS (e.g., policeman's helmet, garlic mustard, herb Robert) and aid in eliminating populations before they become larger and more difficult to treat, requiring more extensive and costly control measures later.

Alternative 3 – Restricted Use Herbicide Alternative

Under Alternative 3, which restricts herbicide use and broadcast spraying, the spread of invasive plants would be checked through eradication, control, or containment more than under the No Action Alternative but less so than under Alternative 2 (The Proposed Action). Forty-three treatment areas totaling 4,047 acres would be treated with herbicides, roughly 31 percent of the 13,000 acres proposed under Alternative 2. Herbicides would only be permitted in high priority treatment areas.

In treatment areas where a combination of treatments, including herbicides, would be allowed, there is a greater likelihood that invasive plants could be treated effectively. Conversely, in treatment areas where herbicide treatment is prohibited and invasive plants, instead, would be treated manually, mechanically, or culturally, large populations of invasive plants and those species that are difficult to treat effectively without herbicides are expected to persist and increase over time. Special status plants, the pale blue-eyed grass and adder's-tongue sites (65-026 and 65-027), for example, are expected to be overrun and displaced by Canada thistle, which threatens both sites.

Summary

The Restricted Herbicide Use Alternative is similar to the Proposed Action except for the following:

- Some invasive plant infestations would be uncontrollable, resulting in adverse effects on native plants and plant communities, including special status plants.

- Forty-three treatment areas totaling 4,047 acres (roughly 31 percent) of the 13,000 acres proposed for herbicide treatment under the Proposed Action would be treated under the Restricted Use Alternative.

- Restricted herbicide use would reduce the potential of short-term negative effects from herbicide treatments, specifically broadcast herbicide applications, on non-target species.

3.6.3. Spread of Invasive Plants to Neighboring Ownerships

The Forest and Scenic Area are intermingled with other federal, state, county, and private ownerships. An issue was raised about the spread of invasive plants from the Forest and Scenic Area to adjacent ownerships.

Currently, under the No Action Alternative, about 1,235 acres of Forest and Scenic Area are being treated for invasive plants annually. This number of acres is less than 10 percent of the estimated 13,000 acres that are either occupied or immediately threatened by invasive species. Seeds from invasive plants in the Forest may end up on other ownerships. The opposite is also true: seeds from invasive plants on other ownerships end up in the Forest. The considerable number of untreated acres in the Forest does not imply that there is a net transport of invasive plant seeds from federal to non-federal lands. The activities, conditions, and vectors that determine spread are dynamic and variable. There is no quantitative measure of the net flow of plant materials across ownership boundaries.

The proliferation of invasive plants is caused by several factors. Robust seed production, seed dispersal mechanisms (light and feathery, sticky, or burr-like seeds), and the presence of conditions favorable to seed dispersal influence the spread of invasive plants. Natural vectors such as humans or animals, or natural forces, such as wind and water, spread invasive plant seeds. Increasing public mobility and access to remote areas of the landscape facilitate seed dispersal. Land management activities that scarify soil or accelerate erosion enhance the germination of invasive plants. These factors play out in difficult to quantify ways throughout the landscape without regard to land ownership. See Section 3.2.4 for more details.

Factors that reduce the spread of invasive plants include prevention and treatment actions, the number of acres treated, and the prioritization of treatment areas.

Due to the diversity of invasive plants affecting the Forest and Scenic Area, the effectiveness of each alternative is directly related to the variety of treatment tools. Given limited treatment budgets, deciding what and where treatments should occur first is a crucial step in the invasive plant management program. Without prioritization, funding may be spent on species or sites that pose lower threats. Adjacency to private or other public ownerships may be one criterion to set priorities for treatment. This criterion, however, should be considered in the context of all factors contributing to plant spread, the effects of different plant species in the landscape, and economic considerations.

Using the most viable treatment options available (combined with regional prevention standards) would most effectively reduce infestations and rates of spread. Some of the invasive plant species present in the Forest and Scenic Area are not controlled well by manual or mechanical treatments (see Section 3.5 – Botany and Treatment Effectiveness). Herbicide choice is the primary variable among the alternatives that would determine potential effectiveness. Because the Proposed Action prescribes broader use of herbicides that control the widest variety of species, it is probably the most effective in reducing the spread to adjacent ownerships. As invasive plant populations are reduced, there would be fewer seeds produced and the spread of invasive species would be diminished. Aggressive implementation and proper treatment area prioritization, however, are equally important in this regard. The No Action Alternative is the least comprehensive, least integrated approach to preventing spread to adjacent lands. The Restricted Herbicide Use Alternative, which relies more on manual and mechanical treatment methods, would produce better results than the No Action Alternative, but would not be as effective as the Proposed Action.

The EDRR treatment of newly discovered invasive plants is the most successful, cost effective, and least environmentally damaging control strategy (ODA, 2001). There is a short time period suitable for eradication and containment of new invasive plant populations. Unchecked, new populations become long-term management problems and sources of seed to spread off federal lands.

Both the Proposed Action and the Restricted Herbicide Use Alternative have an EDRR. The Proposed Action, however, would control some plant species more effectively, because of more permissive use of herbicides. The Restricted Herbicide Use Alternative would control new populations less effectively due to its heavier reliance on manual and mechanical treatment methods. Without an EDRR, the No Action Alternative would not treat newly detected populations.

3.6.4. Cumulative Effects

Common to all three alternatives is the cumulative effect of increased disturbance and recreation over time within the Forest and Scenic Area, driven by increasing human population growth and pressure. This translates into an expected increase in the spread of invasive plants over time, since the human and vehicular vectors would continue to increase.

Alternative 1 – No Action Alternative

Under the No Action Alternative, the likelihood is high, if not certain, that invasive plant infestations would persist, expand, and spread over time within the Forest and Scenic Area. New infestations could be expected to continue to occur over time. Other invasive plant species, not currently known to be within the Forest and Scenic Area, would become established. Native plants, including special status plants, may be lost as native plant communities are negatively altered or displaced. Ecosystem structure and functions, which include the many biogeochemical processes that maintain healthy and diverse forested and rangeland plant communities, would be negatively affected. High priority invasive plant sites would continue to increase in size over time.

Examples include the following:

- Increasingly more riparian corridors would come under threat of knotweed infestations since herbicide treatment with stem injected glyphosate is the only proven way to control this highly invasive knotweed species. Except perhaps in the case of very small populations (containing only a few individuals), manual treatment of knotweed species is ineffective. Manual treatment may actually be a drawback since it could facilitate the spread of knotweed species because of its ability to regenerate and reproduce from root fragments.

- Hawkweed infestations could be expected to spread. The three known orange hawkweed populations in the Mt. Hood Wilderness Area (totaling 15.3 acres in size) would be difficult to control and contain without the option of using herbicides since manual control (hand pulling) has proven to be difficult and of limited effectiveness. New infestations of orange hawkweed could be expected to spread to meadows and other wilderness areas.

Butter and eggs, yellow starthistle, knapweeds, and many other invasive plant species would continue to spread. Without an EDRR to respond to newly inventoried infestations of invasive plants (e.g., policeman's helmet, false brome, garlic mustard), there would be no way to act promptly in the future and eradicate these populations before they expand, spread, and become increasingly more difficult and costly to treat. Due to the limited use of herbicides currently being applied within the Forest and Scenic Area, there would be less potential risk for negative effects on fungi (including mycorrhizal fungi), lichens, and bryophytes.

Ground- and habitat-disturbing forest management activities, over time (10, 20, 30+ years hence), would continue to create opportunities for invasive plants to establish and spread. Management activities include timber harvest, increased visitor and recreational use, road building, road decommissioning, rock excavation at quarries, maintenance and improvement of existing facilities, and construction of new facilities. Demands on the Forest and Scenic Area are likely to continue to increase over the course of time as a result of steady human population growth in the Portland-Vancouver metropolitan area and surrounding areas. Spread of invasive plants from adjacent private lands onto the Forest and Scenic Area can be expected. Without effective treatment, invasive plant populations are highly likely to increase within the Forest and the Scenic Area over time, altering and degrading increasingly more native plant communities and thereby negatively affecting many ecosystem services and values, such as clean air and water, wildlife and plant diversity, forest and soil health, recreational opportunities, and scenic (viewshed) quality. All of these ecosystem services and values would become increasingly more valuable to society over time with the expansion of the greater Portland metropolitan area.

Alternative 2 – The Proposed Action

Under the Proposed Action, expanded use of herbicides to treat invasive plants may harm or kill non-target plants. Herbicide treatments have the potential to harm, weaken, or kill special status plants. For example, more persistent herbicides, such as picloram, could move readily to non-target plants through root translocation or runoff (USDA Forest Service, 2005). Special status plants, if exposed to herbicide applications, would be at greater risk of being harmed or killed. A treatment schedule for persistent infestations that may require herbicide application for three to five years would increase the potential for non-target plants being negatively affected (harmed, weakened, or killed) by herbicides. Many of the invasive plant populations in the 208 treatment areas could require successive years of herbicide application to be effectively treated depending on the extent and severity of the infestation and how invasive plant populations respond to a given treatment.

Non-target plants in the sunflower (*Asteraceae*), legume (*Fabaceae*), or mustard (*Brassicaceae*) families may be the most sensitive to herbicide treatment. Species in the lily family (*Liliaceae*) may be more sensitive to some of the sulfonylurea herbicides (USDA Forest Service, 2005). Potential adverse effects on mycorrhizal fungi, which are beneficial to Pacific Northwest conifers and other native plant species and increase the productivity of forest communities, could occur in treatment areas where herbicides are used. Bryophytes and lichens (e.g., Methuselah's Beard) in treatment areas or nearby could be negatively affected by direct exposure to herbicide spray or from drift because they lack roots and, instead, absorb water and nutrients directly from the atmosphere. PDC would require protection (hand application of herbicide(s), spot spraying, or physical shielding) of special status plants in the treatment areas where they occur with some exceptions. Only 13 of the 208 treatment areas identified and analyzed in the EIS contain special status plants; thus, adverse effects on special status plants would be low and PDC would reduce potential harmful effects.

Manual and mechanical treatments could also harm native plants as well as special status plants. PDC included in Alternatives 2 and 3 would reduce these risks and minimize harm. Manual and mechanical treatments could also alter the composition and structure of native plant communities, as released growing space previously occupied by invasive plants is made available. Certain native plants would be able to outcompete other native plants for this growing space. The growing space could also be re-invaded by invasive plant species. Active restoration for priority 1 (high priority) and priority 2 sites would help in preventing re-invasion (re-infestation) of invasive plants following treatment.

With the passing of time (3 to 10 years or longer), the cumulative effects of not treating invasive plants would be biologically significant and outweigh most concerns about effects on non-target plants and native plant communities, including special status plants. For example, knotweed species are an example of a highly invasive plant that is already present within the Forest and Scenic Area and spreading rapidly in riparian zones in stream and river corridors. Without additional treatment options (herbicide use), populations of invasive plants, including knotweed species, are expected to continue to expand in size, increase in number, and spread elsewhere, displacing native plants and plant communities, including special status plants and, in the process, degrading native ecosystems. By allowing the present situation of ineffective prevention and management of invasive plants within the Forest and Scenic Area to continue, any treatment efforts in the future would become increasingly more difficult and costly. Overall, manual, mechanical, cultural, and herbicide treatments would have an insignificant biological effect as far as harming native plants and plant communities as well as special status plants if the project is implemented with the appropriate PDC. Treatments could be expected to benefit native plants and plant communities and special status plants by restoring native habitats and plant communities.

As with the No Action Alternative, ground-disturbing management activities and use, over time (10, 20, 30+ years hence) would continue to create opportunities for invasive plants to establish and spread. Management activities include, but are not limited to, timber harvest, road traffic from visitor and recreational use, road building, road decommissioning, rock excavation at quarries, maintenance and improvement of existing facilities, and construction of new facilities. Demands on the Forest and Scenic Area are likely to continue to increase over the course of time as a result of steady human population growth in the Portland-Vancouver metropolitan area and surrounding areas. Under the Proposed Action, however, more effective treatment of invasive plants would begin with approximately 13,000 acres identified for treatment. The amount of treated acres and the addition of the EDRR for treating new invasive plant populations would contribute towards controlling and containing existing populations and checking the establishment of new invasive plant populations within the Forest and the Scenic Area. Expansion of herbicide treatment method(s) would protect native plant communities as well as ecosystem services and values from degradation resulting from invasive plant infestations.

Alternative 3 – Restricted Herbicide Use Alternative

Harming, weakening or killing of non-target plant species would be greatly reduced under this alternative since only 4,047 acres, compared to 13,000 acres under Alternative 2 (The Proposed Action), would be treated with herbicides, and broadcast spraying would only be allowed in three treatment areas (the Sandy River Delta, Lolo Pass utility road and corridor, and west side of the BPA power line corridor). Yet populations of invasive plants on the other 8,953 acres of the 13,000 inventoried acres, which contain invasive plants that would be treated only manually, mechanically, or culturally, can be expected to persist and expand over time. Non-herbicide treatments are effective against only small populations of certain invasive plant species.

Similar to the Proposed Action, the EDRR for treating new invasive plants and new infestations not inventoried in this EIS would greatly increase the ability to control and contain existing populations and to respond quickly to new infestations. Restricting broadcast spraying to three treatment areas would reduce effective treatment of existing and new invasive plant infestations compared to the Proposed Action. Invasive plant infestations would be more challenging (time-consuming and labor-intensive) to treat with spot (backpack) spraying and hand/selective application (hand wiping, wicking, painting, injection) of herbicides.

Similar trends in human population growth in the greater Portland metropolitan area with steadily increasing demands on the natural resources provided by the Forest and Scenic Area could be expected, as described under the No Action and Proposed Action Alternatives. The Restricted Herbicide Use Alternative would be expected to be more effective than the No Action Alternative, but less effective than the Proposed Action in treating invasive plants and maintaining native plant communities and the ecosystem services provided by healthy functioning forests and rangelands within the Forest and Scenic Area.

Spread of Invasive Plants to Neighboring Ownerships

The most effective means of combating invasive plants is a comprehensive landscape treatment strategy that integrates and coordinates the treatment actions of all affected and potentially affected land owners (GAO, 2005). Such a strategy, however, is beyond the scope of this project.

The USDA Forest Service estimates that invasive plant control occurs on over 1,250,000 acres in Oregon and Washington (Invasive Plant FEIS, 2005a). No central source exists for compiling invasive plant management information on lands intermingled with the Forest and Scenic Area. There is no requirement for private or corporate land owners to report invasive plant treatment information. Counties and the State of Oregon keep records of herbicide application. For example, records indicate that Clackamas County, Oregon, treated approximately 2,893 acres with five different herbicide formulations in 2004. There is, however, no comprehensive database for tracking herbicide treatment activity. Therefore, an accurate accounting of the total acreage of invasive plant treatment for all land ownerships is not available.

For all alternatives, present and reasonably foreseeable future actions would continue to cause ground disturbance on a landscape scale, resulting in the introduction and spread of invasive plants. Roads would continue to be a major conduit for invasive plants. National recreation studies as well as local trends indicate that recreation uses within the Forest and Scenic Area would continue to increase (Cordell, 1999). Other land management and use activities such as grazing, vegetation management, fuels management, and fire suppression would continue to cause ground disturbance and contribute to the introduction, spread, and establishment of invasive plants within the Forest and Scenic Area as well as on adjacent ownerships.

Some land uses and development on lands near the Forest and Scenic Area would likely continue to decrease effectiveness of USDA Forest Service, state, county, and private invasive plant management. For example, the use of invasive plants by landowners for landscaping, while small individually, can collectively result in significant impacts, especially along riparian corridors.

Positive cumulative effects could occur as the Forest efforts are combined with other Bureau of Land Management, State of Oregon, county, and private landowner efforts, reducing the rate of spread on a regional level. Oregon Department of Agriculture (ODA), for example, is a leader in early detection and rapid response, with up to 20 ongoing or proposed programs at a state or regional level. Also, the Invasive Plant ROD (2005b) contains seven standards to help prevent the spread of invasive plants.

As noted earlier in this document, ODA and Oregon Counties currently spend more than four million dollars annually to manage invasive plants. A January, 2001 report entitled *Oregon Noxious Weed Strategic Plan* recommends that this spending be increased by an additional 5.2 million dollars annually from state and local sources. The same report recommends that spending by all federal agencies in Oregon be increased by 7.2 million dollars per year to adequately implement invasive plant control programs on federal lands in Oregon (ODA, 2001).

3.6.5. Management Standards and Guidelines

Relevant standards and guidelines contained in the Forest Plan and the Northwest Forest Plan are displayed in Appendix B of this document; relevant standards contained in the Scenic Area Management Plan are displayed in Appendix C. This analysis exhibits that the Proposed Action and Restricted Herbicide Use Alternatives are consistent with all relevant standards and guidelines, when the proposed amendments are incorporated. The Forest Plan amendments are discussed in Section 3.16.

3.6.6. Incomplete and Unavailable Information

Studies are not available regarding the effects of herbicide on native non-target species. The EPA performs studies predominantly on crop species rater than native species. Bountin et al. (2004) concluded that it is likely that species tested were not representative of the habitats found adjacent to agricultural treatment areas; thus risk to native species may be underestimated.

Herbicide effects to native species can be extrapolated from the risk assessments or herbicide labels. This information would be used to comply with Invasive Plant ROD (2005b) standard 19, which directs that site-specific information, including potential effects of specific herbicides on non-target species, be considered when making a decision to use herbicides.

CHAPTER 3
Affected Environment and Environmental Consequences

3.7. Economic Efficiency

3.7.1. Existing Conditions

Economic Impacts of Invasive Plants

Invasive plants (noxious weeds) have an enormous impact on Oregon's economy and natural resources. In 1999, Oregon Department of Agriculture (ODA) partnered with Oregon State University (OSU) to study the economic impacts of 21 of the 99 invasive plants listed in Oregon as noxious (See Appendix I – Oregon State Class A & B Noxious Weeds). Existing populations of these 21 species presently reduce Oregon's total personal income by about 83 million dollar, the equivalent of 3,329 annual jobs lost to Oregon's economy from the production foregone by the presence of these invasive plants. The continued expansion of these species could further reduce Oregon's personal income by another 54 million dollar, the equivalent of another 2,143 jobs lost. The total economic loss is much higher. The study estimated that the existing populations and potential expansion of these 21 species cost 100 million dollar annually in lost economic value. This is equivalent to an asset value of about one billion dollars lost. In other words, the value of Oregon's resources is reduced by approximately one billion dollars because of these weeds (The Research Group, 2000). Of the 21 invasive plants highlighted for economic evaluation by ODA and OSU, seven of the species are present in the Forest and Scenic Area and are targets of this proposal: tansy ragwort, spotted knapweed, diffuse knapweed, yellow starthistle, Scotch broom, rush skeletonweed, and orange hawkweed.

By out-competing and displacing economically valuable native plants, invasive plants deprive the marketplace of an important product and affect employment. The region's non-timber forest product industry was estimated to have a value of more than $190 million in 1992 (Oregon Public Broadcasting, 2005). Schlosser and Blatner (1994) estimated that special forest products contribute $200 million or more annually to the Pacific Northwest (Idaho, Oregon, Washington) economy, much of it from the western parts of Oregon and Washington. The largest component is floral greens and Christmas ornamental products with a wholesale value in 1988 estimated to be $130 million. The portion of this total value attributed to wild edible mushrooms in 1992 was estimated to be $20.3 million (Hansis, 1998). The value of exported wild mushrooms, mostly to Germany and Japan, is estimated to be $6 million annually (Oregon Public Broadcasting, 2005). This economic overview is relevant to the project analysis because non-timber forest products harvested from the Forest are part of a regional economic engine.

Table 3-8 displays the number and cost of special forest product permits sold by the Mt. Hood National Forest for fiscal years 2003, 2004, and 2005 (federal fiscal year = October 1 through September 30). The table does not include free-use permits. Many free, personal-use mushroom permits are issued each year.

Table 3-8: Special Forest Products Summary for the Forest – Fiscal Years 2003, 2004, and 2005.

Product	FY 2003		FY 2004		FY 2005	
	Permits Issued	Cost of Permits	Permits Issued	Cost of Permits	Permits Issued	Cost of Permits
Beargrass	746	$20,970.00	761	$24,006.00	727	$23,575.00
Boughs	35	$56,257.17	25	$76,870.43	21	$42,460.00
Cones	2	$40.00	0	$0.00	2	$40.00
Firewood	2016	$49,110.00	1735	$42,760.00	1342	$30,240.00
Medicinal	3	$95.00	5	$110.00	2	$57.00
Mushrooms	91	$1,884.00	546	$14,150.00	187	$4,111.34
Poles	10	$395.37	14	$613.02	11	$951.18
Posts/Rails	3	$53.05	1	$22.80	0	$0.00
Salal/Forest Greens	36	$956.29	61	$2,705.00	41	$1,210.00
Shakebolts	10	$2,361.21	6	$745.83	6	$1,246.00
Stems	11	$227.23	6	$14,454.00	7	$179.08
Transplants	11	$1,517.90	2	$221.25	5	$480.96
Christmas Trees	5878	$29,747.00	4726	$24,137.00	6064	$28,029.50
Total	**8852**	**$163,614.22**	**7888**	**$200,795.33**	**8415**	**$132,580.06**

Employment

Unemployment rates in the state of Oregon have fluctuated considerably during the past several years. Also, they have been higher than the national average. According to the U.S. Department of Labor Bureau of Labor Statistics (2005), Oregon’s seasonally adjusted unemployment rate (preliminary) in August 2005 was 6.7 percent. The preliminary, non-seasonally adjusted rate was 6.3 percent. For the Portland metropolitan area, the preliminary, non-seasonally adjusted rate was 6.2 percent.

In a 2000 report, the Oregon Department of Agriculture estimated that current invasive plant infestations reduce the total personal income of Oregonians by about 83 million dollars (The Research Group, 2000). This is equivalent to 3,329 annual jobs lost to Oregon’s economy from foregone production. Furthermore, the continued spread of only six major invasive plant species could potentially reduce Oregon’s personal income by another 54 million dollars and reduce annual jobs by another 2,143.

3.7.2. Economic Analysis

Management of invasive plants is costly, and fiscal resources are limited. Users of National Forest System lands would pay some of the cost either directly or indirectly. Also, invasive plant management would compete with other land management needs, resulting in opportunity-cost tradeoffs. Two models were used to compare the alternatives economically. First, the total cost of treating all acres in each of the alternative (including No Action Alternative) was estimated based on the treatment prescriptions described in Appendix S. Second, a menu of costs was developed for the Proposed Action and Reduced Herbicide Use Alternatives which shows how much it would cost and how long it would take to treat all inventoried acres depending on how many acres are treated each year. The number of full-time jobs created is also analyzed.

Total Cost Analysis

The costs of the No Action, Proposed Action and Restricted Herbicide Use Alternatives are first analyzed assuming all proposed treatments begin in year one. The costs for the Proposed Action and Reduced Herbicide Use Alternative are based on an aggressive five-year program to treat 13,000 acres. Appendix S – Economic Assumptions contains the treatment regime prescriptions for all areas, which are the basis for this analysis, and the assumptions used in their development. This calculation does not include an economic estimate of potential benefits from reducing or eliminating invasive plants. Costs for the EDRR of the Proposed Action and the Restricted Herbicide Use Alternative are also not included here. The total costs of the two action alternatives are compared to the cost of the No Action Alternative, which assumes only one year of treatment for every area (See Appendix S). It is important to note that the No Action Alternative would treat fewer acres than either of the two action alternatives.

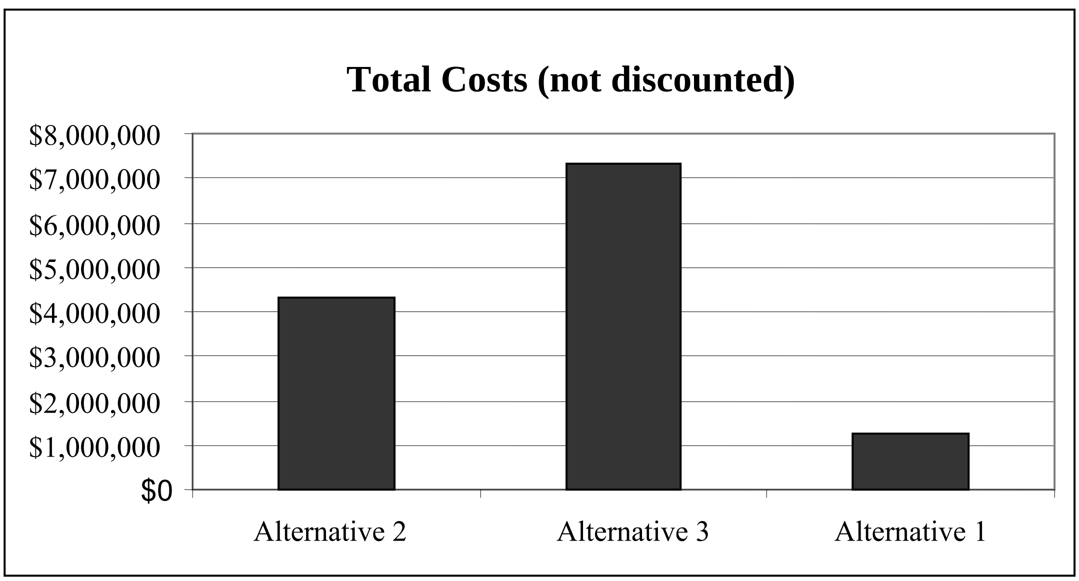
Some treatment costs are based on figures in the Invasive Plant FEIS (2005a) (Pages 4-94 to 4-96). Other treatment costs are empirically derived from recent invasive plant management contracts for the Forest. Herbicide costs not derived from either of these two sources are calculated from data obtained from the 2005 North Dakota Weed Control Guide (Zollinger, 2005). The *Quick-Silver* Program is used to determine the present value of costs. The analysis uses a real discount rate of 4 percent, a rate typically used for ecological investments. The analysis is repeated using a zero percent and a 7 percent real discount rate to test whether the analysis is sensitive to the discount rate. A real discount rate means inflation is not factored into the calculation. The quantitative results of the analysis are shown in Table 3-9 comparing the discounted cash flows (4% and 7% discount rates) to an undiscounted cash flow (0% discount rate). The sensitivity analysis shows that the interest rate used for discounting has no effect on the ranking of alternatives based on cost.

Table 3-9: Total costs for three alternatives to treat inventoried invasive plant populations in the Forest and the Scenic Area calculated using no discount rate, 4% discount rate, and 7% discount rate.

Discount Rate	Alternative 1 – No Action	Alternative 2 – Proposed Action	Alternative 3 – Restricted Herbicide Use
0%	1,271,180	4,329,004	7,317,382
4%	1,214,095	4,241,724	7,174,985
7%	1,175,828	4,180,827	7,076,245

In the total cost analysis, the No Action Alternative would treat 1,235 acres and would cost roughly 1.2 million dollars (4% discount rate). Both action alternatives would treat 13,000 acres. The Restricted Herbicide Use Alternative would be the most expensive, costing nearly 7.2 million dollars (4% discount rate). The Proposed Action would cost about 4.2 million dollars (4% discount rate), which is 60 percent of the cost of the Restricted Herbicide Use Alternative (See Figure 3-3). This difference is attributed to the lower cost of herbicide treatment (compared to manual and mechanical costs) and to the greater assumed effectiveness of herbicide treatments (80 percent for the Proposed Action compared to 60 percent for the Restricted Herbicide Use Alternative).

Figure 3-3: Total costs of Alternatives to treat invasive plants in the Forest and Scenic Area in Oregon without budget constraint.



The average annual treatment cost per acre for each alternative was calculated (See Table 3-10). The No Action Alternative has the lowest per acre cost since it lacks the 5-year integrated treatment strategy of the two action alternatives. All areas included in the No Action Alternative would be treated for only one year; most acres would be treated only once.

Table 3-10: Cost per acre for three alternatives to treat inventoried invasive plant populations in the Forest and Scenic Area.

Alternative 1 – No Action	Alternative 2 – Proposed Action	Alternative 3 – Restricted Herbicide Use
$193.48	$324.25	$540.94

Presently, the average annual cost per acre for the No Action Alternative is 193 dollars. The Proposed Action would increase average annual treatment cost per acre to 324 dollars; and the Restricted Herbicide Use Alternative would have an average annual per acre cost of 541 dollars. If the current invasive plant budget for the analysis area were held constant at roughly 200,000 dollars per year, then the number of acres that could be treated annually in the Proposed Action would be reduced by 51 percent. For the Restricted Herbicide Use Alternative, the number of acres treated annually would be reduced by 70 percent. The treatment regimes prescribed in both the Proposed Action and Reduced Herbicide Use Alternative would be expected to more effectively manage invasive plants than No Action, justifying the higher cost per acre. However, without a substantial increase in appropriated funding, the Forest and Scenic Area may be faced with a protracted treatment program regardless of whether the treatment emphasis is herbicides, manual, mechanical or cultural.

Variable Budget Analysis

Since budgets are limited, the data are also analyzed to show the treatment costs for the Proposed Action and Reduced Herbicide Use Alternative for various annual treatment levels and several hypothetical rates of the invasive plant spread. Tables 3-11 and 3-12 display the number of years it would take and the costs to treat the proposed 13,000 acres for various annual treatment regimes (i.e. the number of acres treated each year). The following examples illustrate the use of Table 3-11 for the Proposed Action (Table 3-12 is interpreted similarly for the Restricted Herbicide Use Alternative). These are only examples, not management preferences:

- If 2,000 acres are treated each year, the annual cost would be $648,000. If untreated invasive plants continue spreading at an annual rate of 8 percent per year, then known populations of invasive plants would not be fully controlled for 16 years at a total cost of $7,937,700.

- If annual treatment budgets are $486,000 per year, then only 1,500 acres could be treated annually. If untreated invasive plants continue spreading at an annual rate of 10 percent, then it would take 48 years to control known populations of invasive plants at a total cost of $21,505,310.

- If the current annual treatment budget of approximately $200,000 per year for the analysis area continues unchanged and untreated areas continue spreading at an annual rate of 8 percent, then the current populations of invasive plants would never be fully controlled. Treatments would fall behind the rate of spread.

Some general conclusions that apply to both the Proposed Action and the Restricted Herbicide Use Alternative can be drawn from Tables 3-11 and 3-12. For any given hypothetical invasive plant spread rate, increasing the number of annual treatment acres would decrease the total cost of the project. The deviations from this regression are due to the discrete nature of the "years" factor; that is, calculations used the number of years as whole numbers disregarding fractions of years. Not surprisingly, at higher rates of invasive plant spread, the total cost of the project and the number of years to control inventoried areas would increase for any fixed number of annual treatment acres.

The variable budget analysis shows that the Proposed Action would cost between 6.2 and 21.5 million dollars. The Restricted Herbicide Use Alternative would cost between 14.2 and 47.9 million dollars. The Proposed Action would take from 8 to 48 years to control the known populations of invasive plants; the Restricted Herbicide Use Alternative would take from 9 to 48 years. For any given treatment regime (acres treated per year) and assumed rate of invasive plant spread, the cost of the Restricted Herbicide Use Alternative would cost between 2.1 and 5.2 times more than the Proposed Action. To illustrate, if 5,000 acres were treated each year, and it were assumed that invasive plants spread 10 percent each year, then it would cost 2.1 times more to implement the Reduced Herbicide Use Alternative than the Proposed Action. If 2,000 acres were treated each year, and it were assumed that invasive plants spread 10 percent each year, then it would cost 5.2 times more to implement the Reduced Herbicide Use Alternative than the Proposed Action. All other treatment regimes fall between these two extremes.

Table 3-11: For Alternative 2 (The Proposed Action), number of years and total cost to control 13,000 acres of invasive plants at various annual rates of plant spread and annual treatment regimes for the Forest and Scenic Area. Assumes the average annual treatment cost for the Proposed Action per acre is $324. Years are N+4 (see notes below). Costs are undiscounted cash flows. For more explanation about this table, see Appendix S – Economic Assumptions.

Annual Treatment Acres	Cost (M$) Per Year	No. Years to Control and Total Cost (M$) at Various Annual Rates of Invasive Plant Spread (%)					
		8%		10%		12%	
		Yrs.	Total Cost	Yrs.	Total Cost	Yrs.	Total Cost
500	$162.00	Never	N.A.	Never	N.A.	Never	N.A.
1,000	$324.00	Never	N.A.	Never	N.A.	Never	N.A.
1,500	$486.00	25	$10,327.31	48	$21,505.31	Never	N.A.
2,000	$648.00	16	$7,937.74	18	$9,233.74	22	$11,825.87
2,500	$810.00	13	$7,492.18	13	$7,492.18	15	$9,112.35
3,000	$972.00	11	$7,046.61	11	$7,046.61	12	$8,018.80
3,500	$1,134.00	10	$7,087.05	10	$7,087.05	10	$7,087.05
4,000	$1,296.00	9	$6,803.48	9	$6,803.48	9	$6,803.48
4,500	$1,458.00	8	$6,195.92	8	$6,195.92	8	$6,195.92
5,000	$1,620.00	8	$6,884.35	8	$6,884.35	8	$6,884.35

Table 3-11 Notes:

- *Annual Treatment Acres* – Each treatment regime analyzed (row of data in Table 3-11) assumes five years of integrated treatments for every area of inventoried invasive plants. To simulate the effectiveness of treatment, the acres in each treatment area are reduced by 80 percent per year for years 2 through 5. Treatment is assumed to be accomplished at the end of year 5. Because each area is treated for five years, the numbers of “new” acres treated in years 2 through N are reduced by 20 percent in order to maintain a fixed budget for each treatment regime. For more explanation, see Appendix S – Economic Assumptions.

- *Cost (M$) Per Year* - Values are in thousand dollars. The amount represents the fixed average annual cost (budget) for the treatment regime. It is calculated by multiplying the annual treatment acres by $324 (the average, annual per-acre treatment cost).

- *Years* – The value is determined by performing “annuity due” calculations (advance payment annuity) using the following parameters: i = invasive plant spread rate (%); PMT = “new” acres treated in years 2 through N; present value = 13,000; future value = 0. The annuity calculation solved for N, the number of years during which new areas would receive initial treatments. In the table, N is increased by 4 years to account for the full 5-year treatment regime (N+4).

- *Total Cost* – Values are in thousand dollars. The amount represents the undiscounted sum of treatment costs (cash flow) for N+4 years.

- *Rates of Spread* – For the limited budget analysis, it is assumed that once treatment is begun on any acre of invasive plants, its spread is halted on that acre. However, since not all acres are treated in year 1 (and some acres would not be treated initially until Year N), invasive plants on those acres would continue to spread at some rate. The table displays the number of years it would take to control the current inventoried areas at several hypothetical annual rates of spread (8, 10, and 12 percent).

Table 3-12: For Alternative 3 (Restricted Herbicide Use), number of years and total cost to control 13,000 acres of invasive plants at various annual rates of plant spread and annual treatment regimes for the Forest and Scenic Area. Assumes the average annual treatment cost for the Proposed Action per acre = $541. Years = N+4 (see notes below). Costs are undiscounted cash flows. For more explanation about this table, see Appendix S – Economic Assumptions.

Annual Treatment Acres	Cost (M$) Per Year	No. Years to Control and Total Cost (M$) at Various Annual Rates of Invasive Plant Spread (%)					
		8%		10%		12%	
		Yrs.	Total Cost	Yrs.	Total Cost	Yrs.	Total Cost
500	$270.50	Never	N.A.	Never	N.A.	Never	N.A.
1,000	$541.00	Never	N.A.	Never	N.A.	Never	N.A.
1,500	$811.50	Never	N.A.	Never	N.A.	Never	N.A.
2,000	$1,082.00	25	$22,992.07	48	$47,878.07	Never	N.A.
2,500	$1,352.50	17	$17,920.08	20	$21,977.58	27	$31,986.08
3,000	$1,623.00	14	$16,635.10	15	$18,258.10	17	$22,153.30
3,500	$1,893.50	12	$15,620.62	13	$17,514.12	14	$22,058.51
4,000	$2,164.00	11	$15,688.13	11	$15,688.13	12	$18,717.74
4,500	$2,434.50	10	$15,214.65	10	$15,214.65	10	$15,214.65
5,000	$2,705.00	9	$14,200.17	9	$14,200.17	9	$14,200.17

Table 3-12 Notes:

- *Annual Treatment Acres* – Each treatment regime analyzed (row of data in Table 3-12) assumes five years of integrated treatments for every area of inventoried invasive plants. To simulate the effectiveness of treatment, the acres in each treatment area are reduced by 60 percent per year for years 2 through 5. Treatment is assumed to be accomplished at the end of year 5. Because each area is treated for five years, the numbers of "new" acres treated in years 2 through N are reduced by 40 percent in order to maintain a fixed budget for each treatment regime. For more explanation, see Appendix S – Economic Analysis.

- *Cost (M$) Per Year* - Values are in thousand dollars. The amount represents the fixed average annual cost (budget) for the treatment regime. It is calculated by multiplying the annual treatment acres by $541 (the average, annual per-acre treatment cost).

- *Years* – The value is determined by performing "annuity due" calculations (advance payment annuity) using the following parameters: i = invasive plant spread rate (%); PMT = "new" acres treated in years 2 through N; present value = 13,000; future value = 0. The annuity calculation solved for N, the number of years during which new areas would receive initial treatments. In the table, N is increased by 4 years to account for the full 5-year treatment regime (N+4).

- *Total Cost* – Values are in thousand dollars. The amount represents the undiscounted sum of treatment costs (cash flow) for N+4 years.

- *Rates of Spread* – For the limited budget analysis, it is assumed that once treatment is begun on any acre of invasive plants, its spread is halted on that acre. However, since not all acres are treated in Year 1 (and some acres would not be treated initially until Year N), invasive plants on those acres would continue to spread at some rate. The table displays the number of years it would take to control the current inventoried areas at several hypothetical annual rates of spread (8, 10, and 12 percent).

Comparison of the Total Cost and Variable Budget Analyses

The total cost analysis indicates that the Restricted Herbicide Use Alternative would cost about 1.7 times more than the Proposed Action (see Table 3-9). The variable budget analysis more realistically shows that the Restricted Herbicide Use Alternative would cost between 2.1 and 5.2 times more than the Proposed Action (see Tables 3-11 and 3-12), depending upon the treatment regime (acres treated each year) and rate of spread. In every case, the higher total cost results in the variable budget analysis for both action alternatives are attributed to invasive plant spread. By delaying treatment, there would be more acres to treat. Because undiscounted cash flows were used in the variable budget analysis, the time value of money was not a factor in the increased cost.

To illustrate this point for the Proposed Action, if annual funding for treatment were set at 1.6 million dollars, the variable budget analysis (Table 3-11) shows that it would take eight years to treat all 13,000 acres. If annual funding for treatment were set at 0.5 million dollars, the variable budget analysis (Table 3-11) then shows that it would take between 25 and 48 years to treat all 13,000 acres, depending upon the rate of invasive plant spread. By comparison, the total cost analysis (Table 3-9, undiscounted) shows that it would take about 4.3 million dollars up front to treat all 13,000 acres in five years.

To illustrate the point for the Restricted Herbicide Use Alternative, if annual funding for treatment were set at 1.6 million dollars, the variable budget analysis (Table 3-11) shows that it would take between 14 and 17 years to treat all 13,000 acres, depending upon the rate of invasive plant spread. If annual funding for treatment were set at 0.5 million dollars, the variable budget analysis (Table 3-12) then shows that inventoried invasive plants might never be fully managed. Treatments would fall behind the rate of spread. By comparison, the total cost analysis (Table 3-9, undiscounted) shows that it would take about 7.3 million dollars up front to treat all 13,000 acres in five years.

Early Detection/Rapid Response Strategy

If new invasive plant populations are detected, the cost per acre for treatment would generally be the same as for proposed treatment areas. If new populations or new species are discovered while the infested areas are still small; however, the areas might be controlled with aggressive treatments in one year. In that case, treatment cost would be less because it would not take five years of integrated treatments to fully manage the areas. For small, newly-established populations in the Proposed Action, (using only year one treatment costs and the cost for inventory/monitoring and restoration) the average cost per acre would be $256. This compares to the average annual cost of $324 per acre to treat inventoried areas. For the Restricted Herbicide Use Alternative, the year one treatment regime applied to small, newly-established areas would cost an average of $410 per acre compared to $541 per acre to treat inventoried areas. There is no EDRR in the No Action Alternative.

The cost of treating 30,000 acres of invasive plants was estimated based on these per acre cost assumptions. The 30,000 acre figure includes 17,000 acres of EDRR treatment acres (the most that would be treated in this project) added to the 13,000 proposed treatment acres in both action alternatives. The cost was estimated for both newly-discovered, small populations ($256/acre and $410/acre for the Proposed Action and Reduced Herbicide Use Alternative, respectively). It was also estimated for newly-discovered, large populations ($324/acre and $541/acre for the Proposed Action and Reduced Herbicide Use Alternative, respectively). The results of these calculations, shown in Table 3-13, indicates that rapid response to new invasive plant populations would not change the ranking of the alternatives relative to cost..

Table 3-13: Total costs for action alternatives to treat 13,000 acres of proposed invasive plant populations and 17,000 EDRR acres assuming both large and small newly-discovered invasive plant populations in the Forest and the Scenic Area (assumes 4% discount rate).

EDRR Scenario	Alternative 2 – Proposed Action	Alternative 3 – Restricted Herbicide Use
Small newly-discovered populations.	8,593,724	14,144,985
Large newly-discovered populations.	9,720,000	16,230,000

Cumulative Effects

The Chief of the USDA Forest Service calls invasive plants one of the four chief threats to National Forest System lands. As such, the USDA Forest Service is planning aggressive programs to treat invasive plants nationwide. Many forests, such as those in the Intermountain West, currently have more serious invasive plant problems than the Forest and Scenic Area.

The cumulative economic effect of this widespread and serious problem would be intense competition for limited funds at all governmental levels. The USDA Forest Service currently spends roughly 4.8 million dollars annually treating about 25,000 acres of invasive plants on National Forests in the Pacific Northwest (2005a). The competition among National Forests for limited appropriated federal funds for treatment programs would likely be great. Likewise, potential partner agencies in county and state government may be overwhelmed with requests for funding assistance. The total cost of all such programs has not been quantified since most forests have not yet solidified plans for their newest treatment programs. Nevertheless, funding would likely be a major limiting factor in the effective implementation of aggressive invasive plant treatment decisions throughout the Pacific Northwest.

Oregon Department of Agriculture and Oregon Counties currently spend more than four million dollars annually to manage invasive plants. A January, 2001 report entitled *Oregon Noxious Weed Strategic Plan* recommends that this spending be increased by an additional 5.2 million dollars annually from state and local sources. The same report recommends that spending by all federal agencies in Oregon be increased by 7.2 million dollars per year to adequately implement invasive plant control programs on federal lands in Oregon (ODA, 2001).

Currently, the average, annual cost per acre for treating invasive plants in the Pacific Northwest is $195 (2005a). The average cost per-acre cost to treat invasive plants for both the Proposed Action and the Reduced Herbicide Use Alternative is considerably higher than the current regional average. It is reasonable to assume that when other forests solidify their treatment plans, their average per-acre costs may also exceed the current average.

As the demand for treatment services rapidly increases, and overwhelms the supply of available treatment providers, supply and demand suggests that there would likely be a short-term increase in treatment costs until more providers become available.

3.7.3. Jobs Created Analysis

The Restricted Herbicide Use Alternative would create the equivalent of about 159 jobs. This alternative would create the most jobs because of its greater use of manual and mechanical treatment methods and because of a higher level of site restoration (see Appendix T which displays the job estimate calculation). Also, the Restricted Herbicide Use Alternative minimizes the use of truck mounted application of herbicides relying instead on more labor-intensive hand applications.

The Proposed Action would create the equivalent of about 94 jobs. The predominant herbicide application method in this alternative is broadcast herbicide applications methods (e.g., truck or ATV mounted boom), a less labor-intensive method. Also, there are fewer acres of site restoration.

The No Action Alternative would create the equivalent of about 38 jobs. This smaller number is chiefly due to fewer acres being treated.

Table 3-14 compares the cost of labor, wage income, and number of jobs created by the three alternatives. All job estimates use a ratio of one job equals $20,000 in wage income per year. Although actual annual wage income per job varies, this ratio provides a constant index for the evaluation of alternatives. As described in Section 3.7.1, most of the jobs created are low-wage, physically-demanding work, typical of manual agriculture and forestry jobs. They are seasonal positions with little, if any, job security. Few workers expect to earn $20,000 per year at these jobs, so the actual number of jobs created may be higher.

Table 3-14: Labor Cost, Wage Income, and Potential Job Estimates for Invasive Plant Treatments in the Forest and Scenic Area.

Alternative	Labor Cost	Wage Income	Jobs @$20k/Year
No Action	$960,680	$768,544	38
Proposed Action	$2,352,572	$1,882,058	94
Reduced Herbicide Use	$3,982,469	$3,185,975	159

Early Detection/Rapid Response Strategy

On average, the treatments prescribed in the Proposed Action would create the equivalent of one $20,000/year job for every 138.3 acres treated. For the Restricted Herbicide Use Alternative, the equivalent of one $20,000/year job would be created for every 81.8 acres treated. Table 3-15 shows the number of jobs that might be created by treating 30,000 acres of invasive plants: the 13,000 treatment acres in the Proposed Action and in the Reduced Herbicide Use Alternative plus the maximum EDRR of 17,000 acres. The calculations assume that newly-discovered populations are large and require the same aggressive treatment prescription described in Appendix S. If newly-discovered populations are small, and treatment is less complex, then fewer jobs would be created. There is no EDRR in the No Action Alternative.

Table 3-15: Jobs created (equivalent to $20,000 per year) by the Proposed Action and the Reduced Herbicide Use Alternatives with EDRR for the Forest and Scenic Area. Assumes the maximum EDRR = 17,000 acres and newly-discovered invasive plant populations are large.

Alternative	Jobs/Acres Treated Ratio	Jobs @$20k/Year
Proposed Action	1/138.3	217
Reduced Herbicide Use	1/81.8	367

Cumulative Effects

Government officials estimate that invasive plant control occurs on over 1,250,000 acres in Oregon and Washington, and more than 90 percent of this control is through the use of herbicides (based on informal discussions with state and county agriculture and noxious weed personnel). These data suggests that the broader regional treatment program looks more like the Proposed Action than the Restricted Herbicide Use Alternative. If this is true, then invasive plant control in the region creates roughly 8,038 jobs annually (applying the average of one $20,000 job equivalent for every 138.3 acres treated). If the treatment regimes throughout the region mimic the Restricted Herbicide Use Alternative (average of one $20,000 job equivalent for every 81.8 acres treated), then about 15,281 jobs would be created annually.

3.7.4. Management Standards and Guidelines

Relevant standards and guidelines contained in the Forest Plan and the Northwest Forest Plan are displayed in Appendix B of this document; relevant standards contained in the Scenic Area Management Plan are displayed in Appendix C. This analysis exhibits that the Proposed Action and Restricted Herbicide Use Alternatives are consistent with all relevant standards and guidelines, when the proposed amendments are incorporated. The Forest Plan amendments are discussed in Section 3.16.

3.7.5. Incomplete and Unavailable Information

The magnitude of funding needs for treating invasive plants Region-wide has not been quantified since most National Forests have not yet solidified plans for their newest treatment programs.

No data is available to ascertain the economic value of special forest products harvested from the Forest or Scenic Area.

3.8. Soil Productivity

3.8.1. Existing Conditions

Soils across the analysis area are quite variable, each with numerous management ratings such as erosion risk, compaction hazard, etc. Management ratings logically follow the variability of the soils themselves, with some soils mapped with a high erosion risk, others with low, and many in between. Although ratings are an adequate analysis tool, in actuality almost any soil regardless of rating can become highly erosive under the right (or wrong) circumstances. Low erosion risk soils that are compacted and bare can become highly erosive on even the slightest slope. Conversely, highly erosive soils, such as the volcanic ash derived ones on the Forest, are stable for decades because of sufficient protective groundcover (tree needles, leaves, wood, etc.). Generally, the soils in the proposed treatment areas on the Forest and Scenic Area are of relatively low fertility and once disturbed tend to be invaded by plant species that tolerate low fertility sites, especially the invasive plant species listed in Table 2-3.

The most productive areas of a given ecotype tend to be riparian zones because of water availability and naturally common accumulation of soil organic matter, and this holds true across the Forest and Scenic Area. As illustrated on the proposed treatment areas map (Figure 2-1), there are numerous riparian areas as well as uplands that have been impacted by the invasion of non-native plants. Although they provide some groundcover, many invasive plants generally tend not to have a desirable fibrous root system found in most native grasses and forbs. Fibrous root systems tend to provide more effective erosion control compared to tap-rooted plants, such as knapweed species. The major exception to this is knotweed species, which produces an extremely fibrous, difficult to eradicate root system. For this EIS the main soil resource concerns are effects on erosion, impacts to soil biology, and potential for herbicides to leach through the soil profile and into groundwater.

The productivity and health of the plant community depends on the maintenance of healthy soils. Regional soil productivity protection standards were originally implemented in 1976 and have been revised several times since then (Pacific Northwest Region Monitoring and Evaluation Report, 2001). Areas of reduced soil productivity, which are the result of past land management activities and subsequent invasion of non-native plants have been identified and restoration projects are being proposed and implemented. Restoring ecological function to soil systems affected by invasive plants are high priority. Due to soil restoration activities, the productive potential of soils on the Forest and Scenic Area are improving in small specific locations. However, overall productivity is threatened in increasingly large areas because of the rapid upward trend and potential for increasing spread of invasive plants.

3.8.2. Analysis Area, and Applicable Standards and Guidelines

The analysis area for soils in this EIS is the Forest and Scenic Area boundaries. No soil specific standards are in place for the Scenic Area, so the Forest Plan standards and guidelines will apply for this analysis. A relative comparison of alternatives will be conducted using two Forest Plan standards (Table 3-16) and risk of herbicide leaching as guidance to address specific concerns and as a basis for risk of subsequent impacts such as sedimentation, impacts to aquatic organisms, etc.

- **Erosion Hazard:** Two possible impacts stemming directly from soil erosion are runoff that carries herbicide with it into watercourses, and runoff from bare areas carrying sediment that impact watercourses. This hazard rating is based upon ***bare*** surface soils coupled with a particular soils' texture, slope, etc.

- **Soil Biology:** Poor or non-functioning soil biological systems may lead to difficulties in revegetation efforts, or decline in existing desirable vegetation. In and of itself, soil biology is extremely difficult to evaluate because of infinitely complex interactions occurring between organisms and their physical (soil) environment, including soil physical and chemical characteristics. It is assumed that soil biological systems would properly function given certain habitat components are present, such as non-compacted soils, appropriate levels of organic matter, and types of native vegetation under which the soil developed.

- **Leaching Risk:** No Forest Plan standards directly address this concern. However, using a combination of soil and herbicide characteristics with existing scientific studies there is sufficient information to compare this risk by the type of herbicide proposed. There are two aspects regarding leaching and herbicides – the potential to contaminate groundwater (i.e. wells), and the potential to contaminate surface water through groundwater movement into streams, springs, etc.

Table 3-16: Forest Plan Soil Standards guiding the soils analysis.

<table>
<tr><td>FW – 025
(Page 4-49)</td><td>In the first year following surface disturbing activities, the percent effective groundcover by soil erosion hazard class should achieve at least the following levels:
<table><tr><th>Soil Erosion Hazard Class</th><th>Effective Groundcover</th></tr><tr><td>Low to Moderate</td><td>60%</td></tr><tr><td>Severe</td><td>75%</td></tr><tr><td>Very Severe</td><td>85%</td></tr></table></td></tr>
<tr><td>FW – 032
(Page 4-50)</td><td>Favorable habitat conditions for soil organisms should be maintained for short and long-term soil productivity</td></tr>
<tr><td>Leach Risk</td><td>A relative rating is located in the body of this section</td></tr>
</table>

This analysis is *risk-based*. It is not meant to be interpreted that 'more soil erosion would occur' with a particular alternative versus another, but the relative *risk* of erosion occurring may be higher with one alternative versus another.

3.8.3. Direct/Indirect Effects: Alternative 1 – No Action

This section examines the effects that *invasive plants have on soils, not effects from any of the proposed treatments*. The majority of the following information in this section comes from the Invasive Plant FEIS (2005a), and illustrates the risk of negative soil impacts that could be expected from the No Action Alternative.

Invasive plants could have negative effects on soil properties. Invasive plants may increase the proportion of bare ground, increase or decrease the amount of organic matter in the soil, deplete the soil of nutrients or enrich the soil with certain nutrients, change fire frequency, and produce toxic herbicides that affect soil organisms. Some of these changes may be difficult to reverse and could lead to long-term soil degradation and difficulty in re-establishing native vegetation.

- **Soil Moisture:** Knapweed species are widespread on the eastern half of the Forest and Scenic Area in dryer ecotypes. Lacey, Marlow and Lane (1989) found that rangelands infested with spotted knapweed had more bare ground than natural bunchgrass/forb grasslands. In a simulated rainfall test, they found that soil erosion more than doubled in knapweed-dominated areas when compared to uninfested areas. They also found significantly lower infiltration rates in the knapweed sites. Even modest losses of the soil surface could have large impacts on soil functioning, since most of the biologically active organic matter is concentrated in the top 1 to 4 inches of soil. Soil erosion also has negative impacts on water quality in associated aquatic systems and the reduction of infiltration decreases groundwater recharge.

  Tyser (1992) also observed low canopy cover of native forbs and low cryptogam cover in stands invaded by spotted knapweed. Any increase in bare ground caused by invasive plants could have negative effects on soil moisture content. During rainfall events, more rain runs off as surface flow. In dry periods, soil is directly exposed to solar radiation and dries out faster. A dry soil surface hinders seedling establishment and would negatively impact plants with surface root systems, such as many native grasses. Exposure of the soil surface causes soil temperatures to be more extreme, due to solar heating during the day and greater radiative cooling at night. These extreme temperatures make seedling establishment more difficult and may affect soil organisms (Sheley and Petroff, 1999). There are small patches of soil crusts present on the very southeast corner of the Forest in the vicinity of Rock Creek. These very small areas have survived the invasion of invasive plants (knapweed primarily), heavy off-highway vehicle use, and grazing. It is likely these areas were more extensive before these disturbances occurred. Although there is no specific monitoring as to the actual amount and trend of soil crusts, it is a logical assumption that these areas are declining and would continue to do so given the continuous impacts that occur in the area on annual basis.

- **Soil Nutrients and Nutrient Cycling:** One function of soil is the cycling of nutrients from dead organic matter into forms that are available to plants. This nutrient cycling is essential for the health and productivity of the ecosystem. Nutrient cycling is a complex process that depends on a multi-level food web that is specific to the site. Biota involved in nutrient cycling includes bacteria, actinomycetes, fungi (pathogenic, saprobic, and mycorrhizal), amoebas, and a wide range of invertebrates. Since this entire system is powered by root exudates and decomposing vegetation from the plant community, changes in plant communities caused by non-native invasion could have large effects on the soil food web (Hobbie, 1992; Van der Putten, 1997).

  A study that compared soil organisms in native grasslands in a natural state and after invasion by cheat grass (*Bromus tectorum*, also found on the eastern side of the Forest and Scenic Area), found that the cheat grass caused changes in most levels of the soil food web (Belnap and Phillips, 2001). Although it is difficult to predict the specific effects of these changes, it is important to recognize that any change in the soil food web has the potential to interfere with critical nutrient cycling processes and to threaten the long-term integrity of the ecosystem.

A study found pronounced differences in soil properties when soil under exotic understory plants was compared to soil under native shrubs (Ehrenfeld, et al., 2001). Soil pH was significantly higher under the exotic plants, as was extractable nitrate. Net nitrogen mineralization was also higher under the exotic plants, indicating changes in the composition or activity of soil microbes caused by the invasive plants. Over time, these changes may have effects on the ecosystem as a whole. Many invasive plants establish more readily on sites with high nutrient availability. Invasive plants that increase the availability of nitrate in the soil may be promoting conditions that favor their own expansion at the expense of native plants that tolerate low nutrient levels. For example, increases in soil nutrient levels have been shown to favor the invasion and success of non-native species in a serpentine soil ecosystem where resources were limited (Huenneke, et al., 1990).

On the other hand, many non-native species deplete soil nutrients. Spotted knapweed has been implicated in reducing available potassium and nitrogen (Harvey and Nowierski, 1989). A reduction in soil nutrient levels makes it difficult for native plants to compete with the invasive plants, and probably also affects the soil biotic community. The long-term effects of these changes are not known.

- **Soil Organisms:** Some invasive plants are allelopathic to other plants, and may produce secondary compounds that affect soil organisms. If an invasive plant produces a secondary compound, the population of soil microbes that could metabolize this compound would increase, while the populations of other microbes would decrease (Sheley and Petroff, 1999). These changes would affect the soil food web and nutrient cycling, and may have impacts on the native plant community.

  One group of soil organisms that is of particular concern is mycorrhizal fungi. These fungi form a mutualistic relationship with plants in nearly all ecosystems and are critical in supplying water and nutrients to plants, as well as protection from root pathogens. Mycorrhizal fungi also play an important role in creating soil structure, particularly in young or poorly developed soils. Mycorrhizal fungi could produce more than 600 feet of hyphae per gram of forest soil. This mass of hyphae binds soil particles together, stabilizing the soil system. Mycorrhizal fungi also produce polysaccharides that bind soil particles into aggregates. These aggregates increase the water holding capacity of the soil, improve oxygen penetration into the soil, and provide microsites for the normal development of communities of bacteria, actinomycetes, and amoebas. Mycorrhizal fungi appear to mediate the transfer of sugars and nutrients from one plant to another. This function may be important in maintaining diversity in the plant community and in the recovery of the plant community after disturbance. The fruiting bodies produced by some mycorrhizal fungi are an important food source for a variety of animals, from invertebrates to large mammals. More than 70 percent of the diet of some small mammals, including the northern flying squirrel, consists of fruiting bodies of mycorrhizal fungi.

Research on the impact of invasive plants on mycorrhizal fungi is lacking, but since plants and mycorrhizal fungi are strongly dependent on each other, it seems likely that drastic changes in the plant community caused by the invasion of non-natives would be accompanied by changes in the mycorrhizal fungus community. Sylvia and Jarstfer (1997) compared the mycorrhizal status of young slash pines (*Pinus elliottii var. elliottii*) in plots with invasive plants and plots that were kept invasive plant free with herbicide treatment. After 3 years, the number of pine root tips colonized by mycorrhizal fungi was 75 percent lower in the invasive plant plots than the invasive plant free plots. In addition, the species distribution of the mycorrhizal fungi associated with the trees had changed.

In the Sylvia and Jarstfer (1997) study, the invasive plants were associated with different fungi than the trees. It is likely that competition from these introduced fungi caused the decrease in the fungi associated with the trees. If mycorrhizal fungi associated with invasive plants successfully compete with native fungi a redistribution of soil resources in favor of the invasive plant would occur. In addition, species of mycorrhizal fungi associated with native plants may be lost from the area of infestation. It may then be difficult to re-establish native vegetation on the site after the invasive plants are removed.

Researchers have found that specific "helper" bacteria in the soil promote the establishment of mycorrhizae and mycelial growth of mycorrhizal fungi (Garbaye and Bowen, 1989). Although little is known about the ecological requirements of these organisms, invasive plants may not support the helper bacteria employed by native plants and fungi.

Conclusion - Alternative 1

- **Erosion Hazard:** A chronic, slow increase in exposure of bare soil and associated soil erosion risk is expected with this alternative as native vegetative cover is replaced by the poor cover provided by many invasive plants. Although this alternative employs the same types of control measures as the other alternatives, they are inadequate to keep up with the rate and spread of invasive plants.

- **Soil Biology:** Without treatment, invasive plant infestations are likely to cause significant changes to the physical, chemical, and biological properties of soils where the infestation occurs. In some cases, it may be difficult to reverse these changes and restore normal soil functions. This legacy of disrupted soil function may increase the effort required to restore native vegetation long after invasive plants are removed. Therefore, it is a more desirable situation to keep native plants on site so that natural interactions can occur within soil chemical, physical and biological processes.

- **Leaching Risk:** The risk of leaching would remain unchanged, assuming existing environmental documents and identified PDC for current herbicide applications are followed.

In summary, evidence and observation show invasive plants can degrade existing non-disturbed sites; keep disturbed, degraded sites in poor condition; or occupy disturbed sites on a temporary basis and eventually get pushed out by native vegetation. In many cases, the problem is not necessarily the invasive plant itself, but the soil disturbance that allows invasive plants into a site to begin with, which makes EDRR an important tool to treat new sites as they occur.

3.8.4. Direct and Indirect Effects: Alternatives 2 & 3 – Proposed Action and Restricted Herbicide Use Alternatives

Manual Treatment

Removal of plant roots would break mycorrhizal hyphae in the soil and probably cause a transient reduction of mycorrhizal function. Studies on crop plants have shown that leaving an undisturbed mycorrhizal network in the soil after harvest (e.g. zero-till agriculture) significantly increases the nutrient uptake of the subsequent crop (Evans and Miller, 1988 and 1990). Establishment of native plants may be more successful on undisturbed soil.

In lower intensity infestations, non-target vegetation could provide erosion control. Manual treatments, such as lopping or shearing, that remove the aerial parts of invasive plants would cause an input of organic material (dead roots) into the soil. As the roots are broken down in the soil food web, nutrients would be released.

The risk of harm to soils from manual treatment is low.

Mechanical Treatment

Using mowing equipment on existing roads is not expected to impact soils. Mowing equipment used off established roads has the potential to compact soil. Soil compaction eliminates soil pores, and reduces water infiltration, aeration, and the ability of plants to root effectively. Due to the limited amount of mechanical treatment proposed, this is not expected to create significant soil impacts. Other mechanical treatments, such as the use of motorized hand tools, are expected to have effects similar to manual treatments.

Cultural Treatment

In this proposal, goats would be used to control blackberry in the Sandy River Delta. No adverse soil impacts are foreseen due to the highly resilient nature of this area, especially considering the substantial disturbance history.

Herbicide Treatments

The effect of an herbicide treatment on the soil depends on the particular characteristics of the herbicide used, how it is applied, and soil physical, chemical and biological conditions.

- **Erosion Hazard:** Mt. Hood Forest Plan FW-025 – Effective Groundcover: On sites where effective groundcover levels are below the standard, vegetation must be established quickly on sites where invasive plants have been removed to minimize the erosion hazard. In some cases, meeting this Standard is the responsibility of the project that is actually causing the disturbance. All alternatives rely on different combinations of the proposed treatment methods. The Proposed Action and Restricted Herbicide Use Alternatives are beneficial to soils, since these alternatives have flexibility in treatment methods, which allows effective treatments and prevents further spread and subsequent degradation of soils due to the presence of invasive plants. These degraded conditions are described above in the Alternative 1 – No Action Alternative section and include: loss of soil, drying of soil, changes in soil chemistry, changes in soil biota, and changes in nutrient cycling processes. In general, alternatives (No Action and Restricted Herbicide Use Alternatives) that would restrict treatment result in fewer acres of invasive plants being successfully treated. Areas infested with invasive plants would continue to remain in a degraded condition.

  Further, many of the proposed herbicides are identified as a risk for runoff in clay soils. In the analysis area east of the Cascade crest, exposed clay surface soils are uncommon and occur in some roadcuts or wet meadow areas where no application or very restrictive PDC would apply. Therefore, the risk of runoff is very low east of the Cascades. West of the Cascades, clay subsoils are commonly exposed in roadcuts, so the risk of runoff would be higher. However, the overall risk of runoff from a clay surface in either scenario is still quite low given the PDC for weather conditions, time of year sprayed, and other surface covering materials such as rock and organic matter that slow down runoff.

- **Soil Biology:** Mt. Hood Forest Plan FW-032 – Soil Organisms: Soil organisms are important to the human environment because they could affect soil productivity. None of the herbicides under consideration has notable effects to overall long term soil productivity or permanent impairment of soil ecosystems. In addition, the other treatment methods (cultural, manual, and mechanical) are much more *un*likely to incur detrimental soil impacts of any substantial size. Information about specific herbicide effects to each of the myriad of soil organisms is scarce. For example, one study may examine the use and effect of a particular herbicide on soil bacteria, while another study examines the use of different herbicides on the soil invertebrate population. There is no study or set of studies that examines the impacts of different herbicides on each and every aspect of soil biology. Much of the research is based on indirect effects such as changes in persistence or metabolism of nutrients. The observed changes may mean a temporary depression in the activity of existing soil organisms, or could signal a complete change in the organisms present. In addition, while a few of the studies could be applied directly to conditions found locally, the majority of them are not specific to local ecosystem conditions.

Although this information is useful, it would cause uncertainty in the predicted effects (i.e., lower confidence) if the proposed herbicide treatments were in large, continuous, blocky acreages. The areas, however, proposed for herbicide applications are in specific spots or narrow bands, such as along roadsides that result in very localized effects.

All alternatives, including the No Action Alternative, allow the use of herbicides in treatment of invasive plants. Although picloram and sulfometuron methyl are of particular concern due to toxicity to soil microorganisms and persistence (picloram only) in soil, all herbicides have some evidence of temporary effects to soil microorganisms. The known effects on soil organisms from the individual herbicides proposed for use in the Proposed Action and Restricted Herbicide Use Alternatives are presented in Table 3-17. It is likely that all herbicide treatments would have some effect on soil biota, but these effects would be more or less transitory depending on the timing, frequency, and herbicide used. The known effects of herbicide treatments on soil would be weighed against the effects of invasive plants on soil that result from no treatment or less effective treatments. All herbicides could persist under some circumstances related to soil texture, organic matter content, and soil moisture level, among others. All action alternatives include a site by site long-term strategy for restoring infestations of invasive plants (See Section 2.1.3 on site restoration; See Section 3-6 – Botany and Treatment Effectiveness), which necessarily includes protecting or improving soil productivity and conditions for soil microorganisms. Successful restoration of native vegetation to areas infested with invasive plants is dependent, in part, on healthy soil organisms. Negative effects to soil organisms and soil productivity could complicate restoration and could delay restoration of native vegetation for a year or more.

Table 3-17: Effects of Herbicides on Soil Organisms.

Herbicide	Effects
Chlorsulfuron	Growth inhibition for some fungi at >10,000 times the maximum application rate. Effects to soil nitrification (SERA, 2004a)
Clopyralid	No effect on nitrification, nitrogen fixation, or degradation of carbonaceous material at 1-10 ppm (parts per million) in soil (SERA, 2004b)
Glyphosate	Readily metabolized by soil bacteria. Substantial information indicating it is likely to enhance or have no effect on soil microorganisms. One study showed transient decreases in the populations of soil fungi and bacteria (SERA, 2003a)
Imazapic	No information. (SERA, 2004c)
Imazapyr	Toxic to some bacteria at relatively high concentration (SERA, 2004d)
Metsulfuron methyl	At high surface application rates, decreases in soil bacteria were seen for 3 days, but reversed completely after 9 days (SERA, 2004e)
Picloram	Toxic to some soil organisms, even at low levels. Increasing persistence with increasing application rates. Most toxic at low pH levels (SERA, 2003b)
Sethoxydim	No effect on mixed bacterial populations at 50 ppm in soil. At 1000 ppm, substantial but transient increases in actinomycetes and bacteria, and slight decreases in various fungi. *Azobacter* in culture showed no inhibition until 5000 ppm (SERA, 2001b)
Sulfometuron methyl	Toxic to soil microorganisms. Microbial inhibition is likely to occur and could be substantial. Soil residues may alter composition of soil microorganisms (SERA, 2004e)
Triclopyr	One study showed inhibition of mycorrhizal fungi only at high (1000 ppm) levels, another study showed inhibition of one mycorrhizal fungus at 0.1 ppm. Expected levels in soil would be well below effect levels for most mycorrhizal fungi (SERA, 2003c)

- **Leaching Risk:** Factors that determine the fate of herbicides in soil include mobility, degradation, and solubility. 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 are important in the fate of herbicides. Degradation rates generally decrease with increasing soil depth and decreasing temperatures. General characteristics for the proposed herbicides are displayed in Table 3-18, with more detailed information by herbicide contained in Appendix U. Herbicides are listed in order of most leach risk to least.

As the table indicates, some of the proposed herbicides are highly soluble in water. Generally this is often taken as an indicator of the mobility of the herbicide in water with few exceptions. Glyphosate, while having a high solubility, also binds tightly with soil particles, because of this it has very low mobility. Herbicides with high mobility potential and long half-lives have a greater potential for leaching into near surface or ground water, if present. All listed herbicides would be expected to have higher adsorption, and lower solubility and half- life than shown in Table 3-18 due to the inherent soil ecological systems found within the Forest and Scenic Area. Therefore, persistence and leaching potentials are some level *lower* than listed in the table, which was constructed by ranking measured levels of adsorption, persistence, and solubility for each herbicide against each other (a relative ranking) in order to display less technical and more understandable results. Examining each of the three ranked criteria together for each herbicide indicates the highest leach risk herbicides are picloram, chlorsulfuron, and imazapyr. Herbicides with the lowest risk for leaching appear to be sethoxydim, triclopyr, and glyphosate.

Table 3-18: Relative Ranking of Herbicide Characteristics and Influencing Factors on Soil Properties. Modified Source: SERA Risk Assessments (2001b, 2003a, 2003b, 2003c, 2004a, 2004b, 2004c, 2004d, 2004e, 2004f).

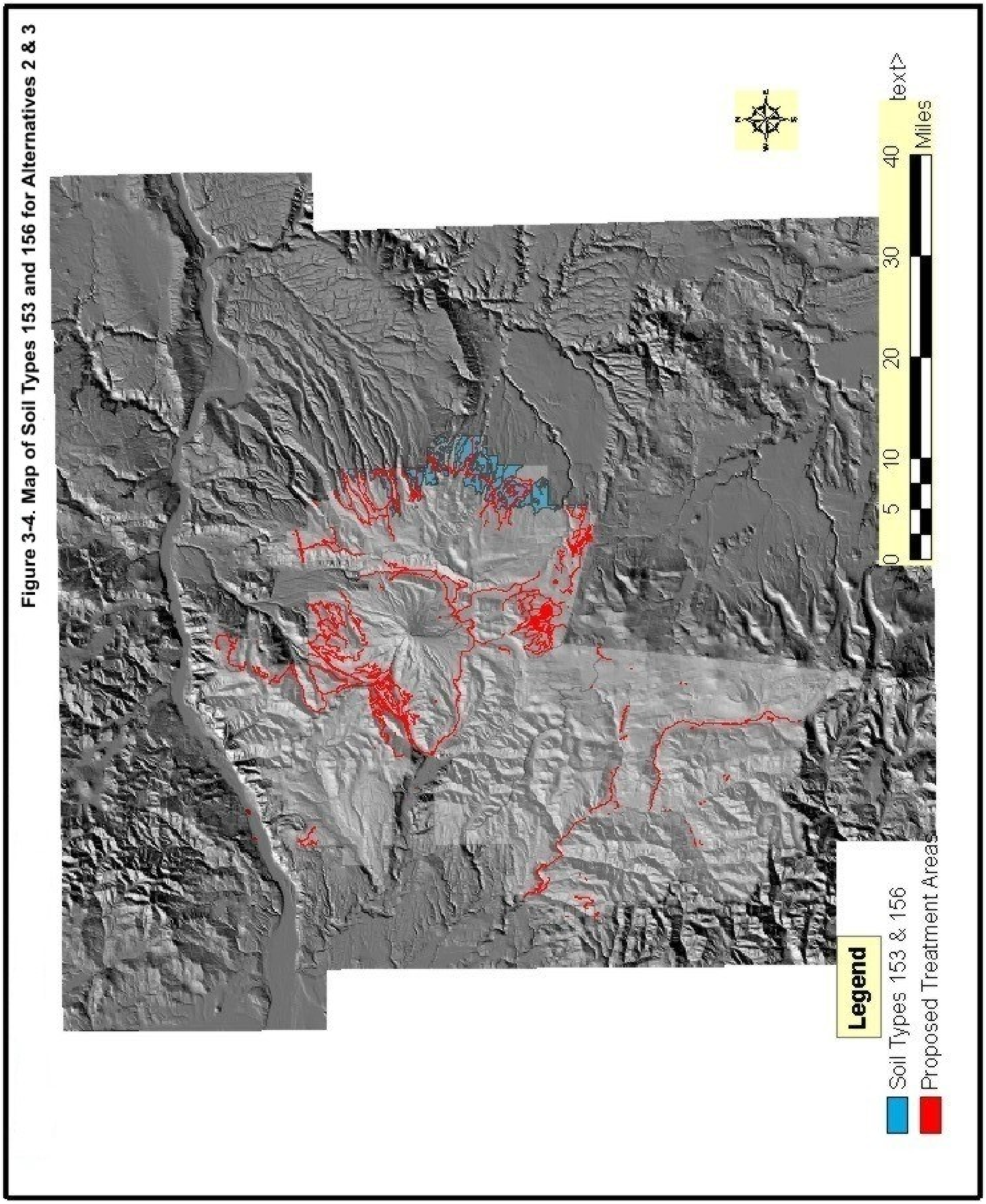
Herbicide	Soil Mobility	Factors Increasing Adsorption	Soil Persistence	Factors Decreasing Half-life	Solubility	Factors Decreasing Solubility
Picloram	High	Increasing organic matter and clay content	Moderate	Decreasing application rate and increasing soil depth	Very High	
Chlorsulfuron	Moderate	Increasing organic matter and low clay content	Moderate	Decreasing pH, increasing organic matter and temperature	High	Decreasing pH
Imazapyr	Low	Increasing organic matter and clay content, decreasing pH (<6.5) and moisture; and time	Moderate	Increasing light, soil microbial activity	Moderate-High	
Clopyralid	High		Low	Increasing moisture	Low	
Imazapic	Low	Increasing organic matter and clay content; and decreasing pH	Moderate	Increasing microflora	High	Decreasing pH
Metsulfuron methyl	Moderate	Increasing organic matter content	Moderate	Increasing microbes	Low-Moderate	Decreasing pH
Sulfometuron methyl	Moderate	Humic acid content	Low-Moderate	Decreasing particle size	Low	Decreasing pH
Sethoxydim	Low	Increasing organic matter	Low		Low-Moderate	Decreasing pH
Triclopyr	Moderate	Increasing organic matter and clay content	Low	Increasing moisture and temperature	Low	
Glyphosate	Very Low	Metallic cations	Low		Moderate-High	Affected by form

An analysis of soil characteristics using the Mt. Hood Soil Resource Inventory (SRI) was conducted to sort which soils would be of lowest risk to soil organism toxicity and leaching when picloram or sulfometuron methyl are applied. It was discovered that there are only two main soil types that do not exhibit the increased risk attributes of soil texture, coarse fragment content, and/or pH. When soils in the SRI are identified as acidic (pH less than 6.9), or have the potential for high percolation rates, then they are recognized as a higher risk for soil organism toxicity or leaching. Potential for high percolation rates occurs with soil textures coarser than loam (i.e., sandy loam and loamy sands), or any texture with greater than 20 percent coarse fragments (i.e., gravel, cobble). The only soil types *not* meeting either of the two criteria are 153 and 156, which are both on the far eastern side of the analysis area, and identified in blue in Figure 3-4. These soils (153 and 156) are wind deposited loamy soils that are located in dryer, more open stands of trees with grass and forbs in the understory, which result in more neutral pH levels. The entire remainder of the analysis areas exhibits acidic pH or relatively high percolation rates. Treatment areas identified as roadside, regardless of soil type, would be of lesser concern for picloram or sulfometuron methyl herbicide applications due to the amount of ground disturbance already present. It is extremely likely that significant soil biological systems have been and continue to be disrupted in these long, linear roadside areas.

Conclusion - Alternatives 2 and 3

- **Erosion Hazard:** There would be a net reduction in soil erosion risk from treated areas in the Proposed Action and Restricted Herbicide Use Alternatives when each site's restoration plan is followed and effective (i.e., restored or temporary effective groundcover). A particular site's effective groundcover level may actually decrease if the amount of vegetation lost from invasive plant eradication exceeds the success of restoration, which is why the implementation of each site's restoration plan is critical. The use of herbicides would accelerate the eradication of invasive plants, allowing desirable native plants to occupy the growing space, which would then provide long-term soil stability and proper function. Based on personal visual observation of previous revegetation efforts (such as riparian and road obliteration projects) on totally denuded sites, few native plants occupied the site in the first year. Effective groundcover for the short-term is achieved with seed, mulch, or combination. By years five to ten, however, sites tended to recover with native plant recolonization, provided the temporary groundcover methods were effective. Some restoration sites on flat terrain actually received no follow-up seeding or mulching and had very good recovery of native plants and thus reduced the erosion hazard.

Figure 3-4. Map of Soil Distribution and Proposed Treatment Areas.



- **Soil Biology:** Alternatives 2 and 3 treat the same amount of acres, but with drastically different strategy. The Proposed Action treats more acres and sites with herbicides, while Restricted Herbicide Use utilizes more non-herbicide treatments. Based on the existing condition and predicted rates of spread, added to the possible restoration, the Proposed Action would result in the most desirable impact on soils. Soil organism communities are likely impacted in some way whether a site is treated or not. Therefore, sites are either considered permanently degraded by invasive plants with no follow-up restoration, or temporarily impacted by herbicides (to some degree depending on which is used), followed by vegetative restoration.

- **Leaching Risk:** Alternative 2 poses the highest leach risk strictly on an acreage treated basis because more acres are treated with herbicides. The risk would be substantially reduced by applicable PDC for application, weather conditions, etc. Table 3-18 above lists herbicides from highest leach risk to lowest, based on numerous factors. The risk of leaching enough herbicide to actually have measurable contamination of a well or surface water body is extremely low, even for the highest leach risk herbicides (picloram, chlorsulfuron, and imazapyr) due to dilution, precautionary PDC, and simply the lack of concentrated multiple applications in a small area that would show up later once sufficient amounts had leached from an application area to a monitoring location.

3.8.5. Alternatives Comparison

The result of this analysis, which examines the impacts on soils from all proposed treatment methods for three alternatives, is summarized in Tables 3-19 and 3-20 below.

Table 3-19: Specific Cause and Effect Concerns as Related to Analysis Standards and Guidelines.

Analysis Element	Cause and Effect	Applicable Forest Service standard or finding	Site-specific Consideration	Process to Address Concern and Tie to PDC Table
Effects of treatments on soil erosion	Treatments have potential to cause soil disturbances that reduce surface cover, thus increasing soil erosion risk	Mt. Hood Forest Plan FW - 025: Effective groundcover	Loss of vegetation that results in elevated surface erosion potential	Annually evaluate proposed treatment sites, review treated sites to determine if groundcover goals have been met, and ensure previous revegetation efforts are not damaged (PDC I.1)
Effects on soil organisms	Picloram and sulfometuron methyl are of concern due to toxicity risks.	Mt. Hood Forest Plan FW – 032: Soil organisms	Soil texture, soil pH	Use other herbicides or treatment methods where soils are acidic (pH > 6.9) due to increased toxicity risk. Where these herbicides are used, no more than one application per year (PDC G.3 and G.4)
Leaching potential	Herbicide treatments may leach through the soil and into groundwater	Concern, no standard or guide	Soil texture, soil pH	Use other herbicides or treatment methods where soils are coarser than loam, or exhibit > 20 percent coarse fragments, or pH is greater than 6.9 (PDC G.3). Identify specific proposed spray areas annually for type of herbicide, soil texture and pH (PDC J.1),

Table 3-20: Summary of Relative Impacts to Soils by Alternative.

Alternative	Acres of Proposed Herbicide Treatment	Acres of Non - Herbicide Treatments	Soil Concerns: Erosion Hazard, Soil Biology, Leach Risk
No Action	600	635	Overall, this alternative addresses soil concerns in *the least* positive way. The current and predicted future negative impacts on soils due to the spread of invasive plants outweigh the small amount of current eradication/control efforts. In addition, without EDRR, future infestations may be difficult to keep in check increasing the risk of future negative soil impacts.
Proposed Action	12,914	50	This alternative addresses soil concerns in *the most* positive way. The current and predicted future negative impacts on soils due to the spread of invasive plants is addressed by aggressively increasing eradication/ control/ containment efforts in a well thought out, sensitive manner. In addition to PDC to substantially reduce the risk of negative effects, the restoration plans for particular sites positively address the effective groundcover standard. With EDRR, future infestations could be addressed while they are small, reducing the risk of negative soil impacts by not treating.
Restricted Use Herbicide	4,047	8,917	This alternative *lies between* the No Action and Proposed Action Alternatives. There may be sufficient positive impacts from treating the priority one sites to 'neutralize' the negative impacts from not treating other areas.

3.8.6. Cumulative Effects

The cumulative effects of an invasive plant infestation could be dramatic and irreversible. Soil lost to erosion may take centuries to replace. The loss of soil biota also could lead to degradation of soil properties that are not easily re-established. Changes in the soil biota could lead to changes in nutrient cycling that lead to a loss of nutrients from the ecosystem. Although very little research has been done on the restoration of soil biological communities, it stands to reason that large persistent invasive plant infestations would detrimentally effect the re-establishment of soil biota and native plant communities. Preventing the spread of invasive plants would have a positive impact on soils.

Cumulative effects of each alternative would be similar to its direct effects. Non-herbicide treatments may result in nutrient decrease, erosion, reduction in mycorrhizal hyphae, increased bare ground, and decreased litter layer, which transient effects are given revegetation with native or non-invasive species. Soil compaction, loss of microbiotic crusts, formation of hydrophobic surface layer on soil, and loss of volatized nitrogen, phosphorus and potassium may have longer term effects and need to be minimized or eliminated through site-specific PDC. Of these three components of this analysis (erosion, leaching risk, and soil organisms), the knowledge of the cumulative effects (defined as multiple applications to one site within a year, which would occur less frequently than single season applications) of herbicide application on soil biota is the most uncertain. Some herbicides are metabolized by soil bacteria, while others are toxic to soil microorganisms or no information about effects to these organisms is available, as described in Table 3-17 above.

Picloram, chlorsulfuron, and imazapic are relatively water soluble and could move off-site in water. These herbicides are moderately adsorbed to soil particles and could be moved off-site with wind or mass soil movement. It is possible, but not likely, that they could be introduced to the Forest and Scenic Area from other sources, such as application(s) on adjacent ownerships. Movement of these herbicides to the Forest and Scenic Area is not expected to affect soil productivity, because most of the Forest and Scenic Area lands are upstream or upwind of other ownerships. It is more likely that these herbicides would move off the Forest and Scenic Area to the other ownerships below. Given the conclusions in the effects analysis, the occurrence of either scenario is very doubtful.

As an example of perspective, the USDA Forest Service use of picloram is less than one percent of agricultural use (SERA, 2003b), while USDA Forest Service use of sulfometuron methyl nationwide is less than one percent of all use in California (SERA, 2004e).

3.8.7. Management Standards and Guidelines

Relevant standards and guidelines contained in the Forest Plan and the Northwest Forest Plan are displayed in Appendix B of this document; relevant standards contained in the Scenic Area Management Plan are displayed in Appendix C. This analysis exhibits that the Proposed Action and Restricted Herbicide Use Alternatives are consistent with all relevant standards and guidelines, when the proposed amendments are incorporated. The Forest Plan amendments are discussed in Section 3.16.

3.8.8. Incomplete and Unavailable Information

Information about specific herbicide effects to each of the myriad of soil organisms is not available. Much of the research is based on indirect effects such as changes in persistence or metabolism of nutrients. The observed changes may mean a temporary depression in the activity of existing soil organisms, or could signal a complete change in the organisms present.

Soil organisms are important to the human environment because they could affect soil productivity, and none of the herbicides under consideration has notable effects to soil productivity. Hence, the unavailable information is insignificant in terms of providing a clear basis for choice between alternatives.

3.9. Water Quality

3.9.1. Existing Conditions

Potential treatment areas are located in nearly every fifth-field watershed on the eastside and westside of the Forest and Scenic Area. The range of elevation, precipitation, and distance from treatment sites to streams is 25 to 5,400 feet, 10 to 120 inches, and zero to more than 2,000 feet, respectively. Site-specific information, including soils, slope, elevation, precipitation, distance to water, and landslide risk, about each potential treatment site is available in Appendix O – Existing Conditions Characteristics.

Water Quality

Surface and groundwater drinking water protection areas were delineated by the Oregon Department of Environmental Quality (DEQ) and Oregon Health Division (OHD) in response to source water assessments required by the 1996 Amendments to the federal Safe Drinking Water Act (SDWA). DEQ and OHD were required to delineate the groundwater and surface water source areas which supply public water systems, inventory each of those areas to determine potential sources of contamination, and determine the most susceptible areas at risk for contamination. Public water systems with greater than three hook-ups or serving more than 10 people year-round are regulated by the requirements in the SDWA.

Watersheds originating on the Forest supply high quality drinking water to approximately one million people in Oregon. There are eight drinking water protection areas including the City of Corbett, Portland, Estacada, The Dalles, various Clackamas River water providers (Oregon City, Lake Oswego), and the Timber Lake Job Corps (Table 3-21) on the Forest that contain proposed invasive plant treatment sites. There are no drinking water protection areas in the Scenic Area. The treatment areas located in each drinking water protection area are shown in Appendix V. Additional information regarding the potential effect of proposed invasive plant treatments on drinking water is located in Section 3-5 – Human Health and Safety.

Table 3-21: Proposed invasive plant treatment acres within drinking water protection areas.

Drinking Water Source	Drinking Water Protection Areas						Grand Total
	Clackamas	Corbett	Estacada	Portland	Timber[1] Lake Job Corp	The Dalles	
Bull Run				1.4			**1.4**
Clackamas River (Estacada)			1,350.0				**1,350.00**
Clackamas River	3.4						**3.4**
Dog River						0.1	**0.1**
Frog Lake					122.3		**122.3**
North Fork Gordon Creek		48.3					**48.3**
South Fork Gordon Creek		12.6					**12.6**
South Fork Mill Creek						24.9	**24.9**
Total	**3.4**	**60.9**	**1,350.0**	**1.4**	**122.3**	**25.0**	**1,562.8**

[1] Frog Lake is a back-up water source for the Timber Lake Job Corp. The primary water source is a well.

Clean Water Act

Rivers, streams, and lakes within and downstream of the treatment areas are used for boating, fishing, swimming, and other water sports. Additionally, the Forest and Scenic Area streams provide habitat and clean water for fish and other aquatic biota, each with specific water quality requirements. The Clean Water Act (CWA) protects water quality for all of these uses.

The CWA 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 Oregon, the DEQ develops water quality standards and lists water quality limited waters. In addition, Region 6 of the Forest Service has entered into a Memorandum of Agreement (MOA) with the Oregon State DEQ to acknowledge the FS as the Designated Management Agency for implementation of the CWA on National Forest land. In an effort to support the CWA, the Forest and Scenic Area conduct a variety of monitoring and inventory programs to determine status of meeting state water quality standards as well as other regulatory and agency requirements. In an average year, approximately 75 sites are monitored for water temperature throughout the Forest and Scenic Area. In addition, other water quality monitoring occurs at various locations throughout the Forest and Scenic Area depending on the year. This could be turbidity monitoring, instream sediment sampling, water chemical sampling or surveys of physical stream conditions. Currently, approximately 25 miles of physical stream habitat is surveyed every year and to date approximately 1,200 miles of stream have been surveyed. Information collected during these surveys includes the number of pools and riffles, the amount of large wood, riparian area condition and types and numbers of fish and other aquatic organisms to name a few of the parameters.

Various portions of nine streams on the Forest and Scenic Area do not meet Federally-approved state water quality standards (www.deq.state.or.us/wq/standards/wqstdshome.htm), and are now listed as water quality limited under Section 303(d) of the CWA on the DEQ 2002 303(d) list. Streams on the Forest and Scenic Area that are on the 303(d) list are shown in Table 3-22, along with the listed parameter. There is no numeric State water quality standards for any of the potential herbicides or adjuvants that may be used in either of the action alternatives, so none of the streams are categorized as water quality limited based on the use of those chemicals.

Table 3-22: Streams on the Forest and Scenic Area that do not meet Federally-approved state water quality standards. These streams are listed as water quality limited under Section 303(d) of the Clean water Act on the DEQ 2002 list. The parameter for which they are limited is listed below.

Sub-basin	Stream	Listed Parameter(s)
Clackamas	Eagle Creek	Water Temperature
	Fish Creek	Water Temperature
Lower Deschutes	Clear Creek	Water Temperature
	Gate Creek	Water Temperature, Sediment
	Rock Creek	Water Temperature, Sediment
Middle Columbia-Hood	Eightmile Creek	Sediment
	Fifteenmile Creek	Sediment
	Fivemile Creek	Sediment
	Ramsey Creek	Water Temperature, Sediment

Streams listed for temperature do not meet the following current state water quality criteria for salmonids:

- Eagle, Fish, and Ramsey creeks: core, cold water habitat (61 ºF) and salmon and steelhead spawning (55 ºF, spawning periods only)
- Clear, Gate, and Rock creeks: salmon and trout rearing (64 ºF)

Only the lower 8,000 feet of Ramsey Creek within the Forest is listed for temperature. Water temperature standards are based on the 7-day average maximum temperature (a running average over seven days is used instead of the daily average temperature). Core, cold water habitat and salmon and trout rearing habitat standards must be met regardless of the time of year, whereas the 55 ºF salmon and steelhead spawning criteria only applies during spawning periods, which vary by species and stream.

By direction of the CWA, where water quality is limited, DEQ develops Total Maximum Daily Load (TMDL) plans to improve water quality to support the beneficial uses of water. For water quality limited streams on National Forest System lands, the USDA Forest Service provides information, analysis, and site-specific planning efforts to support state processes to protect and restore water quality. To date, two TMDL plans have been completed (Sandy River in 2005 and West Hood Subbasin in 2002) while the other basins on the Forest and Scenic Area are planned for completion in the next two years. Once the TMDL plans are completed, streams would be removed from the 303(d) list and stream recovery would be achieved through an implementation plan. USDA Forest Service requirements for the two completed TMDL plans are to follow Northwest Forest Plan and Forest Plan measures that protect and restore water quality. Actions associated with this project would be consistent with both of the TMDL plans.

In addition, a Water Quality Restoration Plan (WQRP) has been prepared for Fish Creek (Clackamas River watershed) and a draft WQRP has been prepared for the headwaters of Fivemile Creek, Eightmile Creek, Fifteenmile Creek and Ramsey Creek by the USDA Forest Service. The purpose of the WQRP is to identify sources and causes of pollution, make recommendations for Best Management Practices (BMP) and restoration to reduce levels of potential pollutants, display any new monitoring that is pertinent to the 303(d) listing parameters and a proposed time-table for completing the restoration work. Information from the WQRP is often used by DEQ to develop their TMDL plan.

The original water temperature 303(d) listing for Fish Creek is based on water temperature monitoring data. The WQRP recommended riparian planting where existing stream shading was insufficient and also riparian thinning to promote more rapid forest growth and shade recovery along streams.

The original 303(d) listing for the other segments is based on information contained in the 1994 Miles Creek Watershed Analysis (USDA Forest Service, 1994a). According to the draft WQRP, fine sediment levels have been reduced in all sample sites in Eightmile Creek and all but one sample site in Fifteenmile Creek between 1994 and 2000. The WQRP attributes the reduction, at least in part, to the implementation of a number of restoration projects that occurred after 1994. The draft WQRP makes several recommendations including continued restoration as funding allows, continued fine sediment monitoring, and implementation of BMP for Forest management activities.

Groundwater

Groundwater is found throughout the Forest and Scenic Area. Groundwater depths vary considerably and range from a few feet to hundreds of feet from the ground surface. Geologic conditions, soil type and precipitation are a few factors that help determine groundwater characteristics. The direction and speed with which groundwater moves are controlled by the slope of the water table and aquifer permeability. Aquifer permeability is a measure of how easy it is for groundwater to move through the geologic material that makes up the aquifer. The steeper the slope of the water table and the higher the aquifer permeability, the faster groundwater would move through a geologic formation. Depending on conditions, it can take anywhere from several hours to many decades for groundwater to move through an aquifer. Groundwater traditionally comes in contact with surface streams, lakes or ponds in the form of seeps or springs. These seeps or springs can be sources of high quality water due to their clean, cold condition.

Riparian Conditions

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 could 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. The extent of the hyporheic zone (place where ground water meets stream water) adjacent to and under the stream surface is increased by large wood in streams. Invasive plants could slow down or prevent the establishment of native trees, decreasing or delaying the future supply of large wood in stream channels.

Riparian forest canopy protects streams from solar radiation in summer, and could moderate minimum winter nighttime temperature, preventing the incidence of anchor ice or freeze-up in streams (Beschta et al., 1987). Changes in water temperature regime could affect the survival and vigor of fish, and affect interspecies interactions (FEMAT, 1993).

Riparian areas are dynamic. Disturbances characteristic of uplands such as fire and windthrow, as well as disturbances associated with streams, such as channel migration, floods, sediment deposition by floods and debris flows, shape riparian areas (FEMAT, 1993). Frequently disturbed ground in riparian areas makes these areas especially vulnerable to plant invasion.

The rapid growth and propagation characteristics of many invasive plants allow them to out-compete native vegetation. This competitive advantage results in the loss of functional riparian communities, loss of rooting strength and protection against erosion, decreasing slope stability and increasing sediment introduction to streams, and impacts on water quality (Donaldson, 1997). Invasive plants are especially difficult to control in riparian areas since invasive plants thrive in the moist environment and treatment measures are sometimes limited.

Knotweed species are an example of an invasive plant with potential effects to riparian areas. Knotweed species leaves fall off in a short period in the fall, leaving soil beneath the plants relatively unprotected from rain, leading to potential for some increased erosion and sediment delivery to streams. In addition, if a relatively large number of knotweed leaves are decomposing in a small stream at any one time, there could be a local increase in biological oxygen demand and a reduction in the amount of dissolved oxygen for other organisms in the stream (USDA Forest Service, 2005a).

3.9.2. Effects Analysis & Methodology

The water quality effects analysis utilizes research and relevant monitoring to provide a context for effects of each of the alternatives. In addition, herbicide concentrations derived from herbicide risk assessments completed by SERA (SERA 2001b, 2003a, 2003b, 2003c, 2004a, 2004b, 2004c, 2004d, 2004e, 2004f) and associated worksheets areused as a general indication of the potential delivery of herbicides to adjacent surface water. These concentrations were modified in the worksheets to reflect some specific site conditions for each of the treatment areas. A complete description of how this information was used in the aquatics analysis can be found in Section 3.10 – Aquatic Organisms and Habitat, and in the Water Quality Specialist Report.

3.9.3. Direct/Indirect Effects

Alternative 1 – No Action Alternative

Under this alternative management of invasive plants would only occur in areas that are covered under existing NEPA. 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. Increased water temperatures resulting from reduced shading due to invasive plants are possible in streams that have the following conditions:

- Stream channel is moderately wide (10 feet to 20 feet);
- Stream channel has an east-west orientation;
- Slopes next to the stream are greater than 30 percent;
- Limited groundwater input
- Riparian area has the potential for larger coniferous or hardwood streamside riparian vegetation; and,
- Site has a large contiguous block of short invasive plants along the south edge of the stream.

The likelihood that the adjacent stream has some increased stream temperature resulting from shade loss increases as the number of these conditions increase at a treatment site. In reality, any stream temperature increase would likely be very localized and small due to the localized nature of most of the infestations and the low probability that all of the conditions described above are found at any one site. It is anticipated that most of the infestation areas have an insignificant effect on water temperature due to meeting very few of the above conditions.

Where invasive plants provide less effective ground cover and a shallow root system than native plants, there is a greater potential for a surface erosion, bank erosion, and in-stream sediment delivery during high intensity rainfall events. This situation is similar to the stream temperature description above, in that most of the sediment increase to adjacent surface water is anticipated to be insignificant, due to the localized infestation of invasive plants. Infestations do have the potential to introduce small, localized amounts of sediment in areas that have highly erosive banks that are covered with a large (approximately 50 feet or more along the edge of the stream) contiguous block of shallow rooted invasive plants. Talmage (2004) found that if a shallower rooted invasive plant species such as knotweed species completely occupy an unstable stream bank, the potential for stream bank instability during high flows is much greater than if the same site was occupied by deeper rooted native vegetation. Invasive plants also could complicate restoration by preventing the re-establishment of native vegetation that is more effective for providing stream shading, stream bank/soil stability, and ground cover.

The localized effects of invasive plants out competing more beneficial native plants on key sites such as stream banks and riparian areas would continue. Invasive plants are likely to spread in areas that do not have an active eradication, containment, and control program. The potential adverse effects to water quality and soil stability would continue to mount.

In addition to the effects of invasive plant infestations described above, effects associated with the current invasive plant eradication program are part of this alternative. The program utilizes manual, mechanical and herbicide treatments to treat a variety of areas in the Forest and Scenic Area. From 1999 to 2003, 3,894 acres of invasive plant infestations have been treated under existing programs, with a typical yearly program treating approximately 1,200 acres (acreage treated in 2003). Of these treated acres, roughly 50 percent are sprayed with herbicides, 40 percent are treated by mechanical means and 10 percent are treated manually. Table 3-23 shows the number of acres of invasive plant treatment within riparian reserves that has occurred from 1999 to 2003 on the Forest and Scenic Area.

Indirect, direct and cumulative effects to the aquatic environment for current treatment programs are contained in each of the existing NEPA documents (USDA Forest Service, 1993a; 1996c; 1998b; BPA, 2001). These documents also contain applicable project design criteria and/or mitigation measures aimed at minimizing introduction of pollutants, such as herbicides and sediment. In general, these documents do not anticipate any indirect, direct or cumulative effects to the aquatic environment.

Table 3-23: Number of acres of invasive plant treatments within riparian reserves that has occurred from 1999 to 2003 on the Forest and Scenic Area under the No Action Alternative (Alternative 1).

Fifth-Field Number	Fifth-Field Watershed Name	Acres Treated in Riparian Reserves
1707010502	Fifteenmile Creek	3.4
1707010503	Fivemile Creek	4.9
1707010506	East Fork Hood River	16.2
1707010507	West Fork Hood River	206.7
1707010508	Lower Hood River	25.2
1707010512	Middle Columbia/Grays Creek	48.7
1707010513	Middle Columbia/Eagle Creek	10.8
1707030605	Beaver Creek	3.1
1707030607	Middle Deschutes River	29.7
1707030609	Tygh Creek	8.3
1707030610	White River	135.4
1708000102	Zigzag River	18.0
1708000107	Columbia Gorge Tributaries	767.5
1708000108	Lower Sandy River	609.1
1709001102	Upper Clackamas River	3.8
1709001103	Oak Grove Fork Clackamas River	18.6
1709001104	Middle Clackamas River	191.0
	Total	**2100.4**

Alternative 2 – The Proposed Action

The Proposed Action would implement invasive plant treatments on up to 13,000 acres within the Forest and Scenic Area. In addition to these 13,000 acres, other acres may be treated as part of the EDRR described in Chapter 1 and Chapter 2 of this document. Effects of this program on water quality are displayed in the EDRR portion of this analysis shown below. Table 3-24 shows the number of acres of invasive plant treatment within riparian reserves on the Forest and Scenic Area. The numbers include herbicide, manual, mechanical, and cultural treatment methods prescribed in this alternative (see Table 2-3).

Table 3-24: Acres of invasive plant treatments within riparian reserves on the Forest and Scenic Area for Proposed Action (Alternative 2). Acreage numbers include herbicide, manual, mechanical, and cultural treatment methods. Also shown are the differences in acres treated between Alternative 2 and Alternative 1. Values in bold represent a reduction in acres treated in riparian reserves between Alternative 2 and Alternative 1.

Fifth-Field Number	Fifth-Field Watershed Name	Acres Treated in Riparian Reserves	Acre Change Between Alternative 1 & Alternative 2
1707010502	Fifteenmile Creek	17.6	14
1707010503	Fivemile Creek	65.7	61
1707010504	Middle Columbia/Mill Creek	45.1	45
1707010506	East Fork Hood River	416.5	400
1707010507	West Fork Hood River	511.0	304
1707010508	Lower Hood River	57.1	32
1707010512	Middle Columbia/Grays Creek	41.1	**-8**
1707010513	Middle Columbia/Eagle Creek	16.0	5
1707030605	Beaver Creek	2.3	**-1**
1707030607	Middle Deschutes River	46.9	17
1707030609	Tygh Creek	56.9	49
1707030610	White River	646.7	511
1708000101	Salmon River	63.3	63
1708000102	Zigzag River	150.3	132
1708000103	Upper Sandy River	505.4	505
1708000104	Middle Sandy River	27.4	27
1708000107	Columbia Gorge Tributaries	639.0	**-128**
1708000108	Lower Sandy River	816.5	207
1709001101	Collawash River	38.1	38
1709001102	Upper Clackamas River	246.0	242
1709001103	Oak Grove Fork Clackamas River	55.6	37
1709001104	Middle Clackamas River	600.7	410
	Total	**5065.2**	

Fifth-field watersheds with the largest increase in treatments within the riparian reserves are the White River (+511 acres), Upper Sandy River (+505 acres), Middle Clackamas River (+410 acres), East Fork Hood River (+400 acres), West Fork Hood River (+304 acres), Upper Clackamas River (+242 acres), Lower Sandy River (+207 acres) and Zigzag River (+132 acres).

The potential adverse effects of the Proposed Action on stream turbidity, dissolved oxygen, water temperature, peak flows, low flows, water yield, and water chemistry are discussed below.

Soil Disturbance, Turbidity and Fine Sediment

Invasive plant eradication has the potential to temporarily leave treatment areas with reduced ground cover which in turn has the potential for increased erosion and resulting sedimentation. In addition, equipment used in plant treatment has the potential to disturb or displace soil, making the soil more vulnerable to erosion. Herbicide treatments do not kill all invasive plants immediately. Repeated treatments over several successive years are needed for invasive plant eradication, containment, and control. As treated vegetation dies there is the potential for surface erosion from exposed soil surfaces and loss of root holding strength. As stated in Section 3.8 – Soil Productivity, there should be a net reduction in soil erosion risk with this alternative when compared to Alternative 1, because desirable native plants that provide long-term soil stability and proper function would eventually reoccupy the treated sites. Short term erosion would be mitigated by creation of a restoration plan that would identify specific measures to ensure protection against erosion and resulting sedimentation. These measures would be implemented as part of the project. A reduction in associated sedimentation is also expected from the reduction in erosion risk since the two are strongly related.

Proposed manual, mechanical, and cultural treatment measures such as pulling, mowing, weed wacking, or grazing by goats are not likely to cause much soil disturbance or increase the potential for measurable surface erosion/sedimentation (see Section 3.8 – Soil Productivity). Hand-pulling involves manually pulling the invasive plant/roots out of the ground. When invasive plants are pulled, some surface soil may be exposed during the process, but the amount of off-site sediment movement is expected to be insignificant due to the small amount of soil exposure expected.

Where invasive plant control measures result in the reduction of area ground cover (e.g. vegetation, duff, litter, or rocks) as called for in the Mt. Hood Forest Plan standard and guideline FW-082 and FW-082, PDC would be implemented to further reduce the risk of erosion and sedimentation. These PDC would be tailored to reduce erosion based on site specific conditions in the treatment areas. Typical PDC such as application of mulch, hydroseeding with soil binding agents or erosion control blankets may be used to reduce the potential for soil detachment from raindrop impact and create a favorable environment for native vegetation to re-establish faster in the treatment area.

It is expected that streams would meet turbidity standards because implementing the PDC would reduce erosion and sediment delivery; the proposed treatments would not create significant amounts of ground disturbance; and most of the invasive plant treatment sites are already adjacent to disturbed areas such as roads (82 percent of the treatment acres). Supporting information regarding the potential effect of proposed invasive plant eradication, containment and control efforts on soil disturbance and ground cover is located in Section 3.8 – Soil Productivity.

Dissolved Oxygen and Nutrients

The herbicide, manual, mechanical, and cultural treatments proposed would not result in significant amounts of plant material or nutrients entering streams or other water bodies at once. Invasive plant treatments would occur at different times and in different places, so the probablity of large amounts of plant material entering surface water all at once is very low. In addition, streams on the Forest and Scenic Area have naturally vegetated riparian areas that provide large amounts of organic matter including tree leaves and needles. Due to the natural high input of organic matter into streams and the small amount of invasive plant material entering the water, a negligible adverse effect on in-stream dissolved oxygen levels is anticipated.

There are few stream reaches that exhibit symptoms of excessive levels of nitrogen or phosphorus (e.g., large mats of algae) that would stimulate primary production. One short stream reach where algae are common is in Clear Branch just below Clear Branch Dam on the Hood River Ranger District. This short section of stream (about one quarter-mile long) has little shade and the water released from the reservoir is thought to be phosphorous rich. The combination of additional nutrients and additional sunlight has stimulated algae growth. Further downstream, once the stream enters a wooded, well-shaded area, the algae disappear rapidly. This combination of sunlight and high nutrient levels is very uncommon in streams on the Forest and Scenic Area.

Virtually all streams have some algae and/or aquatic macrophyte growth as natural components of the ecosystem. The growth of this flora is controlled primarily by water temperature, sunlight, and available nutrients. The relative lack of algae and macrophyte presence is due to cool, well shaded water that is naturally low in available nutrients in most areas. Fertilizer use on the Forest and Scenic Area is uncommon as are the presence of other chemicals that could accelerate (or retard, in some cases) aquatic flora growth.

Water Temperature

Conditions such as stream aspect, streambank slope and riparian vegetation play a role in the rate at which solar energy reaches small forested streams (Brown, 1983). Most invasive plants provide little or no shade to streams, the exception being knotweed species and blackberry in sites that have a very narrow perennial stream channel (less than five feet wide). Temporary loss of knotweed and blackberry vegetation in these small channels has a higher potential for short term water temperature increase when compared to other invasive plant types, because this vegetation is providing shade. As described above, several other physical factors including stream orientation, existing topographic shading and groundwater input play a part in determining whether loss of stream shading would result in water temperature increase. All of the other plants currently provide very little stream shading due to their height and density, so there would be a negligible effect on in-stream temperatures resulting from invasive plant treatment efforts. Any loss of stream shade that may occur is expected to be temporary, until native vegetation reaches and surpasses the height of the invasive plants that are removed. Native shrub recovery (passive restoration) could be relatively rapid (several years), while the length of time for deciduous and coniferous trees to reach maturity could take many years.

On treatment areas where re-vegetation (active restoration) is proposed after herbicide, manual, mechanical, and cultural treatments, re-establishment of native plants would take place more quickly. This could be expected to have positive effects on stream bank stability and stream shading, and potential long-term reduction in water temperature. An insignificant effect on instream water temperature is expected as a result of implementing proposed invasive plant treatment efforts.

The risk for adverse effects to shade-producing native vegetation is relatively low with direct hand/selective and spot spraying (e.g., backpack sprayer) techniques that would be used near waterbodies. Spot spraying enables the applicator to target specific invasive plants, thereby minimizing the potential for overspray to native plants.

Peak Flows/Low Flows/Water Yield

The methods used during the herbicide, manual, mechanical, and cultural treatments of invasive plants are expected to have a negligible or no effect on water infiltration into the soil and surface runoff. Compared to the total watershed, the actual area to be treated by all invasive plant treatment methods is very small (Table 3-26). Herbicide treatment methods would not alter soil parameters that would reduce water infiltration. Soil compaction from manual (hand pulling), mechanical (mowing, etc.), or cultural (grazing by goats) treatment methods is expected to be very minor and localized so increased surface runoff would be insignificant. Eighty-two percent of the proposed treatment acres are located adjacent to roads that already have considerable soil disturbance and compaction. As a result, an insignificant effect on peak flows, low flows, or water yield is expected.

Riparian Structure

Invasive plant treatment and removal in riparian areas is intended to provide the opportunity for the eventual return of native vegetation and corresponding restoration of natural riparian structure. Some desired future conditions for B7 General Riparian Areas identified in the Forest Plan are: "dynamic, multi-aged communities . . ." that consist of a "multi-latered canopy including large tall green trees, dead snags, intermediate size trees and understory vegetation." When invasive plants occupying riparian sites are eradicated, the length of time before suitable native vegetation (passive restoration) returns to perform important riparian functions, such as stream shading and streambank stability, would vary across the Forest and Scenic Area. On invasive plant treatment areas where native vegetation would be planted (active restoration) riparian structure would return more rapidly. In general, improved long-term riparian structure and function due to invasive plant treatment would benefit water quality and listed aquatic species, due to long-term improvements in stream shading, vegetative stream bank stabilization, and in-channel large wood inputs.

Water Chemistry

Herbicides used to control terrestrial invasive plants for the Proposed Action could enter water through spray drift, surface water runoff, percolation and groundwater contamination. This has the potential to reduce water quality due to introduction of herbicides and associated adjuvant and impurities. Some of these adjuvants may also alter water quality characteristics such as pH (Bakke, 2003a). The primary pathway for potential herbicide introduction into surface water depends on a variety of factors including: application method, timing and amount of herbicide application, herbicide properties, soil properties, site conditions and management practices. Once on the ground or plant surface, herbicide fate is controlled by numerous biological, physical and chemical processes including: ingestion by animals, insects, worms or microorganisms; movement downward in the soil; adherence to or dissolved in soil particles; degradation into less (or more) toxic compounds; movement by runoff water on the soil surface; or transported by eroding sediment. Needless to say, herbicide delivery and fate is a very complex situation. Detailed discussions about herbicide delivery and fate are contained in the herbicide risk assessments completed by SERA (SERA 2001b, 2003a, 2003b, 2003c, 2004a, 2004b, 2004c, 2004d, 2004e, 2004f). This information is also summarized in Appendix Q – Herbicide Information Summary and PDC Crosswalk.

Soil type and chemical stability, solubility, and toxicity could determine the extent to which an herbicide would migrate and impact surface waters and groundwater. Some herbicides such as glyphosate strongly adsorb to soil particles, which prevents it from excessive leaching. Other herbicides such as picloram are highly soluble in water and more mobile. The herbicide risk assessments completed by SERA (SERA 2001b, 2003a, 2003b, 2003c, 2004a, 2004b, 2004c, 2004d, 2004e, 2004f) and associated worksheets utilize modeling to predict potential concentrations reaching surface water take these physical characteristics into account. These concentrations were estimated and utilized along with several other factors in Section 3.10 – Aquatic Organisms and Habitat to help determine risk of herbicide treatment to aquatic organisms for specific sites outlined in this EIS.

As stated above, due to its chemical nature picloram has one of the highest potentials of all of the herbicides analyzed in the EIS to leach into groundwater. Some studies have looked at the potential of groundwater contamination from picloram. Neary and others (1985) monitored two springs approximately 140 meters (450 feet) downslope of two 5-acre plots that were treated with picloram applied at the rate of 4.4 lb/ac. The study took place in the Coweta Watershed in North Carolina which has an average annual rainfall of approximately 80 inches. Picloram residues were detected in “trace amounts” 82 days after the initial herbicide treatment. During the 40 weeks that the two springs were monitored, picloram residues were present in only “trace levels” for a period of 18 days. According to the study: “In terms of water quality impacts, there was no adverse effect on the quality of the springs.” It should be noted that the concentration of picloram applied in this study is almost 13 times higher that the application rate that would be allowed for picloram in this EIS.

Bovey et al. (1975) conducted an investigation to determine the concentration of 2,4,5-T and picloram in subsurface water after spray applications to the surface of a seepy area in Texas. A 1-to-1 mixture was sprayed at 2.5 lb/ac every six months on the same area for a total of five applications. Supplemental irrigation in addition to a total of 85.5 cm natural rainfall was used to leach picloram into the subsoil. Seepage water was collected on 36 different dates, and one to six wells in the watershed were sampled at 10 different dates during 1971, 1972, and 1973. Concentration of 2,4,5-T and picloram in seepage and well water from the treated area was extremely low (less than 1 ppb) during the 3-year study. Again, it should be noted that the application rate of this study was considerably higher than the rate proposed in this EIS for picloram.

By contrast, triclopyr BEE (ester formulation) is one of the more potentially toxic herbicides proposed for use in this EIS; however, it is somewhat immobile in soils and tends to rapidly breakdown into the less toxic triclopyr acid (Ganapathy, 1997). In soil, triclopyr BEE hydrolyzes to triclopyr acid with a half-life of three hours (Bidlack, 1978) while in water BEE converts to acid in less than a day (Somasundarm and Coates, 1991; Bidlack, 1978). Triclopyr acid is also photodegradable. A study of photolysis found the half-life of triclopyr acid on soil under mid-summer sun was two hours (McCall & Gavit, 1986). Photodegradation can be particularly important in water. Johnson et al. (1995) found triclopyr acid dissolved in water had a half-life due to photolysis of one to 12 hours.

In a 1990 field study, Stephenson et al. examined the soil dissipation of triclopyr on both sandy and clay soils and its potential for vertical movement. The researchers found triclopyr to be rapidly degraded in both sand and clay soils; 50 percent and 90 percent disappearance of the compound was observed after two and four weeks, respectively. An average of 90 percent or more of the triclopyr did not leach below the organic layer at the two sites over a one year period; 97 percent or more of the triclopyr was recovered within six inches of the soil surface. The authors also found little lateral movement of triclopyr, detecting less than 1 ppb triclopyr in runoff samples from one to 105 days after treatment with 2.7 lbs ai/ac (this application rate is almost three times higher than what is proposed in this EIS). They concluded: "...our field studies of actual triclopyr persistence and mobility confirm earlier laboratory results and indicate that environmental problems are very unlikely to occur because of excessive triclopyr persistence and/or mobility in soil." In contrast, studies conducted for Dow Chemical classified triclopyr as mobile (Hamaker, 1975). This apparent contradiction in soil mobility may be explained by a study that showed that triclopyr sorption to soil increases with time, decreasing the potential for leaching (Buttler et al., 1993).

Several studies have focused on the fate of triclopyr in runoff from forested sites. Thomposon et al. (1995) studied triclopyr BEE and triclopyr acid in first order streams. The authors injected a 3.6 lb ai/ac solution (over three times stronger than what is proposed in this EIS) of triclopyr BEE directly into a small stream at two locations at different depths. Sediment, invertebrates and periphyton were sampled at seven locations at different time intervals. As the herbicide pulse moved downstream, the BEE degraded to the less toxic triclopyr. The study concluded that triclopyr had almost no adverse effects on the drifting and benthic invertebrates. Periphyton growth increased after herbicide introduction possibly due to nutrient enrichment from components in the formulation. Periphyton conditions returned to control levels three months after herbicide introduction.

Newton et al. (1990) studied an application of triclopyr, picloram and 2,4-D to brush in southwestern Oregon. Both triclopyr TEA, and triclopyr BEE were applied to 100 by 200 meter plots at the rate of 2.0 and 3.9 lb ai/ac for the TEA and 1.5 and 2.9 lb ai/ac for the BEE. At 37 days after application, 24 and 51 percent of the applied triclopyr was present in the surface soil. The largest decrease in soil residue occurred between 37 and 79 days after application. As a result of the monitoring, the researchers concluded that due to the immobile nature of triclopyr in soil-water, the herbicide would only move very short distances in forest subsurface flow.

In summary, research indicates that both triclopyr TEA and triclopyr BEE rapidly convert to triclopyr acid which, in the case of triclopyr BEE is considerably less toxic to aquatic organisms. Triclopyr exhibits very little horizontal and vertical movement through soils and degrades fairly rapidly (average half life of several hours to 30 days).

Water runoff during rain events could transport herbicides to waterways, and convey them to aquatic species habitat directly adjacent and downstream of the treatment site. Two factors that help determine herbicide concentrations delivered to aquatic organisms include the amount of herbicide reaching surface water and the dilution of the herbicide once it reaches water. While potential herbicide concentrations delivered to water are discussed above and in other resource sections in this Chapter, these discussions focused on a single herbicide application during the course of a year. In some cases, there is a potential of having multiple applications of an herbicide on a singe site in a year, so there is a chance that some residual herbicide would still be stored in the soil when the next application occurs. The potential of having higher herbicide concentrations delivered to surface water would be highest for those herbicides that have a high persistence in soil and a high mobility through soil. This higher concentration would be most evident in a “first flush” situation, where multiple herbicide applications occur prior to the first fall rains. A table displaying these particular attributes can be found in Section 3.8 – Soil Productivity. Only three herbicides are rated moderate to high in both persistence and mobility categories – picloram, chlorsulfuron and metsulfuron methyl. PDC that include limiting the application of picloram to once per calendar year per site and limiting application of picloram, chlorsulfuron and metsulfuron methyl to soil types that do not encourage persistence and mobility are designed to reduce the likelihood of increased herbicide concentration from the first flush.

As mentioned above, the other factor influencing delivery to aquatic organisms is dilution of herbicide in water. The mixing zone size needed to reduce or dilute downstream herbicide levels below any threshold effect concentration is a critical parameter. Mixing zone size can vary greatly and can depend upon the volume of herbicide input, the volume of the water body, the entry point (e.g., gravel bar inundation or drift deposition), and turbulence, which is generally greater for small but steep headwater streams. Hydrologically complex waterways with meanders, pools, riffles, and eddies that accelerate mixing and dilution are more likely to disperse contaminants than simplified waterways with consistent channel velocities that allow contaminants to maintain a more consolidated profile (Jobson, 1996; Lee, 1995; Heard et al.,2001; as cited in USDC NOAA, 2003). Streams on the Forest and Scenic Area have high channel complexity (wood, pools, boulders), so it is expected that mixing of chemicals would occur rapidly and there would be a rapid decrease of concentration with time. Mixing distances are also usually shorter in smaller streams (Heard et al., 2001; as cited in USDC NOAA, 2003).

Information about downstream mixing and dilution for herbicides used in forestry is relatively limited. Evans and Duseja (1973) sprayed picloram at the rate of one and two lb/ac over areas that ranged between one and two acres. They took runoff samples from a drainage ditch at a distance of 5, 10, 100 and 1,000 meters downstream of the treatment area. The site experienced a 1.5 inch rainstorm within the first week after spraying. Picloram concentrations were diluted 85 percent to 98 percent within 100 meters below the treatment areas and were diluted to concentrations below detection levels in all but one site 1,000 meters below the treatment areas. After 12 weeks all concentrations were ≤ 0.001 ppm and within a year picloram was not detectable. It should be noted that concentrations used in this study are three to six times greater than the concentration proposed in this EIS. In addition, the sample site was a drainage ditch which represents a simplified waterway with a low mixing potential when compared to complex streams found on National Forest land.

Johnsen and Warskow (1980) directly injected 1.5 lbs of picloram at a concentration of 6.258 ppm into a 1.3 cfs stream in Arizona and sampled water at 400, 800, 1,600, 3,200, 6,400 and 9,700 meter intervals along the stream. The original 6.258 ppm solution had been diluted to a concentration of 0.282 ppm (96 percent reduction in concentration) by the time it reached 1,600 meters downstream and 0.10 ppm (99.9 percent reduction in concentration) by the time it reached 3,200 meters downstream. Two days after the picloram injection, concentrations were at or near the detection limit of 0.001 to 0.004 ppm at the 400 to 1,600 meter sample points. It should be noted that the original concentration of 6.258 ppm of picloram that was introduced into the stream by this study is approximately 560 times more concentrated than the highest picloram concentration predicted by the herbicide risk assessments completed by SERA (SERA 2001b, 2003a, 2003b, 2003c, 2004a, 2004b, 2004c, 2004d, 2004e, 2004f) and associated worksheets for any of the treatment sites analyzed in this EIS.

PDC are utilized to reduce or eliminate negative effects of management activities on resources. A detailed discussion of specific aquatic-related PDC and how they would reduce or eliminate herbicide introduction into water is included in Section 3.10 – Aquatic Organisms and Habitat and a list of PDC and how they would address specific effects from herbicide application is summarized in Appendix Q – Herbicide Information Summary and PDC Crosswalk. As described in Section 3.10, the amount of herbicide reaching surface water by spray drift is expected to be minimal considering the restrictions of no broadcast boom spraying within 100 feet of surface water and when wind speeds are outside the range described in the PDC (Section 2.2) as well as using coarse spray, low nozzle pressure spray heads. Herbicides entering surface water through surface runoff are also expected to be minimal, since among other things, targeted spot spraying techniques that reduce the total amount of herbicide applied would be used within 100 feet of surface water (PDC F.1.), application of herbicides is restricted if rainfall is expected immediately after application (PDC C.3.). This would minimize the amount of herbicide reaching the ground surface as well as minimize the potential for herbicide drift.

The potential routes of herbicide entry described above should result in insignificant short term and long term indirect effects to water quality. As discussed above and in Section 3.10 – Aquatic Organisms and Habitat, PDC would be employed to minimize the potential for introduction of herbicides into area surface and groundwater. The likelihood of herbicide drifting would be substantially reduced by: 1) no aerial application of herbicides; 2) limited broadcast spraying outside of the aquatic influence zone; 3) selective application techniques only within the aquatic influence zone; and 4) use of coarse spray, low nozzle pressure spray heads. PDC that would limit the total amount of herbicide applied next to water features by only utilizing selective application techniques, not allowing use of more toxic and mobile herbicides and adjuvants next to water features, restricting application of herbicides if rainfall would occur immediately after application and treating sites to minimize erosion would reduce the likelihood of secondary herbicide introduction. As indicated by the mixing and dilution studies cited in the paragraphs above, any trace amount of herbicide that may reach surface water would be quickly diluted.

Summary of Indirect/Direct Effects

Table 3-25 below is a summary of the potential pathways of effects on water quality from proposed herbicide, manual, mechanical, and cultural treatments of invasive plants. This table is a summary of the information provided above.

Table 3-25: Potential pathways of effects to water quality from treatment methods. (I = Insignificant estimated effect; B = Potential long-term beneficial effect.)

Treatment Methods	Potential Pathways of Effects					
	Soil Disturbance, Turbidity, and Sedimentation	Dissolved oxygen and nutrients	Stream Shade and Water temperature	Peak flows, low flows, water yield	Riparian structure	Water Chemistry
Cultural	I	I	I	I	I	N/A
Manual	I	I	I	I	I/B	N/A
Mechanical	I	I	I	I	I/B	N/A
Herbicides and adjuvants	I	I	I	I	I/B	I
Restoration[1] (revegetation)	B	I	B	B	B	N/A

[1] Restoration (Revegetation) would be done on selected invasive plant treatment sites.

N/A – Not Applicable

The potential adverse effects of the Proposed Action on aquatic organisms/plants and drinking water quality are discussed in the Section 3.5 – Human Health and Safety and Section 3.10 – Aquatic Organisms and Habitat.

Cumulative Effects – Alternative 2

Most proposed invasive plants treatment areas on the Forest and Scenic Area are upstream of other sources of herbicides and sediment on both non-Federal and Federal lands. Where streams migrate and flow downstream through other land ownerships (BLM, Federal, State, Tribal, or private), the potential exists for herbicides or sediments originating from invasive plant treatment sites on the Forest and Scenic Area to mix with those originating from sites being treated off-National Forest System lands. There is also the potential for herbicides and sediments from invasive plant treatment sites adjacent to the Forest and Scenic Area watersheds to mix together at some point downstream if simultaneous treatment occurs. As described in Section 3.4 of this document and Section 4.1.1 of the Invasive Plant FEIS (2005a), the effects could be additive or synergistic in nature. As described in the Water Chemistry section above, expected mixing and dilution of any trace amount of herbicide that may result from invasive plant treatment would occur quickly, making it highly unlikely that herbicide concentrations would be additive or synergistic with similar treatments at the watershed scale. Limited monitoring done by the State of California seems to support this conclusion. In response to concerns about potential contamination of drinking water from herbicide treatments on nearby private lands, numerous surface water samples were collected in the late 1990s both immediately downstream of herbicide application sites (site scale), and on larger channels potentially distant from application sites (watershed scale). Approximately 40,631 pounds of active ingredient of 13 herbicides and 19 insecticides were applied within the privately-owned watersheds upstream of locations sampled at the watershed scale (Jones et al., 2000).

One hundred eight water samples were collected at six sites on the Klamath, Trinity and Scott rivers, and Elk, Pine and Supply creeks on four occasions between September 1998 and October 1999 (Jones et al., 2000). Timing of sample collection was scheduled partially to coordinate with runoff events. The first collection, done under dry conditions in September 1998, served as background. Collections in October 1998 and 1999 sampled storm runoff. Collections in June 1999 corresponded to the end of the heaviest pesticide application season (Jones et al., 2000).

No detectable concentrations of any herbicides were identified (reliable detection limits ranged from 0.04 to 2.0 ppb). The analysis included two herbicides that are being proposed for use in this EIS, glyphosate and triclopyr. Some possible explanations for the lack of detection include several months passed between dry weather application and the first rain, potentially allowing chemical degradation or adsorption to soil. Also, dilution of streamflow between application and monitoring sites may also have contributed to the lack of positive detections (Jones et al., 2000).

Table 3-26 shows the number of acres of treatment in each fifth-field watershed to give an idea about how much treatment would actually occur on the Forest and Scenic Area. In addition, the table displays road density in each fifth-field watershed. Road density could be used as a surrogate for the amount of sediment related to human activity since roads are used to access structures, land treatment sites, and since roads themselves are sources of sediment.

Table 3-26: Ownership, acres of treatment areas and road density in each fifth-field watershed.

Watershed Name	Total Watershed Acres	Percent of Watershed in Forest/ Scenic Area Ownership	Proposed Treatment Acres	Percent of Watershed Treated	Road Density* (mi/mi^2)
Beaver Creek	10,6742.0	1%	45.5	0%	0.2
Bull Run River	88,985.0	88%	2.4	0%	2.6
Collawash River	97,421.1	99%	64.1	0.1%	2.7
Columbia Gorge Tributaries	103,926.1	43%	942.3	1%	0.4
East Fork Hood River	100,953.3	68%	1254.1	1%	1.9
Fifteenmile Creek	157,237.5	11%	227.8	0.1%	0.4
Fivemile Creek	78,190.5	24%	511.8	1%	1.0
Lower Clackamas River	117,660.7	1%	3.4	0%	0.1
Lower Hood River	51,289.3	6%	250.3	1%	1.2
Lower Sandy River	47,155.2	8%	856.6	2%	0.5
Middle Clackamas River	138,506.6	90%	747.4	1%	2.5
Middle Columbia/ Eagle Creek	84,495.2	55%	79.2	0.1%	0.3
Middle Columbia/ Grays Creek	92,722.8	31%	173.3	0.2%	0.4
Middle Columbia/ Mill Creek	130,697.6	13%	214.0	0.2%	0.4
Middle Deschutes River	195,384.6	2%	315.6	0.2%	0.1
Middle Sandy River	40,956.7	16%	40.5	0.1%	1.6
Oak Grove Fork Clackamas River	90,542.0	88%	175.8	0.2%	3.7
Salmon River	73,716.1	92%	172.8	0.2%	1.9
Tygh Creek	81,558.4	51%	298.1	0.4%	0.9
Upper Clackamas River	100,496.8	94%	484.9	1%	3.5
Upper Sandy River	34,200.9	90%	1,060.7	3%	2.5
West Fork Hood River	65,466.3	66%	1,620.5	3%	1.7
White River	176,272.2	60%	3,171.7	2%	2.3
Zigzag River	37,763.7	97%	368.7	1%	1.1

* Road density values include some roads off National Forest System lands

According to the table above, total acres treated in any fifth-field watershed exceeds two percent of the total watershed acreage in only two fifth-field watersheds. Those watersheds are Upper Sandy River and West Fork Hood River. Less than one percent of the total watershed area is proposed for treatment in the majority of the remaining fifth-field watersheds. Forest and Scenic Area ownership in these two watersheds is 89.8 percent and 65.5 percent for the Upper Sandy River and West Fork Hood River respectively. Since the major land holdings are National Forest System lands, effects of invasive plant treatments at individual sites are described in this document. Detrimental effects to water quality from each of the projects are expected to be very low due to PDC that employ measures to reduce or eliminate harmful effects to the aquatic environment. These PDC were developed using modeling, research and other documents and field experience (See Section 2.2, Subsection F: Water Quality and Aquatic Organisms). The majority of the remaining the fifth-field watersheds propose to treat less than 1 percent of the total watershed acres so no cumulative effects from proposed invasive plant treatments are expected.

Even if the invasive plant treatments are occurring at the same time on both Federal and non-federal lands, the potential for sediment-related cumulative effects is very low considering the negligible amount of sediment expected to reach perennial streams from either manual, mechanical, or cultural treatments of invasive plants. Forest streams listed on the 303 (d) list for sediment displayed in the Existing Condition section are located in the Fivemile and Fifteenmile fifth-field watersheds. Only 61 and 14 acres of additional riparian reserve treatment are being proposed in this alternative when compared to the No Action Alternative in these two watersheds. This acreage only represents 0.5 and 1.9 percent of the total riparian reserve in each of the watersheds, respectively. As described above, road density could be used as an indicator of the amount of past and present human disturbance, and the resulting levels of sedimentation. Fivemile and Fifteenmile fifth-field watersheds have road densities of 1.02 and 0.37 mi/mi^2 respectively. These watersheds have low relative road densities when compared to the other fifth-field watersheds in the analysis (14 and 20 highest road densities out of the 24 fifth-field watersheds analyzed in this document). These represent moderate to low relative road densities, which when coupled with the low amount of proposed disturbance in riparian reserves PDC to reduce erosion and sediment delivery and apparent improving trend related to sedimentation identified in the draft WQRP would result in negligible sediment related cumulative effects.

The potential for cumulative effects is negligible considering the insignificant amount of herbicide or sediment expected to reach surface water due to implementation of PDC that would minimize the amount and type of herbicides that actually reach surface water, the distance between potential treatment areas, and dilution over time and space by mixing and additional inflow from downstream tributaries and ground-water entering streams.

Alternative 3 – Restricted Herbicide Use Alternative

Herbicide treatments would be completed only on priority 1 sites under this alternative. All other sites (priority 2 through 5) only have manual, mechanical and cultural methods proposed. The potential effects of priority 1 invasive plant herbicide treatment sites is similar to those described above for Alternative 2 (Proposed Action), but the potential effects from the use of herbicides are much more limited since the number of acres potentially treated is much less.

As described in Section 3.8 – Soil Productivity, this alternative would have a lower potential for long term erosion when compared to the No Action Alternative, due to the establishment of native vegetation on treatment sites. Since the erosion potential is lower, the associated sedimentation resulting from the erosion would be lower than Alternative 1. According to the soils analysis, the primary source of erosion is from the inability of the invasive plants to protect the soil from erosion. Actual erosion and sediment production from the mechanical and manual activity is expected to be very low due to the PDC. Manual, mechanical and cultural treatment methods could be repeated yearly on invasive plant treatment areas if necessary to achieve adequate control of invasive plants. Even with the larger number of acres proposed for treatment with manual, mechanical and cultural treatment methods, the risk of adverse effects on water quality due to sedimentation is expected to be low because PDC (Section 2.2) would reduce that risk.

Cumulative Effects – Alternative 3

As described in the cumulative effects section of Alternative 2, actual treated acres comprise a very small percentage of actual fifth-field watershed acres. Since the amount of herbicide used is less than Alternative 2, concern over cumulative effects associated with herbicide application is less than Alternative 2, which is very low. This is due to less herbicide used overall, implementation of PDC that would minimize the amount and type of herbicides that actually reach surface water, the distance between potential treatment areas as well as dilution over time and space by mixing and additional inflow from downstream tributaries and ground-water entering streams. It is unlikely that herbicide exposure from invasive plant treatments would add or accumulate in-stream because the herbicides considered in this EIS do not bio-accumulate

Forest streams listed on the 303 (d) list for sediment displayed in the Exiting Condition section are located in the Fivemile and Fifteenmile fifth-field watersheds. The number of acres treated in the riparian reserve is the same as Alternative 2 (61 and 14 acres respectively) for these two watersheds, but all of these acres would be treated using manual or mechanical methods instead of manual, mechanical and herbicide. This acreage only represents 0.5 and 1.9 percent of the total riparian reserve in each of the watersheds respectively, which is a very small percentage of the total. As described above, road density could be used as an indicator of the amount of past and present human disturbance, and the resulting levels of sedimentation. Fivemile and Fifteenmile fifth-field watersheds have road densities of 1.02 and 0.37 mi/mi^2 respectively. These watersheds have low relative road densities when compared to the other fifth-field watersheds in the analysis (14 and 20 highest road densities out of the 24 fifth-field watersheds analyzed in this document). These represent moderate to low relative road densities, which when coupled with the low amount of proposed disturbance in riparian reserves, PDC to reduce erosion and sediment delivery, and apparent improving trend related to sedimentation identified in the draft WQRP would result in negligible sediment related cumulative effects.

3.9.4. Early Detection/Rapid Response Strategy

Total treatment acres for the EDRR would be similar to those outlined in Alternative 2 and 3 for each fifth-field watershed. The anticipated treatment acres are shown in Appendix J and are equivalent to what was analyzed in this document. Since this acreage is generally located in the same fifth-field watersheds, many of the physical characteristics that influence herbicide concentration and erosion would be similar for new treatment areas. The proposed program of work would periodically be reviewed to ensure, among other things, that new site meet the conditions outlined in this document (see Section 2.1.3). Due to this in conjunction with the PDC, the potential effects of EDRR herbicide, manual, mechanical and cultural effects treatments are expected to be similar to those described above for Alternatives 2 and 3.

The EDRR proposes to treat up to 13,000 acres annually across the Forest and Scenic Area and would be limited as described in Chapter1 and 2 of this document. This has the potential to create cumulative effects through repeated treatments over a long period of time. Concern from herbicide application is low, due to implementation of PDC that would minimize the amount and type of herbicides that actually reach surface water, the distance between potential treatment areas as well as dilution over time and space by additional inflow from downstream tributaries and ground-water entering streams. Exposure of ground that has been treated to remove invasive plants has the potential for erosion and resulting sedimentation. Sites that were treated in prior years would be in a variety of states of recovery ranging from full native plant re-vegetation to recently treated, seeded and mulched. According to the soils analysis (Section 3.8), erosion is expected to be less on treated sites when compared to the No Action Alternative due to the presence of new native vegetation and PDC that include seeding, mulching and restricting vehicle access. Since this erosion is less than what is present at the site prior to treatment, resulting sedimentation is expected to be less as well. The long-term result is an expectation that these sites would be closer to natural rates of erosion and sedimentation due to the recovery of native vegetation.

3.9.5. Aquatic Conservation Strategy Objectives

In order for a project to proceed, “a decision maker must find that the proposed management activity is consistent with the Aquatic Conservation Strategy objectives” (page B-10, ROD, USDA Forest Service and USDI BLM, 2001). The nine objectives are listed on page B-11 of the Aquatic Conservation Strategy ROD. The effects analysis above has focused on key parameters or indicators that make up elements of the nine Aquatic Conservation Strategy objectives, to determine if the Invasive Plant EIS project would restore, maintain, or degrade these indicators. Once this determination has been made, the indicators should be examined together to make a final determination of whether the project is consistent with the objectives. Table 3-27 displays the individual indicators and the effect this project has on those indicators at the fifth-field watershed scale.

Table 3-27: Water quality indicators and project effects at the fifth-field watershed scale.

INDICATORS	Effects of the Actions Alternative 1			Effects of the Actions Alternative 2			Effects of the Actions Alternative 3		
	Restore[1]	Maintain[2]	Degrade[3]	Restore	Maintain	Degrade	Restore	Maintain	Degrade
Water Quality									
Temperature		X			X			X	
Sediment		X			X			X	
Chemical Contamination		X			X			X	
Habitat Access									
Physical Barriers		X			X			X	
Habitat Elements									
Substrate		X			X			X	
Large Woody Debris		X			X			X	
Pool Frequency		X			X			X	
Pool Quality		X			X			X	
Off-channel Habitat		X			X			X	
Refugia		X			X			X	
Channel Condition and Dynamics									
Width/Depth ratio		X			X			X	
Streambank Condition		X			X			X	
Floodplain Connectivity		X			X			X	
Flow/Hydrology									
Peak/base flows		X			X			X	
Drainage Network Increase		X			X			X	
Watershed Conditions									
Riparian Reserves			X	X			X		

[1] "Restore" means the action(s) would result in acceleration of the recovery rate of that indicator.
[2] "Maintain" means that the function of an indicator does not change by implementing the action(s) or recovery would continue at its current rate.
[3] "Degrade" means to change the function of an indicator for the worse.

The following summarizes Table 3-27:

- The proposed project has a risk of adding some minor amounts of sediment and herbicides to surface water, but since the amount is insignificant and not expected to affect watershed function at the fifth-field scale, the project would maintain this element.

- It is anticipated that this project would aid in restoration of the riparian reserve conditions by allowing native vegetation to return to sites infested by invasive plants.

- Indicators other than those described in the proceeding paragraph would be maintained as outlined in the effects analysis above.

Table 3-28 displays specific Aquatic Conservation Strategy objectives and the indicators from the previous table that comprise each objective. All of the indicators that are checked for a particular objective should be evaluated together to determine whether the action maintains or enhances the specific Aquatic Conservation Strategy objective.

Table 3-28: Aquatic Conservation Strategy objectives and water quality indicators.

	Aquatic Conservation Strategy Objectives								
Indicators	**#1**	**#2**	**#3**	**#4**	**#5**	**#6**	**#7**	**#8**	**#9**
Temperature		X		X				X	X
Sediment				X	X	X		X	X
Chem. Contamination				X				X	X
Physical Barriers	X	X						X	X
Substrate			X		X	X			X
Large Woody Debris			X					X	X
Pool Frequency			X						X
Pool Quality			X						X
Off-Channel Habitat	X	X	X						X
Refugia	X	X						X	X
Width/Depth Ratio			X					X	X
Streambank Condition			X			X		X	X
Floodplain Connectivity	X	X	X				X	X	X
Peak/base Flows					X	X	X		
Drainage Network Increase					X	X	X		
Riparian Reserves	X	X	X	X	X	X		X	X

The following is a summary of how this project compares to the Aquatic Conservation Strategy objectives (Aquatic Conservation Strategy ROD B-10):

- **ACS Objective #1.** This project would at least maintain, if not enhance the distribution, diversity and complexity of watershed and landscape-scale features because of the protection that the Riparian Reserves provide to the aquatic and terrestrial systems and restoration of the Riparian Reserves through invasive plant eradication. No new road crossings of streams or wetlands are proposed, which would maintain the current level of aquatic habitat fragmentation. Channel components that contribute to channel complexity (pool quantity and quality, substrate, flows) would be maintained due to the existence of the Riparian Reserves.

- **ACS Objective #2**. The project would maintain spatial and temporal connectivity within and between watersheds. Nothing proposed with this project would reduce the spatial and temporal connectivity.

- **ACS Objective #3**. This project would maintain the physical integrity of the aquatic system, including streambanks, side channels (refugia), and channel bottom configurations due to the protection provided to Riparian Reserves. PDC aimed at reducing soil compaction and erosion, and the lack of any new stream crossings would greatly reduce risks of increased peak flow, and resulting bank erosion and channel bed scour. There are no temporary roads entering the Riparian Reserves and insignificant short-term inputs of sediment are expected to be very localized if they occur. This project would result in long term benefits to Riparian Reserve conditions, but it is unclear whether they would be noticeable at the fifth-field scale for this objective.

- **ACS Objective #4**. This project would maintain water quality necessary to support healthy ecosystems through project design criteria and the existence of Riparian Reserves. PDC aimed at reducing erosion would maintain the overall sediment levels in the long term, but there is a low risk of a short term, limited increase. In addition, PDC aimed at minimizing herbicide introduction into surface water as described in the text above, would keep concentrations at an insignificant level. Since the amount of these is so small and not expected to effect watershed function, the project would maintain this element.

- **ACS Objective #5**. This project would maintain sediment regimes through PDC and the existence of Riparian Reserves. There is a low risk of slight inputs of sediment from treatment areas, but they are anticipated to be very small and localized.

- **ACS Objective #6.** This project would maintain in-stream flows through PDC and Riparian Reserves. As described in the effects section, no increase in peak flows would result from this project.

- **ACS Objective #7.** This project would maintain the timing, variability, and duration of floodplain inundation through PDC and Riparian Reserves. As described in the effects section, no increase in peak flows would result from this project.

- **ACS Objective #8.** This project would aid in restoration of the species composition and structural diversity of plant communities in riparian areas and wetlands through invasive plant eradication, native vegetation establishment and the existence of Riparian Reserves.

- **ACS Objective #9.** This project would aid in restoration of habitat to support well-distributed populations of native plant and riparian dependent species through invasive plant eradication, native vegetation establishment and the existence of Riparian Reserves.

3.9.6. Management Standards and Guidelines

Relevant standards and guidelines contained in the Forest Plan and the Northwest Forest Plan are displayed in Appendix B of this document; relevant standards contained in the Scenic Area Management Plan are displayed in Appendix C. This analysis exhibits that the Proposed Action and Restricted Herbicide Use Alternatives are consistent with all relevant standards and guidelines, when the proposed amendments are incorporated. The Forest Plan amendments are discussed in Section 3.16.

3.9.7. Incomplete and Unavailable Information

Invasive plant inventories are incomplete, so the locations of future infestations cannot be predicted. Recently, a nation-wide database, NRIS/Terra, has been implemented that would enable the tracking of existing infestations, the addition of new inventory locations, and the aggregation of invasive plant data at regional and national scales. It is unlikely, however, that budget or staff time allotted would ever be sufficient to have completely up-do-date inventories of invasive plants across the Pacific Northwest Region.

In addition, the GLEAMS model runs for all surfactants and adjuvants are not available at the time of this document. These model results would give a better idea about expected delivery of particular chemicals to surrounding surface water, which in turn would help provide a better prediction of resulting effects to the aquatic environment.

3.10. Aquatic Organisms and Habitat

3.10.1. Existing Conditions

The following section describes existing distribution and relative status of native and/or culturally important salmonid species as well as two aquatic snails on the Forest and Scenic Area. A description of habitat conditions, limited to those habitat parameters that could be affected by actions proposed in this EIS, follows the salmonid species discussion. Included in the habitat section is a description of critical habitat and essential fish habitat. National Marine Fisheries Service (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). Essential fish habitat is waters and substrate necessary to fish (specifically chinook and coho salmon) for spawning, breeding, feeding, or growth to maturity. Most of the information regarding fish distribution and habitat conditions was taken from existing Oregon Department of Fish and Wildlife and/or USDA Forest Service survey information, much of which is unpublished data.

Aquatic Organisms

Salmonids (salmon, trout and char) are used as management indicator species of aquatic habitats in the Forest Plan. Due to their value as game fish and their sensitivity to habitat changes and water quality degradation, salmonids are used to monitor trends within Forest streams and lakes. Although other fish species may be present (e.g., sculpins and dace), population status and trends are unknown. Since more information exists on salmonids, this group serves as a better choice for monitoring aquatic environments.

The Forest and Scenic Area are home to several populations of salmon, steelhead, and resident trout. There are over 1,600 miles of fish-bearing streams on the Forest, with approximately 300 miles supporting anadromous populations of salmon and steelhead. In the Scenic Area, there are 60 miles of fish-bearing streams, with 17 miles supporting anadromous species (all land ownerships); 47miles of fish-bearing streams, with 10 miles supporting anadromous specis on National Forest System lands within the Scenic Area.

Most salmonids that reside in Forest and Scenic Area streams are an important cultural, economic and recreational resource. A number of species are listed as endangered or threatened under the Endangered Species Act (ESA), or are sensitive species identified by the USDA Forest Service, Pacific Northwest Region, Regional Forester (Table 3-29), by distinct population segment (DPS) or evolutionarily significant unit (ESU), which are large geographic areas that usually contain several sub-populations of the species considered to be in the same metapopulation. For example, a Lower Columbia River ESU steelhead would not be expected to breed with a Middle Columbia River ESU steelhead, even though it is the same species.

Table 3-29: Special status species found in Forest and/or Scenic Area streams. The date after the listing status is the date of listing or the most recent status review and subsequent Federal Register notice.

Species	DPS/ESU	Status	Major River Systems Where Found
Bull Trout (*Salvelinus confluentus*)	Columbia River DPS	Threatened 6/1998	Hood River, Columbia River
Steelhead Trout (*Oncorhynchus mykiss*)	Lower Columbia River ESU	Threatened 1/2006	Sandy River, Clackamas River, Hood River, West Columbia River Gorge Tributaries, Columbia River
Steelhead Trout	Middle Columbia River ESU	Threatened 1/2006	Fifteenmile, Fivemile, Mill Creeks, Columbia River
Chinook Salmon (*O. tshawytscha*)	Lower Columbia River ESU	Threatened 6/2005	Sandy River, Clackamas River, Hood River, West Columbia River Gorge Tributaries, Columbia River
Chinook Salmon	Upper Willamette River ESU	Threatened 6/2005	Clackamas River
Coho Salmon (*O. kisutch*)	Lower Columbia River ESU	Threatened 6/2005	Sandy River, Clackamas River, Hood River, West Columbia River Gorge Tributaries, Columbia River
Federally Listed Species found only in the Columbia River by the Action Area			
Steelhead Trout	Upper Columbia River ESU	Threatened 1/2006	Columbia River
Steelhead Trout	Snake River ESU	Threatened 1/2006	Columbia River
Chinook Salmon	Upper Columbia River ESU	Endangered 6/2005	Columbia River
Chinook Salmon	Snake River ESU	Threatened 6/2005	Columbia River
Chum Salmon (*O. keta*)	Columbia River ESU	Threatened 1/2006	Columbia River, West Columbia River Gorge Tributaries, Sandy River
Sockeye Salmon (*O. nerka*)	Snake River ESU	Endangered 6/2005	Columbia River
USDA Forest Service, Pacific Northwest Region Sensitive Species			
Redband/ Inland Rainbow Trout (*O. mykiss*)	Not Applicable (N/A)	Sensitive 7/2004	White River, Mill Creek, Badger-Tygh, Fifteenmile, Fivemile
Columbia duskysnail (*Lyogyrus n. sp. 1*)	N/A	Sensitive - 7/2004; Survey and Manage – 1/2001	Throughout Forest/Scenic Area
Other Species Addressed in this Analysis			
Basalt juga (snail)	N/A	Survey and Manage 1/2001	Springs and seeps in the Scenic Area
Pacific lamprey (*Lampetra tridentata*)	N/A	Culturally and locally important	Columbia River, West Columbia River Gorge Tributaries, Fifteenmile Creek, Mill Creek, Sandy River
Coastal Cutthroat Trout (*O. clarki*)	N/A	Forest Management Indicator Species	Throughout Forest/Scenic Area except White River and most of the Fifteenmile Creek basins.

Aquatic macroinvertebrates are an important resident of streams, lakes, and ponds in the Forest and Scenic Area. Presence, abundance, and status of macroinvertebrate species that reside in area water bodies are not well understood. Most streams within the Forest and Scenic Area have good water quality within their natural constraints (e.g., glacial streams are naturally turbid at times and carry a high sediment load) and habitat conditions are generally favorable. Macroinvertebrate populations appear robust and a range of species representing a wide variety of feeding groups (predators, grazers, leaf shredders) are usually present, but definitive studies to characterize diversity, richness, and biomass are lacking. Therefore, with the exception of the Columbia duskysnail, other aquatic macroinvertebrates are discussed collectively in regards to their anticipated response to proposed treatments.

Listed or sensitive species in Table 3-29 were federally listed or designated as sensitive for a number of factors. Although there are different reasons for their current status, common issues include impaired fish passage at dams and other obstructions, commercial and recreational fishing, habitat modification and/or loss, hatchery influences, and pollution. Hydropower, irrigation, domestic water supply, and flood control dams have disrupted migrations and eliminated historically available habitat. Commercial and recreational fishing have reduced numbers of wild fish in some populations. Habitat has been degraded, simplified, and fragmented due to a variety of land management activities. Hatchery programs have strongly influenced populations, partly by dilution of native gene pools due to interbreeding. Reduced water quality from both point and non-point sources has had an impact at localized, and even regional scales, in some watersheds. Impacts to the Columbia duskysnail and Basalt juga have primarily been from habitat modification and water quality degradation.

Columbia River Bull Trout

The only known population of bull trout in the Forest is found in the East Fork Hood River and Lower Hood River fifth-field watersheds. Bull trout presence in the Forest has been documented in the Middle Fork Hood River, Clear Branch both above and below Clear Branch Dam, Pinnacle Creek, Coe Branch, Eliot Branch, Bear Creek, and the mainstem Hood River (Figure 3-5). Most bull trout in the Middle Fork Hood River are found primarily within Laurance Lake (reservoir), and in Clear Branch and Pinnacle creeks. Clear Branch Dam, completed in 1969, has effectively split the Hood River bull trout population into two segments. Above the dam, the population of bull trout is believed to exhibit primarily an adfluvial life history: adult fish reside in the reservoir and move into Clear Branch or Pinnacle Creek as early as June, spawn mainly during September, and move back into the reservoir to spend the winter. There may be a fluvial (completely stream dwelling) population component above the reservoir as well.

Below Clear Branch Dam it is believed there are fluvial and adfluvial subpopulations present, but relatively little is known about this segment of the overall population. A small number of individuals annually migrate into the Hood River from the Columbia River, and some individuals have returned more than once (Hood River Soil and Water Conservation District, 2004; French, 2006). Other large bull trout have been observed below Clear Branch Dam that are not tagged, thus leading biologists to believe there may be a wholly stream resident population as well.

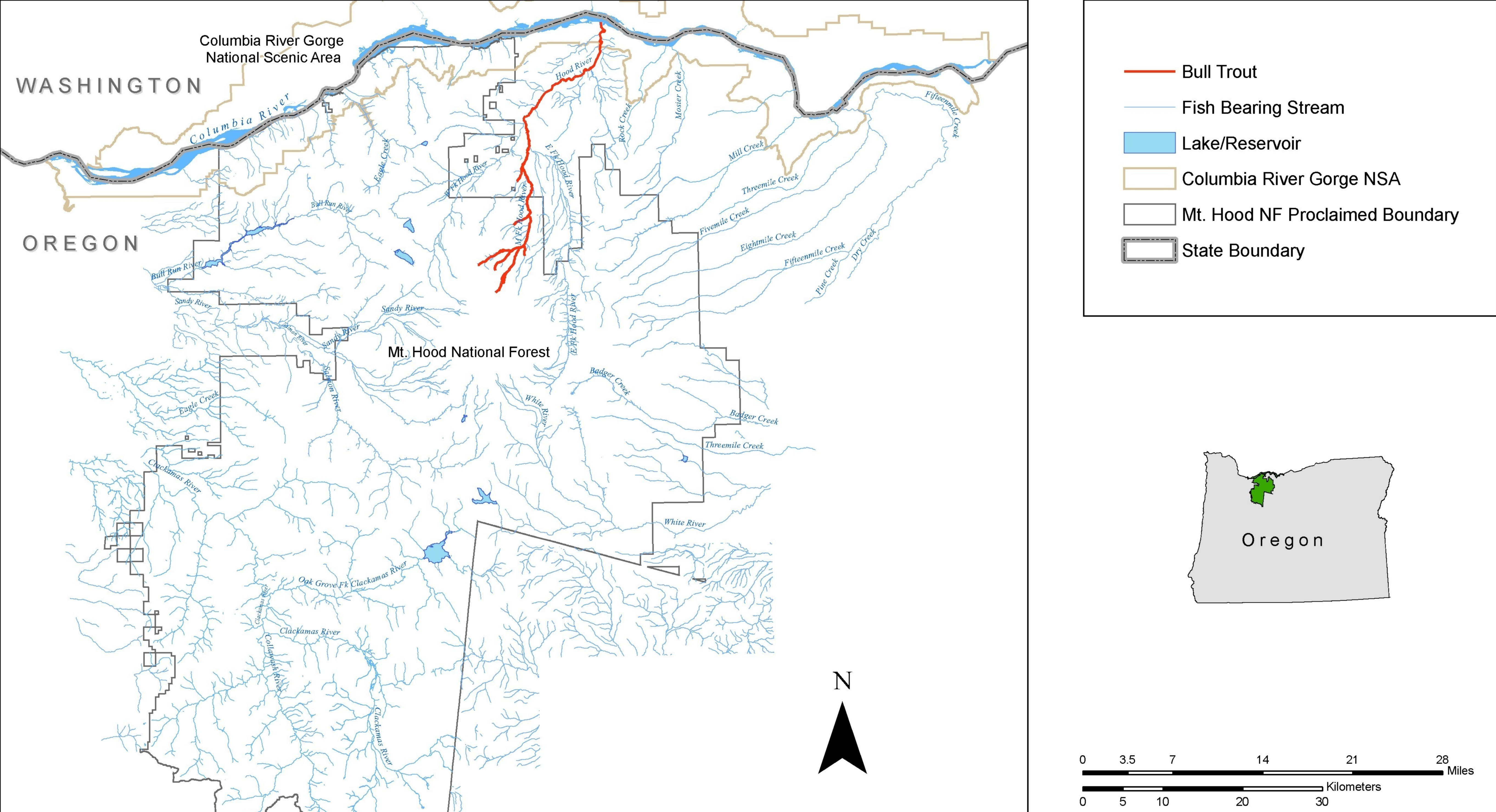


Figure 3-5. Bull Trout Distribution

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Bull trout use of Scenic Area streams is not well understood. Given that some adult bull trout move between the Columbia and Hood rivers it is obvious there is some bull trout use in the Columbia River mainstem. One tagged adult bull trout from the Hood River was captured by a fisherman in Drano Lake, located on the Washington side of the Columbia River about 12 miles downstream of the Hood River. Whether adult bull trout migrating out of the Hood River overwinter in the mainstem Columbia River and/or utilize other tributaries to the Columbia is not known. Also, there may be bull trout that spawn in other river systems besides the Hood River that make use of the Columbia River at some point in their lives.

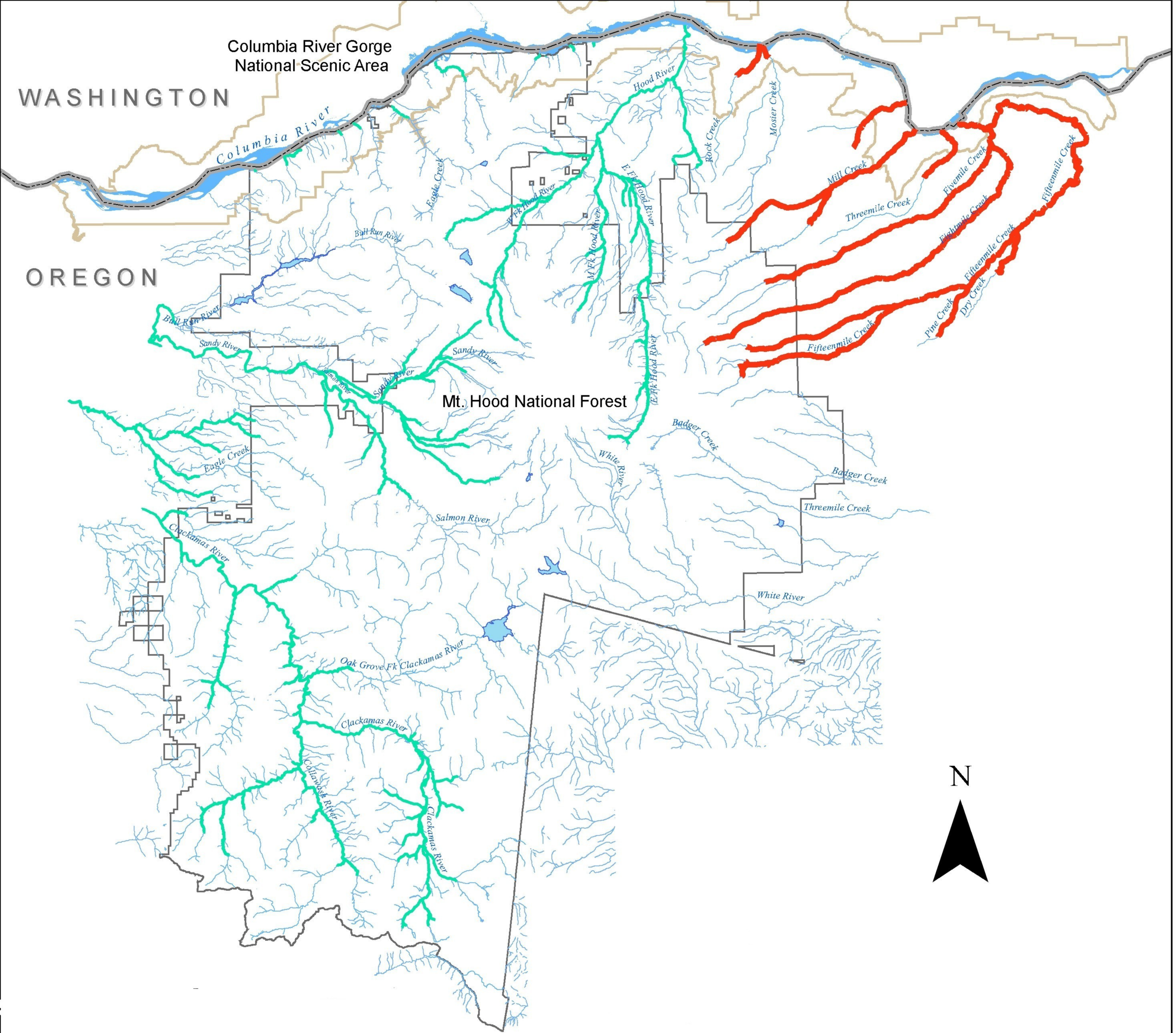
Bull trout reach sexual maturity between four and seven years of age and are known to live as long as 12 years. Bull trout spawn in the fall, and require clean gravel and very cold-water temperatures for spawning and egg incubation. Bull trout fry utilize side channels, stream margins, and other low velocity areas. Adults require large pools with abundant cover in rivers. Presumably, the various forms of bull trout interbreed, which helps to maintain viable populations throughout their range.

Lower Columbia River Steelhead

Lower Columbia River steelhead are found in the Clackamas River, Sandy River, Hood River, and some West Columbia Gorge tributaries (Figure 3-6), as well as the Columbia River mainstem for migration to and from the Pacific Ocean[2]. Adult winter steelhead enter rivers and streams primarily from March through June. A small run of summer steelhead occurs in the Hood River. These fish enter the mainstem Hood River from June through September, overwinter in larger tributaries or the mainstem, and spawn the following spring. Adult steelhead spawn in late winter to spring (January–June), depending in part on the run type (summer or winter steelhead), stream discharge and water temperature. Steelhead fry emerge from the gravel between late June and late July, and rear in freshwater habitat for one to three years. Yearling juvenile steelhead are usually found in riffle habitat, but some of the larger juvenile steelhead will be found in pools and faster runs. Smolt emigration takes place primarily from March through June during spring freshets.

In regards to habitat utilization, steelhead are more of an opportunist anadromous species compared to Chinook and coho salmon. As such, they are often more widespread and can utilize smaller streams more readily than many salmon species. Their stronghold habitats on the Forest and Scenic Area tend to be larger rivers and streams.

[2] This use of the Columbia River also applies to other anadromous fish species described herein.



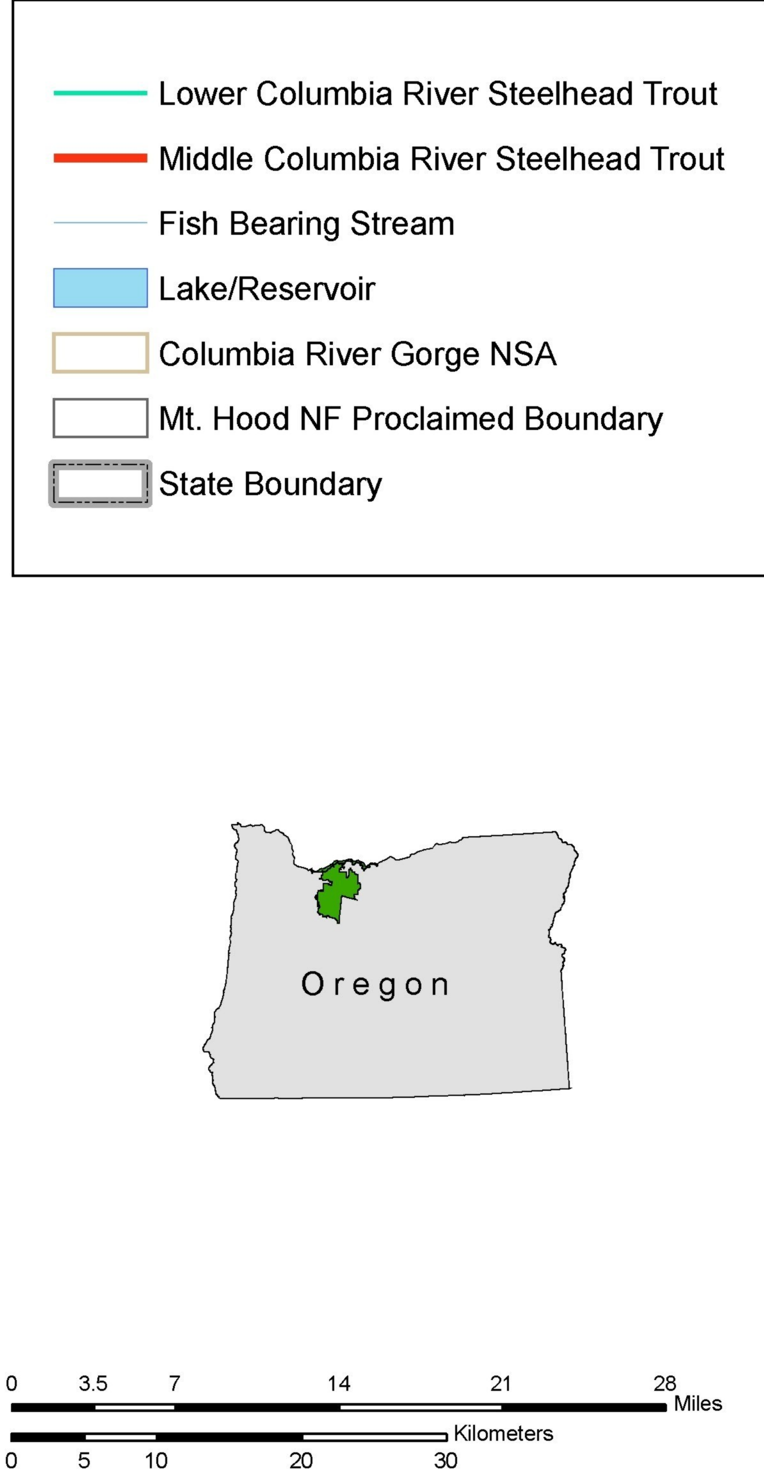


Figure 3-6. Lower and Middle Columbia River Steelhead Trout Distribution

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Middle Columbia River Steelhead

Middle Columbia River steelhead presence on the Forest is limited to the Fifteenmile, Fivemile, and Middle Columbia Mill Creek fifth-field watersheds (Figure 3-6). Also, there are some steelhead that ascend tributaries to the Columbia River in the Scenic Area, near The Dalles, Oregon. This stock is the eastern-most run of wild winter steelhead trout in the Columbia River Basin[3], and thus, is unique at local and regional scales. Steelhead have been documented upstream of the Forest boundary in North Fork Mill Creek, Fifteenmile Creek, Ramsey Creek, Fivemile Creek, and Eightmile Creek. A barrier falls restricts steelhead from ascending to the Forest in South Fork Mill Creek. Life history information and run timing is similar to that described for Lower Columbia River winter steelhead.

Lower Columbia River Chinook

Lower Columbia River Chinook salmon occur in the Sandy River and Hood River Basins, the Clackamas River Subbasin as well as in some West Columbia River Gorge tributaries (Figure 3-7). This ESU is made up of both spring and fall run components. The spring run occurs in the Hood River and Sandy systems, while fall run Chinook are present in all three river systems.

Most spring Chinook salmon in the Hood River Basin ascend the West Fork Hood River, and based on available information, use appears to be low in the East and Middleforks of the Hood River. Fall Chinook are found only in the mainstem Hood River and up to Punchbowl Falls near the mouth of the West Fork Hood River. Fall Chinook are also found in some Columbia River tributaries within the Scenic Area.

Spring Chinook in the Sandy River Basin utilize the mainstem Sandy River and upper basin tributary streams, such as the Salmon River, Zigzag River, Still Creek, and Clear Fork of the Sandy River. They enter these watersheds from April through August and spawn from August through early October. Spring-run Chinook salmon in the Sandy River have been influenced by spring-run Chinook salmon introduced from the Willamette River ESU. Analyses, however, suggest that considerable genetic integrity still exists in the Sandy River population (Myers et al., 1998).

Fall Chinook within the Sandy and Clackamas rivers primarily spawn and rear in the mainstem and larger tributaries downstream from the Forest. The fall Chinook populations in the Lower Columbia River ESU have a large-scale hatchery component and experience relatively high harvest and extensive habitat degradation. Most fall run fish emigrate to the marine environment as sub-yearlings. Modifications in the river environment have altered the duration of freshwater residence. Tule fall Chinook salmon return at adult ages three and four; while “bright” fall Chinook salmon return at ages four, five, and six.

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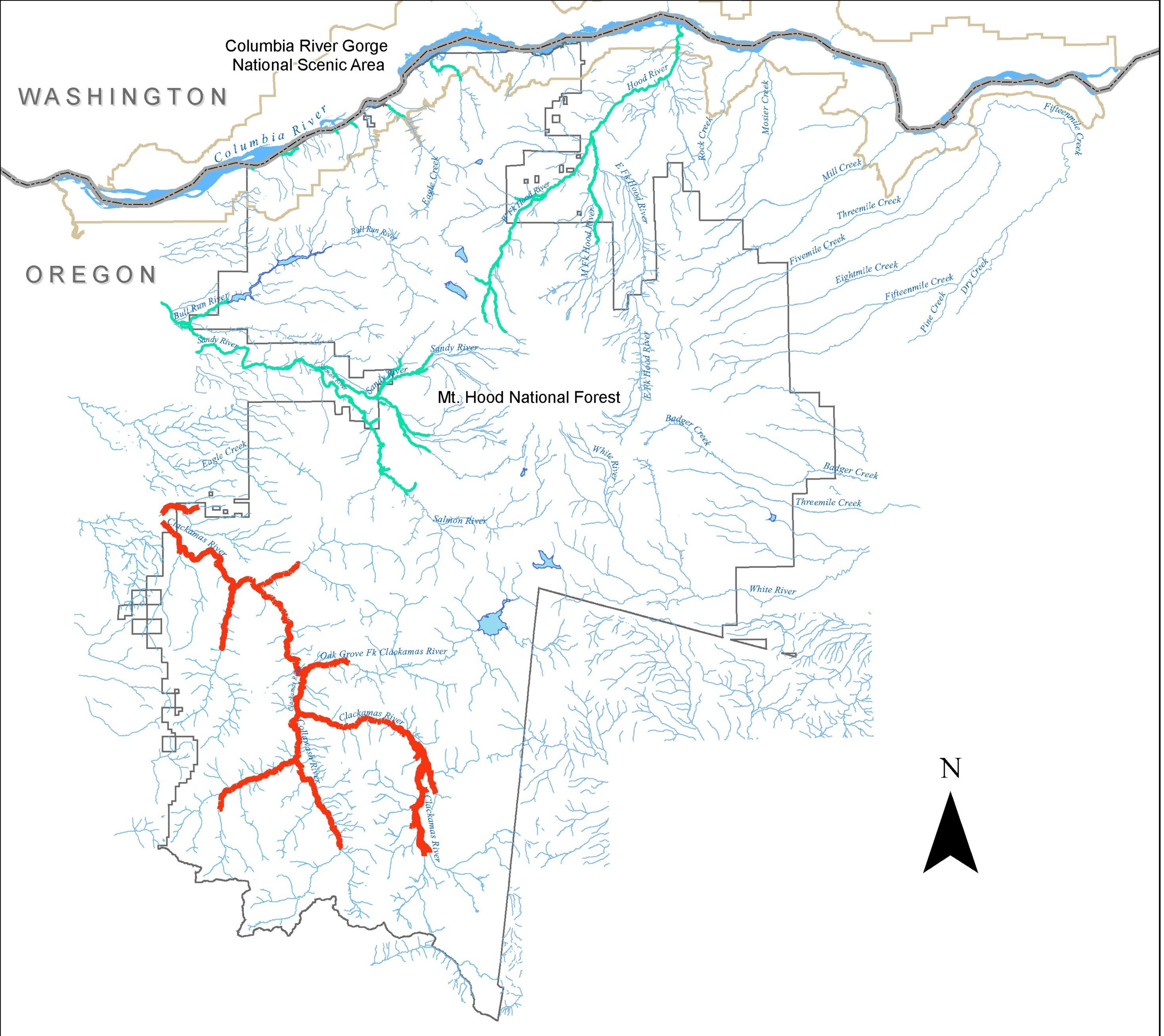
[3] It has not been confirmed that steelhead in the Mill Creek Watershed or other tributaries to the Columbia River near The Dalles are the same genetic stock as those found in the Fifteenmile Creek and Fivemile Creek watersheds. The USDA Forest Service assumes these fish are the same, but that has not been validated.



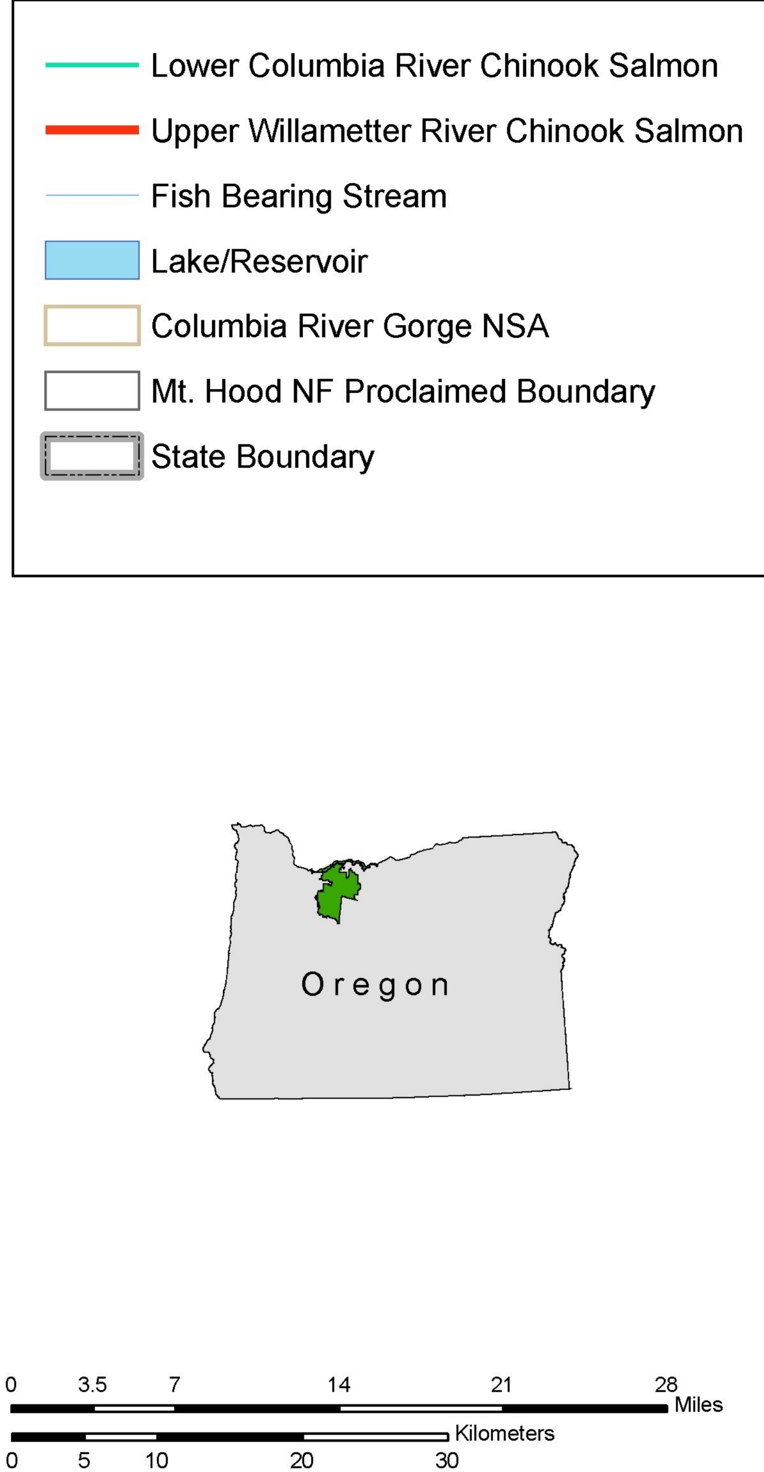


Figure 3-7. Lower Columbia River and Upper Willamette Chinook Salmon Distribution Map

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Upper Willamette River Chinook

Upper Willamette River spring Chinook salmon occur only in the Clackamas River Subbasin (Figure 3-7). The ESU consists of both naturally spawning and hatchery produced fish. These spring Chinook enter the Clackamas River Subbasin from April through August and spawn from September through early October. These fish primarily spawn and rear in the mainstem Clackamas River and larger tributaries. Spawning in the upper Clackamas drainage has been observed in the mainstem Clackamas from the head of North Fork Reservoir upstream to Big Bottom, the Collawash River, Hot Springs Fork of the Collawash River, lower Fish Creek, South Fork Clackamas River, Oak Grove Fork, and Roaring River.

The life history of Upper Willamette River Chinook includes traits from both ocean- and stream-type developmental strategies. The timing of the spawning migration is limited by Willamette Falls. High flows in the spring allow access to the Upper Willamette River Basin, whereas low flows in the summer and autumn prevent later-migrating fish from ascending the falls. The low flows may serve as an isolating mechanism, separating this ESU from others nearby.

Lower Columbia River Coho Salmon

Coho stocks occurring on the Forest are currently found in the Sandy, Clackamas, and Hood river systems, as well as in some West Columbia River Gorge tributaries (Figure 3-8). The indigenous run of coho salmon in the Hood River is at a very low level and may be extinct, but there is some natural reproduction occurring (French, 2006). The coho salmon that do enter the Hood River appear to primarily utilize the mainstem as well as the lower reaches of the East Fork Hood River.

The Clackamas River contains an early run stock and the last significant run of wild late-winter coho in the Columbia River Basin. Spawning occurs mid-September to the end of April with the peak occurring mid-February. Adults prefer deep pools and tributaries for over-wintering, while juveniles will seek out inundated floodplains and other protected slow-water habitats, such as side channels and slow water pools. Woody debris and habitat diversity are important to this species. Primary streams utilized in the Sandy River Basin include the Sandy River, Salmon River, Still Creek, and Zigzag River. In the Clackamas River, coho are found mostly in the Clackamas River, Collawash River, Fish Creek, Oak Grove Fork, and Hot Springs Fork.

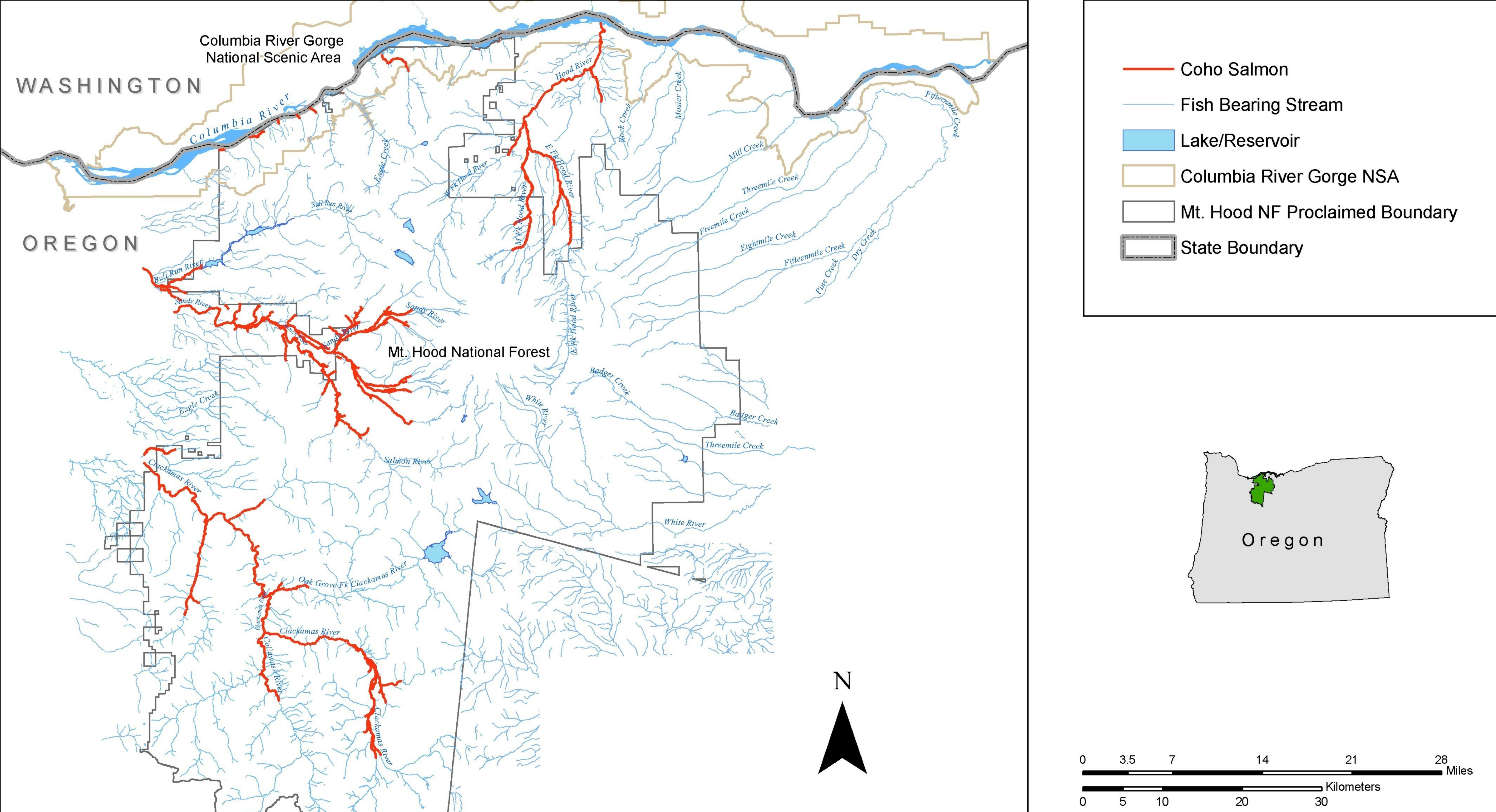

Figure 3-8. Lower Columbia River Coho Salmon Distribution

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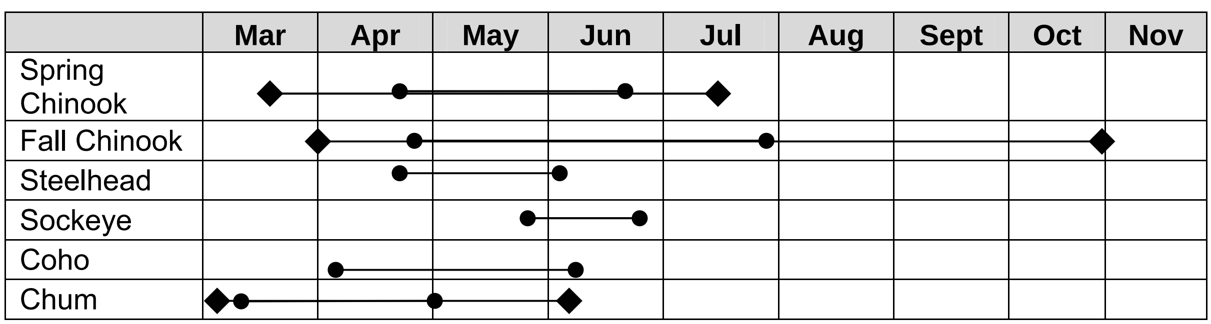
Listed Species Found Primarily in the Columbia River

The six anadromous salmonid stocks discussed below use the Columbia River primarily as a migration corridor to and from spawning and primary rearing areas in the middle and upper Columbia River Basin, well upstream of the action area described in this EIS. Both adults and juveniles migrate through the Columbia River Gorge during certain times of the year, and could be present during periods when invasive plant treatments occur. The period of time they spend in the Columbia River Gorge, however, is believed to be relatively brief, especially adults. With the exception of chum salmon, none of these species are known to utilize the Columbia River mainstem in the Scenic Area or Oregon tributaries for spawning or primary rearing.

Adult anadromous salmon and steelhead migrate in the main channel of the Columbia River, generally mid-channel and in the upper 25 feet (range one to 50 feet) of the water column. Outmigrating juveniles (smolts) tend to use near shore and off-channel habitat, but also will use mid-channel and deeper water habitats where the velocity is greater. Juvenile downstream migration behavior and timing (Table 3-30) varies greatly depending on species, age, season, photoperiod and habitat availability. Data for chum salmon are from seining data at various locations below Bonneville Dam as that is where most Columbia River salmon reside.

Table 3-30: Downstream juvenile migration timing for six federally listed salmonid stocks based on passage at Bonneville Dam. Data was taken from the Bonneville Dam Fish Passage Center for 2001-2005, except for chum salmon which is based on seining data below Bonneville Dam. The period between the dots is the primary migration period, but some individuals migrate during the longer period designated by the diamonds.



- **Upper Columbia River Steelhead:** This inland steelhead ESU encompasses the Columbia River Basin upstream from the Yakima River to the United States/Canada border. Adults return to the Columbia River in late summer and early fall, and most migrate quickly upstream to their natal streams. Some individuals, however, overwinter in mainstem Columbia River reservoirs and then ascend over dams in the middle Columbia River in April and May.

- **Snake River Steelhead:** The Snake River steelhead ESU is distributed throughout the Snake River drainage system, including tributaries in southwest Washington, eastern Oregon and north/central Idaho. Snake River Basin steelhead are generally classified as summer run, based on their adult run timing patterns. Summer steelhead adults enter the Columbia River from late June to October and would be expected to migrate upstream through the Columbia River Gorge primarily in July and early August.

- **Upper Columbia River Spring Chinook:** The drainages encompassing this ESU are between the Rock Island and Chief Joseph dams on the upper Columbia River. Adults would migrate upstream through the Columbia River Gorge primarily from March through May.

- **Snake River Chinook (spring, summer and fall runs):** This run consists of spring and summer Chinook salmon returning to the major tributaries of the Snake River. Snake River spring Chinook adults migrate through the Columbia River Gorge from March through June, and summer run adults would pass from June into September. Snake River fall run Chinook salmon enter the Columbia River in July and August and move quickly upstream as they are seen at the lower Snake River mainstem dams from August through November.

- **Columbia River Chum:** Chum salmon in the Columbia River once numbered in the hundreds of thousands of adults and, at times, approached a million per year. The total number of chum salmon returning to the Columbia River in the last 50 years has averaged perhaps a few thousand per year. The majority of the Columbia River chum salmon populations spawn and rear in the Columbia River and tributaries below Bonneville Dam. Some spawning has been documented in the mainstem Columbia River, as well as several tributaries in Washington. Spawning in Oregon tributaries below Bonneville Dam has not been documented.

  Up to several hundred adult chum salmon per year ascend Bonneville Dam, but little is known where of all these fish spawn. On the Oregon side of the river small numbers have been documented spawning in Eagle Creek and others in shoal areas of the Columbia itself near Multnomah Falls (Fiedler, 2006). Spawning in other Oregon tributaries to the Columbia River is possible. Columbia River chum enter the Columbia River beginning in late September, and spawning peaks November through December. Fry emerge from the gravel from February to April, and typically out-migrate within a month of emergence.

- **Snake River Sockeye:** This run of sockeye spawns at the highest elevation, and has the longest freshwater migration (over 900 miles) compared to any other sockeye population in the world. Adults return into the Columbia River in summer, with peak migration over Bonneville Dam in July.

USDA Forest Service, Pacific Northwest Region Sensitive Species

- **Redband Trout:** Redband/inland rainbow trout (redband trout) occur in the White River, Tygh Creek, Fifteenmile Creek, Fivemile Creek, and Middle Columbia/Mill Creek fifth-field watersheds on the Forest (Figure 3-9). Redband trout populations within the White River and Tygh Creek watersheds are genetically distinct from those in the Deschutes River and are unique among other redband trout populations east of the Cascades (Currens et al., 1990). Rainbow trout within the other watersheds listed above may be the redband subspecies (Behnke, 1992), but definitive genetic analysis has not been conducted.

Spawning occurs in the spring, fry emergence from the gravel normally occurs by the middle of July, but depends on water temperature and exact time of spawning. Redband rainbow trout prefer water temperatures from 50 to 57 ^{o}F, but have been found actively feeding at temperatures up to 77 ^{o}F in high desert streams of Oregon and have survived in waters up to 82 ^{o}F.

- **Columbia Duskysnail:** This species of aquatic mollusk has been found across the Forest during surveys conducted over the past several years (Mt. Hood National Forest, unpublished data). Although surveys have not been conducted in the Scenic Area, they are likely present in habitats described below. Habitat requirements for this species are fairly specific: cold, well oxygenated springs, seeps, and small streams, preferring areas without aquatic macrophytes (Furnish and Monthey, 1998). Individuals have not been found in larger streams and rivers, or glacial streams.

  Surveys for the Columbia duskysnail have been conducted at sites across the Forest for a wide range of projects. This mollusk has been found in many areas across the Forest and is likely to be present in seeps, springs, and smaller streams near some sites proposed for invasive plant treatment in this EIS.

  The Columbia duskysnail (and Basalt juga, discussed below) is also a Survey and Manage species as outlined in the Northwest Forest Plan. The Forest Plan was amended by the 2001 *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines*. Annual species reviews have been conducted since 2001 to incorporate the new information gained from surveys and from other research. Changes to species lists were made that include moving species to different categories, changing their range or taking them off the list. The most recent annual species review was documented in a memo on December 19, 2003.

  The decision to conduct surveys for all survey and manage species lies with the line officer based on input from resource specialists (USDA Forest Service and USDI BLM, 2001). The line officer needs to consider the probability of species presence as well as the probability that the project would cause a significant negative effect on the species habitat or the persistence of the species at the site. Surveys for the two survey and manage aquatic mollusks would not be conducted as part of this project, even though presence of the Columbia duskysnail at least is likely, because anticipated effects would not significantly affect habitat or species persistence at each site.

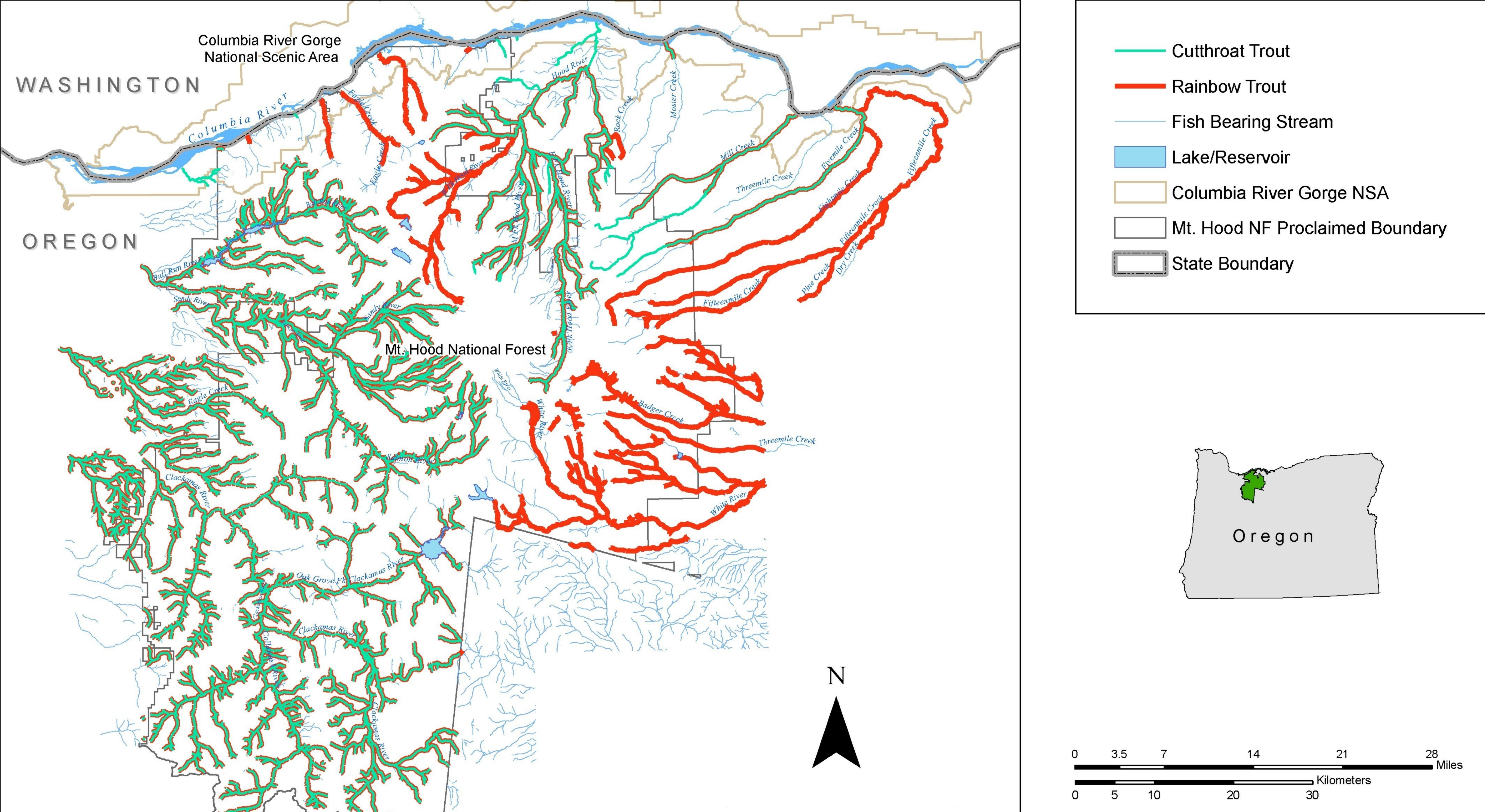


Figure 3-9. Rainbow and Cutthroat Trout Distribution

Other Important Aquatic Species

- **Basalt Juga:** These small snails have only been found at two location within the Oregon portion of the Scenic Area: in Canyon Creek just west of the town of Hood River and in several small seeps just above (south) Interstate 84 about half-mile east of The Dalles Dam. Individuals have been found at several locations on the Washington side of the Scenic Area and east of the Scenic Area on both sides of the river. They have never been found in any survey conducted on the Forest, and they are not believed to reside in Forest streams. Their habitat requirements appear similar to the Columbia duskysnail's (Furnish and Monthey, 1998). Given known locations, any small seeps, springs or streams within the Scenic Area are potential habitat where they may reside.

- **Pacific lamprey:** Relatively little is known about Pacific lamprey distribution and population status in streams within the Forest and Scenic Area. These fish have been documented in various watersheds including West Columbia River Gorge Tributaries, Fifteenmile Creek, Mill Creek, and Sandy River, as well as the Columbia River itself. Pacific lamprey are culturally important to indigenous tribes in the area and some tribal fishing does occur in Fifteenmile Creek near the mouth.

  The mapped distribution (Figure 3-10) reflects the known distribution based on spawning surveys, smolt trapping and personal observations by Forest Service fisheries personnel. It is likely they are more widespread than indicated in Figure 3-10, especially in Columbia River tributaries and the Sandy River Basin. A falls near the mouth of the White River is a complete barrier to all fish species thus Pacific lamprey are not present in this watershed upstream of that point. Dam barriers in the Hood and Clackamas rivers appear to preclude lamprey upstream, although some lamprey may ascend past North Fork Dam on the Clackamas.

  Pacific lamprey have a unique life history (Wydoski and Whitney, 2003). The adults spawn from April through July in streams. Eggs hatch in about three weeks and the larvae burrow into silt and mud in slower areas of coldwater streams. The larvae live in the stream bottom like this for four to seven years at which point they metamorphose into adults and migrate to the Pacific Ocean to begin their adult, parasitic lifestyle.

- **Coastal cutthroat trout:** Cutthroat trout occurring in waters of the Forest and Scenic Area are composed of two native stocks: an anadromous (sea-run) form and resident stock. These fish are a Management Indicator Species on the Forest and Scenic Area. Resident populations of cutthroat are widespread throughout much of the Forest and Scenic Area (Figure 3-9). Historically, sea-run cutthroat trout occurred in the Clackamas River, Sandy River, and Hood River, but these anadromous cutthroat populations appear to have greatly declined throughout these watersheds. Consistent indicators in abundance trends for most populations of either resident or sea-run cutthroat trout do not exist. Coastal cutthroat trout tend to spawn in very small (first- and second-order) tributaries. They spawn from December to May; young emerge from gravel during June and July. Young fry move into channel margin and backwater habitats during the first several weeks. During the winter, juvenile cutthroat trout use low velocity pools and side channels with complex habitat created by large wood. Coastal sea-run cutthroat juveniles rear in freshwater for two to three years.

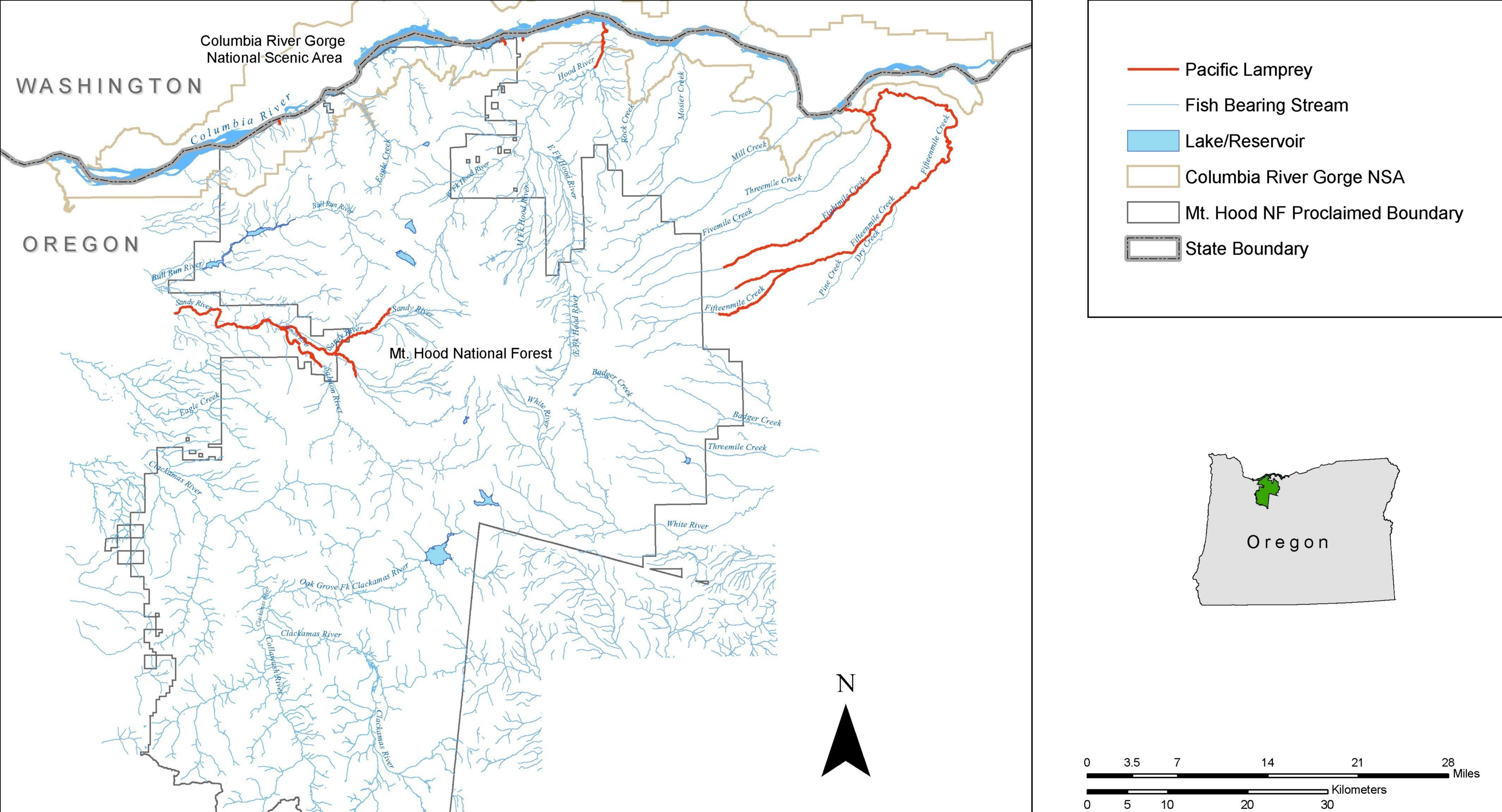


Figure 3-10. Map of Pacific Lamprey Distribution

Critical Habitat

Critical habitat has been designated for Columbia River bull trout, Lower Columbia River steelhead trout, Mid-Columbia River steelhead trout, Lower Columbia River Chinook salmon, and Upper Willamette River Chinook salmon. Much of the discussion concerning critical habitat, including effects analyses, will center on the primary constituent elements (PCE) described below for each species.

Bull Trout Critical Habitat

Bull trout critical habitat has been designated in the mainstem Hood River, West Fork Hood River, Middle Fork Hood River, and a short section of the East Fork Hood River (70 Federal Register 56233, September 26, 2005) (Figure 3-11). The upper limit of designated critical habitat was halted at the Forest boundary in the West Fork and Middle Fork. No bull trout critical habitat was designated elsewhere on the Forest or Scenic Area.

The PCE of bull trout critical habitat are derived from studies of bull trout habitat requirements, life history characteristics, and population biology. The PCE are:

- Permanent water having low levels of contaminants such that normal reproduction, growth and survival are not inhibited.

- Water temperatures ranging from 36 to 59 ^{0}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 for 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 over-winter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine substrate less than 0.25 inch 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 connectivity to contribute to water quality and quantity.

- Migratory corridors with minimal physical, biological, or chemical barriers between spawning, rearing, over-wintering, 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 non-native species present.

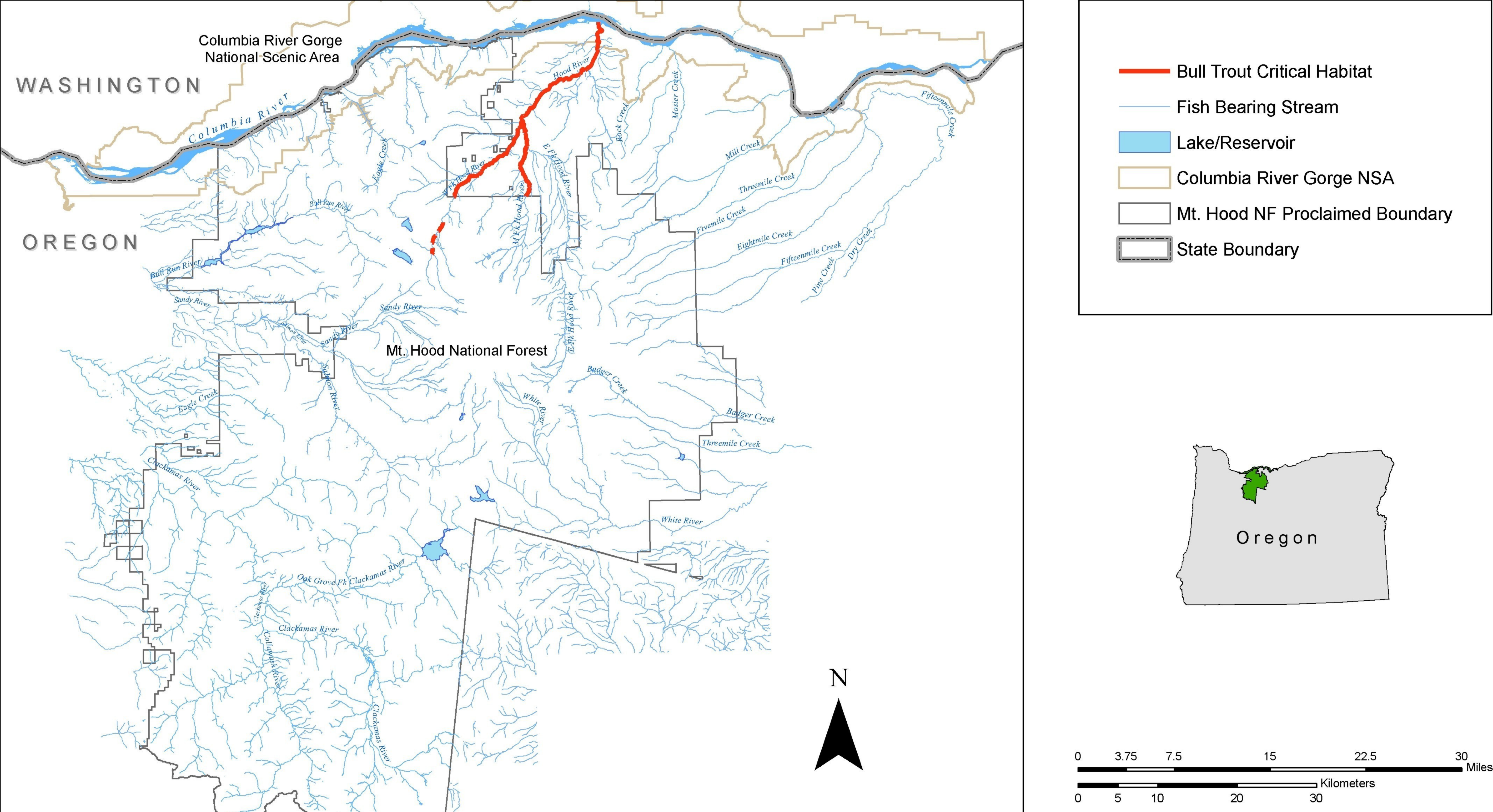


Figure 3-11. Bull Trout Critical Habitat

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Steelhead Trout and Chinook Salmon Critical Habitat

Critical habitat for several evolutionarily significant units of the above species was designated in September 2005 by the NMFS (70 Federal Register 52630, September 2, 2005). Unlike bull trout critical habitat, which did not include stream reaches on the Forest and Scenic Area, critical habitat for steelhead and Chinook encompasses a large amount of the available habitat across all land ownerships. Lower Columbia River steelhead and Chinook critical habitat is the most ubiquitous across the Forest and Scenic Area because these species are the most widespread (Figure 3-12). Mid-Columbia River steelhead critical habitat is present only in the Fifteenmile and Mill Creek watersheds on the eastside of the Forest, and some small tributaries to the Columbia River in the Scenic Area. Critical habitat for Upper Willamette River Chinook is centered in the Clackamas River Subbasin (Figure 3-13).

Primary constituent elements for steelhead and Chinook are sites and habitat components that support one or more life stages. The first three, listed below, refer to freshwater habitat components, whereas the last three relate to estuarine or marine habitat components. Nothing proposed in any alternative would have an affect on estuarine or marine habitat components, thus they are not discussed.

- Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development.

- 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.

- Freshwater migration corridors free of obstruction and excessive predation 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.

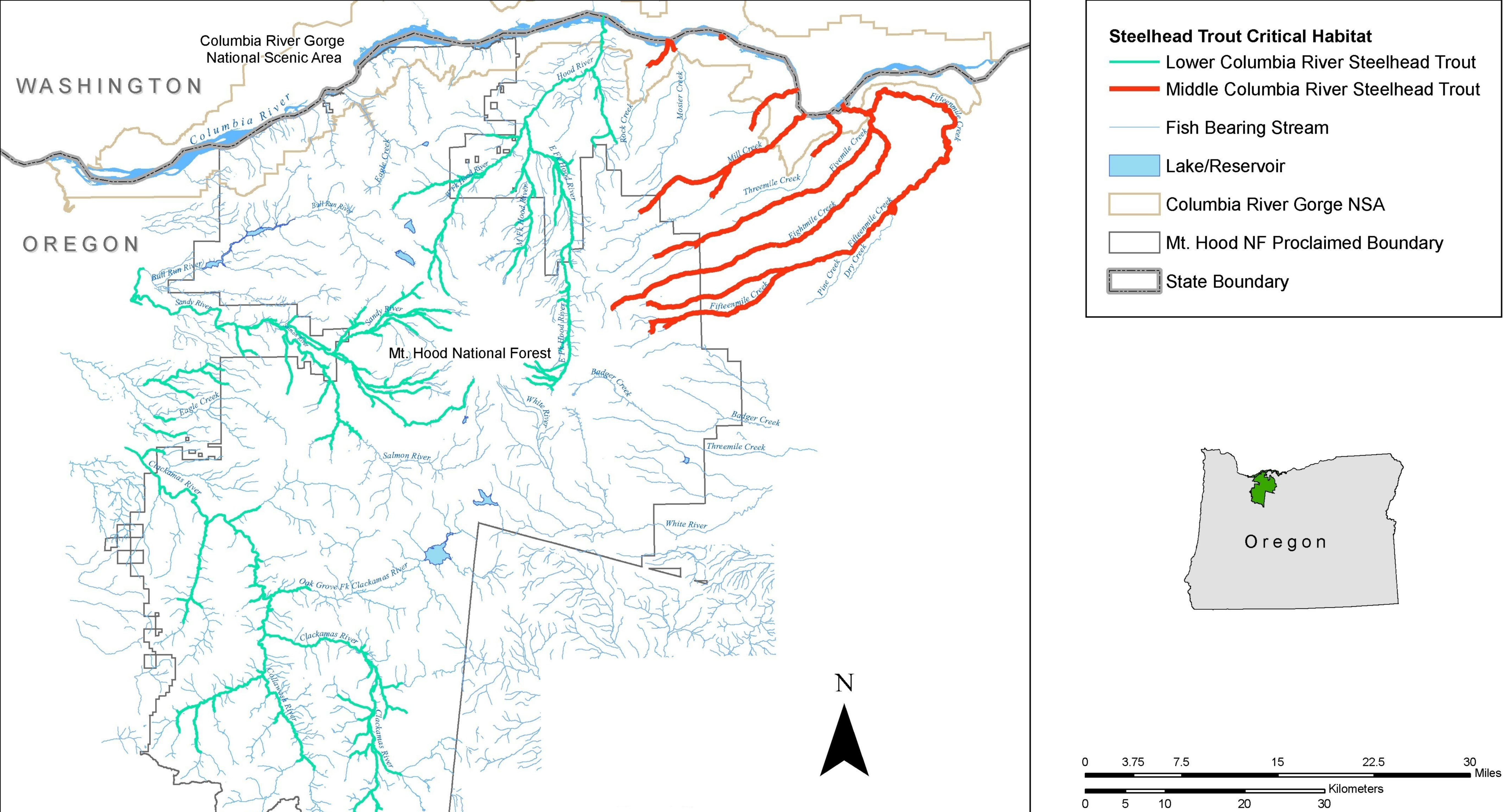

Figure 3-12. Lower and Middle Columbia River Inland Steelhead Trout Critical Habitat

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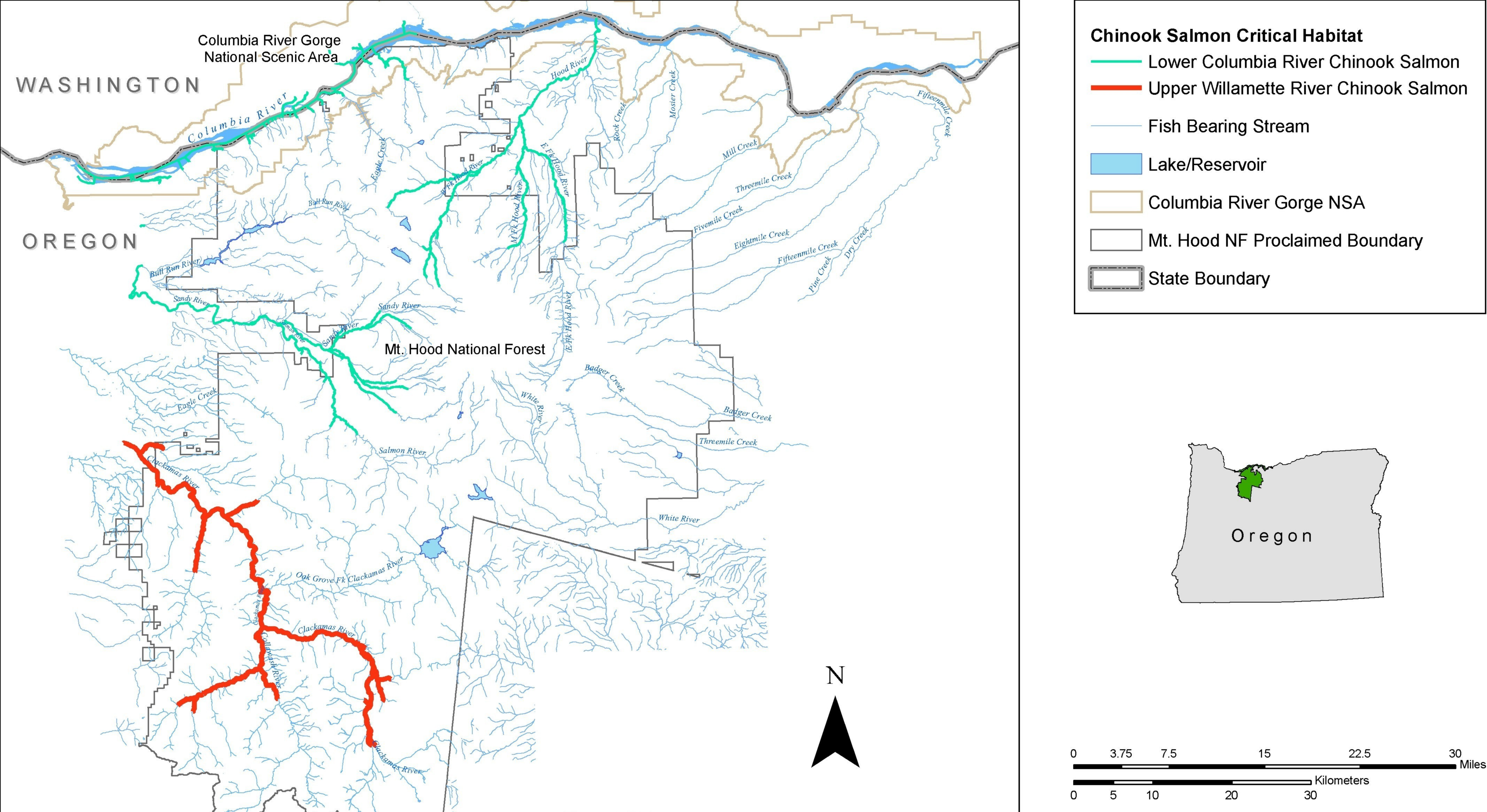

Figure 3-13. Lower Columbia River and Upper Willamette River Chinook Salmon Critical Habitat

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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 – in this case Chinook and coho salmon. Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all proposed actions that may adversely affect EFH. Adverse effects include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH.

Pacific salmon (Chinook and coho) EFH was designated in 1999, but the actual identification of stream reaches considered to be EFH was left to the action agencies, such as the USDA Forest Service. EFH is coincident with Chinook salmon critical habitat where it's designated. In addition, however, are streams within the Fifteenmile Creek and Mill Creek watersheds that support either Chinook and/or coho, but were not designated as critical habitat. Specifically, the USDA Forest Service considers the following stream segments as EFH: Fifteenmile Creek from its mouth to the Forest boundary; Eightmile Creek from its mouth to the Forest boundary; Mill Creek from its mouth to the confluence of the North and South Forks; South Fork Mill Creek from its mouth to the impassable falls at near river mile 2.3; and North Fork Mill Creek from its mouth to the Forest boundary.

There are several streams in the Scenic Area that contain EFH. Most of these stream segments are short as the distance between creek mouths and natural impassible barrier falls is often less than one-half mile. There are a few exceptions, however, such as the Sandy River, Tanner Creek, Herman Creek, and Viento Creek, which all have a mile or more of EFH.

Aquatic Habitat Conditions

Aquatic habitat conditions across the Forest and Scenic Area vary depending on the location, past land management activities, and natural events such as floods, fire, and debris torrents. In general, streams that have experienced little to no land management are in good condition even though Forest Plan standards (i.e., pools per mile, pieces of wood per mile) are not always met. Some of these streams have been impacted by natural events and, indeed, were formed or maintained by such events. Glacial streams such as White River, Newton Creek and Eliot Branch of the Hood River are examples of streams exhibiting relatively degraded conditions due to natural events (in this case repeated glacial debris flows).

Fish habitat conditions within watersheds where land management has occurred range from poor to good, depending on the type and scale of disturbance, proximity to streams, and duration of land management activities. On the westside of the Cascades, watersheds have been affected by logging, dams, road construction, and past flood control activities. Some grazing has occurred in the Clackamas River Subbasin. On the eastside, major land management activities contributing to degraded aquatic habitat have included logging, road construction, irrigation, agriculture, and grazing. Separately and cumulatively, these activities have resulted in some loss of connectivity, reduction of stream shading, alteration in riparian vegetation and function, increased sedimentation, reduced instream large woody debris, and loss of pools.

Despite past impacts, most streams or stream segments contain good quality habitat. There are no streams with degraded conditions over their entire length within the Forest and Scenic Area, even those streams listed on the DEQ 303d list. A common scenario is shorter stream segments experiencing some impairment interspersed with good habitat quality reaches. Water quality, in terms of temperature and fine sediment is good to excellent across most of the Forest and Scenic Area with few streams listed on the DEQ 303d list (See Table 3-22 in Section 3.9 – Water Quality), but in some streams habitat conditions decline further downstream.

Actions proposed in all alternatives would not affect physical stream habitat parameters such as pool quantity and quality, large woody debris levels, channel geometry, stream flow, or the amount of spawning size gravel. Treatment of invasive plants would not target conifers or deciduous trees, thus impacts to these species and the benefits they provide as habitat elements would be negligible. As such, there will be no further discussion of these parameters, including describing existing conditions.

Instead, existing habitat conditions and subsequent analysis will focus on those habitat elements that could be affected by invasive plant treatment: water temperature, fine sediment levels, water chemistry, dissolved oxygen, and nutrients. Existing conditions for these elements focus on areas where conditions are poor, because the vast majority of streams within the Forest and Scenic Area are in good condition based on available information from water quality and physical habitat surveys. A detailed discussion of these elements can be found in Section 3.9 - Water Quality. The discussion below focuses on the relationship between these habitat elements and fish populations/habitat.

Water Temperature

Water temperatures across the Forest and Scenic Area are generally cool and fall within preferred ranges for salmonids. Preferred temperatures vary by species and lifestage, but generally range from 10-16 ºC for many salmonids, although spawning often occurs at lower temperatures (Bjornn and Reiser, 1991). Some streams near the forest boundary exceed 16 ºC in late summer and fall, but there are no known streams within the Forest and Scenic Area where water temperatures approach lethal limits of 23-29 ºC. In terms of fish and other aquatic animal requirements, shade is most important in water temperature regulation. Primary shade producing elements within the Forest and Scenic Area are coniferous and deciduous trees and, to some extent, topography. The amount of shade varies across the Forest and Scenic Area, and in some cases shade has been reduced due to land management activities such as timber harvest, roads, and grazing.

Fine Sediment

Levels of fine sediment (defined here as sand or silt <1 mm in diameter) in spawning habitat or riffles within stream reaches across the Forest and Scenic Area vary widely depending on a variety of factors, including parent soil type, stream size, gradient, flow regime, water source (e.g., glacial, spring-fed, snowmelt), and past land management activities. Many streams on the Forest in particular have naturally high sediment loads given their glacial origin. Local fish stocks and other stream dwelling animals have evolved to survive in these conditions. Many studies have taken place to try and determine the amount of fine sediment in spawning gravel that limits survival of salmonid embryos. Many investigators have accepted that significant embryo mortality can be expected when fine sediment (particles <0.8 mm in diameter) approaches or exceeds 20 percent of the redd (Waters, 1995)

As mentioned above, there are segments of some streams with high amounts of fine sediment that may be detrimental to salmonid spawning and egg incubation, reduce insect production or survival, and may decrease available rearing habitat by filling pools or other slow water areas. In glacial streams, such as the East Fork Hood River, this is largely a natural phenomenon. In non-glacial streams within the Forest the amount of fine sediment in suitable spawning areas and riffles can exceed 20 percent, thus exceeding the standards set in the LRMP. This standard is exceeded in streams that have experienced little to no land management indicating the source is natural, at least in some areas.

Water Chemistry

There are no known streams or stream reaches within the Forest or Scenic Area that are impaired for water chemistry (in this context water chemistry refers to the presence of herbicides, pesticides, or other chemicals). Herbicide application to control invasive plants to date has been limited (see Section 3.10.2.1). Likewise, the use of pesticides, fertilizers, and other chemicals agents within the Forest and Scenic Area has not been a common occurrence. Mining utilizing cyanide leach methods has not occurred in this area. As such, surface waters do not contain large amounts of chemicals and there are no areas with long standing chemical sources leading to degraded conditions for aquatic organisms.

Dissolved Oxygen

Dissolved oxygen (DO) levels, which are tied to water temperature, are believed to be well within the tolerable range for salmonids in streams across the Forest and Scenic Area. Salmonid DO requirements vary somewhat depending on the life stage (Bjornn and Reiser, 1991); incubating eggs in the gravel may be the most susceptible to low DO levels. Results from the literature vary, but levels of 8 mg/L or higher have been correlated with high survival of embryos and alevins. Spawning and rearing salmonids can survive DO concentrations <5 mg/L, but growth, food conversion efficiency, and swimming performance may be adversely affected (Bjornn and Reiser, 1991). In summary, DO levels above 8 mg/L appear to satisfy living requirements for adult and juvenile salmonids.

Forest and Scenic Area streams where DO has been measured, which are relatively few (at least on a regular basis), generally have DO levels in excess of 8 mg/L. Since DO is linked closely with water temperature (increased water temperatures decrease the solubility of DO in the water, thus decreasing DO levels), and since water temperatures are well within the tolerable range for salmonids across the Forest and Scenic Area, it is assumed that DO levels naturally fall within the acceptable range.

3.10.2. Effects Analysis[4]

3.10.2.1. Alternative 1 – No Action Alternative

Actions proposed in this alternative would continue already approved invasive plant treatments at locations across the Forest and Scenic Area. Using 2003 as an example, 1,235 total acres were treated with over half (58 percent) of the total acres estimated to lie within riparian reserves and an estimated 23 percent within the aquatic influence zone (AIZ) (Table 3-31). Within the Forest, the vast majority of sites were located on the Barlow Ranger District within the White River, Middle Deschutes River, and Tygh Creek fifth-field watersheds, although there were relatively large areas available for treatment in the Upper Sandy River and Middle Clackamas River watersheds. Most treatment in the Scenic Area occurred in the Sandy River Delta.

Table 3-31: Acres treated within upland areas, riparian reserves, and the aquatic influence zone in 2003 within the Forest and Scenic Area. The total acres treated was the actual amount treated, but the area within each land type was estimated based on the percentage of each land type treated from 1999-2003.

Land Type	Acres (and Percent of Total) of Treatment		
	Scenic Area	Forest	Total
Upland Area	142 (21%)	381 (68%)	523 (42%)
Riparian Reserve	533 (79%)	179 (32%)	712 (58%)
Aquatic Influence Zone	160 (24%)	118 (21%)	278 (23%)
Total Acres Treated*	**675**	**560**	**1235**

* Note the total acres treated is the sum of the upland area and riparian reserve area only. The riparian reserve area includes the aquatic influence zone.

4 Additional information regarding the impacts of this project on fish species is contained in Fisheries Biological Evaluation and Fisheries Biological Assessment. Also, additional information on a variety of aquatic species is available in Appendix W – Summary Tables of Site-Specific Herbicide Effects for Various Aquatic Species.

Direct and Indirect Effects

Existing treatments already occurring under existing NEPA are not extensive or aggressive enough to eradicate, or even control, existing invasive plant infestations. In addition, many new infestations would not be treated under this alternative. As a result, the biggest effect of the No Action Alternative on aquatic organisms and ecosystems is the continued existence and spread of invasive plants that could out-compete native vegetation. Severe infestations of some invasive plant species could negatively affect a variety of riparian functions at the site-specific scale including shade and soil stability. Although not every infestation would reduce aquatic habitat quality, there is an increase in the risk of accelerated impairment without aggressive treatment.

Direct and indirect effects from both herbicide and non-herbicide treatments are possible under this alternative. Effects have already been described in the environmental analyses that lead to approval of existing invasive plant treatments. There are stipulations regarding treatments in riparian areas in each of the environmental analyses that limit effects to aquatic species and habitat. These stipulations vary but include no herbicide treatment buffers, no spray buffers, and no mechanized equipment zones adjacent to streams. In addition, prevention practices included in the Invasive Plant ROD (2005b) would be applied to currently approved treatments, providing an additional layer of protection for aquatic resources.

Cumulative Effects

Cumulative effects on aquatic fauna and flora from invasive plant treatment across the Forest and Scenic Area are possible given repeated treatments each year and over the course of several years, as well as from past, present and future land management activities across all land ownerships that could affect the habitat elements described above. The cumulative effects analysis discussed herein, and for Alternatives 2 and 3 below, address the past, present and future invasive plant treatments across the project area and downstream on salmonids, macroinvertebrates, and aquatic plants/algae.

The physical scope of this cumulative effects analysis incorporates the entire Forest and Scenic Area, as well as non-federal lands located within the fifth-field watersheds that lie partially on the Forest and Scenic Area (See Section 3.2.4). Discussion of the latter is tempered with the knowledge that herbicide use and other activities that could contribute to cumulative effects are extensive, plus there is no known tracking system or database that definitively summarizes such activities. The time scale associated with this cumulative effect analysis is 10 to 15 years.

Land management activities to be considered in this analysis are those that could affect the habitat and biological elements discussed above, primarily shade, water temperature, nutrients, dissolved oxygen, food resources, and fine sediment and turbidity. Site-specific and cumulative effects from herbicides on aquatic fauna and flora are discussed in the Alternatives 2 and 3 sections. The full scope of activities that could affect one or more of the above elements is extensive; this discussion will focus on those that are believed to have a larger potential impact. These activities are as follows:

- Timber harvest
- Road building and maintenance
- Agricultural practices
- Herbicide application
- Urban influence

The following discussion details potential or expected effects on habitat and biological elements from each of the land management activities. It is organized by the element being discussed as one or more land management activities could affect any given element. A comparison of invasive plant treatment effects under the No Action Alternative to other activities is presented. Much of the following discussion would apply to cumulative effects associated with the two action alternatives and thus will be referred to extensively in those sections.

Water Temperature

Water temperature is closely linked to the amount of shade provided by vegetation, although other factors such as stream flow also help moderate temperatures. The activities described above that could reduce shade (e.g., timber harvest, roads, grazing) also could lead to corresponding increases in water temperature, if the amount of shade removed or artificially maintained at a low level affects long reaches of stream. Summer water temperature increases resulting from shade loss are more pronounced in small streams, especially on the eastside of the Cascades where summer air temperatures are generally warmer for longer periods of time.

Aside from shade reduction, the only other land management activity implemented as part of any of the above activities that could have a potentially large impact on water temperature are water withdrawals for irrigation, power production, and/or municipal use. Water withdrawals for these purposes occur at a large number of locations across the Forest and Scenic Area, as well as from downstream reaches. Increases in water temperature from water withdrawals would be more likely in smaller streams, reasoning that a higher percentage of the total flow would be diverted, and on the eastside of the Cascades where less water in streams, coupled with warmer air temperatures, would result in water temperature increases. There are certainly instances, however, where large streams experience significant water withdrawals during times of the year when increased water temperatures result downstream. The East Fork Hood River near the town of Parkdale (below the Forest) is one example.

As previously mentioned, there has been an extensive effort to monitor water temperature in streams across the Forest and Scenic Area, and with a few exceptions these streams meet Oregon DEQ water temperature criteria. It appears then, that although water temperatures in streams within the Forest and Scenic Area may have risen as a result of shade reductions or water withdrawals, there are few instances where these increases lead to DEQ standards not being met. Below the Forest boundary, especially east of the Cascade crest, many streams reaches do not meet DEQ temperature standards for a variety of reasons.

Potential increases in water temperature resulting from invasive plant treatments authorized in the No Action Alternative would not lead to a cumulative increase in water temperature in any stream within the Forest or Scenic Area, or downstream from either the Forest or Scenic Area. This is based on the very small amount of typical riparian treatment across all fifth-field watersheds. These treatments would not reduce shade enough to increase water temperatures due to the small size of treated area and the fact that the majority of species treated do not provide shade.

Nutrients and Dissolved Oxygen

These two habitat elements are discussed together as they often are interrelated, although DO levels are also correlated with water temperature. Increased nutrient levels in area streams could result from a variety of factors including, but not limited to, fertilizer application near or in streams, large amounts of decomposing vegetation, point or non-point pollution sources that increase nitrogen and/or phosphorus levels, and the presence of reservoirs that could act as nutrient sinks, releasing nutrient rich water compared inflow conditions. Increases in nutrients could stimulate algae and macrophyte growth, which in turn could lead to increased oxygen demand and subsequent reductions in DO.

Of the land management activities presented above, agricultural practices would have the highest potential to increase nutrient levels in area streams. As such, most increases, both in the past and foreseeable future, would occur primarily on non-federal land. One exception, at least in the past, is fertilization of forested areas to promote new tree growth. The application of fertilizers in the Forest, and especially Scenic Area, is now very uncommon. The effects of fertilizer application are relatively short-term since the fertilizer is quickly taken up by aquatic fauna and/or diluted. Past forest fertilization, therefore, would have resulted in a nutrient spike that could have stimulated plant growth for a short period, but not a sustained amount of time. Future fertilization projects are not scheduled in the Forest or Scenic Area, but the use of fertilizers on other federal ownerships, or state or private lands is possible.

Common agriculture practices on both sides of the Cascades involve the application of fertilizers. In addition to lands designated for agriculture, many private homeowners apply fertilizers to lawns and/or gardens that could then be washed into surface waters. Although applying fertilizer on one lawn is negligible, application across an entire neighborhood could result in nutrient spikes or prolonged increases in nutrient levels. Agriculture fertilizer application could occur across large land areas and, at times, could result in large influxes of nutrients into surface water. In areas where shade also is limited, the combination of increased nutrients with increased sunlight could result in large amounts of plant and algal growth.

Nutrient increases due to decaying plant matter in most areas would primarily be a small scale, natural process. Invasive plants treated on the Forest and Scenic Area would be left on the ground and not disposed of in or near creeks. Since invasive plant treatments currently authorized are very small in scale and located primarily away from surface water, there is little chance that large amounts of cut or killed vegetation would be deposited in streams. Consequently, an increase in nutrients even at the site scale would be small and the cumulative contribution to other nutrient sources downstream would be irrelevant. Similarly, decreases in DO levels, either from an increase in nutrients and subsequent biological oxygen demand and/or increased water temperatures, would be insignificant.

Food Resources

It is difficult to quantify the current state of food resources in streams within the Forest and Scenic Area as well as downstream. Given the generally good water quality seen in streams within the Forest and Scenic Area it is probable that aquatic communities also are in good health. Areas of degradation, both natural and human exacerbated, do exist: floral and faunal communities likely are somewhat impaired in these areas. Also, some water quality parameters in some watersheds worsen downstream, therefore it stands to reason that floral and faunal communities at least have been altered in terms of species diversity.

Since the impacts to habitat from already approved invasive plant treatments would not contribute to cumulative habitat and water quality effects downstream, there also would not be cumulative effects to food resources. Treatments in the aquatic influence zone are small in scope, spread across many fifth-field watersheds, and would not result in measurable effects on habitat, and thus food resources.

Fine Sediment and Turbidity

Erosion and sedimentation are natural processes that occur in every landscape and stream system. Land management activities could exacerbate this process. Timber harvest activities both during and following implementation could disturb soil, reduce vegetative ground cover, and reduce or eliminate the duff layer, leading to increased erosion rates that may increase stream sedimentation. Past timber harvest across the Forest and on other federal, state, and private land was widespread, occurring in virtually every fifth-field watershed and in many areas resulted in large amounts of fine sediment entering streams. Little timber harvest has occurred in the Scenic Area in the last several decades.

Roads could be a significant, chronic source of fine sediment to streams and other water bodies. Native surface and gravel roads, in particular, often contribute large amounts of fine sediment to streams. Road densities vary considerably across the landscape depending in large part on past timber sale activity and urban development (see Section 3.9 – Water Quality). The sediment contribution per unit area from roads could be much greater than all other land management activities combined, even compared to other logging activities that disturb soil such as log skidding and yarding (Gibbons and Salo, 1973). Roads in non-forested and urban areas also could contribute large amounts of sediment to streams, especially during storm events.

Erosion from crop fields and pastures also could be significant depending on location and farming practices. In areas where vegetated buffer strips are incorporated much of the eroded soil could be trapped before entering streams, likewise no-till farming practices that leave stubble over the winter also reduce erosion rates. Even so, erosion from a farmed field would be greater than a fully vegetated piece of land. Livestock grazing also could accelerate soil erosion in and along streams because cattle reduce the amount of soil stabilizing riparian vegetation, and often trample and degrade stream banks, increasing erosion susceptibility.

Urban areas also could be sources of fine sediment. Homes and other structures are sometimes built adjacent to streams with partial or complete riparian vegetation removal, or replacement with other species that may not provide the same degree of soil stability. Impervious surfaces, such as parking lots and roads, decrease infiltration and increase storm related runoff peaks, potentially exacerbating stream bank erosion.

Although some soil erosion could occur resulting from invasive plant treatment under the No Action Alternative, the amount of fine sediment entering streams would be negligible. Most treatments involve some form of a buffer for mechanized treatment, and hand applied treatments such as hand pulling or spot herbicide spraying have a low risk of soil disturbance. Compared to past, present, and future land management activities else that either resulted in large-scale erosion, or have a relatively high potential to do so, invasive plant treatments currently authorized would contribute very little to the cumulative sediment load in area streams.

3.10.2.2. Aquatic Organism Screening and Analysis Methodology – Action Alternatives

Large Scale Analysis

To focus the effects analysis on particular sites that could result in higher risk of effects from herbicide treatments to aquatic organisms, a screening process was used. The process incorporated a number of physical and chemical factors that, when looked at together, identified areas needing to be analyzed in greater detail because they could lead to a higher risk of detrimental effects to aquatic organisms. These factors included: whether any of the proposed treatment area was within a Riparian Reserve; proximity of treatment areas to streams, lakes, and pond;, and the potential of any herbicide to enter water at a high enough concentration to potentially result in a biologically relevant response from aquatic organisms, which is an action or result of an action that significantly impairs or disrupts essential behavioral patterns such as breeding, feeding or sheltering. “Biological relevance” is meant to convey the idea that there are a range of actions that may have some small effect on a listed species or the species’ habitat, but that effect would not significantly affect essential behavioral patterns such as breeding, feeding, or sheltering. This screening process resulted in a subset of proposed treatment sites that may have a higher risk of effects from herbicides to aquatic organisms.

Site Specific Analysis

A more detailed analysis was conducted on the higher risk sites identified by the process described above. This analysis included an examination of a variety of local site parameters and PDC that influence delivery of herbicides to provide a qualitative assessment of risk of detrimental herbicide effects to aquatic organisms. Local site-specific field conditions (other than soil type and precipitation) were compared with those assumed in the SERA risk assessments and worksheets to determine if the amount of herbicide entering water would have the potential to be higher or lower than the model output. The following parameters were examined:

- *Average site slope:* If the actual slope was greater than 10 percent, modeled results may underestimate actual herbicide concentrations in water. If the actual slope was less than 10 percent, modeled results may overestimate actual herbicide concentrations. (Source of data: GIS)

- *Stream flow (based on stream size):* If the actual stream flow was greater than 1.8 cfs, modeled results may overestimate actual herbicide concentrations. If the actual streamflow is less than 1.8 cfs, modeled results may underestimate actual herbicide concentrations. It was assumed that streams greater than seven feet in width had flows greater than 1.8 cfs, and streams narrower than seven feet had lower flows. (Source of data: Forest and Scenic Area stream surveys)

- *Riparian vegetation type:* If the actual vegetation type is non-vegetated, modeled results may underestimate actual herbicide concentrations. If the actual vegetation type is shrub or tree dominated, modeled results may overestimate actual herbicide concentrations. (Source of data: GIS)

- *Acres proposed for treatment within 100 feet of the stream/pond:* If the actual treatment site is located 100 feet or further from the closest water body, the modeled results may overestimate the actual herbicide concentration. Similarly, if less than 10 acres of the block is within 100 feet of the water body, the modeled results may overestimate the actual herbicide concentrations. On the other hand, if more than 10 acres of the treatment block is located within 100 of the closest water body then the modeled results may underestimate actual herbicide concentrations. Note that the modeled block width was 50 feet, but for our screening process and site specific analysis the 100 foot aquatic influence zone was used as this area had already been calculated for each site. (Source of data: GIS)

The above parameters were examined to identify whether site conditions were similar to those modeled in the GLEAMS runs for the SERA Herbicide Risk Assessments (2001b, 2003a, 2003b, 2003c, 2004a, 2004b, 2004c, 2004d, 2004e, 2004f) or not. Other model assumptions were also taken into consideration and evaluated when comparing worksheet outputs with actual sites. For example, the model assumes all herbicide would be broadcast sprayed up to the water's edge, which would not occur under either of the action alternatives. Another assumption is that the treatment block, or site, acts as a small drainage with all the applied herbicide emptying into the adjacent water body at a single point. This is not the case in a real life herbicide application situation. Finally, the model assumes that herbicide entering water bodies would be diluted instantly. The amount and rate of dilution would vary depending on the mixing zone characteristics (see Section 3.9 – Water Quality).

Application and Expected Benefits of Aquatic Project Design Criteria

The PDC related specifically to water quality and aquatic ecosystems, including standards adopted as part of the Invasive Plant ROD (2005b), were intended to greatly reduce the undesired effects of invasive plant treatments. The application of the PDC at each site would further minimize, and in some cases eliminate, effects to aquatic flora, fauna, and habitat regardless of the treatment method. The following discussion outlines how the consequences of the various proposed treatments would be minimized by implementation of the PDC.

One important PDC (B.1) was intended to inform applicators at the beginning of each season of the spray sites and associated sensitive areas. This briefing would ensure each applicator was aware of the presence and location of sensitive aquatic areas, as well as pertinent operational details, including acceptable treatment timing. The presence of ESA listed fish species and the preferred timing of treatments to avoid particularly important or sensitive life stage periods (such as spawning and egg incubation) would be addressed. This would result in increased effectiveness to properly implement all PDC.

Several PDC, including B.9 and G.5, would greatly reduce the chance that treatment activities would disturb aquatic fauna during implementation. These PDC limit human access to streams or other water bodies and ensure mechanized equipment (tractors, all-terrain vehicles) would not operate directly adjacent to water bodies. Since sensitive stream segments and/or time periods would be identified up front as outlined above (PDC B.1), along with the PDC stipulating Oregon Department of Fish and Wildlife Guidelines for Timing of In-Water Work Periods (Appendix M) would be followed, personnel conducting herbicide treatments would not enter any streams with listed fish species during sensitive spawning and rearing time periods. The need for workers to enter water is very low anyway because all invasive plants proposed for treatment, with the exception of knotweed species, are terrestrial species and PDC stipulating herbicide would not be applied in water.

Numerous PDC (B.3, G.5, G.6, I.1) are intended to minimize the risk of soil erosion into adjacent water bodies by restricting areas where mechanized spraying equipment could operate, as well as the incorporation of erosion control measures at any site where vegetation removal could result in sediment delivery to water. The intent is to allow treatment to address site specific invasive plant objectives while ensuring that treatment does not result in excess erosion to water bodies.

Herbicide Project Design Criteria

Standards outlined in the Invasive Plant ROD (2005b), as well as the PDC in this EIS, are designed to avoid water contamination from herbicides. Many of the PDC regulate operational considerations of herbicide application, such as how much herbicide could be transported each day, the distance from open water that refueling or tank cleaning could occur, wind and other weather application guidelines, and stipulations regarding acceptable herbicides for certain situations. The intent of these PDC is to ensure environmentally safe application designed to reduce or eliminate detrimental effects to aquatic ecosystems. The following discussion focuses on those PDC that directly contribute to the protection of water bodies on the Forest and Scenic Area.

Herbicides used to control invasive terrestrial plants have the potential to enter water through a variety of pathways including spray drift, surface water runoff or percolation. Various PDC have been designed to greatly reduce or eliminate the chance that herbicides could enter water through these pathways. These include utilizing spot spraying or other selective herbicide application techniques within certain distances of surface water (F.1), limiting the use of herbicides that are more toxic to the aquatic environment (F.1 and F.2) and specifying environmental conditions for application that reduce offsite herbicide movement (C.1, C.2, C.3).

Water Contamination from Drift

Drift is one mechanism for unintended offsite introduction of herbicide when it is applied as a spray. Drift occurs when fine droplets of liquid herbicide become windborne and are transported to adjacent areas. It is a physical process that depends on droplet size (which is dependent on opening size and application pressure), nozzle height and weather conditions (primarily wind), rather than specific properties of an herbicide (USDA Forest Service, 2005a). The herbicide droplets could be subsequently deposited on surface waters that either contain aquatic species or serve as runoff conduits to water containing aquatic species.

In a ground, application broadcast spray drift study conducted by the Spray Drift Task Force (1997), the amount of drift varied depending on droplet size, wind, and nozzle height. When nozzle height was 20 inches, wind speed 10 mph (crosswind), and a spray droplet volume median diameter of 341 microns (a common size in agricultural applications), the amount of drift outside the direct spray zone was only 0.5 percent of the total sprayed. If the application rate were one pound of active ingredient per acre then only 0.08 ounce (2.28 g) per acre would be deposited 25 feet outside the spray zone. At 100 feet, the deposition amount would be less than half that amount, about 0.03 ounces (0.9 g) per acre. For the largest droplet size (762 microns) increasing the nozzle height to 50 inches more than doubled the spray deposited at 25 feet compared to the control tests, but the amount deposited at 100 feet was about the same as the control (0.03 ounces per acre). This illustrates how increasing droplet size also decreases the opportunity for drift.

Felsot (2001) used the EPA/USDAFS AGDRIFT model that utilizes a combination of physical equations that describe spray drift and field measurements. AGDRIFT simulations of herbicide sprays were made for several application scenarios, including a truck mounted spray boom set at two heights. Felsot found that in the ground spray scenario, 99.5 percent of the applied spray remained on the target area and 99.9 percent of the applied spray remained within 100 feet downwind of the last spray swath.

The Empire State Electric Energy Research Corporation commissioned a 1989-1990 study aimed at:

- Assessing the effect of buffer zone width and vegetation density on herbicide deposition outside treated powerline rights-of-way.

- Field testing the effectiveness of specific buffer strategies in protecting water quality during operational herbicide treatment.

- Determining water quality criteria for protecting aquatic organisms and human health (Environmental Consultants Inc., 1991).

Spray of an herbicide containing 2,4-D ester (which is not proposed for use in this EIS) was measured on vertical arrays of string located 0, 10, 25, 50, 75 and 100’ from the edge of the sprayed area. A dye was added to the herbicide mixture to stain the string arrays. The stem foliage treatment was made from atop an all-terrain vehicle, with nozzles adjusted to produce a coarse spray under 50 lb/sq inch pressure. The low-volume basal treatment, applied by backpack sprayer, was intended to coat evenly all exposed bark on the lower 18 inches of each stem.

This study found that dye deposition occurred at all distances from zero to 100 feet into the buffer zones, although typically concentrations were an order of magnitude greater at zero feet than at 100 feet, and concentrations generally (although not absolutely) decreased with increasing distance into the buffers. Among other items, the report concluded:

Trained field crews that are effectively supervised can achieve safe herbicide applications that do not result in biologically relevant direct application or drift of herbicide into vegetated areas more than 25 feet from the edge of the treated area. Biological relevant is an action or result of an action that significantly impairs or disrupts essential behavioral patterns such as breeding, feeding or sheltering. This provides protection for humans using water from, and for aquatic organisms that are in, the areas designed to be protected by the use of buffers of the dimensions found effective in this test when using 2,4-D ester. If herbicides of lower toxicity than 2,4-D ester are used, narrower buffers could be used and still achieve protection.

An additional study was conducted by this same group to determine:

- Effects of buffer zone and application strategy on direct application and drift of herbicide to surface water.

- Effects of buffer zones on herbicide movement to surface water during autumn, early winter and spring following treatment.

Water bodies near eight powerline rights-of-way were monitored for picloram, triclopyr, imazapyr or 2,4-D for parts of an 8-month post-treatment period. Sites were selected with sandy or loamy soils anticipated to be most likely to allow herbicide leaching to streams

Most of the several hundred samples collected had non-detectable concentrations. Samples with detectable herbicide concentrations (triclopyr, imazapyr and picloram) were collected shortly after application or during the first significant rainfall after treatment. One detection occurred in the spring after autumn treatment. The highest single concentrations detected were 0.002 mg/l triclopyr, 0.001 mg/l picloram and 0.006 mg/l imazapyr. Quantifiable detections were made at six of the eight sites.

The report acknowledges that it is unlikely that maximum concentrations were captured because the samples were composited at daily intervals. Consequences of the 24-hour compositing are described as minimal with respect to risk analyses based on continuous exposure for times ranging from 48 to 96 hours.

The report concludes that:

- “The 100 foot buffer was well tested and achieved the presumed goal of protecting aquatic organisms and human health”.

- “The 30 foot buffer was well tested for basal applications and achieved the presumed goal of protecting aquatic organisms and human health”.

- Based on indirect evidence, the 50 foot buffer for stem foliar application would achieve water quality goals.

Several PDC would greatly reduce the likelihood of introduction of biologically relevant amounts of herbicides into the aquatic environment from broadcast spray drift. These include limiting broadcast spraying to distances greater than 100 feet from surface water, utilization of low pressure nozzles that apply larger droplets, application of triclopyr by spot application methods only and spraying when wind velocities are between two and 10 mph. As illustrated in the studies summarized above, this would result in a low risk of introduction of toxic levels of herbicides for aquatic species.

Drift associated with spot spraying (direct foliar applications) would be very low although studies quantitatively assessing drift from spot spray applications have not been encountered. The following summary was taken from recent fish biological assessments prepared by the Bureau of Land Management (Ruediger and Roberts, 2005) and the Willamette National Forest (Sheehan, 2005). Hatterman-Valenti (1995) estimated drift for hydraulic sprayers with hand-held wands in field studies. These drift values were used as an upper bound estimate for drift from a backpack sprayer (Labatt-Anderson, 2002). For the backpack sprayer the amount of drift was extremely low: the mean percentage of total spray that drifted was 0.08 percent at a distance of three feet and 0.03 percent at seven feet. Labatt-Anderson (2002) estimated drift at 25 feet as 0.001 percent for the backpack sprayer.

Based on the various studies cited above, the amount of herbicide that could directly enter surface water via drift from spot application is extremely low. For example, using the study in the preceding paragraph, one pound of herbicide applied via spot application at 25 feet could result in only 0.00001 lb or 0.005 grams reaching water from drift. This small amount would be diluted rapidly in even the smallest streams. Herbicides more toxic to aquatic life, such as glyphosate and picloram, cannot be sprayed within 50 feet of surface water. Other, less toxic herbicides could be spot sprayed up to edge of the bankfull channel if permissible given label instructions. Triclopyr BEE, which is very toxic to aquatic organisms, is not allowed for use within 150 feet of any water body or intermittent stream, regardless of the application method (see PDC F.1).

Water Contamination from Runoff, Leaching, and Percolation

Herbicides could potentially enter streams and other water bodies in water transported by runoff, leaching, or percolation. Section 3.9 – Water Quality, contains a discussion of the fate of various herbicides once they are deposited on bare soil. Highlighted are picloram and triclopyr, which are potentially more toxic to aquatic fauna than some other proposed herbicides and, in the case of picloram, highly soluble and mobile in sandy soil. However, cited studies indicate little evidence of picloram in groundwater, even though application rates far exceeded those proposed in this EIS. Nonetheless, the potential movement capability of picloram is addressed by incorporating a design feature that prevents use of picloram (as well as sethoxydim and non-aquatic glyphosate) within 50 feet of standing water and high water table areas.

All of the herbicides proposed for use under all of the alternatives could be transported in surface runoff; however, there is a low risk of this occurring given herbicide label instructions and PDC that restrict use during periods of precipitation or if precipitation is forecast within 24-hours of application. As explained in Section 3.9, those herbicides that rate moderate to high in both persistence and mobility categories (such as picloram) could also enter water bodies during a “first flush” scenario in the fall. However, PDC have been designed to limit application of these herbicides to once per year, as well as application only in soil types where persistence and mobility are reduced.

Relatively little herbicide would actually come into contact with bare soil within 100 feet of water bodies. Spot application targets individual plants or groups of plants and the applicator has a high level of control over the amount sprayed and thus can ensure most herbicide is deposited on the plant(s). This in turn results in less herbicide moving offsite from over spray areas (u.e., soil) into adjacent water bodies when compared to broadcast spraying. Furthermore, the overall total amount of herbicide applied by spot spraying would be less than broadcast spraying since spot application is more discriminatory. Broadcast spray would result in much more herbicide reaching bare soil because herbicide is normally applied in a continuous swath over a much larger area than spot spraying.

PDC Application Summary

As a result of all PDC are designed to protect aquatic resources the risk of a biologically relevant amount of herbicide reaching any water body is negligible. Broadcast spray limitations, focused application of spot spraying, limited drift, and other restrictions on certain herbicides depending on site conditions would result in very little herbicide reaching water via drift or other pathways. Although the actual amount of herbicide reaching water cannot be fully quantified, based on the professional judgment of the EIS interdisciplinary team hydrologist, fish biologist, and soil scientist and available research and monitoring, herbicide amounts reaching any surface water would be much lower than predicted (modeled).

3.10.2.3. Alternative 2 – Proposed Action

Invasive plant treatments considered in this EIS include manual, mechanical, cultural (e.g. goat grazing), and herbicide application methods, as well as site restoration (revegetation and erosion control) following treatment. All of the treatment methods have the potential to affect aquatic flora and fauna and their habitat through several pathways, primarily through effects to riparian and/or aquatic vegetation, sedimentation, water quality, and food sources. The majority of potential effects would be indirect (i.e., effects occurring after treatment implementation, but resulting from that treatment). The intensity and extent of treatment effects to aquatic plants, algae, fish, aquatic invertebrates, and their habitat would vary depending on a variety of factors, such as area treated, soil type, proximity of the treatment to water, and weather conditions during and after treatment.

Invasive plant treatment proposed in this alternative is the most aggressive of the three alternatives outlined in this EIS. A detailed description of treatment objectives, methods, locations, and expected duration was presented in Chapter 2. Other interdisciplinary team specialists, notably the soil scientist and hydrologist, further describe treatments and their potential effects on soil, riparian, and aquatic resources. Note that the following discussion focuses on existing, known sites only. The EDRR will be discussed in its own section. About 5,065 acres in riparian reserves are available for treatment in any given year, although it is unlikely that all acres would be treated each year since that is a “worst case scenario” that includes a rate of spread factor that significantly increases the potential treatment area beyond actual infested area (see Chapter 2).

Treatment methods in riparian reserves vary but are mostly a combination recognizing that one specific method would not be totally effective (Table 3-32). Treatment in the aquatic influence zone is significantly less than in riparian reserves. Most areas to be treated include herbicide application; very few acres would be treated solely with manual or mechanical methods.

Table 3-32: The area of proposed treatment methods in riparian reserves and the aquatic influence zone for the entire Forest and Scenic Area under the Proposed Action.

Proposed Treatment Method	Riparian Reserve Acres	Aquatic Influence Zone Acres
Manual, Mechanical	39.0	22.8
Herbicide	21.8	10.0
Herbicide with Manual	79.8	48.8
Herbicide with Mechanical	62.9	24.7
Herbicide with Mechanical and Cultural	1,402.4	425.7
Herbicide with Manual and Mechanical	3,438.2	1,584.0
Herbicide with Manual, Mechanical and Cultural	21.2	21.2
TOTAL	**5,065.3**	**2,137.2**

The following discussion of direct and indirect effects is grouped by non-herbicide and herbicide treatments.

Non-Herbicide Treatments: Direct Effects

Direct effects from non-herbicide treatments to aquatic fauna and flora would only occur if treatment methods were implemented directly adjacent to, or within, water bodies where aquatic plants, algae, macroinvertebrates, or fish are present. To be a direct effect there would have to be an immediate impact that would harm aquatic species, or immediately alter a habitat element, such as water temperature or overhanging vegetation that could provide fish cover. As such, any activity outside the aquatic influence zone, and most activities inside this zone, has no potential to directly affect aquatic resources.

Disturbance of aquatic organisms from personnel working in water would be minimal and would only occur during the Oregon Department of Fish and Wildlife in-water work period to avoid spawning and egg incubation. Equipment operation would not disturb aquatic organisms because of the 25 foot no operation buffer. Goats would not enter water to graze at the two sites in the Scenic Area where proposed. To concentrate the grazing in areas infested with invasive plants the goats are confined within temporary fence enclosures. The enclosures may be set up adjacent to surface water but would not cross creeks or other water bodies. The goats, therefore, may graze adjacent to, but not in, surface water.

Immediate alterations to overhanging vegetation, or other aquatic habitat elements, would not occur as a result of manual, mechanical, or cultural treatments. Mowing, the method that would remove the most vegetation in a short time is not allowed within 25 feet of surface water. Manual treatments could remove invasive plants that are growing adjacent to water but not the two species that are large and could overhang water – knotweed species and blackberry. Goat grazing could remove patches of blackberry, but at site 22-07 (Wells Island) it would not impact shade as larger trees are the shade producing vegetation there. At the Sandy River Delta (22-01) the grazing would occur along sloughs or wetlands that are potentially accessible to fish only during winter and spring, whereas the grazing would occur in summer and fall.

Non-Herbicide Treatments: Indirect Effects

Indirect effects associated with non-herbicide treatments have the potential to affect the following: water temperature, dissolved oxygen and/or nutrient levels, and fine sediment/turbidity. However, the effect on these habitat and water quality elements is expected to be negligible (see Section 3.8 – Soil Productivity and Section 3.9 – Water Quality).

The combination of site specific conditions (such as naturally high organic matter sources, other shade producing vegetation, limited soil exposure following treatment) and PDC would greatly limit the chance for impacts large enough to detect. The intensity and duration of any water temperature increases, turbidity, or nutrient levels, or decreases in DO would not be enough to rise to the level where biologically relevant effects to any aquatic fauna or flora would occur. Likewise, any fine sediment deposited on the streambed as result of non-herbicide invasive plant treatments would not be enough to affect aquatic macroinvertebrate survival, fish spawning success, fish feeding, or the amount of fish rearing habitat.

Herbicide Treatment: Riparian Reserve Site Summary

It is highly unlikely that herbicides would enter water via drift or from other transport mechanisms when applied outside riparian reserves due to the distance from surface water, adsorption, degradation, and accumulation in plants. As such the application of herbicides at sites located outside riparian reserves would not result in a biologically relevant herbicide amount entering area water bodies. Fifty two of the 208 known sites are located wholly outside riparian reserves (Table W-3, Appendix W). These sites, encompassing 592 acres, will not be discussed further in the aquatic related analysis.

Sixty nine of the remaining 156 sites are located partially or wholly within riparian reserves but not near fish-bearing streams (Table W-4, Appendix W). These sites encompass about 1975 acres, or about 15 percent, of the total known acres proposed for treatment with herbicides. Of those 1,975 acres, 267 acres (13.5 percent) lie within riparian reserves, but only 148 acres (7.5 percent) are within the aquatic influence zone. Thirteen of these sites lie completely outside the aquatic influence zone. Herbicide treatments proposed at these 69 sites would have no effects on any fish species due to their distance from fish-bearing waters, coupled with Invasive Plant ROD standards (2005b) and PDC designed to minimize water contamination from herbicides.

The remaining 87 sites (Table W-5, Appendix W) are located adjacent to fish-bearing streams and they make up the majority of the proposed treatment area –10,514 acres or 80 percent. Less than half of this area (4,803 acres), however, lies within riparian reserves. More importantly, less than 20 percent (1,988 acres) lie within the aquatic influence zone. Almost 80 percent (1,575 acres) of the aquatic influence zone acres lie adjacent to streams that contain federally listed fish species. Most of the 87 sites have invasive plant treatments proposed within the aquatic influence zone, but many sites have a very small amount.

General Herbicide Treatment Consequences

Based solely on the SERA herbicide risk assessments and associated worksheets, very few proposed herbicides would result in concentrations greater than the acute No Observable Effect Concentration (NOEC) for aquatic organisms[5]. *In no case would the proposed application of any herbicide result in direct mortality of any aquatic organism*. At 11 sites, glyphosate, AQ glyphosate, picloram, and AQ triclopyr resulted in predicted concentrations greater than the NOEC for fish; and at three sites, imazapic and chlorsulfuron exceeded the NOEC for aquatic plants. The modeled concentrations do not take into account PDC and site specific parameters as compared to model assumptions. This is an extremely important fact to remember during the following discussion because *the actual concentrations of herbicide reaching any water body would be far less than model predictions because of the PDC*. Furthermore, it is important to remember that not all herbicides are proposed for use at all sites and predicted concentrations only exceed the NOEC at few sites. For example, AQ glyphosate, proposed for use at 81 sites near fish-bearing streams, only exceeded the NOEC for fish at eight of those sites. More detailed analysis results are discussed below and also can be found in Appendix W for the four aquatic organism groups.

Herbicide risk assessment modeling conducted as part of the Invasive Plant FEIS (2005a) analysis indicated that chronic toxicity index concentrations for all aquatic organisms was not possible under a worst case delivery scenario (USDA Forest Service, 2005a). In other words, for a chronic effect to occur large amounts of herbicide would have to be applied continuously, or at regular intervals, to result in a constant supply of herbicide to water. This scenario would not occur as proposed in this EIS, even for those sites that could be treated up to three times each year. As such, only acute effects are possible and chronic effects will not be discussed further in this analysis.

If individual fish were impacted as a result of proposed herbicide treatment, the effects would be sub-lethal. This is due to the very small amounts of herbicide and adjuvants, far below lethal levels, that might reach water where fish reside. The ecological significance of sub-lethal effects depends on the degree to which they influence behavior essential to the survival and reproductive potential of individual aquatic species. Sub-lethal effects are not readily apparent in fish (USDA Forest Service, 2005a). When small changes in the health of individual fish are observed in a laboratory setting (e.g., a small percent change in behavior, the activity of a certain enzyme, or an increase in oxygen consumption), it may not be possible to infer a significant loss of essential behavior patterns of that fish species in the wild (USDA Forest Service, 2005a). The question becomes one of biological relevance – Is the effect large enough to reduce fitness, survival, or some other aspect of behavior?

Much of the available toxicological research regarding the effects of herbicides and adjuvants on fish and other aquatic organisms has focused on the lethal dose. Although more limited, some research has investigated at least some of the sub-lethal toxicological endpoints generally considered important to the overall health and fitness of aquatic species. These sub-lethal toxicological endpoints are defined as:

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[5] The NOEC is the concentration of herbicide at which there are no statistically or biologically significant differences in the frequency or severity of any effect in the exposed or control population. In many cases, at least for fish, the NOEC is estimated as 1/20th of the LC_{50} for a particular herbicide (see Tables W-1 and W-2 in Appendix W).

- Increase or decrease in growth;
- Changes in reproductive behavior;
- Reduction in number of eggs produced, eggs fertilized, or eggs hatched;
- Developmental abnormalities, including behavioral deficits or physical deformities;
- Reduced ability to osmoregulate or adapt to salinity gradients;
- Reduced ability to tolerate shift in other environmental variables;
- Increased susceptibility to disease and/or predation; and,
- Changes in migratory behavior.

NMFS Northwest Fisheries Science Center has conducted research on the sub-lethal effects to fish from technical grade herbicides and some formulations for picloram (Tordon K), clopyralid (Transline), imazapyr (Habitat), imazapic (Plateau), triclopyr (Garlon 3A and Renovate), and glyphosate (no specific formulation tested for glyphosate) using zebra fish (*Danio rerio*). The results have not yet been published. Preliminary results suggest that the sub-lethal effects investigated do not occur in zebra fish for the herbicides and formulations tested.

Other studies have attempted, directly or indirectly, to correlate the effects of herbicides or other contaminants to sub-lethal effects in a variety of fish species. Various behavior mechanisms, growth rates, and predator/prey interactions have all been studied. The risk assessments completed by SERA (2001b, 2003a, 2003b, 2003c, 2004a, 2004b, 2004c, 2004d, 2004e, and 2004f) contain comprehensive reviews of many of these studies and, therefore, a detailed synopsis will not be presented here. A few examples, however, illustrate that observed behavioral and/or growth differences have been observed, but at much higher herbicide concentrations than would result from proposed herbicide treatments. For example, in one study conducted by Cohle and McAllister (1984, as cited in SERA 2004d) both bluegill and rainbow trout exhibited abnormal behavior during 96–hour bioassays with the herbicide Arsenal (imazapyr) at concentrations at or exceeding 32 mg/L. The highest concentration in water predicted in our analysis was 0.000002 mg/L before PDC. In addition, Morgan et al. (1991, as cited in SERA 2003c) conducted studies with a flow through Y-maze to test avoidance of Garlon 3A (triclopyr TEA) by rainbow trout. They found a threshold for avoidance response to be 800 mg/L. Static tests to determine lethality resulted in a 200 mg/L threshold for behavioral changes. The highest concentration in water predicted in the analysis conducted for this EIS is 0.30 mg/L.

Woodward (1979) found that picloram did affect cutthroat trout fry growth, but not at concentrations below 0.29 mg/L. The highest concentration in water anticipated in our analysis was 0.065 mg/L before PDC. In tests comparing juvenile bull trout and swim-up juvenile rainbow trout sensitivity to picloram, bull trout were more sensitive than rainbow trout in terms of growth rates (weight) compared to control fish (Fairchild et al., 2005). In the 28-day flow through tests, the NOEC for bull trout was 0.3 mg/L, compared to 1.2 mg/L for rainbow trout, both well above anticipated concentrations from the analysis conducted for this EIS.

Weis et al. (2001) have extensively studied populations of mummichog (*Fundulus heteroclitus*), an abundant intertidal fish species found on the east coast of the continental United States. They compared populations residing in healthy streams with one population in a very polluted stream and demonstrated biochemical alterations leading to behavioral changes that lead to reduced growth, condition, and life span. Based on the results of their work, it seems clear that sub-lethal effects, as a result of high contaminant levels, can result in negative individual and population impacts in the polluted watershed. Herbicides, however, were not the focus of this study; the culprit appears to be "many organic contaminants and metals." The polluted stream is surrounded by industrial sites, a sewage treatment plant, a power plant, and a major highway – anthropogenic conditions far different than the conditions within the Forest and Scenic Area. Although the study does demonstrate sub-lethal effects, it does not pinpoint the source (or sources) and the authors point out that impaired prey capture is likely a result of overall contaminant loading, which appears quite high, rather than any single chemical. Based on the description of their study site, it is safe to assume the Forest and Scenic Area streams are far less polluted. It is the professional opinion of the Fisheries Biologist on this EIS team that the small amount of herbicide proposed for use would not lead to individual or population effects as described by Weis et al. (2001).

The reaction or susceptibility of fish to herbicides may vary depending on the life stage. For example, a multitude of studies have been conducted on the effects of various glyphosate-based herbicides on a number of fish species and life stages. In one study conducted by Folmar et al. (1979), the 96-hour LC_{50} ranged from 1.3 mg/L to 16 mg/L for various life stages of rainbow trout. In general, the LC_{50} was higher for older and larger life stages (at or above the fingerling stage). A notable difference was that the LC_{50} for eyed eggs was 16 mg/L, compared to 8.3 mg/L for a 2.0 g fingerling and adult (weight not specified). Folmer et al. (1979) also noted differences in effects among four different fish species (presumably all adults): fathead minnow appeared most sensitive (LC_{50} = 2.3 mg/L), whereas channel catfish were least sensitive (LC_{50} = 13 mg/L).

Triclopyr also varies in its effects to different fish species, regardless of the type or formulation. As summarized in the risk assessment (SERA, 2003c), LC_{50} concentrations of triclopyr TEA ranged from 240 mg/L for rainbow trout (life stage not specified) to 947 mg/L for fathead minnow (life stage not specified). Although, the study showed that there was significant variation in effects on the same species in different studies. Triclopyr TEA and BEE both break down to triclopyr acid rapidly in water and soil (Ganapathy, 1997), and thus, the acid form may be the most prevalent and of the most concern in both water and soil until further breakdown occurs. Triclopyr acid is more toxic than Triclopyr TEA with LC_{50} concentrations of 117 mg/L for rainbow trout and 148 mg/L for bluegill (SERA, 2003c). TCP, a primary breakdown product of both triclopyr TEA and BEE in soil (Ganapathy, 1997), is more toxic than the TEA formulation with LC_{50} concentrations ranging from 1.5 mg/L for rainbow trout to 2.1 mg/L for Chinook salmon to 12.5 mg/L for bluegill.

Product formulations often include adjuvants (additives mixed with the herbicide solution to improve performance of the spray mixture), or recommend the addition of adjuvants that could have toxic effects themselves. Effects of surfactants (a common group of adjuvants) to aquatic species have received some study (USDA Forest Service, 2005a). In general, aquatic species are more susceptible to adverse effects from surfactants than terrestrial species. At least some of the aquatic sensitivity to surfactants is due to irritation of gill membranes, and alteration of their permeability and molecular exchange properties. Due to the small amounts used resulting in very low concentrations reaching water (much lower than protective concentrations), the effects to aquatic organisms would be negligible from NPE-based surfactants (Bakke, 2003b). Concern has been expressed about the potential for surfactants increasing the movement of other harmful materials, such as pesticides, into soils. Herbicide mobility could be increased by the use of surfactants, but effects to mobility are unlikely given the low concentration of surfactants in the soil/water matrix at USDA Forest Service application rates (Bakke, 2003a).

The combination of POEA (polyethoxylated tallow amine) surfactant and glyphosate may be harmful to fish and invertebrates since they breathe by movement of water. The combination of POEA surfactant and glyphosate has been shown to cause inflammation of gill tissue in fish, and to reduce survival rates especially for young fish (Folmar et al., 1979). Folmar (1979) demonstrated that the surfactant POEA is actually more toxic to fish than the herbicide it is mixed with (Folmar et al., 1979). This agrees with the conclusion in the SERA Risk Assessment for glyphosate (SERA, 2003a). Formulations of glyphosate that do not contain surfactants are available and labeled for aquatic use, and would be used near water as needed under all alternatives.

The above discussion highlights several important factors that are important to our analysis and the interpretation of the results. These factors are summarized below.

Herbicides may have different levels of effects on fish depending on the life stage and/or species. For all herbicide HQ calculations, however, the lowest cited dose (or $1/20^{th}$ of the LC_{50}) that correlated to the NOEC regardless of the fish species and/or life stage was used. This is an additional safety factor in the analysis and ensures our results apply to all aquatic species and life stages. Though the discussion above centers on fish, the potential impacts and effects also apply to invertebrates and plants/algae.

Sub-lethal effects to fish resulting from herbicides have been documented in several studies although the research is not as extensive as that for lethality. Based on the available information, **the concentrations of herbicide that are expected in the Forest and Scenic Area water bodies are less (in most cases far less) than concentrations that resulted in observed sub-lethal effects**. Note that these predicted concentrations are based solely on the modeled GLEAMS runs *before* site specific conditions and PDC are taken into consideration. PDC are expected to further reduce the amount of herbicide/adjuvant reaching water.

Herbicide Treatments: Direct Effects

Herbicide application, as proposed under the Proposed Action, would not result in direct mortality to aquatic organism. The estimated concentrations are all far below lethal levels for every aquatic organisms studied. While the amount of herbicides and adjuvants expected to reach water are estimated to be extremely low under the Proposed Action, the USDA Forest Service cannot conclude with certainty that the levels of chemicals potentially reaching streams harboring aquatic organisms would be zero. However, the amount is expected to be biologically irrelevant as explained below.

Aquatic Plants and Algae

Aquatic plants are a natural, and important, component of aquatic communities. Aquatic plants, especially phytoplankton, are consumed by small invertebrate animals, which in turn are consumed by larger animals such as birds or fish. Phytoplankton also could be consumed directly by certain fish. Small fish could be consumed by larger fish and by birds. Any impact to a component of the aquatic community may have a ripple effect on the food web.

Based on the risk assessments used for this analysis, typical application rates of two herbicides, imazapic, and chlorsulfuron, could result in exposure concentrations that exceed the acute NOEC for aquatic plants, but only at three sites (Table 3-33)[6]. No mortality of aquatic plants would occur at any site. Other herbicides proposed for use did not exceed the acute NOEC at any site. At each of the three sites there are other herbicides that are not predicted to exceed the aquatic plant NOEC that could be used, if effective and practical, to further reduce effects to aquatic plants. Predicted herbicide exposures did not exceed the acute NOEC for algae at any site.

Conditions at the three sites, when compared to the SERA herbicide risk assessments and associated worksheets assumptions, indicate far less herbicide would actually enter water than predicted. Of the three sites, the one with the highest risk of larger amounts of herbicide entering water would be 66-084 because it borders a small stream and has steeper slopes than assumed in the model (but with a vegetation buffer strip that would result in less herbicide routed to the stream). In site 22-01 the slope is less than assumed and the presence of riparian vegetation buffers would reduce the amount of herbicide entry. Although the amount of aquatic influence zone area is relatively large this is spread over a wide area (the site is about 1,573 acres in total size) and streams are much larger than modeled so dilution would be greater.

A comparison of some of the major model assumptions with on the ground conditions and PDC is warranted and would apply to all application sites, regardless of risk. There are three major assumptions in the model that would rarely, if ever, be met in the field at Forest or Scenic Area sites and as a result far less herbicide would ever reach surface water as a result of proposed treatment.

The first is that the model assumes herbicide is broadcast sprayed up to the water's edge continuously across the entire treatment block. In no case would this ever happen in the field due to the 100 foot no broadcast spray buffer. There are no sites where invasive plants blanket the entire aquatic influence zone across the entire site; instead, the invasive plants grow in discreet patches.

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[6] See Tables W-6 and W-7 in Appendix W for predicted algae and aquatic macrophyte hazard quotient values for all sites within riparian reserves.

This means the actual amount of herbicide applied within the 100 foot swath closest to a water body would be less than modeled because spot spraying and hand application target individual plants or groups of plants. Due to the differing site conditions, it is not possible to estimate the actual amount of herbicide that would be applied, but it would be less than the modeled one lb/acre because there are no sites where invasive plants cover an entire treatment area to the exclusion of other plant species.

The second relates to modeled block size. The 10 acre block is assumed to be 50 feet wide and 8,672 feet long directly adjacent to the water body. In actuality, this scenario would likely never be realized in the field. Most aquatic influence zone treatment acres, by site, are smaller than 10 acres in size. For those sites where the aquatic influence zone size exceeds 10 acres (22-01, 66-008, 69-008, a few others) the aquatic influence zone "block" that would be treated is not a continuous area along a water body. By definition, the aquatic influence zone is 100 foot wide, not 50 feet as modeled, so at many sites even though aquatic influence zone acres are being treated that does not mean the treatment site is directly adjacent to a water body.

Finally, this is a point source model that assumes all herbicide drains from the block at a single point; in effect, the block as described above acts as a small watershed. "The point source assumption is a simplification and is reasonably conservative – i.e., it [would] lead to somewhat higher concentration estimates than alternate assumptions" (SERA, 2004g). If runoff were to come uniformly off the treatment block, instead of at a single point, the average concentration in water would be about 72 percent of the point source assumption (SERA, 2004g). Point source runoff would not occur at any known site on the Forest or Scenic Area. In actuality, the herbicide that does runoff would approximate the uniform runoff assumption; although, herbicide would not drain or leach at uniform rates. Instead, herbicide would runoff or leach from numerous areas at different rates resulting in smaller amounts reaching the water body at different times in different places. This is a major difference that would result in less herbicide reaching water at any point in time or space, thus concentrations in water would be less at any given time.

In summary, although the actual amount of herbicide reaching water cannot be quantifiably predicted based on differences in site conditions and PDC, it is clear that the amount reaching water would be far less than predicted. In all of these sites, application of PDC as described above would result in far less herbicide routed to water regardless of site conditions. As such, the effects to aquatic plants at these sites would be biologically irrelevant.

Invertebrates and Fish

Direct effects to aquatic invertebrates or fish from herbicide application would only occur if there were enough herbicide entering water at a given site to immediately cause an acute, sub-lethal effect that significantly impairs some biological function. This would not occur because of PDC designed to greatly minimizing drift, especially buffers, that would result in insignificant amounts (if any) entering water bodies. Concentrations would be far below lethal and NOEC concentrations. Direct application to water would not occur.

Table 3-33. Proposed sites within riparian reserves where the NOEC was exceeded for at least one herbicide for aquatic plants and/or fish. Site specific conditions (average slope, vegetation buffer difference, stream width, sites acres within the aquatic influence zone, and the amount of stream bank treated) are displayed for comparison with assumed values in the SERA herbicide risk assessments and associated worksheets (listed below the table).

Treatment Site ID	Within AIZ?	NOEC Exceeded?		T&E Fish Present?	Pacific Northwest Region Sensitive Fish Present?	Ave. Slope (%)	Vegetation Difference	Stream width (ft)	AIZ Acres
		Aquatic Plants	Fish						
22-01	Y	Y	Y	Y	N	2	Less Delivered	100	425.7
22-07	Y		Y	Y	N	4	Less Delivered	500	21.2
65-012	Y		Y	N	N	33	Less Delivered	5	2.6
65-019	Y		Y	Y	N	16	More Delivered	116	4.7
65-028	N		Y	Y	N	23	Less Delivered	40	0.0
65-029	Y		Y	Y	N	17	Less Delivered	40	2.6
65-031	Y		Y	N	N	7	Less Delivered	10	1.6
65-036	Y		Y	N	N	29	Less Delivered	10	1.6
65-041	Y		Y	Y	N	31	Less Delivered	40	0.1
66-008	Y		Y	Y	Y	18	No Change	8	103.1
66-052	Y		Y		Y	21	More Delivered	12	1.1
66-053	Y	Y		Y	N	62	No Change	15	0.6
66-071	Y		Y	N	N	24	Less Delivered	10	12.1
66-084	Y	Y		Y	N	16	Less Delivered	7	7.7
66-091	Y		Y	N	Y	28	Less Delivered	10	12.7
69-008	Y		Y	Y	N	25	Less Delivered	20	210.4
69-012	Y		Y	Y	N	0	Less Delivered	5	0.2
69-028	Y		Y	N	N	13	Less Delivered	10	0.8
69-029	Y		Y	Y	N	1	More Delivered	8	0.4

SERA herbicide risk assessments and associated worksheet assumptions:

- Herbicide applied via broadcast spray up to waters edge across the entire treatment block.
- Site slope is 10 percent.
- Vegetation along the stream at the treatment site is sparse grass.
- Stream size is approximately 7 feet wide by 1 foot deep (corresponds to 1.8 cfs).
- The application block is a rectangle 10 acres in size that is 50 feet wide and 8672 long adjacent to the stream. (AIZ acres are a conservative comparison of this block size. Since the AIZ is 100 feet wide by definition not all treatment within this zone would occur within 50 feet of the stream.)
- The model assumes the 10 acre block is essentially a small watershed with all herbicide emptying into the adjacent water body at a single point.

Herbicide Treatments: Indirect Effects

Algae and Aquatic Plants

There would be no indirect effects to aquatic plants or algae resulting from the implementation of this alternative. There would be no mortality of any aquatic flora and the amount of herbicide that could leach into water bodies over time would be so small due to PDC, adsorption, degradation, and dilution it would be biologically irrelevant.

Invertebrates

Predicted herbicide concentrations did not exceed the NOEC for aquatic invertebrates at any site. There would be no mortality of aquatic invertebrates at any location as a result of herbicide application. Potential reductions in DO that could locally affect aquatic invertebrates due to large die-offs of aquatic plants or algae (USDA Forest Service, 2005a) would not occur because aquatic vegetation itself would not be treated with herbicides and not enough treated plants would fall in water at any site to decrease DO concentrations.

Fish

Since this EIS analyzes the effects of invasive plant treatment at sites across the Forest and Scenic Area, the number of fish species (and life stages) potentially affected is diverse. The following discussion and summary focuses on salmonids because most is known about their distribution, life history, and habitat needs. Likewise, much of the toxicity information available was also related to salmonids, specifically rainbow trout. Other fish species, such as lamprey and sculpin, are also important members of the aquatic community however there was no known herbicide toxicity information available for these species. Since definitive toxicological information regarding the herbicides and adjuvants proposed for use in this EIS were best summarized by the SERA risk assessments (2001b, 2003a, 2003b, 2003c, 2004a, 2004b, 2004c, 2004d, 2004e, and 2004f) and Bakke (2003a and 2003b) these were used as the basis for herbicide effects on fish. Given that the lowest cited dose concentration, regardless of fish species or life stage, was used to calculate HQ values, it is assumed that potential effects to fish other than those specifically studied would be similar.

Biologically relevant effects to fish from herbicide application are not expected as a result of herbicide treatments. No fish mortality would occur at any site as the potential herbicide concentrations are all much lower than lethal concentrations.The risk of adverse effects to listed aquatic species is expected to be discountable if the concentration of herbicide or adjuvant is less than the NOEC (USDA Forest Service, 2005c). Likewise, adverse effects to other, non-listed fish species would also be discountable. At all sites except those profiled below the acute NOEC for fish was not exceeded by any herbicide. At the 70 sites with fish present not discussed below the low predicted herbicide concentrations coupled with PDC and site specific conditions as described above, would render effects to fish biologically irrelevant.

Based on the risk assessments used for this EIS, four herbicides (glyphosate, AQ glyphosate, AQ triclopyr, and picloram) could result in exposures that exceed the acute NOEC for fish, but only at 17 sites (Table 3-33)[7]. Of those 17 sites, salmonids listed as threatened are present at 10 sites, salmonids that are USDA Forest Service, Pacific Northwest Region 6 sensitive are found at three sites, and other salmonids, such as cutthroat trout, are the only salmonids present at five sites (but they also are found at most other sites). The herbicide glyphosate exceeded the NOEC at five sites (22-01, 22-07, 65-019, 69-012, and 69-029), picloram at four sites (65-028, 65-029, 65-031, and 65-041), AQ triclopyr at one site (66-071), and AQ glyphosate the rest of the sites (as well as site 66-071 – the only site where two proposed herbicides exceeded the NOEC). At all site other herbicides are proposed that could be substituted for ones with a predicted NOEC exceedance.

The 17 sites vary regarding conditions that would reduce the risk that herbicides could enter water (Table 3-33) but in all cases the expected amount of herbicide reaching streams would be less than modeled. For the most part, the sites have physical characteristics that would further minimize the risks posed by herbicides such as well vegetated buffer strips, larger streams (hence more stream flow) than modeled, and few acres treated in the aquatic influence zone.

Application of PDC and site specific conditions that differ greatly from model assumptions would reduce the risk of potential herbicide effects at all of the above sites. Glyphosate and picloram cannot be applied within 50 of open water and, like all of the herbicides; they cannot be broadcast sprayed within 100 feet. These PDC alone would render their effects irrelevant at sites where proposed because the model assumes broadcast spray up to the water's edge. Spot application of AQ glyphosate as opposed to the modeled broadcast application would alleviate the risk of biologically relevant effects at sites where proposed.

As previously described, the exceedance of the NOEC for glyphosate likely has more to do with the added POEA surfactant in modeled formulations rather than glyphosate itself, which was classified as non-toxic or practically non-toxic to freshwater fish by the EPA (SERA, 2003a, page 4-12). PDC within the aquatic influence zone would reduce the potential effects of glyphosate as none would be applied within 50 feet of open water, regardless of the application method. Relatively high application rates compared to other proposed herbicides are likely the cause of AQ glyphosate (which does not include a surfactant) exceeding the NOEC. Glyphosate binds very tightly to soil particles, and thus, is not easily leached out. As such, it would not leach into nearby water bodies in great amounts, further reducing its potential effects on aquatic organisms.

Picloram is one of the few herbicides proposed that persists in soil: most of the other proposed herbicides degrade or leach out relatively quickly. For this reason, picloram would not be applied within 50 feet of open water and it would only be applied once per year, even at sites where treatment is proposed up to three times in a given year.

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[7] See Table W-9 in Appendix W for a list of predicted fish hazard quotient values for all sites within riparian reserves.

Based on this analysis, the available site-specific evidence, and PDC, the amount of herbicide that could enter water at all sites, including the 17 described above, would be less than the NOEC and result in no relevant biological effects to fish or other organisms.

Designated Critical Habitat and Essential Fish Habitat

Bull Trout

Most of the PCE for bull trout critical habitat would not be affected by application of herbicides as outlined in the Proposed Action. Invasive plant treatments involving herbicides would not change the availability of permanent water or the long-term contaminant level of that water (PCE-1). Any herbicide entering area streams (no lakes or ponds are designated as critical habitat) would be routed downstream in a short-term pulse lasting minutes or hours. Although herbicide application in some areas could result in localized shade reduction, these would not lead to an increase in water temperature (PCE-2). Most invasive plants provide no shade and those large enough to do so, such as knotweed species, are currently localized in small patches.

There would be no effect to physical habitat structure, substrate conditions, natural flow patterns, connectivity with seeps and springs, or migration barriers (PCE-3 through 7). Herbicide use would not affect current distribution of non-native fish species (PCE-9). Since there would be no aquatic plant, algae and aquatic invertebrate mortality, as described above, there would be no effect to the bull trout food base.

Steelhead Trout and Chinook Salmon

Although worded differently, the PCE for steelhead and Chinook critical habitat are similar in scope and intent as those for bull trout. Similarly, most of the elements outlined in the PCE would not be affected by herbicide treatments on the Forest and Scenic Area. The critical habitat for these two species encompasses a much larger area than bull trout critical habitat and in most river systems extends well upstream of the Forest boundary.

Herbicide treatments would not affect physical habitat characteristics, water quantity and floodplain connectivity, or freshwater migration (PCE-2a, 2c, and 3). The physical condition of spawning areas would not be affected (PCE-1). Since most steelhead and Chinook spawn in areas where there is adequate depth and velocity for their particular needs, this implies adequate mixing to greatly dilute the already small amount of herbicide that may enter streams and pass through spawning areas. Most of the known spawning streams for both species are much larger than the GLEAMS modeled stream flowing at 1.8 cfs so the concentration of herbicide would be lower than presented in this analysis. The discussion above regarding potential effects on the bull trout food base (e.g., forage) would also apply to salmon and steelhead.

Early Detection/Rapid Response Strategy

The EDRR is critical to eradicate or control new or as yet undiscovered invasive plant infestations in the next 15 years. Although it is not possible to characterize yet undiscovered site conditions, it is assumed that new sites would be similar in terms of soil type, slope, proximity to water, and other site conditions to at least one known site being analyzed in this EIS. As such, it is possible to predict potential effects from herbicide treatment applications, given the stipulations discussed in Chapter 2. The annual and total acre limitations described in Chapter 2, coupled with fifth-field watershed and riparian reserve area restrictions, are designed to allow treatment flexibility while at the same time ensuring that no watershed or riparian area is subject to excessive treatment.

As outlined above, treatment of sites or portions of sites located outside riparian reserves would not result in any effects to aquatic fauna or flora. As such any proposed treatment outside riparian reserves would not require further scrutiny from an aquatic perspective. Treatment within riparian reserves would be expected to have the same level of impact as described above for known sites as long as site conditions met those encountered for known sites. Given that a wide range of conditions were assessed across the Forest and Scenic Area, such as slope, actual proximity to water, presence of vegetation along the water body, etc., it is likely that the analysis of existing sites encompasses a wide enough range of conditions that would approximate most, if not all, conditions encountered in the future.

No new herbicides would be used at any new sites. The effects of already analyzed herbicides would be the same as described above as long as new site conditions where they are proposed are similar to those already analyzed. Since herbicide application at relatively few sites resulted in concentrations exceeding the NOEC for any aquatic organism, the fact that the GLEAMS model assumptions are conservative and the application of PDC coupled with site conditions would result in even less herbicide actually delivered to water, it is apparent that the risk of biologically relevant effects across the Forest and Scenic Area is quite low. As such, this would hold true at future sites.

Cumulative Effects

Although cumulative effects to stream shade, water temperature, nutrients and dissolved oxygen, food resources, and turbidity/fine sediment are possible under this alternative and could be greater than that described for the No Action Alternative, the overall treatment of invasive plants on the Forest and Scenic Area would not add significantly to effects from other land management activities. As discussed in Section 3.9 – Water Quality, the invasive plant treatments proposed at the fifth-field watershed scale would impact less than two percent of the total watershed in all but two watersheds. The two watersheds where treatments would cover more than two percent are primarily federally owned, thus many of the activities that could contribute to related cumulative effects, such as agriculture and urban influence, are not widespread. The cumulative effects of proposed treatments on the above elements, therefore, would be quite low for the same reasons as described in Alternative 1.

It is recognized that just because the sheer scale of proposed treatment the effects from this alternative would likely be greater than in the No Action Alternative, but at the fifth-field scale the effects would still be negligible. To put it in perspective, although a maximum of 13,000 acres are proposed for treatment in a given year under this alternative, only 2,137 of those acres are within the aquatic influence zone where most effects to aquatic resources would occur. The aquatic influence zone acres are spread over 22 fifth-field watersheds and encompass from less than 0.01 percent to slightly over 0.6 percent of the fifth-field watershed area. In most watersheds the amount of proposed aquatic influence zone treated is less than 0.1 percent of the total watershed area. Fewer acres would actually be treated for reasons already described. Especially given restrictive PDC, the cumulative effects would be quite small at the fifth-field scale.

Site-specific analysis outlined above indicates the anticipated effects from herbicide application on all aquatic fauna and flora to be irrelevant, with no mortality. PDC, including restrictions on some herbicides with higher biological risk (such as triclopyr), are more restrictive than application controls used on state and private land (although we are assuming all formulation labels are followed regardless of the application site). As such, the very low impact of herbicide use on the Forest and Scenic Area would contribute very little to the overall cumulative herbicide effects at the fifth-field watershed scale. (See Section 3.2.4 – Ownership Patterns and Herbicide Use on Other Lands for more details.)

Repeated herbicide treatments at the same location in a given year or over several years are not expected to result in cumulative effects to aquatic organisms. The herbicides proposed have not been shown to bioaccumulate in aquatic organisms (USDA Forest Service, 2005a) and the small amounts anticipated to enter water bodies would be diluted or excreted quickly. The few herbicides known to persist in soil are only proposed for use once per year, minimizing their effect and concentration in riparian soils (see Section 3.8– Soil Productivity).

3.10.2.4. Alternative 3 – Restricted Herbicide Use Alternative

Although the same area is proposed for treatment in this alternative compared to Alternative 2, the area proposed for treatment using herbicides is much less (Table 3-34). Alternative 3 relies more on manual and mechanical treatments. For example, over half of the riparian reserve acres (52 percent) in this alternative would be treated with non-herbicide methods only, compared to less than one percent in Alternative 2. Similarly, 57 percent of aquatic influence zone treatments would be non-herbicide treatments only, compared to 0.1 percent in Alternative 2. More detail on the specific areas for treatment can be found in Chapter 2 and Section 3.9– Water Quality. As in Alternative 2, the area in riparian reserves proposed for treatment in any given year is more than what would actually be treated given the rate of spread factor used in determining treatment acres for this EIS.

Since less herbicide would be used, the effectiveness of treatments would be less, resulting in the need to treat sites more often, except at priority 1 sites where herbicides are still proposed. The following discussion of direct and indirect effects is grouped by non-herbicide and herbicide treatments.

Table 3-34: The area of proposed treatment methods in riparian reserves and the aquatic influence zone for the entire Forest and Scenic Area under the Restricted Herbicide Use Alternative.

Proposed Treatment Method	Riparian Reserve Acres	Aquatic Influence Zone Acres
Manual	92.8	52.2
Mechanical	9.8	4.6
Manual, Mechanical	2,491.7	1,139.9
Manual, Mechanical, Cultural	21.2	21.2
Herbicide	8.8	6.6
Herbicide with Mechanical	53.1	20.1
Herbicide with Manual and Mechanical	985.5	466.9
Herbicide with Mechanical and Cultural	1,402.4	425.7
TOTAL	**5,065.3**	**2,137.2**

Non-Herbicide Treatments: Direct Effects

Potential direct effects from non-herbicide treatments to aquatic fauna and flora under this alternative would be the same as expected in Alternative 2, except that treatments may occur more frequently in an attempt to control invasive plants. Due to PDC that still apply however there would be no change in anticipated effects compared to Alternative 2.

Non-Herbicide Treatments: Indirect Effects

The same habitat elements discussed in Alternative 2 could be indirectly affected under this alternative. There would be no difference in effects to nutrients, dissolved oxygen, or shade reduction from blackberry removal under this alternative as compared to Alternative 2. Goat grazing is not prescribed over a larger area in this alternative and the efficiency of this grazing would be the same as in Alternative 2. Although more plants may be cut or killed from manual or mechanical methods, the amount disposed of in surface water (if any) would be the same as previously described.

As described in Section 3.9 – Water Quality, the risk of erosion and potential sediment delivery to surface water under this alternative from manual and mechanical methods is very low, even lower than Alternative 1.

Herbicide Treatments: Riparian Reserve Site Summary

Of the 43 sites where herbicide treatment is proposed under this alternative, 17 of the sites are located outside riparian reserves. The application of herbicides at sites located outside riparian reserves would not result in a biologically relevant herbicide amount entering area water bodies, thus they are not discussed further. Nine of the 26 sites with some riparian reserve herbicide treatments are located adjacent to, or near, water bodies that do not harbor fish (Table W-4, Appendix W). These sites encompass 173 total acres with relatively little treatment proposed in riparian reserves (16 acres) and in the aquatic influence zone (11 acres).

The remaining 17 sites where herbicides are proposed for use under this alternative are located adjacent to fish-bearing streams. Six of the sites are near water bodies that do not harbor special status fish species, but the remaining 12 sites are located next to streams where threatened, and in one case endangered, salmonids reside (Table W-5, Appendix W). None of the sites are located on the Barlow Ranger District.

Although less than half the sites where herbicides are proposed for use in this alternative are located wholly or partially along fish-bearing streams, they make up the majority of the proposed herbicide treatment area – about 3,674 acres or 91 percent of the 4,047 acre total. Over half (66 percent) of these site acres lie within riparian reserves, and one quarter of the acres (906 acres) lie within the aquatic influence zone. All 17 sites have some treatment proposed within the aquatic influence zone, though at several sites it is a very small amount. Four sites are quite large compared to the others (22-01, 66-007, 69-008, 69-027); these four sites encompass 3,295 acres of which 2,293 acres are within riparian reserves and 842 acres within the aquatic influence zone.

Herbicide Treatments: Direct Effects

Since the priority 1 sites in this alternative are the same as in the Proposed Action, potential site specific effects would be the same as already described for those sites. There would be no effect from herbicide treatment at priority 2 to 5 sites. Less than half the total riparian reserve acres proposed for herbicide treatment in the Proposed Action would be treated under Alternative 3, and proposed herbicide treatment in the aquatic influence zone is about two thirds less than the Proposed Action.

Aquatic Plants and Algae

Typical application rates of two herbicides, chlorsulfuron and imazapic, could result in exposures that exceed the acute NOEC for aquatic plants, but only at sites 22-01 and 66-084 (refer to Table 3-33 also). The same discussion regarding potential effects from herbicides outlined for Alternative 2 would apply here for these two sites.

Invertebrates and Fish

As described for Alternative 2, direct effects to aquatic invertebrates or fish from herbicide application are not expected. Predicted herbicide concentrations are already well below lethal doses even before the application of PDC, which would result in even lower concentrations in water. Mortality to aquatic invertebrates or fish would not occur at any site.

Herbicide Treatments: Indirect Effects

Algae, Aquatic Plants, and Invertebrates

As in Alternative 2, there would be no indirect effects to aquatic plants or algae resulting from the implementation of this alternative. There would be no mortality of any aquatic fauna and the amount of herbicide that could leach into water bodies over time would be so small due to PDC, adsorption, degradation, and dilution it would be biologically irrelevant. Predicted herbicide concentrations did not exceed the NOEC for aquatic invertebrates at any site thus effects to these organisms would be irrelevant. There would be no mortality of aquatic invertebrates at any location as a result of herbicide application.

Fish

Under this alternative there are only two herbicides, glyphosate and AQ glyphosate, which could result in exposures exceeding the acute NOEC for fish, but only at the seven sites listed below (refer to Table 3-33 as well):

22-01	*65-019*	*66-008*
69-008	*69-012*	*69-028*
69-029		

Salmonids listed as endangered or threatened are present at six of the seven sites (all but 69-028); there are USDA Forest Service, Pacific Northwest Region sensitive fish species present at site 66-008.

As described in Alternative 2, although the predicted herbicide concentrations exceed the NOEC at these sites the actual expected concentrations would be much lower due to specific site conditions and PDC. At no site is mortality anticipated and the amount of herbicide that could enter water would be so small as to be irrelevant from a biological perspective.

Early Detection/Rapid Response Strategy

The same rationale and process described for the Proposed Action would apply to the Restricted Herbicide Use Alternative in regards to EDRR, except only the priority one sites would be treated with herbicides. It is likely the amount of herbicide applied in the future overall would be less than in the Proposed Action; however, this depends on the nature and location of new infestations. The same potential effects to riparian and aquatic systems already described would apply to areas treated under this alternative.

Cumulative Effects

Anticipated cumulative effects associated with the Restricted Herbicide Use Alternative would be negligible at the fifth-field watershed scale. On a relative range of effects the actions in this alternative would fall between the No Action and Proposed Action Alternatives in terms of herbicide effects, but would actually be less from a potential sedimentation perspective compared to the No Action Alternative. The cumulative effects of proposed treatments on the habitat elements described previously would be quite low for the same reasons as described for the previous alternatives.

Although the riparian acres proposed for treatment are the same as in Alternative 2, the area subject to herbicide treatment is about half of that in the Proposed Action. Conversely, the riparian acres proposed for only manual or mechanical treatments more than doubles compared to the Proposed Action. All PDC would still apply, minimizing treatment effects at all sites.

3.10.3. Determination of Effects Including Essential Fish Habitat

Determination of Effects on Proposed, Endangered, and Threatened Species (PETS) Species – Alternative 1

Given the scale of existing treatments, PDC already in place, and the incorporation of USDA Forest Service, Pacific Northwest Region prevention practices (Invasive Plant ROD, USDA Forest Service, 2005b), the effects to PETS species from authorized invasive plant treatments would not change from original determinations outlined in existing NEPA documentation. If anything, effects from future treatment would be less due to the application of prevention practices. Cumulative effects related to treatment would be insignificant.

Since approved treatments would not eradicate or control invasive plants, aquatic habitat conditions at large invasive plant infestation sites could worsen. The scale and severity of habitat degradation would depend on several factors including the invasive plant species present. For example, Japanese knotweed can grow in large patches and exclude virtually all other plant species; reproduce rapidly and in a variety of ways; and roots shallowly. As such, it is a poor stream bank stabilizer and one of the most detrimental invasive plants to aquatic environments. As a result of increased invasive plant spread, riparian and aquatic habitat conditions would experience a slow decline in areas with large infestations.

Effects on listed and USDA Forest Service, Pacific Northwest Region sensitive species would not change from original determinations as a result of this decline in habitat conditions; however, the trend in habitat conditions could be negative and lead to more degraded conditions at some sites.

Determination of Effects on PETS Species – Alternative 2

The Forest Service cannot state that no herbicide would ever enter any water body, but the analysis illustrates than the potential amounts would be so small as to be biologically insignificant. The potential amount of sedimentation and shade reduction also is quite small and would not result in any significant change in amounts of fine sediment or water temperature. Potential effects would be short-term and biologically irrelevant to all PETS species (Table 3-35), and the long-term result of proposed treatment at all sites would be beneficial as native riparian vegetation would be restored.

Although the effects of future herbicide treatments can be predicted based on existing site conditions, it is difficult to predict where new sites would be found and thus which stocks may be affected. Thus, the chance that invasive plant treatment may occur near streams with listed fish or USDA Forest Service, Pacific Northwest Region sensitive species from future herbicide treatment cannot be ruled out. Effects from such treatment would be insignificant however as treatment and site conditions would approximate those already described at known sites.

There is a low probability of minor, discountable negative effects to designated Chinook salmon, chum salmon and steelhead trout critical habitat at the site scale. At the 5th field watershed scale the effect would be neutral. Essential fish habitat would not be adversely affected.

Determination of Effects on PETS Species – Alternative 3

Effects from this alternative would be similar to those in Alternative 2 (Table 3-35), but on an even smaller scale as fewer acres would be treated with herbicide, the primary mechanism for impacts to aquatic species.

There is a low probability of minor, discountable negative effects to designated Chinook salmon, chum salmon and steelhead trout critical habitat at the site scale. At the 5th field watershed scale the effect would be neutral. Essential fish habitat would not be adversely affected.

Table 3-35. A summary of anticipated effects for aquatic PETS species that are found within the Forest and Scenic Area from Alternatives 2 and 3.

Species	DPS/ESU	Effect Determination	Rationale
Bull Trout	Columbia River	NLAA	Potential short-term disturbance; EDRR.
Steelhead Trout	Lower Columbia	NLAA	Potential short-term disturbance; EDRR; Potential sub-lethal effects from herbicide application.
Steelhead Trout	Middle Columbia	NLAA	Potential short-term disturbance; EDRR.
Chinook Salmon	Lower Columbia	NLAA	Potential short-term disturbance; EDRR; Potential sub-lethal effects from herbicide application.
Chinook Salmon	Upper Willamette	NLAA	Potential short-term disturbance; EDRR; Potential sub-lethal effects from herbicide application.

Species	DPS/ESU	Effect Determination	Rationale
Chum Salmon	Columbia River	NLAA	Potential short-term disturbance; EDRR.
Coho Salmon	Lower Columbia	NLAA	Potential short-term disturbance; EDRR; Potential sub-lethal effects from herbicide application.
Federally Listed Species found only in the Columbia River			
Steelhead Trout	Upper Columbia	NLAA	Not present near treatment area; Columbia River so large herbicide is greatly diluted.
Steelhead Trout	Snake River	NLAA	Not present near treatment area; Columbia River so large herbicide is greatly diluted.
Chinook Salmon	Upper Columbia	NLAA	Not present near treatment area; Columbia River so large herbicide is greatly diluted.
Chinook Salmon	Upper Columbia	NLAA	Not present near treatment area; Columbia River so large herbicide is greatly diluted.
Sockeye Salmon	Snake River	NLAA	Not present near treatment area; Columbia River so large herbicide is greatly diluted.
USDA Forest Service, Pacific Northwest Region Sensitive Species			
Redband/Inland Rainbow Trout	NA	MIIH	Potential short-term disturbance; EDRR; Potential sub-lethal effects from herbicide application.
Columbia duskysnail	NA	MIIH	Potential short-term disturbance; EDRR; Potential sub-lethal effects from herbicide application.
Critical Habitat and Essential Fish Habitat			
Steelhead and Chinook Critical Habitat		NLAA	Discountable impacts
Essential Fish Habitat		NAA	Discountable impacts

Abbreviations/ Acronyms:

CH	Critical Habitat
NE	No Effect
NLAA	May affect, not likely to adversely affect
MIIH	May Impact Individuals or Habitat, but Will Not Likely Contribute Towards Federal Listing or a Loss of Viability to the Population or Species

3.10.4. Management Standards and Guidelines

Relevant standards and guidelines contained in the Forest Plan and the Northwest Forest Plan are displayed in Appendix B of this document; relevant standards contained in the Scenic Area Management Plan are displayed in Appendix C. This analysis exhibits that the Proposed Action and Restricted Herbicide Use Alternatives are consistent with all relevant standards and guidelines, when the proposed amendments are incorporated. The Forest Plan amendments are discussed in Section 3.16.

3.10.5. Incomplete and Unavailable Information

Studies of effects to aquatic mollusks, fungi, or unicellular organisms are generally not available. Herbicide effects to these organisms are possible, although available information indicates both benefits and negative effects. Effects to aquatic mollusks, fungi and unicellular organisms are likely to be transient and localized. Standards and PDC that protect other aquatic organisms and are expected to also protect these organisms.

Information concerning sub-lethal herbicide effects to fish and other aquatic organisms is also limited. The SERA risk assessments for some herbicides were based on studies that identified the NOEC for sub-lethal effects (SERA, 2001a, 2003a, 2003c, 2003e; Bakke, 2003b). These risk assessments most likely described the risk of sub-lethal effects to fish and the overall significance to fish populations. For other herbicides, the risk assessment estimated NOEC from lethal doses, which may or may not encompass concern for sub-lethal effects. The estimated NOEC values, however, are very conservative to take into account sub-lethal effects.

3.11. Wildlife

3.11.1 Existing Conditions

There are a number of ways that the Forest and Scenic Area analyze projects to ensure that the diversity of species found on the Forest and Scenic Area are maintained. Since the list of existing species is so extensive, it is more beneficial to concentrate the analysis on species that are more sensitive to anthropogenic influences. A variety of lists have been developed to help look at species that either are declining, sensitive to management, or important from a recreational perspective. Some species or species groups could be considered a litmus test for the ecology of the area because they are more easily detected and could be surveyed.

The following lists are arranged in order of importance for analysis: wildlife special status species which includes Pacific Northwest Regional Forester's sensitive species, survey and manage species, Forest Plan management indicator species (MIS), and landbirds listed as Partners in Flight focal species. The main discussion of these species and list is to determine what species on the list require further analysis for effects from invasive plant treatments. For some species, such as the threatened, endangered and sensitive species and survey and manage species, the effect is determined for the individual species. For other species such as the MIS and landbirds the effects analysis are used to assess the impact to similar species in that group.

The first step in the analysis is to determine what species would be present in the area and habitats that would be treated. Some of the species on the list may occur in the area at some time during the year, but do not when the treatments are expected to occur and do not need further analysis. One example is the red-necked grebe: the red-necked grebe is only a winter migrant and no nesting has been documented on the Forest and Scenic Area. The second step is to look at the species habitat and range, and determine the potential for the species to be in an area that proposed for treatment. The tables summarize the present knowledge of these species on the Forest and Scenic Area, in order to concentrate the analysis on the species most likely to be affected by invasive plant treatments.

Wildlife Special Status Species

The Forest and Scenic Area terrestrial wildlife included in the USDA Forest Service, Pacific Northwest Region's Proposed, Endangered, Threatened and Sensitive species program are listed in Table 3-26. The Proposed, Endangered, Threatened and Sensitive species program is a proactive approach for meeting the USDA Forest Service's obligations under the Endangered Species Act (ESA); National Forest Management Act (NFMA); National Policy direction as stated in USDA Forest Service Manual, 2670 Section; and the U.S. Department of Agriculture Regulation 9500-4. The primary objectives of the program are to ensure that USDA Forest Service actions do not contribute to a loss of viability, or cause a trend toward listing under ESA. Species identified by the U.S. Department of Interior, Fish & Wildlife Service (FWS) as "candidates" for listing under the ESA, and species that meet the USDA Forest Service criteria for protection, are included on the USDA Forest Service, Pacific Northwest Regional Forester's Sensitive Species Lists.

Table 3-36: Special Status/Sensitive Wildlife Species. These are terrestrial wildlife species found on the Forest and Scenic Area that are included in the USDA Forest Service, Pacific Northwest Region's "Proposed, Endangered, Threatened and Sensitive species program." (T=Threatened; E=Endangered; S=Sensitive; P=Proposed).

Species	Forest Occurrence	Scenic Area Occurrence
Northern Spotted Owl (T)	Documented	Documented
Northern Bald Eagle (T)	Documented	Documented
Oregon Slender Salamander (S)	Documented	Documented
Larch Mountain Salamander (S)	Documented	Documented
Cope's Giant Salamander (S)	Documented	Documented
Cascade Torrent Salamander (S)	Documented	Documented
Oregon Spotted Frog (S)	Documented	Suspected
Painted Turtle (S)	Suspected	Documented
Northwestern Pond Turtle (S)	Suspected	Documented
Horned Grebe (S)	Documented	Documented
Red-necked Grebe (S)	No Records	Documented winter migrant
Bufflehead (S)	Documented	Documented
Harlequin Duck (S)	Documented	Documented
American Peregrine Falcon (S)	Documented	Documented
Gray Flycatcher (S)	Suspected	Suspected
Black Swift (S)	No records	Suspected
Baird's Shrew (S)	Documented	No records
Pacific Fringe-tailed Bat (S)	Documented	Suspected
Pacific Pallid Bat (S)	No records	Documented
California Wolverine (S)	Documented	Documented
Pacific Fisher (S)	Suspected	Suspected
Crater Lake Tightcoil (*Pristiloma arcticum crateris*) (S)	Documented	No records
Dalles Sideband (*Monadenia fidelis minor*) (S)	Documented	Documented
Puget Oregonian (*Cryptomastix devia*) (S)	Documented	Documented
Columbia Oregonian (*Cryptomastix hendersoni*) (S)	Documented	Documented

The following details information for each of the special status species listed in Table 3-36. The descriptions focus on the action area for this project. The action area consists of the Forest and Scenic Area in Oregon.

- *Northern Spotted Owl*: This bird is widespread on the Forest on both sides of the Cascades and on the Scenic Area. Experiencing a population decline across its range for reasons that are still being analyzed.

- *Northern Bald Eagle*: This bird is widespread along the Columbia River in the Scenic Area and limited in distribution to a few larger lakes on the Forest. Experiencing a population recovery across most of its range in the Pacific Northwest.

- *Larch Mountain Salamander*: Limited in distribution to rocky, forested areas especially where there is talus. More common on the Scenic Area. There are only a few locations on the Forest.

- *Oregon Slender Salamander*: Widespread across both the Forest and Scenic Area. The known range for this species expanded in the last six years onto the eastside of the Cascades.

- *Cope's Giant Salamander*: Although it has limited range this species is found in fair numbers on both the Forest and Scenic Area in small cold moderately swift streams on the west side of the Cascades.

- *Cascade Torrent Salamander*: Although it has limited range this species is found in fair numbers on both the Forest and Scenic Area in small cold moderately swift streams and seeps on the west side of the Cascades.

- *Painted Turtle*: Although potential habitat exists, there are no known locations in the action area. The only known painted turtle site on the administrative units is on the Washington side of the Scenic Area, which is not in the action area. This species is easy to detect when present so it is not anticipated that any turtles are located in the project area or the ED/RR area.

- *Northwest Pond Turtle*: There are only a few known sites located on the Scenic Area. This species is easy to detect when present. There are no known locations on the Forest.

- *American Peregrine Falcon*: The peregrine falcon is a bird that occurs in small numbers in highly specialized cliff areas on both the Forest and Scenic Area.

- *Gray Flycatcher*: This small flycatcher uses sagebrush for its principal habitat. It is suspected on both the Forest and Scenic Area where a small amount of sagebrush occurs. There are no records of the species on either area. This species will not be analyzed for effects because there is no risk of impact for this species.

- *Black Swift*: This swift is the largest of the North American swifts and nest under or adjacent to large waterfalls. They are extremely secretive and difficult to find. Due to the large number of waterfalls in the Scenic Area, they are officially listed as suspected for the Scenic Area. There is also some potential for them on the Forest since there are a number of large waterfalls. This species will not be analyzed for effects, since there is no risk of impact for this species because no herbicide treatments would occur near large waterfalls.

- *Horned Grebe*: This aquatic bird is mostly observed in the winter on the Forest and Scenic Area. No breeding records occur. This species has been documented on both the Mt. Hood and the Scenic Area.

- *Red-necked Grebe*: This aquatic bird is mostly observed in the winter on the Scenic Area. No breeding records occur. This species has been documented on the Scenic Area; however it will not be analyzed for effects. There is no risk of impact for this species since it is a winter migrant and there would be no invasive plant treatments during the time that these species would be present.

- *Bufflehead*: Buffleheads are ducks that have been documented breeding recently on the Forest. This species occurs regularly in winter on both the Forest and the Scenic Area.

- *Harlequin Duck*: Harlequin ducks occur in small numbers on Cascade streams on the Forest and Scenic Area.

- *California Wolverine*: There are records of occurrence as recently as 1996 from the Forest and 1990 for the Scenic Area. This mammal species occurs only in small numbers, if at all. It is possible that the amount of people presence on public lands has eliminated this species, but there is hope of finding wolverines still inhabiting our landscape. Recent analysis by Dr. Keith Aubry speculates that wolverine records in Oregon my be from wandering individuals at times of food shortages in their primary territories to the north and east (Aubry, Keith B. et al, Western Forest Carnivore Committee Conference March 2006).

- *Baird's Shrew*: Baird's shrews are documented on the Forest, but not on the Scenic Area. There is a lack of good information on the actual populations of this species on the Forest. Surveys tend to kill this species, so there is a reluctance to do extensive surveys to determine the full extent of the population.

- *Pacific Fringed-tailed Bat*: There are is one documented occurrence of this bat on the Forest, but it is listed as suspected on both units. The documented occurrence was revealed through personal communication with Mark Perkins, a bat researcher that conducted bat surveys on Mt. Hood National Forest in the 1990s (Perkins, 2006).

- *Pacific Pallid Bat*: This bat is typically found in the drier areas of Oregon. It has been documented on the Scenic Area. The bat inhabits buildings, caves, rocky crevices, and may roost under bridges.

- *Pacific Fisher*: Fishers were eliminated from most of Oregon, by fur trappers, many years ago. Efforts to restock the species from British Columbia took place on the eastside of the Cascades in the Crater Lake area. There have been no documented records of this mammal closer than the Crescent Ranger District, Deschutes National Forest.

- *Crater Lake Tightcoil–Pristiloma arcticum crateris*: This snail species is so small that it is difficult to survey. There is a record of this species on the Forest. This species requires higher elevations with persistent snow cover. Perennial wet situations in mature forest habitats among rushes, mosses and other surface vegetation or under rocks and woody debris within 30 feet of open water in wetlands, springs, seeps and riparian areas.

- *Dalles Sideband–Monadenia fidelis minor*: This snail inhabits the dryer areas of both the Forest and Scenic Area. This species is usually associated with basalt talus, within 200meters of streams, seeps, or springs in steppe or dry forest plant communities. May be found among rocks, shrubs, or other vegetation and under down wood.

- *Puget Oregonian–Cryptomastix devia*: Both the Forest and Scenic Area are home to this snail species. Mature or old growth forest habitat, typically on or under hardwood logs and leaf litter. Rocks and talus, which are cool and moist beneath, may also be used. These snails are also found on or in the litter under sword fens growing under hardwood trees and shrubs, especially big leaf maples.

- *Columbia Oregonian–Cryptomastix hendersoni*: This snail species is slightly more abundant than the Puget Oregonian and has been located on both administrative units. Generally found within 100-meters of streams, seeps and springs east of the Cascade divide and in the Columbia Gorge. In Western Cascades, it could also be found in mature forested habitats outside of riparian areas, among small, moist talus, hardwood leaf litter or shrubs, or under longs or other debris.

Survey and Manage Species

In 1994, the U.S. Department of the Interior, Bureau of Land Management (BLM) and the USDA Forest Service adopted standards and guidelines for the management of habitat for late-successional and old-growth forest related species within the range of the Northern Spotted Owl, commonly known as the Northwest Forest Plan (USDA Forest Service and USDI BLM, 1994). Mitigation measures were included for the management of known sites, site-specific pre-habitat disturbing surveys, and/or landscape scale surveys for about 400 rare and/or isolated species. These are species that, either because of genuine rarity or because of a lack of information, the Agencies did not know whether they would adequately be protected by other elements of the Northwest Forest Plan (USDA Forest Service and USDI BLM, 1994). The standards and guidelines for these mitigation measures are known as Survey and Manage (USDA Forest Service and USDI BLM, 2001). This decision was amended in January 2001 by the *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines*. The 2004 *Record of Decision to Remove of Modify the Survey & Manage Mitigation Measures Standards and Guidelines* (USDA Forest Service and USDI BLM, 2004), removed the standards and guidelines, and moves some species onto the Region's Proposed, Endangered, Threatened and Sensitive species program(USDA Forest Service and USDI BLM, 2004). On January 9, 2006, Judge Pechman issued an order that set aside the 2004 Record of Decision (USDA Forest Service and USDI BLM, March 22, 2004) and reinstated the 2001 Record of Decision (USDA Forest Service and USDI BLM, January 2001), along with any amendments or modifications (including the 2003 Annual Species Review decisions) that were in effect as of March 21, 2004.

Table 3-37 lists the terrestrial Survey and Manage species that will be included in the analysis for the invasive plant treatment projects.

Table 3-37: Terrestrial Survey & Manage Species, included in the Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (USDA Forest Service and USDI BLM, 2001). (S=Sensitive).

Species	Forest Occurrence	Scenic Area Occurrence	Surveys Needed?
Great Gray Owl	No Records	No Records	No
Oregon Red Tree Vole	Documented	Documented	No
Larch Mountain Salamander (S)	Documented	Documented	No
Evening Field Slug (*Derocerous hesperium)* (S)	No Records	No Records	Yes
Crater Lake Tightcoil (*Pristiloma arcticum crateris*) (S)	Documented	No Records	No
Dalles Sideband (*Monadenia fidelis minor*) (S)	Documented	Documented	No
Puget Oregonian (*Cryptomastix devia*) (S)	Documented	Documented	No
Columbia Oregonian (*Cryptomastix hendersoni*) (S)	Documented	Documented	No

On page 22 of the Standards and Guidelines of the 2001 Survey and Manage ROD it indicates that, “the line officer should seek specialists’ recommendations to help determine the need for surveys based on site-specific information”. The line officers for this decision are the Mt. Hood National Forest, Forest Supervisor and Columbia River Gorge National Scenic Area, Area Manager. It is the Forest Wildlife Biologist recommendation that surveys are not necessary for the great gray owls on either the Forest or Scenic Area, based on a lack of records from multiple surveys over several years,

Great gray owls were searched for during strategic surveys and project surveys from 1995-1998. No owls have ever been recorded during those surveys and no one has ever reported a great gray owl sighting on the Forest or Scenic Area. In addition, there are no habitat changes that would adversely affect great gray owl populations or there prey. Because the likelihood of an owl being present is low and the effects to the habitat would not impact great gray owls, it is recommended that no surveys be completed for this species.

Red tree voles are arboreal species and there are no treatment methods that would affect this species or it’s habitat due to the ecology of this vole. It is the Forest Wildlife Biologist recommendation that surveys are not necessary for red tree voles for the invasive plant treatment project covered in this EIS.

Larch Mountain Salamanders are terrestrial salamanders that are closely associated with mature timber and rock talus. All of the known locations in the Scenic Area and Forest for this salamander are in this type of habitat. An extensive amount of surveys were done on the Forest for this species and no new locations have been discovered despite research level survey efforts. The recommendation for this species on the Forest and Scenic Area is to avoid impacts to this species by not planning projects in this habitat. The PDC eliminate the need to survey for this species.

Derocerous hesperium, a rare slug has not been located on the Forest despite extensive pre-project surveys and strategic survey efforts. In discussions with Steve Dowlan (2006), one of the authors of the 2003 Survey Protocol for terrestrial mollusk, he indicated that *Derocerous hesperium* had recently been discovered in grassy wet meadows with standing water. Dowlan (2006) felt that surveys were not warranted in areas that do not meet this habitat description. There are no anticipated impacts to the habitat or populations of this slug if they happen to be present in the proximity of the treatment areas. Therefore, it is the Forest Wildlife Biologist recommendation that efforts to survey for these species be confined to the meadow at site 69-028 unless they are part of the surveys for other species. Surveys for this species were completed in May and June of 2006 at site 69-028. The habitat at this site was too dry for this species, and no other sensitive or Survey and Manage mollusk were located during the protocol surveys.

Pristiloma arcticum crateris (Crater Lake Tightcoil), *Monadenia fidelis minor* (Dalles Sideband), *Cryptomastix devia* (Puget Oregonian), and *Cryptomastix hendersoni* (Columbia Oregonian) are not found in the habitats that are planned for treatments or the PDC has been designed to reduce the impacts of treatment by avoiding broadcast boom spraying in the habitats where these species could potentially be found (near seeps, springs, and riparian areas). Since these species are typically under leaf litter or rocks and logs during the temperatures and humidity where invasive plant treatments normally take place, the potential impacts to these species does not warrant surveys. There would not be a substantial change to the native habitats that these species inhabit so the recommendation is that no surveys for these species be implemented for the treatment of invasive species.

Management Indicator Species (MIS)

The Forest Plan, which includes the Scenic Area lands in Oregon, utilized a strategy of Management Indicator Species (MIS) to represent other species: these species require special wildlife considerations. These species presumably are representative of the habitat needs of other species because they have similar biological traits. The species selected were elk, deer, pileated woodpecker, American marten, Northern Spotted Owl, silver gray squirrel, and Merriam’s turkey. All of these species are analyzed except Merriam’s turkey, which is an introduced species.

Landbirds

Approximately 176 bird species occur on the Forest and Scenic Area utilizing a wide variety of habitats. One hundred and eight of these birds are classified as landbirds. Of these birds 6 species are included in this analysis because they are recommended for management by the Partners in Flight Landbird Conservation Plan (2004) and the Conservation Strategy for Landbirds in Coniferous Forest of Western Oregon and Washington (Altman, 1999). The six species that are analyzed are: hermit warbler, blue grouse, rufous hummingbird, willow flycatcher, band-tailed pigeon, and olive-sided flycatcher. These species have wide distribution on the Forest and Scenic Area.

State Recognized Species Analysis for Scenic Area Management Plan

The Scenic Area Management Plan incorporates the state listed species as a analysis tool. The species are addressed and effects to these species are located in Table X-4 in Appendix X – Effects of Herbicides on Wildlife Species. The effects analysis for these species is based on similar species addressed by the body of this EIS. This includes species in the same taxonomic group, life history, distribution, and feeding strategy. The effects to amphibians and reptiles are largely unknown and this is also reflected in this table.

3.11.2 Effects Analysis & Methodology

Excerpts from the Invasive Plants FEIS (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 and Scenic Area. Additional information regarding the impacts of this project on wildlife species is contained in Appendix X – Effects of Herbicides on Wildlife Species, and Wildlife Specialist Report, Biological Evaluation, and Biological Assessment.

The following terminology and introduction from the Invasive Plants FEIS (2005a) are repeated here for easy reference, and are pertinent to discussion of effects on wildlife on the Forest (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, 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 & Hansen, 1969; Nolte and Fulbright, 1997, McMurray et al., 1993a; McMurray et al., 1993b). The use of herbicides to treat invasive plants, however, does have the potential to harm 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. Birds and mammals may ingest vegetation or insects that have been sprayed with some herbicides and potentially experience these types of effects.

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. A metabolite of triclopyr, 3,56-trichloro-2-pyridinol (TCP), is toxic to 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 results of the herbicide analysis indicate 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.

The measuring factors used for comparing the alternatives are:

- The total number of acres of wildlife habitat benefited by removal of invasive species to restore native vegetation and rate of treatment.

- The number of treatment acres that bisect or traverse areas of late-successional habitat where potential exposure to herbicides could occur for special status species using this habitat type.

Surfactants (NPE) 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. For the purpose of analysis, it is assumed that the number of plausible exposure scenarios that exceed the toxicity indices is the same for surfactant as it is for the herbicides. No estimate of acres treated using NPE surfactants is made because surfactants may not be used, or other additives may be used instead, so there is no direct correlation between acres treated with herbicide and acres treated with NPE.

Analytical Methods

The analytical methods used in determining toxicity of herbicides and surfactants on wildlife species including special status species, management indicator species and land birds can be found in Appendix X.

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 PDC is determined by Geographic Information System (GIS) analysis of the number of acres of herbicide treatment that dissect or traverse habitat that is suitable for Northern Spotted Owls (eighty years old and older with multilayered canopies and greater than 60 percent canopy closure).

The number of special status species potentially impacted by manual, mechanical, or cultural treatments following implementation of the PDC is determined by Geographic Information System (GIS) analysis of the number of acres of non-herbicide treatment that dissect or traverse habitat that is suitable for Northern Spotted Owls (eighty years old and older with multilayered canopies and greater than 60 percent canopy closure).

Effects Thresholds

Thresholds provide an overall measurement of how the Proposed Action would influence the existing environment. The regulations issued by the CEQ to implement the NEPA define significance of effects in terms of context and intensity. Context refers to the geographic area of effect, which varies with the physical setting of the Proposed Action and with each element of the environment being analyzed. Intensity refers to the severity of the effect. Duration also must be considered in the assessment of effects and effects must be quantified as much as possible. For this environmental impact statement, effects thresholds are defined using five categories of significance:

- **No Effect** effects *would not* cause any observable change in natural conditions or impact the species being analyzed.
- **Negligible** effects may or may not cause observable changes to natural conditions or the species being analyzed; regardless, they do not reduce the integrity of a resource.
- **Minor** effects cause observable and short-term changes to natural conditions or the species being analyzed, but they do not reduce the integrity of a resource.
- **Moderate** effects cause observable and short-term changes to natural conditions or kill or harm the species being analyzed, and/or they reduce the integrity of a resource.
- **Major** effects cause observable and long-term changes to natural conditions and may kill a large number of the species being analyzed, and they reduce the integrity of a resource.

Biological Evaluation Process and Summary

Forest management activities that may alter the habitat for special status species are required to undergo review in a Biological Evaluation (FSM 2671.44 and FSM 2670.32) as part of the NEPA process. The Biological Evaluation process (FSM 2672.43) is intended to document that proposed management actions would not jeopardize the continued existence or cause adverse modification of habitat for listed or proposed species, or lead towards the likelihood of Federal listing for sensitive species

The Biological Evaluation is a 4-step process as follows:

Step 1) Pre-field review to determine if habitat for the species is present.

Step 2) Field reconnaissance to determine if the species is present.

Step 3) Risk assessment/analysis of effects for species by alternative. Risk assessment is based on evaluation of impacts to habitat (even if the habitat is not known to be occupied), individuals (risk from disturbance, actual physical harm to an individual or direct loss of habitat in known occupied territories), and population (based on available regional information).

Step 4) A biological investigation if the risk assessment reveals a trend towards federal listing (sensitive species only) or consultation with the FWS if a may effect call is made for T, E, or P species under the Proposed Action.

Each PETS species associated with the project area is evaluated based on these steps. Evaluation of impacts on a given species may be complete at the end of Step 1 (e.g., if no habitat is present, the risk is automatically determined to be none) or may extend through Step 4. If field reconnaissance is not undertaken and habitat is available, species occurrence is assumed.

The FWS may modify a project based upon consultation. In addition, the USDA Forest Service provides for modification to any project based on a contract provision that is included in all project contracts. This provision provides for the protection of any threatened or endangered species and their habitat.

3.11.3 Direct/Indirect Effects

The wildlife analysis shows there is little concern for direct or indirect effects from any of the proposed treatment methods. The PDC have alleviated any concern for toxic effects of the herbicides proposed by this document. When a concern existed a PDC was proposed to reduce or eliminate the negative effect. There have been almost no concerns for wildlife related to the other treatment methods. Disturbance to nesting birds, which is common to all methods proposed is the most likely negative indirect effect that would occur as a result of invasive plant treatments. This would result in some loss of reproduction for a small number of ground nesting birds. The list of herbicides being analyzed were selected for both their ability to effectively treat target plants and their relative safety to humans, terrestrial and aquatic wildlife species and fish. The following discussion focuses on "potential exposures." Exposures to herbicides have a small potential to occur because of PDC. In order to be objective, potential herbicides are examined in the unlikely event that there is an unintentional exposure.

The number of acres of potential exposures is estimated for each alternative based on the suite of herbicides that could be used. This is addressed for individual species when habitat has been delineated, and indicates the number of ways that animals could be exposed to a harmful dose of herbicide. "Plausible" includes worst-case scenarios, many of which are very unlikely to actually occur. Individual projects conducted are likely to involve small total acreages, or long narrow road shoulders. The default value used in aquatic exposure scenarios (e.g., amphibians) is a 10-acre treatment area. Herbicide application to larger areas would increase the likelihood of exposure, while a small number of acres would reduce likelihood of exposure, compared to the area analyzed in the exposure scenarios. The number of acres treated at one time within one project area is likely to influence the likelihood of exposure to herbicides for wildlife.

Indirect mortality is possible from sub-lethal effects that could increase susceptibility to predation. Indirect effects to wildlife from cumulative herbicide exposure are also possible. For example, if a sub-lethal exposure affects an internal organ and the effect is not quickly reversed, then subsequent exposure could cause cumulative damage. All the herbicides in this EIS are excreted rapidly (often within 24 to 48 hours), and do not accumulate up the food chain. This reduces, but does not eliminate, the potential for these types of cumulative damage to internal organs.

The herbicides with greatest potential for harm to birds and mammals, in decreasing severity are triclopyr, picloram, glyphosate, sulfometuron methyl, and clopyralid. The effects analysis is based on using the typical treatment and not the highest rate allowable (See Table 2-7).

The effect to habitat and diversity could be demonstrated by an excerpt from research by Sullivan et al. (1998a): “Both indices of shrub diversity, however, were not different over the 5 years. Herbicide treatment initially reduced crown volume index of herbaceous vegetation, but values quickly recovered to untreated levels by the second year after treatment. Herbaceous species diversity was not affected by herbicide treatment. Diversity of small mammal communities apparently was not affected by herbicide application. In general, diversity of plant and small mammal communities seemed to be maintained, and hence, these treatment sites may not lower overall diversity of a forested landscape” (Sullivan et al. 1998). Also, Sullivan field tested the effect of herbicides for snowshoe hares and summarized the following: “Herbicide-induced habitat alteration in optimum habitat seemed not to affect abundance of snowshoe hares during summer and autumn” (Sullivan 1994). And this was further tested for bird species diversity by the following excerpt: “During autumn and winter, more birds and more species were found on sites treated with herbicides than on reference sites” (Schulz et al, 1992)

Table 3-38: Summary of project effects to Special Status Wildlife Species. (T=Threatened; E=Endangered; S=Sensitive; P=Proposed).

Species	Project Effects Alternatives 2 & 3	Reason	Project Effects Alternative 1	Reason
Northern Spotted Owl (T)	No effect	No effect from herbicide due PCD and minor effect from disturbance.	Minor effect	No Effect from herbicide due to PCD and No Effect from disturbance.
Northern Bald Eagle (T)	No effect	PDC eliminate effects	No effect	Not in habitat
Oregon Slender Salamander (S)	Minor effect	Could travel into sprayed areas.	Minor effect	Could travel into sprayed areas.
Larch Mountain Salamander (S)	No effect	PDC eliminate spraying in habitat.	No effect	Not in habitat
Cope’s Giant Salamander (S)	No effect	No aquatic effects expected due to PDC	No effect	Not in habitat
Cascade Torrent Salamander (S)	No effect	No aquatic effects expected due to PDC	No effect	Not in habitat
Oregon Spotted Frog (S)	No effect	No aquatic effects expected due to PDC	No effect	Not in habitat
Painted Turtle (S)	No effect	No aquatic effects expected due to PDC	No effect	Not in habitat
Northwestern Pond Turtle (S)	No effect	No aquatic effects expected due to PDC	No effect	Not in habitat
Horned Grebe (S)	No effect	No aquatic effects expected due to PDC	No effect	Not in habitat
Red-necked Grebe (S)	No effect	No aquatic effects expected due to PDC	No effect	Not in habitat
Bufflehead (S)	No effect	No aquatic effects expected due to PDC	No effect	Not in habitat
Harlequin Duck (S)	Minor effect	Minor effect from disturbance	No effect	Not in habitat
American Peregrine Falcon (S)	Minor effect	Minor Disturbance, No herbicide Effects	No effect	Not in habitat
Gray Flycatcher (S)	No effect	Specialized habitat.	No effect	Specialized habitat.
Black Swift (S)	No effect	Specialized habitat.	No effect	Specialized habitat.
Baird’s Shrew (S)	Minor effect	Could travel into sprayed areas.	Minor effect	Could travel into sprayed areas.

Species	Project Effects Alternatives 2 & 3	Reason	Project Effects Alternative 1	Reason
Pacific Fringe-tailed Bat (S)	No effect	Not likely to come in contact with spray or ingest insects sprayed.	Minor effect	Not likely to come in contact with spray or ingest insects sprayed.
Pacific Pallid Bat (S)	Minor Effect	Use habitat treated. Ingestion of treated insects possible.	Minor Effect	Use habitat treated. Ingestion of treated insects possible.
California Wolverine (S)	No effect	Unlikely to be in areas sprayed.	No effect	Unlikely to be in areas sprayed.
Pacific Fisher (S)	No effect	Unlikely to be in areas sprayed.	No effect	Unlikely to be in areas sprayed.
Evening Field Slug (Derocerous hesperium) (S)	No effect	Pre Project Survey	No effect	Not in habitat
Crater Lake Tightcoil (*Pristiloma arcticum crateris*) (S)	Minor effect	Method of application should reduce chances of being in contact with herbicides	No effect	Not in habitat
Dalles Sideband (*Monadenia fidelis minor*) (S)	Minor effect	Could travel into sprayed areas	No effect	Could travel into sprayed areas
Puget Oregonian (*Cryptomastix devia*) (S)	Minor effect	Method of application should reduce chances of being in contact with herbicides	No effect	Not in habitat
Columbia Oregonian (*Cryptomastix hendersoni*) (S)	Minor effect	Method of application should reduce chances of being in contact with herbicides	No effect	Not in habitat
Great Gray Owl	No effect	Not located on the Forest or Scenic Area.	No effect	Not located on the Forest or Scenic Area.
Oregon Red Tree Vole	No effect	Forage outside spray zone	No effect	Forage outside spray zone
Pileated Woodpecker	No effect	Specialized Forage	No effect	Specialized Forage
American Marten	No effect	Unlikely to be in areas sprayed.	No effect	Unlikely to be in areas sprayed.
Deer and Elk	Minor effect	Forage on the ground along roads occasionally	Minor effect	Forage on the ground along roads occasionally
Hermit Warbler	No effect	Forage outside spray zone	No effect	Forage outside spray zone
Blue Grouse	Minor effect	Forage on the ground along roads occasionally	Minor effect	Forage on the ground along roads occasionally
Willow Flycatcher	No effect	Forage outside spray zone	No effect	Forage outside spray zone
Band-tailed pigeon	Minor effect	Forage on the ground in openings occasionally	Minor effect	Forage on the ground in openings occasionally
Olive-sided flycatcher	No effect	Forage outside spray zone	No effect	Forage outside spray zone
Rufous Hummingbird	No effect	Specialized Forage	No effect	Specialized Forage

Proximity of Species Habitat to Treatment Area

The level of exposure is key to the effects analysis for the impacts to wildlife. One analysis point that is common to all of the alternatives is the proximity of habitat to the treatment areas. The majority of the treatments occur in early seral stage habitat. The notable exceptions are knotweed species and English ivy, which occur in any age stand. Knotweed species are most often found in riparian areas that may contain mature forest. The majority of the TES species and two of the MIS species occur in mature forest or aquatic habitats. Most often, these areas would not be receiving treatments. In the case of knotweed species and English ivy, the treatments would be implemented in such as way that the species would be adequately protected from receiving high exposure to herbicides. English ivy would be treated with manual and mechanical treatment methods, and knotweed species would receive stem injection or prudent use of foliar spray. Pacific pallid bats, deer and elk are the exception to the rule because they are heavy users of early seral habitats especially for foraging. Pallid bats have a very limited range in the Forest and Scenic Area, being confined to the drier habitats in the Scenic Area.

Mature forest species are still analyzed because they occasionally pass through early seral habitats to get to adjacent stands. During these times they could be exposed to herbicides or forage on prey that have been in these areas. The level of exposure should be kept in mind as the species accounts are being reviewed.

Manual, Mechanical, and Cultural Treatment Effects Common to All Alternatives

There are no adverse effects to habitat from the use of manual, mechanical or cultural treatment to any of the species analyzed for any of the alternatives. There is a possible indirect effect of disturbance to nesting birds. Some birds would be flushed during the nesting season from personnel that are conducting manual, mechanical or cultural treatments. Most of these birds would return to the nest if only flushed once or twice because nest fidelity is high. There are a few species where disturbance may cause a nest failure for that year. Occasionally, mammals may also be displaced during one of these types of treatments. This could result in some young animals wandering away from the maternity site during this type of treatment. In some of these scenarios the young may become separated from the mother and die as a result. The actual number of times that this would happen is impossible to determine, and would vary depending on the species, time of year, and the individual animal involved. Treatments later in the year would have less effect on both mammal and avian disturbance, and resulting reproductive loss.

Alternative 1 – No Action

Alternative 1 has the least number of acres of herbicide treatments that potentially could expose birds or mammals, such as pallid bats, Baird's shrews, blue grouse, deer and elk that eat insects or vegetation to herbicides (Table 2-1). The three herbicides (glyphosate, picloram, and triclopyr) permitted in this alternative could result in 1235 acres of herbicide exposure that may, in rare cases, exceed the toxicity indices at typical application rates. This alternative, however, utilizes spot spraying more than it does broadcast spraying on the majority of treatment sites so this overestimates the impacts for this alternative. This is the only alternative that includes dicamba. The Invasive Plant FEIS (2005a) demonstrated that although this herbicide us very effective, it has a higher potential to exceed LOAELs compared to other herbicides analyzed, including those are included in the Proposed Action and Restricted Herbicide Use Alternatives.

All four herbicides included in this alternative have the potential to have toxic effects for some species. The herbicide effects analysis indicated that glyphosate has the greatest potential for harmful doses to amphibians. The surfactant found in some glyphosate formulations is particularly toxic to aquatic species. Management direction in this alternative, however, severely restricts herbicide use in aquatic amphibian habitat, making this scenario less likely to occur.

Picloram has potential risk to amphibians if it reaches the aquatic resource. Since little research has been done on the effects of herbicides on amphibians, fish are used as a surrogate for analysis. PDC that limit the distance herbicides may be spray near water features that could contain fish or amphibians would reduce this risk. Also, there is a lack of information on the effects to amphibians if they are directly sprayed. Terrestrial amphibians regulate moisture by staying hidden most of the day under bark, logs, and rocks. This should protect amphibians from being directly sprayed by herbicide in most cases.

There is a risk to small insect eating mammals from ingesting picloram. The Baird's shrew, a small insect eating mammal, is not likely to have habitat that is being treated in this alternative. The Baird's shrews inhabit older forested stands and this alternative treats open disturbed sites.

Triclopyr has the greatest risk to terrestrial wildlife. Plausible scenarios indicate risk to amphibians, deer and elk, migratory birds, and small insect eating mammals. These scenarios are considered worst case and the actual results are not expected to occur due to PDC (Section 2.2) that are implemented to reduce this risk. Due to the risk to wildlife and fish resources, triclopyr would not be broadcast boom sprayed.

Although the use of herbicides represents potential risks to wildlife, in practice, the management direction included in this alternative as well as the environmental conditions and animal behavior would tend to minimize actual impacts. 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 species habitat from loss due to invasive plants.

Alternative 2 – Proposed Action

The Proposed Action rehabilitates the greatest amount of wildlife habitat by eradicating, controlling and containing invasive plants. This rehabilitation would return these areas to native vegetation. Many of the native plant species are preferred for cover and forage by several species of wildlife such as deer, elk, snowshoe hare, and mountain quail, not to mention native butterflies and insects. It is expected that removing competing vegetation would improve habitat for these species and others after the site is restored.

Alternative 2 also treats the greatest amount of habitat that bisects or traverses mature forest where the potential for exposure of special status species wildlife is increased. By examining the life cycles of the special status species it becomes evident that the concern for exposure is minor because these species do not use the non-late seral habitats adjacent to their preferred late seral habitats on a regular or frequent basis. The amount of habitat adjacent to or bisected by the treatment areas is quantified in Table 3-39, Treatment Acre by Alternative and Spotted Owl Habitat Type, under suitable Northern Spotted Owl habitat. There are a little over five times as many acres in Alternative 2 near late-successional habitat that could include broadcast spraying than in Alternative 1 or 3. This demonstrates a greater potential for exposure.

Most of the species analyzed do not use the early seral habitats that are being rehabilitated so the effects to these species both negative and positive are minor. The improvements are greatest for early successional species where the invasive plants occur most frequently. Examples of species benefited are deer, elk, quail, sparrows, finches, towhees, voles, mice, and weasels. These same species are at a higher risk from herbicide, manual, mechanical, and cultural treatment than other species because of their use of the target habitats. Herbicides permitted in the Proposed Action include chlorsulfuron, clopyralid, glyphosate, imazapic, imazapyr, metsulfuron methyl, picloram, sethoxydim, sulfometuron methyl, and triclopyr. The effects analysis of herbicide use (Appendix X, Table X-1) indicates that there are plausible scenarios that could put focal species at risk from use of clopyralid, glyphosate, picloram, sulfometuron methyl, triclopyr and NPE surfactant. Implementing the PDC (Section 2.2) reduces the effects to individuals in the treatment area.

In this alternative, 2,373 acres would be treated annually with triclopyr, glyphosate, picloram, clopyralid, and sulfometuron methyl, posing a potential risk to species of wildlife designated as sensitive by the Regional Forester on these acres. There is an estimated 12,682 acres that occur in habitats used to some degree by wildlife where exposure to herbicides is likely. The acres of exposure do not imply that wildlife would necessarily receive toxic dosages, but merely demonstrates a risk. PDC and limiting certain herbicides to backpack spot spraying should drastically reduce the actual impacts of using the herbicide treatments.

The Proposed Action represents a more than a five-fold increase in acres of potential exposure compared to Alternative 1. However, in relation to the total acres of habitat available for insect and vegetation-eating birds and mammals within the project area (1.1 million acres on the Forest and 39,000 acres on the Scenic Area), and the wide distributions of most of their populations, 13,000 acres per year represents a negligible risk to wildlife on a Forest scale.

All scenarios in this alternative do not approach a dose known to cause any adverse effect. The potential for some effects, to occur, however, cannot be ruled out. Potentially harmful scenarios from triclopyr are not plausible due to management direction in this alternative restricting use to selective application methods (Standard 16, Invasive Plant ROD, 2005b). Triclopyr scenarios are therefore not expected to occur. All other bird and mammal scenarios in this alternative exceed only the NOAEL and do not approach a dose known to cause any adverse effect (LOAEL). Nevertheless, the potential for some effects to occur cannot be ruled out.

High application rates of glyphosate with surfactant could be lethal to amphibians, as discussed in Alternative 1. Management direction in this alternative requires the consideration of appropriate formulations and application method to reduce or eliminate negative effects to aquatic biota, so this effect is not likely to occur.

The 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. By allowing the treatment of 13,000 acres each year this adds additional risk factors to wildlife just by adding additional exposure scenarios. This also expands the treatment into areas that may not have been originally anticipated; however, the new sites could likely be in the same vicinity of current treatment areas as the current invasive plants spread. The risk factors do not change and the PDC (Section 2.2) would still reduce the effects to little or no impacts to wildlife species.

Similar to Alternative 1, the management direction included in this alternative as well as the environmental conditions and animal behavior would tend to minimize actual impacts. At the project scale, choices could be made to avoid situations that could cause harm to wildlife. For example, certain herbicides could 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. Actual adverse effects are therefore not likely to occur. Any short-term adverse effects would be largely offset by the long-term benefits to these species from protecting their habitat from loss due to invasive plants.

Alternative 3 – Restricted Herbicide Use Alternative

Alternative 3 would treat the same 13,000 acres of invasive plant infestations that are treated in the Proposed Action. The difference between Alternative 2 and Alternative 3 is the amount of herbicide that would be used in these two alternatives. In the EDRR for Alternative 2 the treatments would be primarily with herbicides, and in Alternative 3 treatments would be mostly manual and mechanical.

In Alternative 3, 2028 acres of broadcast boom spraying occurs, whereas the Proposed Action (Alternative 2) would treat 12,214 acres with a broadcast boom sprayer. This is mentioned because broadcast boom spraying although more efficient at treating invasive plants is the most likely to spray herbicides on plants that would be eaten by wildlife and indirectly spray insects and small less mobile wildlife species such as newts and salamanders. Of the 2028 acres that would be sprayed by broadcast boom sprayer only 507 acres of this is in or adjacent to mature forest that would be considered suitable Northern Spotted Owl habitat and where potential special status species might be present in these adjacent stands.

The biggest difference in the effect of this alternative compared to the Proposed Action is the effectiveness of the treatment. Manual, mechanical and cultural treatments have been attempted in the past as the sole way to control invasive plants and the effect has been met with very minor successes (See Section 3.6 – Botany and Treatment Effectiveness). This alternative still puts the species that rely on the early successional habitat at more risk from habitat loss, compared to the risk that a few individuals could receive a toxic dose of an herbicide treatment.

The EDRR for Alternative 3 would still be 13,000 acres potentially per year but the treatments would not include herbicides except for the high priority areas. This eliminates any concern for toxic effects to wildlife and aquatic organisms. Manual, mechanical and cultural treatments are not really a concern for wildlife unless they disrupt nesting or reproduction.

Alternative Comparison

Alternative 2 also has the greatest benefit to wildlife habitat by reducing or eliminating invasive species on approximately 13,000 acres of the Forest and Scenic Area. The results of the analysis, however, indicate that Alternative 2 poses the highest exposure potential to wildlife from herbicides. It includes the greatest number of acres of treatment that are adjacent or bisect late-successional forest. Under Alternative 2, approximately 12,682 acres[1] are projected for treatment with herbicides where estimated doses could potentially expose wildlife to herbicides. Potential exposure to TES species occur on 2,373 acres.[2] Most of these acres would not be suitable habitat for the TES species that could be affected. Additionally, PDC would reduce the risk of exposure.

Alternative 3 includes 4,047 acres of treatment that could potentially expose birds, amphibians, and mammals that eat vegetation or insects to herbicides. Potential herbicide exposure of special status species occur on 506 acres.[3]

In contrast, Alternative 1 poses the lowest potential exposure risk to wildlife from herbicides. Under Alternative 1, two hundred thirty five acres would be treated with herbicides where some potential exist for exposure of special status species.

These differences seem substantial, however in practice, the management direction included in all alternatives (including the No Action Alternative) as well as the environmental conditions and animal behavior would tend to minimize actual impacts. At the project scale, choices could be made to avoid scenarios that could cause harm to wildlife. For example, certain herbicides could be avoided in specific areas or times of the year, where/when grass-eaters or amphibians may be at risk.

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[1] Quarries and administrative sites that have no potential to affect wildlife populations due to low amounts of habitat are not considered as plausible scenarios that could affect sensitive or MIS species.

[2] These acres are based on the acres of suitable Northern Spotted Owl habitat, since the sensitive species potentially affected would also utilize mature stands for habitat.

[3] These acres are based on the acres of suitable Northern Spotted Owl habitat, since the sensitive species potentially affected would also utilize mature stands for habitat.

During analysis for possible impacts to threatened or endangered species, the analysis indicated that the risk of ingesting or absorbing herbicides from treatments was negligible. The proximity of invasive plant treatments and the noise created from mechanized methodologies could cause some disturbance to bald eagles based on current standards for disruption and disturbance distances. If implementation of new treatment sites, under EDRR, are close to new or unknown nest sites. A seasonal restriction in treatment areas within a quarter mile of a bald eagle nest site would be implemented when nests are located (PDC H.1). Early analysis indicated a possible need for protection of Northern Spotted Owls from disturbance. A test of spray equipment was initiated to determine the amount of noise created by the spray truck and equipment. Noise level measurements of spray equipment indicate that although noise levels could be detected and elicit an alert response from the owls, the noise level would be below what is currently considered to be disruptive to breeding and feeding activities. The sound level measurement of a truck mounted boom sprayer was 64 decibels and is below the threshold for disturbance. All other sounds from other treatment methods are less than that of a truck mounted boom sprayer. Therefore there are no effects from disturbance from invasive plant treatments.

3.11.4 Cumulative Effects

Herbicide use occurs on lands other than the Forest and Scenic Area. Herbicide use occurs on other federal, state, and county ownerships, state and private forestry lands, rangeland, utility corridors, road rights of way, agricultural lands and private residences. Herbicide use on Pacific Northwest National Forests could contribute to some cumulative effects, but data is lacking that would permit any quantitative estimates of cumulative exposure or risk.

Since much wildlife move and migrate, they could be exposed to herbicides on adjacent lands or along their migration routes. Species could be exposed to the same herbicide on multiple ownerships, or a combination of different herbicides. Wildlife could also be exposed to other chemicals, such as insecticides, rodenticides, fungicides, and others. This project does not include the use of any other types of chemicals, but the herbicide triclopyr and the insecticide chlorpyrifos share a common metabolite, TCP, which is toxic to aquatic organisms. Thus, the use of triclopyr could add to TCP exposure resulting from the use of chlorpyrifos. Another example of a potential cumulative effect is from hexachlorobenzene, a ubiquitous industrial pollutant, which is found in both picloram and clopyralid. While the amounts of hexachlorobenzene added to the environment from USDA Forest Service use of picloram and clopyralid do not represent a substantial addition in comparison to existing background levels (SERA, 2003b, 2004b), it could be considered a cumulative effect.

The Invasive Plants FEIS (2005a) has addressed the cumulative effects for the Oregon and Washington region. The conclusion of the Invasive Plant FEIS (2005a) was that a three percent increase in land treated with herbicides, spread across the two state project area would not significantly increase potential adverse effects to wildlife. Additive effects from herbicide exposure are not likely to occur, or would be minimal, because herbicides considered in this EIS do not accumulate in the body, nor concentrate up the food chain (See SERA Risk Assessments, 2001b, 2003a, 2003b, 2003c, 2004a, 2004b, 2004c, 2004d, 2004e, 2004f). Adverse effects that do occur would only occur to a few individual animals, and would not result in any important effects to any species populations.

The small contribution that USDA Forest Service use of herbicide for invasive plant treatment makes to the statewide totals for herbicide use indicate that the potential cumulative effect on a regional scale is very small. Likewise, the relatively small differences between the alternatives, in comparison to the totals, make insignificant any differences between the alternatives in potential for cumulative effects to wildlife.

3.11.5 Species Specific Discussions

A full discussion of the direct, indirect, habitat, disturbance, and cumulative effects to threatened or endangered species are included in this section.

Only a summary of the effects of invasive plant treatment and analysis for all non-threatened or endangered species is included here. Appendix X – Effects of Wildlife Species includes a more detailed analysis of the species habitat, lifecycle information, and in-depth discussion of the effects of the various treatments and alternatives for these species.

3.11.5.1 General Overview of Herbicide Analysis by Species

This analysis is the potential effects prior to implementing the standards and guidelines from the Invasive Plant ROD (2005b) and the PDC (Section 2.2). 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 analysis is those effects that could be expected to exceed toxicity index based on the information outlined in Appendix P of the Invasive Plant FEIS (2005a). 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 aquatic salamanders would have the same sensitivity to herbicides as fish.

- Small insectivorous birds that defend territories may feed in the same area and are subject to chronic exposures. Exposures to herbicides by the three Partners in Flight watch listed insectivorous migratory birds, however, is probably 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.

- Grouse may return to the same areas to feed on a regular basis, especially if the food supply is close to a breeding display area. As a result, chronic exposures may occur.

- Bats feed over a large enough area to not be subjected to chronic exposures.

- Mustelids travel widely and would not be in the same area long enough to be subjected to chronic exposures.

- Northern Spotted Owls and 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.

- Woodpeckers and hummingbirds would not be exposed to herbicide because of their feeding methods. Their food sources are protected. Since the beetles and ants that the woodpeckers feed on are buried inside of decaying wood, and since the nectar of flowers is inside the "throat" of the flower which is formed by the elongated petals, the food source of these two groups of birds is not likely to be contaminated by spraying herbicides.

- Deer and Elk would occasionally feed in the same area for multiple days leading to chronic exposures.

- The impacts to mollusk may be greater than depicted in the table based their skin may absorb herbicides more than the invertebrates that were used in the analysis. The likelihood of the sensitive mollusk being in the areas targeted for spraying, however, is extremely low based on habitat types.

3.11.5.2 Northern Spotted Owl (*Strix occidentalis caurina*): Threatened

A. Habitat

Old growth coniferous forest is the preferred nesting, roosting and foraging habitat of spotted Northern Spotted Owls in Oregon. Old growth habitat components that are typical for Northern Spotted Owls are: Multilayered canopies, closed canopies, large diameter trees, abundance of dead or defective standing trees, and abundance of dead and down woody material. The following describes Northern Spotted Owl habitat as defined in the *Programmatic Biological Assessment for Projects with the Potential to Modify the Habitats of Northern Spotted Owls and/or Bald Eagles or Modify Critical Habitat of the Northern Spotted Owl*, Willamette Province, FY 2005-2006 (Reference).

- *Suitable habitat* for the Northern Spotted Owls consists of habitat used by owls for nesting, roosting *and* foraging (NRF). Generally this habitat is 80 years of age or older, multi-storied and has sufficient snags and down wood to provide opportunities for nesting, roosting and foraging. The canopy closure generally exceeds 60 percent. A wildlife biologist makes site-specific determinations and delineations of suitable habitat.

- *Dispersal habitat* for the Northern Spotted Owls generally consists of mid-seral stage stands between 40 and 80 years of age with canopy closures of 40 percent or greater and an average dbh of 11 inches. Spotted owls use dispersal habitat to move between blocks of suitable habitat; juveniles use it to disperse from natal territories. Dispersal habitat may have roosting and foraging components, enabling Northern Spotted Owls to survive, but the habitat lacks structure suitable for nesting. A wildlife biologist makes site-specific determinations and delineations of dispersal habitat.

- *Critical Habitat Units (CHU)*: Designation of critical habitat serves to identify lands that are considered essential for the conservation and recovery of listed species. The functional value of critical habitat is to preserve options for the species eventual recovery. The Service's primary objective in designating critical habitat was to identify existing Northern Spotted Owl habitat and highlight specific areas where management considerations or protections should be given highest priority. CHU were distributed in a manner that would facilitate demographic interchange.

Since the designation of Northern Spotted Owl critical habitat in 1992, the Northwest Forest Plan (USDA & USDI 1994a) developed as a conservation strategy for all late-successional forest species, including the Northern Spotted Owl. Like critical habitat, the Northwest Forest Plan (USDA Forest Service and USDI BLM, 1994) was based on the work of the Interagency Science Committee. In addition, the Northwest Forest Plan incorporated recommendations from the Northern Spotted Owl recovery team and addressed the needs of other late-successional forest-associated species.

Primary Constituent Elements

Primary constituent elements are environmental factors the FWS determines are essential to a species' conservation. For the Northern Spotted Owl the primary constituent elements of critical habitat have been identified as the physical and biological features that support nesting, roosting, foraging, and dispersal (USDI, 1992a).

Current Information

In 2004, the FWS initiated a 5-year review of the Northern Spotted Owl, *Scientific evaluation of the status of the Northern Spotted Owl* (Courtney et al., 2004). The review collates and analyzes the recent body of knowledge related to the Northern Spotted Owl since it was listed as a threatened species in 1990. The review includes a summary of current threats to the Northern Spotted Owl, including the barred owl, West Nile virus, habitat modification, and forest management challenges associated within the existing legal framework. Also included in the 5-year review is a report entitled, *Status and Trends in Demography of Northern Spotted Owls, 1985-2003* (Anthony et al., 2004).

The information in Coutney et al. (2004) and Anthony et al. (2004) was reviewed by Alan Dyck, Forest Wildlife Biologist for the Forest. The results of the 5-year review do not alter how the Forest Wildlife Biologist determines the effects to the Northern Spotted Owl or its habitat. This project was also reviewed for consistency with the Northwest Forest Plan (USDA Forest Service and USDI BLM, 1994). As a result of the review, the effects to the habitat and the owl has not changed and the information in Courtney et al. (2004) does not alter the effects determination made for the treatment of invasive plants.

B. Pre-Field Review

Habitat Available Within the Project Area

Yes. The Proposed Action (Alternative 2) has approximately 2373 acres of the treatment areas that are either adjacent to or bisect suitable Northern Spotted Owl habitat. Also, there are approximately 2976 treatment acres of dispersal habitat. Of these acres, 2175 acres that would receive broadcast boom spray treatments in/or adjacent to suitable habitat (Table 3-39). Approximately 2582 treatment acres are in or adjacent to Northern Spotted Owl critical habitat and 2068 acres are in Late Successional Reserve (LSR). LSR are a Northwest Forest Plan land allocation: this land allocation is managed to protect and enhance conditions of forest ecosystems, which serve as habitat for late-successional and old-growth related species, including the Northern Spotted Owl.

Disturbance Noise Levels from Invasive Plant Treatments

To determine if sound level disturbance would impact Northern Spotted Owls, a sound level reading was made on the truck and spray pump used by Hood River County. Two distances were measured for sound levels on a dirt parking area on a cold clear morning at 10 yards and 35 yards. At 10 yards, the decibel reading was 72 decibels and at 35 yards it was 64 decibels. In a white paper for the FWS, Kent Livesey analyzed the research on Northern Spotted Owl disturbance factors (BA 2003). In the document Livesey states, "...we estimated these sound-only levels to be: 40 dB for the ambient sound level; 44 dB for the detect threshold; 57 dB for the alert threshold; 70 dB for the disturbance threshold; and 92 for the injury threshold." The Willamette Province Level One Team has interpreted this information and assigned a threshold for disturbance effects calls. When the sound levels reach the disturbance threshold 70 decibels, the effect determination is *May Affect, Not Likely to Adversely Affect* Northern Spotted Owls when the sound level reaches 92 decibels and above, the effect determination is *May Affect, Likely to Adversely Affect* Northern Spotted Owls. If sound levels are below 70 decibels, there is no effect anticipated. These effect determinations are reflected in the distance charts that are located in the Programmatic Biological Assessment (Reference).

C. Field Reconnaissance

A Level A survey was conducted for the project area in addition to examining some habitat during field reconnaissance. There is a high potential for species presence in some locations based on current field reconnaissance, GIS (Geographic Information System) analysis, and on historic data.

D. Analysis of Direct and Indirect Effects

Alternative 1 – No Action

Effects to the owl would be limited to the existing planned invasive plant treatments. The habitat would continue to function as Northern Spotted Owl suitable or dispersal habitat. The effects analysis indicates that there would be no toxic effects to Northern Spotted Owls from the use of herbicides on the 450 acres of treatment on the Forest and 150 acres on the Scenic Area.

The indirect effect of noise and disturbance would be negligible due to the very small area of suitable habitat and low noise created by mechanical and sprayers in the project area. Sound level readings of spray equipment indicate that sound levels were below the harm level at less than 35 yards and would be near ambient at the distance any owl would be nesting from the treatment areas. Manual and mechanical treatment would result in less noise than the use of broadcast boom spraying. ***There is no effect to Northern Spotted Owls from disturbance.*** The majority of the invasive plant treatments that would create noise occur along roads and openings. The Fish and Wildlife Service has indicated in the Biological Opinion for the Fiscal Year 2006 to 2007 May Affect, Likely to Adversely Affect (LAA) Disturbance activities, Willamette Planning Province Owls that Northern Spotted Owls rarely nest at or immediately adjacent to road or edges (Kerns et al. 1992, Perkins 2000). These effects are analyzed in the Biological Opinion for Effects to Northern Spotted Owls (*Strix occidentalis caurina*) from the Willamette Planning Province Fiscal Year 2006 – 2007 (FY06-07)activities that have the potential to adversely affect, due to disturbance, on U.S. Department of the Interior; Bureau of Land Management, Eugene District and Salem District, and the U.S. Department of Agriculture; Mt. Hood National Forest, Willamette National Forest and the Columbia River Gorge National Scenic Area (FWS Reference Number 1-7-05-F-0663). Implementation of this project would have no impact to habitat connectivity cells. ***There are no negative effects to habitat. The effects determination of invasive plant treatment on Northern Spotted Owls is No Effect to Northern Spotted Owls or their habitat. There are no effects to Critical Habitat since there are no changes to the primary constituent elements.***

Alternative 2 – Proposed Action

The Proposed Action would bisect or be adjacent to Northern Spotted Owl suitable, dispersal, critical habitat and LSR. The treatment areas are in habitats (mostly roads or openings) that cross or are within a GIS polygon designated as one of the categories of Northern Spotted Owl habitat. The breakdown of treatment acres in or adjacent to Northern Spotted Owl habitat is as follows: 2373 acres Northern Spotted Owl suitable habitat, 2976 acres dispersal habitat, 2582 critical habitat, and 2068 acres are in or adjacent to LSR. Approximately 18 percent of the proposed treatment areas would be in or adjacent to suitable Northern Spotted Owl habitat. The Proposed Action is to treat 2175 acres of areas in or adjacent to suitable habitat by broadcast boom spraying with a broadcast boom spray truck. There would be no impact to any of the primary constituent elements of Northern Spotted Owl habitat. The benefit to the habitat would be eliminating invasive plants that would otherwise out compete native vegetation which principle prey species use for foraging. The indirect effect of noise and disturbance would be negligible due to the very small area of suitable habitat and low noise created by mechanical and sprayers in the project area. Sound level readings of spray equipment indicate that sound levels were below the harm level at less than 35 yards and would be near ambient at the distance any owl would be nesting from the treatment areas. ***There is no effect to Northern Spotted Owls from disturbance.*** The majority of the invasive plant treatments that would create noise occur along roads and openings. The Fish and Wildlife Service has indicated in the Biological Opinion for the FY06-07 LAA Disturbance activities, Willamette Planning Province Owls that Northern Spotted Owls rarely nest at or immediately adjacent to road or edges (Kerns et al. 1992, Perkins 2000). Implementation of this project would have no impact to habitat connectivity cells. There are no negative effects to habitat. ***The effects determination of invasive plant treatment on Northern Spotted Owls is No Effect to Northern Spotted Owls or their habitat. There are no effects to Critical Habitat since there are no changes to the primary constituent elements. The effects determination for Critical Habitat is No Effect.***

Table 3-39: Treatment Acre by Alternative and Spotted Owl Habitat Type.

Habitat Type or Treatment	Treatment Acres Bisecting or Adjacent		
	Alternative 1	**Alternative 2**	**Alternative 3**
Suitable habitat	<1,235	2,373	2,373
Broadcast Boom spraying in suitable habitat	<415	2,175	507
Dispersal habitat	<1,235	2,976	2,976
Critical Habitat	<1,235	2,582	2,582
Broadcast Boom spraying in Critical Habitat	<415	2,222	548
Manual and/or mechanical treatment only	635	83	10,417

Alternative 3 – Restricted Herbicide Use Alternative

Distribution of habitat types adjacent to the treatment areas is the same as Alternative 2. From the table above it is clear that the difference in the alternatives is the amount of area that would be sprayed with a broadcast boom sprayer. There would only be 507 treatment acres adjacent to suitable habitat sprayed by broadcast boom sprayer in this alternative. Both the toxic effect analysis and the analysis for disturbance show a negligible effect of the treatment on Northern Spotted Owl survival or recruitment and no effect to their habitat. ***The effects determination of invasive plant treatment on Northern Spotted Owls is No Effect.***

- *Effects to NRF and Dispersal Habitat on a Local and Watershed Scale:* There are ***no effects*** to the primary constituent elements of NRF (suitable) or dispersal habitat. There would be no changes in the age or structure, understory layer, down logs, or snag habitat. There may be improvements in forage for prey species in some situations. The removal of invasive plant species may improve prey habitat and contribute to improved prey conditions.

- *Effects to Critical Habitat:* This project occurs adjacent to and in 2582 acres of critical Northern Spotted Owl habitat. No components in the Proposed Action or Restricted Herbicide Use Alternatives including herbicide, manual, mechanical, and cultural treatments would affect the ability of critical habitat to aide the recovery of the Northern Spotted Owl. There are no changes to the primary constituent elements of the habitat by any of the treatment methods. ***The effects determination for Critical Habitat is No Effect***.

- *Effects to Northern Spotted Owl on a province scale (Willamette Province):* The FWS issued an opinion on the effects noise disturbance of the herbicide treatments in the programmatic biological assessment titled, Programmatic Biological Assessment for Activities with the Potential to Disturb Northern Spotted Owls and/or Bald Eagles in the Willamette Province FY2006-2007." The conclusion reached is the following: "After reviewing the current status of the bald eagle and Northern Spotted Owl, including critical habitat, the environmental baseline for both species, the effects of the Proposed Action, and the cumulative effects, it is the Service's biological opinion that the FY 2005-2006 Habitat Modification Projects in the Willamette Province are not likely to jeopardize the continued existence of the bald eagle or Northern Spotted Owl and is not likely to destroy or adversely modify designated critical habitat for the Northern Spotted Owl" (USDI, 2005). The acres contained in the programmatic biological assessment were for the effects of the projects in treatment areas covered in Alternative 1. After taking noise level readings of herbicide spray equipment that would be used to treat invasive plants in the project area, it is clear that sound levels are below the disturbance threshold established by the Level One Team; therefore, there is no need for further consultation for disturbance to this species for invasive plant treatment from herbicide spraying. The sound levels generated by other manual and mechanical treatments also are considered below the disturbance threshold.

- *Effects to Northern Spotted Owl on the entire range of the species (Washington, Oregon, and California):* The Record of Decision for Amendments to USDA Forest Service and USDI Bureau of Land Management Project Documents within the Range of the Northern Spotted Owl established a system of land allocations and a set of standards and guidelines that is considered to be consistent with maintaining viability for the Northern Spotted Owl across its range (USDA Forest Service and USDI BLM 1994). This EIS meets all the Standards and Guidelines set forth within this decision document.

Early Detection/Rapid Response Strategy

This provision creates the possibility of invasive plant treatment outside of the original mapped treatment areas. Expanding the area of treatment would have no effect on habitat, exposure to herbicide, or disturbance of Northern Spotted Owls. The actions created by the treatments pose no risk to Northern Spotted Owl survival or reproduction.

Cumulative Effects

Currently, the only foreseeable future actions on USDA Forest Service lands within the watersheds that might be considered cumulative herbicide use and invasive plant treatments to the Proposed Action are those projects already approved and listed in the No Action Alternative and the EDRR. There would continue to be management activity within these watersheds that have the potential to adversely impact Northern Spotted Owl individuals due to disturbance. These types of projects would continue to be consulted on with the FWS. There are no actions outside of USDA Forest Service lands that become a cumulative effect for Northern Spotted Owls because there is no impact to Northern Spotted Owl habitat, the effect of noise is local and would not be considered cumulative and the herbicides used do not bioaccumulate. The possibility that there could be 13,000 acres of treatment per year with EDRR does not alter the determination of effects to the habitat or herbicide effects on the owl. The analysis of spray equipment noise levels and the type of equipment being used for cultural, manual and mechanical treatment has eliminated the concern for disturbance to Northern Spotted Owl nesting, foraging, or reproductive success.

E. Project Design Criteria

PDC or seasonal restrictions are proposed for the treatment of invasive plants in suitable habitat in the LSR and Congressionally Withdrawn land allocations. These restrictions would only be applied to areas of suitable habitat in these land allocations. There are 48 treatment sites in LSR totaling approximately 2068 acres for the Proposed Action. Of these sites there are 1058 acres that are suitable Northern Spotted Owl habitat. Treatment of invasive plants must occur during the critical breeding season for Northern Spotted Owls, but the noise levels produced by the treatment methods would not reach the level of harm. As a result, there is no need for further mitigation.

F. Communication with U.S. Fish & Wildlife Service

The Northern Spotted Owl was listed as threatened throughout its range under the ESA (55 CFR 26114) on June 22, 1990. Any action that would result in a beneficial effect or could result in an adverse impact to the Northern Spotted Owl would result in a may effect determination and would require consultation with the FWS.

Consultation with the FWS was initiated on for the treatment of invasive species in two separate consultation avenues. Disturbance effects of invasive plant treatments were analyzed and consulted on in the Programmatic Biological Assessment for Activities with the Potential to Disturb Northern Spotted Owls and/or Bald Eagles in the Willamette Province FY2006-2007 (Reference) and the Willamette Province Level One Team was given a presentation on the effects analysis and subsequent determination made on the effects to the Northern Spotted Owl and its habitat from the treatment of these invasive plants. The Level One Team was informed that the Forest and Scenic Area had determined that the effect from the use of herbicide, manual, mechanical, and cultural treatment of invasive plants was no effect to the Northern Spotted Owl or its habitat. The team was reminded that the disturbance effects had been analyzed in the Programmatic Biological Assessment. There was only one comment from the Level One Team on the use of herbicides: the comment was related to the use of picloram and its effects to fish through impacts to their food source. The comment was forwarded to the fisheries biological on the interdisciplinary team. The Level One Team made no comments on the effects determination.

A letter was sent to the U.S. Fish and Wildlife Service on August 29, 2006 amending the Biological Assessment to reflect effects determinations based on project alternatives information.

3.11.5.3 Northern Bald Eagle (*Haliaeetus leucocephalus*): Threatened

A. Habitat

The bald eagle is a permanent resident in Oregon. Their nests are usually located in multi-storied stands with old-growth components, and are near water bodies that support an adequate food supply. Nests, which usually consist of a bulky platform of sticks, are usually located in the super-canopy of trees or on a cliff. Nest sites are usually within one-quarter mile of water in the Cascades.

Adequate forage sources are possibly the most critical component of bald eagle breeding and wintering habitat. Fish, waterfowl, rabbits, and various types of carrion comprise the most common food sources for eagles in the Pacific Recovery Plan area. Wintering bald eagles perch on a variety of substrates, proximity to a food source being the most important factor influencing perch selection. Eagles tend to use the highest perch sites available that provides a good view of the surrounding area. Communal roosts are invariably near a rich food source and in forest stands that are multi-storied and have at least a remnant old growth component.

B. Pre-Field Review

Habitat Available Within the Project Area

Yes. There are five areas outlined on the Forest and Scenic Area that are designated as part of the Bald Eagle recovery area. Two of these areas have eagles nesting in them. Two of the other areas do have eagles utilizing them throughout the year and may have undocumented nesting. All of the areas do have some invasive treatments planned (Sites #). There are three areas designated as bald eagle habitat areas (A13) in the Forest Plan which have proposed treatments. The habitat could be utilized as nesting, roosting, or perching habitat for the bald eagle.

C. Field Reconnaissance

A Level A survey was conducted. There is some potential for this species to inhabit the project area. Birds are nesting in the Timothy Lake and Clear Lake Areas as well as Rock Creek Reservoir, just off the Doewar. No communal roost areas are known for the Forest. There has been consistent use by adults in two areas of the Forest and nesting occurs within a half mile of some of the roadside treatment areas.

D. Analysis of Direct and Indirect Effects

Effects Common to All Alternatives

No effect to the bald eagles would occur from ingesting or contacting herbicides. The effects analysis (Appendix X, Table X-3) showed no anticipated toxic effects to bald eagle. The concentrations of herbicides from invasive plant treatment would not be elevated to a point where there would be any observable effect to eagles.

Alternative 1 – No Action

This alternative includes some pre-existing invasive plant treatments, including herbicide, manual, and mechanical treatment methods. There are three roadside treatment areas (Sites #) that are within a half-mile, but over one-quarter mile of a previously occupied bald eagle nest near Rock Creek Reservoir. These areas are outside the disturbance distance of the bald eagle nest. The nest was not occupied in 2005 but was successful in fledging young the previous year (Thurman, 2005). Due to of the proximity to the treatment areas, it is possible that people working in the treatment area could potentially create nest site disturbance. It is unlikely, however, given the nest was established in the proximity to the roads being proposed for treatment. There is already a fair amount of recreation at the lake near the nest site and the invasive plant treatments could potentially add to this disturbance.

It is more likely that the nest is hidden from the road well enough to not be impacted by the treatments. ***The effect determination is No Effect to bald eagles or their habitat.***

Alternatives 2 & 3 – Proposed Action & Restricted Herbicide Use Alternatives

- *Effects to Habitat:* Bald eagles usually nest within one-quarter mile of a water body in the Cascades. Eagles utilize large trees with platform nest. Diets vary with location and food availability. Eagles on the Forest primarily forage on fish although it is possible for them to eat carrion and dead or injured waterfowl on the lakes.

  There are three proposed treatment sites (Sites #) that are in mapped bald eagle habitat that was identified as part of the Forest Plan. There are 369 acres of treatment area that are adjacent to or within these bald eagle habitat areas (A13) land allocations.

  The primary constituent elements of bald eagle habitat include nest trees within a quarter mile of a water body and large trees for nesting and roosting. There are no treatments that would affect the availability of these habitat elements.

- *Effects to Individuals:* There are two nest sites (thought to be alternates for the same pair) in the Clear Lake and Timothy Lake area (Sites #). These nest sites have produced young in the past (Isaacs, Frank B. and Robert G Anthony, March 2006). The distance from treatment areas to the nest sites is slightly over six tenths of mile for the nearest roadside treatment area. This distance is outside the disturbance distance for bald eagles. ***The effect determination is NO Effect to bald eagles or their habitat.***

- *Effects to Population:* None expected since no effects to individuals and no effects to habitat occurring with project implementation.

Early Detection/Rapid Response Strategy

This provision creates the possibility of invasive plant treatment outside of the original mapped treatment areas. Expanding the area of treatment would have no effect on habitat or from exposure to herbicide. There is a possibility of treatment areas moving closer to a nest tree and within the disturbance zone of eagles. If the treatment area expands into the area within a quarter mile of a bald eagle or one half mile line of sight it would be necessary to adhere to a seasonal restriction outlined in the PDC H.1. or re-consult with the Fish and Wildlife Service.

Cumulative Effects

No cumulative effects for the treatment of invasive plants from herbicide, manual, mechanical or cultural treatments or the EDRR.

E. Project Design Criteria

None.

F. Communication with U.S. Fish & Wildlife Service

The northern bald eagle is listed as threatened throughout its range under the ESA (55 CFR 26114) on June 22, 1990. Any action that would result in a beneficial effect or could result in an adverse impact to the bald eagle would result in a may effect determination and would require consultation with the FWS.

Consultation with the U.S. Fish and Wildlife Service was initiated for invasive plant treatment in July of 2005 through the document titled "Programmatic Biological Assessment for Activities with the Potential to Disturb Northern Spotted Owls and/or Bald Eagles in the Willamette Province FY2006-2007." There were no effects to bald eagle from invasive plant treatment that were determined and therefore the Fish and Wildlife Service Biological Opinion did not list any terms or conditions March 2005.

3.11.5.4 Canada Lynx (*Lynx Canadensis*): Threatened

A. Habitat

In the Pacific Northwest, lynx are associated with high elevation, boreal forests that typify northern latitudes. They are found primarily above 4000 feet in Washington. Although scarce in Oregon, lynx range and habitat in Oregon and Washington is unclear. High quality lynx habitat is comprised of a mosaic of early successional forests with high prey densities (especially snowshoe hare) for foraging, and of late-successional forests with an accumulation of down logs used for denning, thermal and security cover. Intermediate successional stages are used mainly for travel and landscape connectivity but may also provide foraging opportunities.

B. Pre-Field Review

Habitat Available Within the Project Area

No. In a letter dated August 2 of 2001 (USDA, 2001) and updated on December 3 of 2003 (USDA, 2003), the Forest has made a determination, based on the best available scientific and commercial data, that the Canada lynx and its habitat are currently not present on the Forest and Scenic Area. This letter is consistent with the January 2001 *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and Mitigation Measure Standards and Guidelines* (USDA Forest Service and USDI BLM, 2001), and is consistent with the Lynx Conservation Assessment and Strategy (Ruediger, 2000) as specified in this Record of Decision.

The Lynx Nationwide Survey protocol was implemented and resulted in no lynx being located on the Forest and Scenic Area. Forest-wide winter tracking surveys have been conducted during the winters of 1994-1995, 1995-1996, 2000-2001, 2001-2002, 2002-2003, and 2003-2004. No lynx were detected during these surveys.

No further analysis needed due to lack of habitat.

3.11.5.5 Larch Mountain Salamander (*Plethodon larseli*): Sensitive

Effects Common to All Alternatives

There are no treatments planned in Larch Mountain salamander habitat. For Alternatives 2 and 3 the PDC would reduce the probability that any Larch Mountain salamanders would be near an area that would have herbicide treatment.

Alternative 1 – No Action

No short or long-term effects to the Larch Mountain salamander would be predicted with this alternative. There are no direct or indirect effects of invasive plant treatment on Larch Mountain salamanders. The treatment areas covered under the existing NEPA analysis have no known locations in an area where Larch Mountain salamanders are expected to occur. Extensive previous surveys on the Barlow Ranger District did not locate any LMS. It is possible but not expected that the BPA transmission line area (Sites #66-007 and #69-008) and or existing treatment areas in the Scenic Area could have possible Larch Mountain salamander sites adjacent to the transmission line which have not been discovered.

Alternatives 2 & 3 – Proposed Action & Restricted Herbicide Use Alternatives

- *Effects to Habitat:* The Larch Mountain salamander prefers moist environments, typically in mature forest, and tends to avoid large open areas. These alternatives would not significantly alter the trees per acre and would not affect existing logs that are currently in these stands. It is probable that the microclimate would change within the road prism temporarily as a result of the invasive plant treatments, but this habitat is not considered suitable for Larch Mountain salamanders. Thus, these alternatives would not degrade or remove potential Larch Mountain salamander habitat from the area.

- *Effects to Individuals:* A PDC is designed to eliminate concern for impacts to Larch Mountain salamanders. Although limited surveys for this species have been completed in the invasive plant treatment areas, potential habitat for the Larch Mountain salamander appears to occur. Species presence, therefore, is assumed in some areas but is impacts are avoided because of the implementation of the PDC.

- *Effects to Population:* No detrimental effects should occur to individuals of the population due to the Larch Mountain salamander PDC, and therefore adverse effects to the population are not expected to occur. The Hood River and Barlow Ranger Districts on the Forest have recently conducted extensive surveys for the Larch Mountain salamander for three years, but found no populations or individuals outside of the Larch Mountain vicinity. In addition, although the range of the species is small, there is abundant potential habitat for the species in protected lands on the Forest, Scenic Area, and Gifford Pinchot National Forest. Predominantly, these protected lands are Wilderness areas, Congressional Reserves, Late-Successional Reserves, and Scenic Area lands.

Early Detection/Rapid Response Strategy

The implementation of the PDC for Larch Mountain salamanders should eliminate any potential impacts to this species from implementation of the. No additional effects to populations are anticipated due to the EDRR.

Cumulative Effects

There are very few invasive plant treatment areas that that are within the known distribution of Larch Mountain salamanders. The habitat for this species lowers the likelihood of projects being planned in the area where this salamander lives. The projects in the Scenic Area have the greatest potential for impacting this species, but none of the treatments are planned in talus or rocky substrates. PDC for Larch Mountain salamanders eliminates any effect to this species so there are no cumulative effects.

3.11.5.6 Oregon Slender Salamander (*Batrachoseps wrighti*): Sensitive

Effects Common to All Alternatives

The herbicide effects analysis for Oregon Slender salamander indicated that there is very little information on the effects of herbicide on amphibians. Amphibians have skin that could move herbicides more readily into their system than other wildlife species. It is, therefore, assumed that the effects could be toxic for many of the herbicides that are proposed, if the herbicide contacts the skin through direct spraying or the amphibian moving into the herbicide shortly after the area being sprayed. Based on this assumption, it is predicted that some Oregon Slender salamander individuals could be impacted by herbicides used in their habitat.

Oregon Slender salamanders are not often found on roadsides or forest openings (the areas where most invasive treatments would occur); rather they prefer to live in forested stands. Also, their habit of living under bark and in rotten logs would almost eliminate their exposure to herbicides, manual and mechanical treatment methods.

Alternative 1 – No Action

No short-term or long-term effects to the Oregon Slender salamander would be predicted with this alternative. The treatment areas covered under the existing NEPA analysis are located near areas where Oregon Slender salamanders are expected to occur. Due to their habitat preference, their exposure to herbicide, manual and mechanical treatment methods is extremely limited. Therefore there are no direct or indirect effects to this species.

Alternatives 2 & 3 – Proposed Action & Restricted Herbicide Use Alternatives

- *Effects to Habitat:* No effects to habitat are anticipated because the habitat preference for Oregon Slender salamander is different than the areas being treated. The only exception to this is the Recreational Residence area where English ivy would receive manual and mechanical treatments in wooded conditions. In the course of treating English ivy vines there is potential to disrupt pieces of bark and down wood where Oregon Slender salamanders may hide. This is a microhabitat consideration and the salamanders would move to alternate hiding areas.

- *Effects to Individuals:* There would be very limited opportunities for Oregon Slender salamanders to be exposed to invasive plant treatments. The effects to Oregon Slender salamander are minor. There would be 2175 acres adjacent to habitat that would be considered suitable for Oregon Slender salamanders that would be treated by broadcast boom spraying in Alternative 2 and 507 acres broadcast boom sprayed in Alternative 3. It is conceivable that during the spring salamanders that are dispersing could wander into a treatment area, when the area is adjacent to or through an older stand of trees similar to the suitable habitat for Northern Spotted Owls. When these cases occur, it is probable that the individual coming in contact with herbicides could be adversely impacted. It is anticipated, however, that this occurrence would be very limited and the number of individuals affected would be small. It is not expected that individuals would be adversely impacted by the manual, mechanical, or cultural treatments. Due to their habitat preference, their exposure to herbicide, manual and mechanical treatment methods is extremely limited. Therefore there are no anticipated direct or indirect effects to this species.

- *Effects to Population:* No detrimental effects are expected to could occur to individuals and therefore adverse effects are not expected to the population as a whole. The Hood River and Barlow Ranger Districts on the Forest have recently found approximately 300 individuals of this species while conducting surveys for the Larch Mountain salamander. In addition, although the range of the species is small, there is abundant potential habitat for the species in protected lands on the Mt. Hood and Willamette National Forests as well as the Scenic Area. Predominantly, these protected lands are Wilderness areas, Congressional Reserves, Late-Successional Reserves, and National Scenic Area lands.

Cumulative Effects

There are no anticipated impacts to this species therefore there are no cumulative impacts from the treatment of invasive plants from herbicide, manual, mechanical or cultural treatments, or the EDRR. Impacts if any are expected to be few and would not impact populations.

3.11.5.7 Cope's Giant Salamander (*Dicamptodon copei*): Sensitive and Cascade Torrent Salamander (*Rhyacotriton cascadae*): Sensitive)

Alternative 1 – No Action

No effects to the Cope's Giant salamander or Cascade Torrent salamander would occur with implementation of this alternative. There is potential habitat for these species on the near the BPA transmission line (Sites #66-007 and #69-008), but no areas of the Scenic Area were identified that would be impacted from treatments that are planned. Impacts to these species were analyzed under existing NEPA documents.

Alternatives 2 & 3 – Proposed Action & Restricted Herbicide Use Alternatives

- *Effects to Habitat, Individuals, and Populations:* The PDC intended to protect water quality and aquatic organisms would protect these salamanders. There are several streams and wet areas occurring within or adjacent to the invasive plant treatment area. The potential for increased sedimentation to these water sources from herbicide, manual, mechanical, and cultural treatments is minimal. The greatest risk to individuals is from the use of picloram, glyphosate, and triclopyr based on the herbicide effects analysis (Appendix X, Table X-3) and comments from the FWS (Bridges, personal communication). If these herbicides entered the stream or seep they could reduce invertebrate populations through reductions in aquatic plants or be toxic to both species. PDC that are intended to reduce herbicide making it into the stream and prudent use of picloram, glyphosate, and triclopyr should eliminate the hazard to these two aquatic salamanders (Section 2.2 – Project Design Criteria for All Alternatives). The protection measure proposed to eliminate the risk to listed fish would be adequate to protect individuals, habitat and populations. PDC (F.1.) that designates a 100 foot aquatic influence zone on streams, where special treatment precautions would occur, should eliminate the risk to these two species. Based on the PDC there are no effects predicted for the proposed treatment to populations of Cope's Giant salamander and Cascade Torrent salamander.

Early Detection/Rapid Response Strategy

There are no additional effects predicted for Cope's Giant Salamander or Cascade Torrent Salamander from the additional areas that could be treated with the EDRR. There are no effects to aquatic organisms anticipated due to the PDC.

Cumulative Effects

No effects are anticipated to these salamanders so no cumulative effects are predicted to occur with the Proposed Action. There would be some increase in sediment from reduction of vegetation but it expected to be small and would travel a short distance within the stream. PDC (F.1.) restricts treatments near streams would reduce or eliminate the majority of the cumulative effects. Currently, there are no foreseeable future actions other than those previously mentioned on the Forest and Scenic Area within the watersheds that are predicted to impact the Cope's Giant salamander or Cascade Torrent salamander or there habitat.

3.11.5.8 American Peregrine Falcon (*Falco peregrinus anatum*): Sensitive

Effects Common to All Alternatives

Based on the herbicide effect analysis (Appendix X, Table X-1) there is very little risk of direct effects to Peregrine Falcons from the use of herbicides. The only possible direct effect is the possible ingestion of herbicides by eating birds that had been exposed to herbicides. The analysis shows no toxic effect from this exposure at levels that are probably higher than the actual exposures. The indirect effect to these birds would be from disturbance from workers doing herbicide, manual, mechanical, or cultural treatments. There is some potential for some disturbance at one sites but this site is in an area of high traffic now so the effect would be minor.

Alternative 1 – No Action

There is no nesting habitat or known locations in the areas of existing treatment areas or areas where existing NEPA is in place. Migrating or foraging may take place here but there is little to no effect anticipated from activities associated with this alternative.

Alternatives 2 & 3 – Proposed Action & Restricted Herbicide Use Alternatives

Both alternatives have the same minor impact to Peregrine Falcons because the high priority sites that would be treated in both alternatives have the same impact. A high priority site (Site #) is adjacent to a Peregrine Falcon nest site. The effect of having a potential disturbance to nesting peregrines would occur in both alternatives. This indirect effect is expected to be minor due to existing human traffic that the birds currently tolerate.

- *Effects to Habitat, Individuals, and Populations:* There is no effect to Peregrine Falcon habitat. No alternative would alter cliff habitat. Herbicide, manual, mechanical, and cultural treatments have potential of disturbing nesting and foraging falcons. Falcons are fairly sensitive to disturbance and would occasionally abandon nest sites when they are disturbed. The disturbance factor is less when they chose nest locations where they have a regularly reoccurring amount of human activity as evidenced by their use of bridges and buildings in a downtown location. The nest site adjacent to the high priority treatment site is a similar type of location. There is a high degree of vehicle traffic in the immediate vicinity of this nest site. The effect, therefore, would be minimal on the nesting success of this pair from invasive plant treatment. Therefore the effect of disturbance would be minor to peregrine falcons.

  No effects are expected from any of the invasive plant treatment methods to either individuals or the population of peregrine falcons.

Early Detection/Rapid Response Strategy

The analysis is the same for the EDRR. It is not expected that there would be any additional nest sites affected by the EDRR.

Cumulative Effects

Since the herbicides selected do not pose a risk from bioaccumulation or a long residual effect there are not anticipated cumulative effects from either projects on or off of the Forest and Scenic Area.

3.11.5.9 Northern Painted Turtle (*Chrysemys picta*): Sensitive and Western Pond Turtle (*Clemmys marmorata marmorata*): Sensitive

Effects Common to All Alternatives

Very little research has been done on the effects of herbicides to reptiles. It is assumed therefore that the effects would be similar to other aquatic organisms such as fish (See Section 3-10 – Aquatic Organisms and Habitat). The PDC should reduce the risk of toxic effects and sedimentation from mechanical and manual methods.

Alternative 1 – No Action

No effects to the northern painted turtle or western pond turtle would occur with implementation of this alternative. There are no known locations where the previously approved invasive treatments occur.

Alternatives 2 & 3 – Proposed Action & Restricted Herbicide Use Alternatives

There are no treatment sites adjacent to the known locations for the turtles in the Scenic Area. There are no known locations and no anticipated impacts to turtles on the Forest. PDC F.1. that restricts treatments near water systems should effectively eliminate the risk to the turtles.

Cultural methods such as the use of goats to control invasive plants would have a minor detrimental effect on turtle reproduction since the goats could walk along the shoreline of a pond and crush the shallow buried turtle eggs. Reproductive failure due to egg predation is possibly the reason for the decline in the turtle population. Goats could add to this loss. At this time there are no proposed cultural treatments at the known locations for the turtles. This method should be not be used in the known locations in the EDRR.

- *Effects to Habitat, Individuals, and Populations:* There is a negligible potential for impacts to turtles, their populations or their habitat. By restricting herbicide use within 100 feet of a body of water, there should be very little chance of exposure to the turtles. The run-off that occurs should not raise concentrations to a level that would have toxic effects on the turtles. Currently, there are no planned treatments adjacent to a pond occupied by turtles. The EDRR would take into account the turtle locations and would take measures to avoid impacts to the turtles.

Cumulative Effects

Currently, there are no past, present, or foreseeable future actions within the area where turtles are known to occur that are predicted to impact the northern painted turtle, western pond turtle or their habitat.

3.11.5.10 Horned Grebe (*Podiceps auritus*): Sensitive and Bufflehead (*Bucephala albeola*): Sensitive

Effects Common to All Alternatives

The herbicide effects analysis (Appendix X, Table X-1) determined that there were no toxic effects from any of the herbicides analyzed for bufflehead and horned grebes. There are no treatments on the Forest that would be directly adjacent to ponds utilized by these species. On the Scenic Area, there are two treatment areas (Site #) where the use of goats in combination with other treatment methods in the Sandy River Delta (an area where these two species could occur). This area is not utilized for nesting and the effects from using any of the treatment methods would cause an impact to these two species. It is anticipated that some harassment from the treatments could occur but the effects would be minor to these birds.

Early Detection/Rapid Response Strategy

No impacts are anticipated for horned grebes, bufflehead, or their habitat from the EDRR.

Cumulative Effects

There are no cumulative effects predicted for this species because the effects from herbicide would not reside in the water long enough to accumulate in the system to affect these water birds in the fall or winter. Manual, mechanical, and cultural treatments are not anticipated to have any affect on bufflehead and horned grebes.

3.11.5.11 Harlequin Duck (*Histrionicus histrionicus*): Sensitive

Effects Common to All Alternatives

The herbicide effects analysis (Appendix X, Table X-1) determined that there were no toxic effects from any of the herbicides analyzed for harlequin ducks. However, in discussion with the FWS about the use of herbicides there is concern for the health of macro invertebrate populations following the use of picloram. Picloram could affect the aquatic insects that harlequin ducks forage. The PDC F.1. restricting herbicide application within 100 feet of a stream or body of water is designed to reduce or eliminate this risk.

Alternative 1 – No Action

No effects to harlequin ducks would occur with implementation of this alternative. There are no known or suspected locations on the Barlow Ranger District, where the majority of the previously approved invasive treatments occur.

Alternatives 2 & 3 – Proposed Action & Restricted Herbicide Use Alternatives

Both the high priority sites for Alternative 3 and Alternative 2 have locations within the road prism near the streams and rivers where harlequin ducks are known to occur (Sites #). PDC F.1. restricts treatments near water systems labeled herbicides should effectively eliminate the risk to harlequin ducks. Sediment caused by manual and mechanical methods and even the reduction of streamside vegetation may temporarily increase sediment that could affect the macro invertebrates that these ducks forage. At this time there are no proposed cultural treatments at the known or suspected locations for harlequin ducks.

Manual, mechanical, and herbicide treatments along the stream courses where harlequin ducks nest have the potential of disturbing nesting ducks. The work within the first 5 feet of the stream may cause hens to abandon their nest and could result in nest failure that year. Both the annual treatment of knotweed species and the EDRR could make this disruption of nesting an annual event until the invasive plants are treatment.

- *Effects to Habitat, Individuals, and Populations:* Some loss of nest habitat may occur as streamside vegetation is removed as a result of treatment. It is not known how often harlequin ducks utilize invasive plants for nesting, but it is expected that occasionally these ducks would utilize knotweed species for nesting cover. When this is the case there would be a temporary loss of cover until natural vegetation returns.

It is anticipated that there would be negative effects to individuals from nest disturbance. This effect could last several years for a particular stretch of stream where infestations occur. In some cases this disturbance could result in nest failure. More often, it would be a temporary disturbance and, if the hen is late into incubation, than the hen should return.

The loss of individuals from nest disturbance would be localized and would not affect harlequin duck populations.

Early Detection/Rapid Response Strategy

The EDRR would increase the opportunity for affecting the macro invertebrates in the stream but the PDC would reduce or eliminate this risk. The continued presence in streamside areas to control knotweed species could potentially disrupt nesting for this species. Since the distribution of harlequin ducks is widely scattered, the effects would be limited to a few individuals and would be similar to recreation in the area.

Cumulative Effects

The manual and mechanical treatments have the most potential for causing cumulative effects of disturbance to nesting birds. Campgrounds, roads, and aquatic recreation such as rafting, kayaking, and fishing all create cumulative effects to these ducks. The continued intrusion into the harlequin's habitat is additive and could reduce the reproductive rate for these birds and the use of habitat.

3.11.5.12 Wolverine (*Gulo gulo*): Sensitive

Alternative 1 – No Action

No direct or indirect effects to the wolverine would occur with implementation of this alternative. The existing human use of this area would continue to limit opportunities for wolverines to utilize the area. The area, however, would continue to provide potential habitat for the species.

Alternatives 2 & 3 – Proposed Action & Restricted Herbicide Use Alternatives

- *Effects to Habitat and Individuals:* There is a very minor potential for disturbance (an indirect effect) and loss of utilization of some of the potential wolverine habitat by this implementing these two alternatives. Increasing human presence in low traffic areas would degrade the utilization of this habitat for wolverines, if they still exist on the Forest. Compared to other existing human presence in the treatment areas, the effects would be miniscule by comparison.

  The herbicide effect analysis (Appendix X, Table X-1) shows no toxic effects (direct effect) determined from herbicide use on wolverines. There are no anticipated direct or indirect effects from manual, mechanical or cultural treatments because their location is not in the proximity of areas identified as possible denning areas (Mt. Hood National Forest GIS system).

Early Detection /Rapid Response Strategy

The EDRR would potentially increase the amount of impact from human disturbance on the Forest and Scenic Area. The methods themselves would not pose a threat to wolverines, but the increase in human activity is a factor for a species that prefers seclusion. The effect is expected to be minor.

Cumulative Effects

The primary cumulative effect predicted for this species is to increase both the number of visitors to this area and expand the area of human impact in the project area. An increase in human use in this area could cause wolverines to discontinue utilizing the area. That is assuming that the current level of use has not already had that impact.

Currently, there are many foreseeable future actions within the Forest that are predicted to impact wolverines and their habitat. Winter recreation, hiking, and climbing as well as proposed improvements for these activities increase human activity in the area, and would add to the effect of disturbance. Since there is already a high amount of human activity in the area from ski areas, businesses, a major highway, recreational uses and homes the effect of this project is considered to be a minimal addition. Any increase in human activity in areas where wolverines exist is a cumulative effect on this species.

3.11.5.13 Baird's Shrew (*Sorex bairdii permiliensis*): Sensitive

Alternative 1 – No Action

No direct or indirect effects to the Baird's shrew would be predicted with this alternative. The areas treated by the existing NEPA documents would not have Baird's shrews because they are on the eastside of the Cascades or they are no in Baird's shrew habitat.

Alternatives 2 & 3 – Proposed Action & Restricted Herbicide Use Alternatives

- *Effects to Habitat:* Effects to Baird's shrew habitat are predicted to be minor. Although the areas treated are adjacent to suitable habitat for the shrew, the treatment areas themselves are not considered good habitat. The greatest possibility for exposure to herbicides would be on the 2175 acres of habitat adjacent to or in mature forest that would be broadcast boom sprayed. There is a lower chance of exposure in Alternative 3 where only 507 acres of habitat in or adjacent to mature forest would be broadcast boom sprayed in this alternative. A key component of habitat for this species is down logs. This alternative would not impact existing logs that are currently in these stands. No change in the microclimate in the adjacent stands is anticipated. It is predicted that this Proposed Action would not degrade nor remove potential Baird shrew habitat from the area.

- *Effects to Individuals:* Direct and indirect effects to Baird's shrews would be small due because of their habitat use. Although no surveys for this species have been completed in the invasive plant treatment project area, there appears to be potential habitat for the Baird shrew in the adjacent older forested stands. For this reason, species presence is assumed in these areas. Several of these stands with potential habitat are adjacent to other suitable habitat that individuals could migrate into after project implementation. As a result, shrews moving from one stand to another could pass through the treated area. This could cause exposure to herbicide by these individuals both directly and from the insects they ingest (direct and indirect effects). These shrews do not have long home ranges so they may receive a chronic exposure to the herbicides. The effects analysis (Appendix X, Table X-1) showed a toxic level of exposure is possible for Baird's shrews with the following herbicides: clopyralid, picloram, sulfometuron methyl, triclopyr, and NPE surfactant. Triclopyr would only be spot sprayed so the effect of this herbicide on shrews is expected to be minor.

  Although the effects analysis shows a high level of toxicity for the shrews the risk to exposure is minor. Openings and roadside habitats where most of the invasive plant treatments would take place is not shrew habitat and only a few individuals who wander into this habitat are expected to be exposed. When exposed, however, there is a minor chance that the shrews could receive a toxic dose.

  No impacts from manual, mechanical or cultural treatment are expected. These methods would not affect shrews.

- *Effects to Population:* Although detrimental effects could rarely occur to individuals of the population, adverse effects are not expected to the population as a whole. In addition, there is abundant potential habitat for the species in protected lands on the Forest and Scenic Area. Predominantly these protected lands are Wilderness areas, Congressional Reserves, Late-Successional Reserves, and National Scenic Area lands. The effects to Baird's shrews are expected to be minor and should not impact shrews at the population level.

Early Detection /Rapid Response Strategy and Cumulative Effects

The EDRR would increase the exposure risk to the shrews by both expanding the area of impact and by creating annual exposure opportunities until the invasive plants are treated. The habitat where invasive plants are being controlled, however, is on the fringes of the shrew's habitat.

The EDRR is the only cumulative impact to the Baird's shrew. The annual attempt to treat invasive plants may take annual tolls on the individuals adjacent to herbicide treatment areas. No impacts are expected for shrews off the Forest and Scenic Area that would lead to a cumulative effect.

Cumulative Effects

No cumulative effects are anticipated for Baird's Shrew because there are rarely any invasive species treatments, including herbicide treatments that occur in their habitat.

3.11.5.14 Pacific Fringe-tailed Bat (*Myotis thysanodes vespertinus*): Sensitive

Effects Common to All Alternatives

The herbicide effects analysis (Appendix X, Table X-1) for Pacific Fringe-tailed bat showed little toxic effects determined for any of the herbicides. The NPE surfactant was the only toxic effect predicted for this species. Since bats feed above the areas that would be sprayed, there is no likely effect from direct contact with herbicide. The Pacific Fringe-tailed bat has been documented in areas outside the Pacific Northwest as eating beetles and gleaning these insects off vegetation. In this area, however, they tend to eat more moths than other insects. There is the possibility that insects (moths in particular) that are in the herbicide spray zone could fly in areas where bats could feed on them. Since bats forage over a wide area, it is not anticipated that they would receive a chronic dose from eating contaminated insects. The potential does exist in each alternative for Pacific Fringe-tailed bat to ingest insects that have been sprayed with herbicides (an indirect effect).

Alternative 1 – No Action

There is an extremely low potential for impacts to Pacific Fringe-tailed bats from this alternative. The species has not been documented in this area and the method of feeding on moths would make the risk to this species extremely low. The previous projects covered by existing NEPA documents would provide an opportunity of exposure to herbicides under this alternative.

Alternatives 2 & 3 – Proposed Action & Restricted Herbicide Use Alternatives

Due to the large area of treatment and wide variety of habitat types that this alternative encompasses, there is an increased risk to bats in general, and the Pacific Fringe-tailed bat would have a greater chance of being in an area where invasive plants would be treated with herbicides and the NPE surfactant. The NPE surfactant poses a risk to the bats if they ingest insects sprayed with the surfactant. The surfactant shows some toxicity to insect eating mammals from acute exposures. The risk is minor that the bats would be in the area and that they would ingest a flying insect that has been treated with the herbicides. There are no identified risks to bats from manual, mechanical, or cultural treatments.

- *Effects to Habitat:* Pacific Fringe-tailed bat uses caves and buildings for roosting and maternity colonies. These would not be impacted by any of the alternatives.

- *Effects to Individuals:* There is a very minor possibility that a few individuals could be impacted by the use of NPE surfactant. This would be rare and may never occur due to the low risk of ingesting insect coated in herbicides.

- *Effects to Population:* There would be no impact to populations. The limited risk to individuals would be even less to the population.

Early Detection /Rapid Response Strategy

The EDRR would expand the opportunity of exposure to herbicides both spatially and temporally. The risk would continue to be low.

Cumulative Effects

The cumulative effect would be the ongoing nature of the invasive plant treatment project.

3.11.5.15 Pacific Pallid Bat (*Antrozous pallidus pacificus*): Sensitive

Effects Common to All Alternatives

The herbicide effects analysis (Appendix X, Table X-1) for Pacific pallid bat showed minor toxic effects determined for any of the herbicides. The NPE surfactant was the only toxic effect predicted for this species. Since bats feed in the areas that would be sprayed and take prey from the ground or shrubs, there is a likely effect from ingesting insects that have come in contact with herbicide(s). The Pacific Pallid Bat has been documented in areas outside the Pacific Northwest as eating beetles and gleaning these insects off the ground and vegetation. There is the possibility that insects (moths in particular) in the herbicide spray zone could be ingested by bats. Since bats forage over a wide area, it is not anticipated that they would receive a chronic dose from eating contaminated insects. The potential does exist in each alternative for Pacific Pallid Bats to ingest insects that have been sprayed with herbicides.

Alternative 1 – No Action

There is an extremely low potential for impacts to Pacific Pallid Bats from this alternative. The species has not been documented in the areas targeted for herbicide treatment in this alternative. The previous projects covered by existing NEPA documents would provide a very limited opportunity of exposure to herbicides.

Alternatives 2 & 3 – Proposed Action & Restricted Herbicide Use Alternatives

Due to the large treatment area and wide variety of habitat types that these alternatives encompass, there is an increased risk to bats in general and the Pacific Pallid Bat would have a greater chance of being in an area where invasive plants would receive herbicide treatments, possibly including the NPE surfactant. The NPE surfactant pose a risk to the bats if they ingest insects sprayed with the surfactant. The surfactant shows some toxicity to insect eating mammals from acute exposures. The risk is minor that the bats would be in the area and that they would ingest a flying insect that has been treated with the herbicides in the eastern portion of the Scenic Area. There is no identified risk to bats from manual, mechanical, or cultural treatments.

- *Effects to Habitat:* Pacific Pallid Bat uses caves, rocky areas and buildings for roosting and maternity colonies. These would not be impacted by any of the alternatives.

- *Effects to Individuals:* There is a very minor possibility that a few individuals could be impacted by the use of NPE surfactant. This would be rare and may never occur due to the minor probability of ingesting insect coated in herbicides.

- *Effects to Population:* There would be no impact to populations. The limited risk to individuals would be even less to the population.

Early Detection/Rapid Response Strategy

The EDRR would expand the opportunity of exposure to herbicides both spatially and temporally. The risk would continue to be low.

Cumulative Effects

The cumulative effect would be the ongoing nature of the invasive plant treatment project.

3.11.5.16 Fisher (*Martes pennanti pacifica*): Sensitive

Effects Common to All Alternatives

No effects to the fisher would be predicted with any alternative because there is no established presence of fishers on the Forest.

- *Effects to Habitat:* Although there is no established presence of fisher on the Forest, there is the potential that populations to the south could move onto the Forest in the future. There is no evidence of this, but habitat is being considered in this analysis.

  The alternatives would not impact stand structure enough to alter fisher habitat. These alternatives would retain existing logs that are currently in these stands. Also, it is likely there would be additional down woody debris generated by the project. The microclimate would change within the harvest units, but probably not to the degree to make the treatment areas unsuitable for the fisher. Thus, these alternatives would degrade but not remove fisher habitat from the area. It is not expected that treatment in these stands would increase fragmentation of suitable habitat for the species.

- *Effects to Individuals:* Although no surveys for this species have been completed in the Invasive treatment areas, there appears to be potential low quality habitat for the fisher within the older forested stands. For this reason, species presence is assumed in these areas.

  There is the slight possibility that a fisher traveling through the area could be impacted by the disturbance associated with implementation of this project. The stands with potential habitat, however, are adjacent to more suitable habitat that individuals could easily migrate into during project implementation. The proposed project does not have the potential to extirpate individuals that are present in or adjacent to the units. Fishers are not believed to be highly sensitive to human activity. Any fishers currently utilizing the area could easily change their travel habitat to avoid the management activity.

- *Effects to Population:* Effects are not expected to the population since there would be no adverse effects to any individuals.

Cumulative Effects

No cumulative effects would occur from the proposed invasive plant treatments.

3.11.5.17 Crater Lake Tightcoil (*Pristiloma arcticum crateris*): Sensitive

Alternative 1 – No Action

No effects to the Crater Lake Tightcoil would be predicted with this alternative. Projects occurring under existing NEPA are not in habitat for this species.

Alternatives 2 & 3 – Proposed Action & Restricted Herbicide Use Alternatives

- *Effects to Habitat:* It is anticipated that some habitat areas for this species may be present in the riparian areas, where knotweed species would be treated. Some treatment may take place in some portion or, in rare cases, all of the home range for this small species. In some rare cases, the amount of opening created by controlling the infestations could change the microclimate to make the habitat is no longer suitable. This would be a very rare situation based on the absence of this species in previous surveys.

  There are no major changes in effects expected between Alternatives 2 and 3. The knotweed treatment is part of both alternatives, and this is the area most likely to be habitat for this species. There are no projects using manual, mechanical or cultural that are expected to impact this mollusk.

- *Effects to Individuals:* It is possible that some individuals may be removed from the population due to invasive species treatment in riparian areas even though the herbicides effects analysis showed no effect (Appendix X, Table X-1). The footprint of the treatments themselves is small in terms of ecological scale and, therefore, the resulting loss of individuals is anticipated to be small relative to the overall local population of these mollusks. PDC H.2. that limit the distance to streams and seeps should avoid impacting most individuals.

- *Effects to Population:* Although it is anticipated that there is potentially some loss of individuals, these mollusk are widely scattered over the landscape from Klamath County, Oregon to the Forest and Scenic Area. Crater Lake Tightcoil occurs throughout the Oregon Cascades in widely scattered populations. The effect of this project would be extremely local and should not severely impact the population.

Early Detection/Rapid Response Strategy

The EDRR may extend the possible risk to the mollusk. The effects analysis, however, shows no toxicity from herbicides to this species, and it is not expected that the EDRR would increase the risk to this species significantly.

Cumulative Effects

There are very few projects that have the potential to impact Crater Lake Tightcoil due to the widespread habitat distribution. Most projects do not occur within or buffer the types of habitats, such as seeps, springs, or riparian areas, where the species is found. As a result, impacts to this species are rare. There are no anticipated cumulative effects for this mollusk.

3.11.5.18 Dalles Sideband (*Monadenia fidelis minor*), Puget Oregonian (*Cryptomastix devia*), Columbia Oregonian (*Cryptomastix hendersoni*): Sensitive

Alternative 1 – No Action

Effects to these three mollusks would be rare in this alternative. Projects occurring under existing NEPA are not in habitat for these species.

Alternatives 2 & 3 – Proposed Action & Restricted Herbicide Use Alternatives

- *Effects to Habitat:* It is anticipated that some habitat areas for these species may be present in the riparian areas, where knotweed species would be controlled. Some treatment may take place in some portion of the home range for these small species. In some rare cases, the amount of opening created by controlling the infestations could change the microclimate to make the habitat no longer suitable. The percentage of the habitat occupied by the infestations is small so the impact would be minor for the species. By following the PDC H.2. and avoiding the use of herbicides within 100 feet of a spring or seep, the risk to the species would nearly be eliminated.

  There are no major changes in effects expected between Alternative 2 and 3. The knotweed treatment is part of both alternatives and this is the area most likely to be habitat for this species. There are no projects using manual, mechanical or cultural that are expected to impact this mollusk.

- *Effects to Individuals:* It is possible that some individuals may be removed from the population due to invasive species treatment in riparian areas even though the herbicides effects analysis showed no effect (Appendix X, Table X-1). The footprint of the treatments themselves is small in terms of ecological scale and, therefore, the resulting loss of individuals is anticipated to be small relative to the overall population of these mollusks. PDC H.2. that limit the distance to streams and seeps should avoid impacting most individuals.

- *Effects to Population:* Although it is anticipated that there would potentially be some loss of individuals these mollusk are widely scattered over the landscape in Oregon and on the Forest. There is no anticipated major impact to the local populations even though there may be an impact to individuals. The effect of this project would be extremely local and should not severely impact the local or regional mollusk populations.

Early Detection/Rapid Response Strategy

The EDRR may extend the possible risk to these mollusks. Since the effects analysis shows no toxicity from herbicides to this species, it is not expected that the EDRR would increase the risk to this species significantly.

Cumulative Effects

There are very few projects that have the potential to impact Dalles Sideband, Puget Oregonian, or Columbia Oregon due to their habitat type and widespread distribution. Most projects do not occur within or buffer the types of habitats, such as seeps, springs, or riparian areas, where the species if found. As a result, the impacts to this species are rare. There are no anticipated cumulative effects for this mollusk.

3.11.6 Management Indicator Species (MIS)

3.11.6.1 Pileated Woodpecker (Dryocopus pileatus)

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, 2003). Pileated woodpeckers occur throughout the proposed treatment areas.

Alternative 1 – No Action

None of the treatments occurring under existing NEPA analysis impact pileated habitat, forage, or nesting. There are no effects to pileated woodpeckers from this alternative.

Alternatives 2 & 3 – Proposed Action & Restricted Herbicide Use Alternatives

None of the proposed treatments would affect pileated woodpecker habitat, forage or nesting. 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 pileated woodpeckers (Appendix X, Table X-1). No habitat would be affected by manual, mechanical or cultural treatments. The EDRR would not increase or decrease this risk.

Cumulative Effects

There are no anticipated effects to this woodpecker, and there are no expected cumulative effects.

3.11.6.2 American Marten (Martes americana)

The American marten is a Forest Management Indicator Species. Concern for this species arises out of their association with mature and old-growth forest.

Alternative 1 – No Action

Martens are expected to occur in some of the areas treated under the existing NEPA. 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 2 & 3 – Proposed Action & Restricted Herbicide Use Alternatives

Martens do occur throughout the proposed treatment areas at the higher elevations. The analysis for these alternatives is the same as Alternative 1. 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 as indicated in Appendix X, Table X-1 and there is no habitat altered. The effect determination for martens and their habitat is *No Effect*. This includes the EDRR as well as all treatment methods.

3.11.6.3 Deer and Elk

The effects to deer and elk are almost identical, since their habitat requirements and forage are so similar.

Deer

There are two different subspecies of mule deer that occur in Oregon: the subspecies expected to occur within the treatment areas is the black-tailed deer (*Odocoileus hemionus)*. The black tailed deer is a Forest Management Indicator Species. Concern over this species arises from its status as an important game species.

Elk

Elk (*Cervus elaphus*) are Forest MIS. Two subspecies of elk occur on the Forest and Scenic Area. Roosevelt Elk (*Cervus elaphus roosevelti*) occur on the westside of the Cascades, and Rocky Mountain Elk (*Cervus canadensis nelsoni*) on the eastside of the Cascades. Concern over this species arises from its status as an important game species.

Effects Common to All Alternatives

Invasive plants probably affect deer and elk more than any other species analyzed in this section. Invasive plants out compete and replace native forage plants for these ungulates. Eradicating, controlling and/or containing invasive plants could substantially improve deer and elk 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, deer and elk would 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 Invasive Plant ROD (2005b) contains a standard that restricts the use of triclopyr and does not allow broadcast boom spraying of this herbicide.

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). Deer and elk both eat grasses so they are more susceptible to toxic effects than carnivores.

Alternative 1 – No Action

Under the existing NEPA for invasive plant treatment, the use of triclopyr is available. This is the only herbicide that the effects analysis (Appendix X, Table X-1) shows as a potentially toxic herbicide for deer and elk. Since these projects are in deer and elk habitat, there potentially these projects could impact deer and elk where they occur.

Alternative 2 – Proposed Action

There is at least some deer and elk forage on every acre of the proposed treatment areas. Potentially deer and/or elk could be affected by the treatment of invasive plants. As a result, potentially 13,000 acres of habitat could be improved by the removal of invasive plant, but also could expose of deer and elk to herbicides. There are 4,665 acres of proposed treatment that could potentially have toxic effects for deer and elk through the use triclopyr. This effect is offset by the fact that the herbicide 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 deer and elk rarely forage on the invasive plants targeted for treatment.

If we assume deer and elk would ingest enough triclopyr to be toxic as a worst-case scenario, we can be sure that it would happen infrequently. Exposures of this magnitude are expected to be extremely rare, especially with a restriction of no broadcast boom spraying of this herbicide.

Alternative 3 – Restricted Herbicide Use Alternative

Similar to Alternative 2, deer and elk forage exist in all acres of this alternative. There would be 13,000 acres of that would have improved forage by treatment. There are 2,821 acres that could be treated with triclopyr but would have little potential toxic effects by eliminating broadcast boom spraying of triclopyr.

The assumptions for toxicity are similar to Alternative 2. It is not expected that there would be any reasonable expectation that there would be a high enough dose for exposure to reach a chronic dose. The worst case scenario is that there is a minor potential, however, that an occasional animal could receive a toxic dose of triclopyr. This would not affect the population of deer or elk. 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.

Cumulative Effects

It is not known how many acres of invasive plant herbicide treatment would occur near the borders of the Forest and Scenic Area where this project could affect deer and elk that move across the boundary to forage. In these isolated situations, however, there could be cumulative effect of the herbicides on individual deer or elk that forage on both private and National Forest System lands in the Forest and Scenic Area that have been treated with herbicides. In rare situations, there could be an individual animal that received a toxic dose from this scenario. At this time there are no reports of animals in agricultural or commercial tree operations that have suffered toxic effects from use of herbicides where herbicides are used more widely for vegetation control.

3.11.7 Other Species of Interest – Landbirds

A. Habitat and Species Present

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. Widespread declines in populations of many landbirds have intensified interest in avian conservation and resulted in policy direction to evaluate the impact of proposed activities on the nesting habitats of these species.

The North American Breeding Bird Survey Program found that 75 percent of forest dwelling migrants in eastern North America declined in population during the 1980's (Robbins et al., 1989). Potential causes of these declines are numerous and diverse, and may involve corridors and stopover sites, or a combination of these factors (Sherry and Holmes, 1992). Related to these potential causes is the problem of nest parasitism by the brown-headed cowbird, populations of which have expanded significantly in the last few decades due primarily to human-induced changes in the landscape (Ehrlich et al., 1988). 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, 1992). 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).

USDA Forest Service Landbird Strategic Plan

In September 2000, the USDA Forest Service Landbird Strategic Plan (2000) was distributed. This plan set forth goals and actions to assist meeting the USDA Forest Service commitment to provide habitat for sustainable resident and migrant landbird populations and monitor their populations through time. It also provides direction to assess and disclose the effects of management actions on landbirds in NEPA documents. The strategic plan provides the incentive and means to make landbird conservation a part of all activity planning. It serves as new science that must be taken into account when planning and implementing USDA Forest Service actions.

Partners in Flight

Partners in Flight, a council of international parties interested in the conservation of migratory birds, has developed the North American Landbird Conservation Plan (2004) and several regional plans. The Forest and Scenic Area falls within the consideration zone for the Conservation Strategy for Landbirds in Coniferous Forest of Western Oregon and Washington (Altman, 1999). These plans summarize the conservation status of landbirds on a national scale and regional scale respectively. They also identify the species most in need of attention in each region. The plans have determined focal species based on habitat and risk criterion.

Focal Species Analyzed

The National Plan breaks the priorities for the species down to three levels: immediate action, management, and long-term planning and responsibility. The only species in the proposed treatment area that falls into the immediate action level is the Northern Spotted Owl: this species is covered previously in this section. The management level is the second highest priority and is used for this analysis. These species are also listed under the regional plan based on their habitat relationships.

The Conservation Strategy For Landbirds in Coniferous Forest of Western Oregon and Washington (reference) 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.” That stated, 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.

The following species are listed in both plans and were used for analysis purposes and represent a variety of habitats and feeding strategies; hermit warbler (*Dendroica occidentalis*), blue grouse (*Dendragapus obscurus*), rufous hummingbird (*Selasphorus rufus*), willow flycatcher (*Empidonax traillii*), band-tailed pigeon (*Columba fasciata*), and olive-sided flycatcher (*Contopus cooperi*). The herbicide effects analysis showed no toxic effects from the proposed treatment methods to these birds. Appendix P of the Invasive Plants EIS (2005a) 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 the species analyzed would be exposed chronically due to feeding strategies of these birds. Two exceptions are for the blue grouse and band-tailed pigeon, which are opportunistic feeders that would feed on the ground and would return daily to a good food source.

For these two species, triclopyr and NPE surfactant could cause toxic effects with chronic exposures. Triclopyr, according to the Invasive Plant ROD standards (2005b), would only be spot sprayed so this should limit the amount of exposure and may eliminate the risk to landbirds from this herbicide. There might be some additional circumstances where this assumption could be incorrect and, as a result, some individuals of other species may receive a chronic does and be adversely impacted. Triclopyr, however, did not affect landbirds in a field study done by Homes. In summary he states: "On the basis of our observation that TBEE had no significant adverse effects at a concentration greater than the maximum expected environmental concentration, we propose that forestry applications of triclopyr at registered dosage rates pose little risk to wild songbirds." (Holmes et al., 1994)

B. Analysis and Determination of Effects

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 (See Section 3.6 – Botany and Treatment Effectiveness). 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). 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 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 Regional EIS indicted that there was a low toxicity of herbicides to birds. But because of the large gaps is 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 1 – No Action

The herbicide effects analysis from Appendix X, Table X-1shows no effect from herbicides to the species analyzed except triclopyr and NPE surfactant for blue grouse and band-tailed pigeon. These two herbicides are allowed under the existing NEPA, so there could be some effect to these two species if they feed in areas that are sprayed with triclopyr or NPE surfactant. The treatment areas are limited and should not result in a large exposure to these species or other landbirds that are not analyzed. In addition, by eliminating the use of triclopyr from broadcast spraying the exposure to triclopyr is severely reduced.

Alternative 2 – Proposed Action

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, mechanical, and cultural) 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.

This alternative includes the use of triclopyr on 4,665 acres. Since this herbicide is only approved for spot spraying, the risk of exposure is reduced substantially. It is not likely that band-tailed pigeons, blue grouse or other ground feeding birds that they represent would receive chronic dosages that would become toxic.

EDRR would expose landbirds to a possible 13,000 acres of 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 affects.

Alternative 3 – Restricted Herbicide Use Alternative

Impacts to landbirds under Alternative 3 would be similar to those described under Alternative 2 with 2,821 acres of proposed treatment that could potentially have exposure for grouse and pigeons through the use triclopyr. This could affect other bird species not considered under this analysis: these species are represented by ground foraging species such as grouse or pigeons. The effects of triclopyr would be a minor effect to birds because of the low toxicity of the herbicides analyzed and the restricted use of triclopyr.

Cumulative Effects

Birds are mobile animals that could potentially receive a dose of herbicides on private, state, or National Forest System lands in the Forest and Scenic Area, and fly to another area where herbicides are being used. In very rare cases, there is a potential for receiving a toxic dose. It is not possible to predict the amount of times this would actually happen but it is anticipated that this would only happen in extremely rare cases. It is also impossible to predict the effect of two different herbicides interacting synergistically that could cause a toxic effect. For example if a bird were to fly here from an agricultural field where there was use of a pesticide and then the bird arrived on the National Forest and ingested a herbicide there could be a combined effect that could harm the bird. For such an individual the effects would be cumulative, there are no major cumulative effects anticipated for any species populations.

3.11.8 Game Animals

A variety of game animals exist on the Forest and Scenic Area. The list includes major species such as deer, elk, waterfowl, grouse, quail, squirrels, and wild turkeys. The majority of these species forage in openings, along road edges, and meadows. Some of these areas would be treated with herbicides. There is a high probability that some of these animals would ingest plants that have been sprayed by herbicides. One herbicide, triclopyr, had a potential effect for deer and elk based on chronic exposure. Since the method of delivery would be spot spraying, there are no anticipated toxic effect to deer and elk, although there is still a minor potential for a toxic effect. Deer, elk, and grouse 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 to not bio-accumulate in the fat of animals, there would be no increase in the toxic effect to someone eating the animal. The dosage 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 a 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 3.5 – Human Health and Safety for more information.

3.11.9 Oregon State Sensitive Species

The 2004 revision to the Management Plan for the Scenic Area plans for evaluating a wider range of species than normally included in the Mt Hood National Forest analysis. The Management Plan of the includes state listed species. The Management Plans glossary defines its review as follows:

> **Sensitive wildlife species:** Animal species that are (1) listed as endangered or threatened pursuant to federal or state endangered species acts, (2) listed as endangered, threatened, sensitive, or candidate by the Washington Wildlife Commission, (3) listed as sensitive by the Oregon Fish and Wildlife Commission, or (4) considered to be of special interest to the public, limited to great blue heron, osprey, mountain goat, golden eagle, and prairie falcon.

In the SMA, sensitive wildlife species also include animal species recognized by the Regional Forester as needing special management to prevent them from being placed on federal or state endangered species lists.

Appendix X, Table X-4 shows the effects analysis for the species listed for Oregon that may occur in the Scenic Area. The species listed have similar analysis to the other species already analyzed earlier. Many of these species are already represented by other similar species that have already been analyzed. For example there are four additional bat species but these species are similar in their requirements and habits to the fringed-tailed bat previously considered in this document. As such, the only further analysis for these species will be in the Appendix X, Table X-4.

3.11.10 Management Standards and Guidelines

Relevant standards and guidelines contained in the Forest Plan and the Northwest Forest Plan are displayed in Appendix B of this document; relevant standards contained in the Scenic Area Management Plan are displayed in Appendix C. This analysis exhibits that the Proposed Action and Restricted Herbicide Use Alternatives are consistent with all relevant standards and guidelines, when the proposed amendments are incorporated. The Forest Plan amendments are discussed in Section 3.16.

3.11.11 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 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 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.

There is very limited information on the toxic effects of herbicides on amphibians as noted in Section 3.11.3 under Alternative 1 – No Action, and in Section 3.11.5.6 Oregon Slender Salamander.

Both indices of shrub diversity, however, were not different over the 5 years. Herbicide treatment initially reduced crown volume index of herbaceous vegetation, but values quickly recovered to untreated levels by the second year after treatment. Herbaceous species diversity was not affected by herbicide treatment. Diversity of small mammal communities apparently was not affected by herbicide application. In general, diversity of plant and small mammal communities seemed to be maintained, and hence, these treatment sites may not lower overall diversity of a forested landscape (Sullivan et al., 1998a).

3.12. Congressionally Designated Areas and Scenery Management

The Columbia River Gorge is a congressionally designated area, established by the Columbia River Gorge National Scenic Area Act of 1986. Effects to the Scenic Area are described throughout Chapter 3. The sections below specifically address the affected environment and consequences for designated wilderness areas and wild and scenic rivers. A discussion of effects to scenery management in the Scenic Area is contained in this section.

3.12.1 Existing Conditions

Wild and Scenic Rivers

There are five rivers which are part of the Wild and Scenic Rivers System in the Forest. Invasive plant species have been found and treatment is proposed in all five river corridors. Early detection could prompt additional treatments in any of the river corridors. Table 3-40 lists the wild and scenic rivers in the Forest and the acres in each management category (wild, scenic, or recreation) where invasive plants have been inventoried. Tables 3-44 and 3-45 describe the inventoried areas (1,465.5 acres) within wild and scenic river corridors in the Forest that would be treated for invasive plants in the Proposed Action and the Reduced Herbicide Use Alternative.

Table 3-40: Wild and Scenic River Segments and Acres by Management Category within the Administrative Boundaries of the Mt. Hood National Forest.

River Segment	Mt. Hood National Forest Acres	Other Ownership	Total Acres
Clackamas National Recreation River	8,640	0	8,640
Clackamas National Scenic River	6,400	0	6,400
Roaring National Recreation River	64	0	64
Roaring National Wild River	4,320	0	4,320
Salmon National Recreation River	3,360	0	3,360
Salmon National Wild River	4,800	0	4,800
Sandy National Wild River	1,440	0	1,440
White National Recreation River	4,992	0	4,992
White National Scenic River	2,080	0	2,080
Total Acres	**36,096**	**0**	**36,096**

The intent of the 1968 Wild and Scenic Rivers Act is to maintain the free-flowing character of the designated rivers and to protect their “outstandingly remarkable values.” Outstandingly remarkable values (ORV) 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. The ORV’s for the five wild and scenic rivers in the Forest are identified in Table 3-41. Detailed descriptions of the rivers and their outstandingly remarkable values are documented in the following management plans which are posted on the Forest website (http://www.fs.fed.us/r6/mthood/publications/):

- Clackamas National Wild and Scenic River and State Scenic Waterway. Environmental Assessment and Management Plan. (USDA Forest Service, 1992)
- Roaring National Wild and Scenic River. Environmental Assessment and Management Plan. (USDA Forest Service, 1993b)
- Salmon National Wild and Scenic River. Management Plan. (USDA Forest Service, 1993c)
- Upper Sandy National Wild and Scenic River. Management Plan. (USDA Forest Service, 1994a)
- White River National Wild and Scenic River. Management Plan. (USDA Forest Service, 1994b)

Table 3-41: Outstandingly Remarkable Values (ORV) for the Wild and Scenic Rivers in the Mt. Hood National Forest.

ORV	Clackamas River	Roaring River	Salmon River	Sandy River	White River
Botany/Ecology	X	X	X	X	X
Cultural Resources	X				X
Fisheries	X	X	X	X	X
Geology				X	X
Hydrology			X		X
Recreation	X	X	X	X	X
Scenery		X	X	X	X
Water Quality		X			
Wildlife Habitat	X	X	X		X

Wilderness

The 1964 Wilderness Act established the National Wilderness Preservation System to ensure that parts of the United States would be preserved and protected in their natural condition. A wilderness area is defined, 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. The Wilderness Act places responsibility upon the administering agency for preserving the wilderness character of the area.

There are five wilderness areas that are entirely within the Forest (Badger Creek, Bull of the Woods, Mark O. Hatfield, Mt. Hood, and Salmon-Huckleberry) and a portion of one other wilderness area in the Forest (Mt. Jefferson). Table 3-42 shows the number of acres of each of the Wilderness areas in the Forest. Since trails are a primary pathway for the introduction and spread of invasive plants in wilderness, the miles of trail (in the Forest) for each wilderness are also shown.

Invasive plant species have been inventoried only in the Mt. Hood Wilderness. Three sites, totaling 15.3 acres, have been inventoried. A 3.7 acre site (Treatment ID 69-028) is in a meadow along Burnt

Lake trail (Trail #772). A 9.8 acre site (portion of treatment ID 66-003) is along McGee Creek trail (Trail #672). A 1.8 acre site (portion of treatment ID 66-005) is along the Pacific Crest National Scenic Trail (Trail #2000) near Lolo Pass. The EDRR of the Proposed Action and Reduced Herbicide Use Alternative could prompt treatment in other wilderness areas as well.

Considering treating invasive plants in wilderness creates a management dilemma; it is usually not possible to both preserve natural conditions (treatment) and to also refrain from human manipulation (no treatment). A choice must usually be made to either preserve natural conditions by actively manipulating wilderness to manage invasive plants, or to keep wilderness free from intentional human manipulation and compromise natural conditions because of changes to the environment caused by invasive plants. Making this choice involves deciding upon the minimum requirement, which is whether or not management action is necessary in wilderness to preserve wilderness character. If it is decided that management action is warranted, then the minimum tool needed to implement treatment with the least adverse effects to the wilderness resource must be addressed (Hendee, 1990).

Table 3-42: Land Area and Miles of Trail in the Six Wilderness Areas which are Entirely or Partially in the Mt. Hood National Forest

Wilderness	Total Acres	Mt. Hood National Forest Acres	Miles of Trail [1]
Badger Creek	24,000	24,000	62
Bull of the Woods	27,427	27,427	56
Mark O. Hatfield	39,000	39,000	90
Mt. Hood	47,160	47,160	106
Mt. Jefferson	107,008	5,021	3
Salmon-Huckleberry	44,600	44,600	54
Total	**289,195**	**187,208**	**371**

[1] Indicates miles of trail within the boundaries of the wilderness in the Mt. Hood National Forest

Scenery Management

Beautiful scenery may be the benefit enjoyed by the largest number of people who visit the Forest and Scenic Area. The visual resources of the Forest attract tourists from all parts of the nation, as well as nearby residents. The sheer beauty of the Forest is a significant part of the region's human environment. There is always a dynamic tension between the need to actively manage National Forest System lands and the desire by citizens to view naturally appearing landscapes.

Sightseeing and visiting sites of interest are important and rapidly growing outdoor recreation pursuits in the United States (Cordell, 1999). Cordell projected the number of sightseers in the Pacific Coast region to increase by 87 percent between the years 1995 and 2050. For the same time period, the number of trips and the number of days spent sightseeing are projected to increase by 138 percent and 159 percent, respectively.

Recent visitor sampling by both the Forest (2003) and the Scenic Area (2000) generated some statistics about the popularity of driving for pleasure and viewing scenery in the areas. Table 3-43 shows selected statistics from the National Visitor Use Monitoring Reports for the Forest (Kocis et al., 2004) and the Scenic Area (Kocis et al., 2001). Visitors in both survey areas were asked about their satisfaction with the scenery they saw during their visit, and about how important this feature was to them. Overall, visitors to the Forest rated scenery as 4.8 (on a scale of 1 – 5; 4 = good, satisfied; 5 = very good, very satisfied). The mean importance rating for the Forest visitors was 4.5 (on a scale of 1-5; 4 = important; 5 = very important). Overall, visitors to the Scenic Area also rated the scenery as 4.8. The mean importance rating for Scenic Area visitors was 4.9.

Table 3-43: Measurement of People Viewing Scenery in the Forest (measured in 2003) and Scenic Area (measured in 2000). Source: National Visitor Use Monitoring (Kocis et al., 2001 and Kocis et al., 2004). Statistics with an * are among the top five activities in which respondents participated. Columbia River Gorge National Scenic Area statistics include participants in Washington State as well as Oregon.

Unit of Measure	Mt. Hood National Forest (2003)	Columbia River Gorge National Scenic Area (2001)
Number of National Forest Visits	4,076,119	1,992,881
Number of People (and %) Who Participated in “Driving for Pleasure” during National Forest Visit	1,227,727 (30%)*	936,654 (47%)*
Number of People (and %) Who Reporting “Driving for Pleasure” as Their Primary Activity during National Forest Visit	155,300 (4%)	99,644 (5%)*
Number of People (and %) Who Participated in “Viewing Scenery” during National Forest Visit	2,433,851 (60%)*	757,295 (38%)
Number of People (and %) Who Reporting “Viewing Scenery” as Their Primary Activity during National Forest Visit	346,877 (9%)*	239,146 (12%)*

Protecting or enhancing scenic integrity is one of the purposes for the management of the Scenic Area. The Scenic Area Management Plan (2004) divides Gorge lands into either General Management Area (GMA) or Special Management Area (SMA). Scenic standards, derived from the Forest Service Scenery Management System (SMS), differ for the two areas. The Plan also identifies 22 key viewing areas from which the public can view Scenic Area landscapes. Key viewing areas from which the Oregon portion of the Scenic Area can be viewed are:

- Beacon Rock
- Bonneville Dam Visitor
- Bridal Veil State Park
- Cape Horn
- Columbia River
- Cook-Underwood Road
- Crown Point
- Dog Mountain Trail
- Historic Columbia River
- Interstate 84, including rest
- Klickitat County Road 123
- Larch Mountain
- Larch Mountain Road (SMA
- Multnomah Falls
- Oregon Highway 35
- Pacific Crest Trail
- Panorama Point Park
- Portland Women's Forum State Park
- Rooster Rock State Park
- Rowena Plateau and Nature Conservancy
- Sandy River
- Sherrard Point on Larch Mountain (SMA only)
- Washington State Route 14
- Washington State Route 141
- Washington State Route 142
- Wyeth Bench Road (SMA only)

Table 3-44 lists the landscape setting, land use designation, and scenic standards for the seven inventoried invasive plant sites in the Scenic Area. The landscape setting is the combination of land use, landform, and vegetation patterns that distinguish an area in appearance and character from other portions of the Scenic Area. Land use designation is the zoning allocation.

Forest visual quality was inventoried in 1973 (and updated in 1983) using the Visual Management System which predates SMS. The Forest Plan FEIS categorizes the results of the inventory according to variety class, sensitivity level, distance zones, and visual condition (USDA Forest Service, 1990a). The Forest Plan prescribes visual quality objectives (VQO) to be achieved within various scenic viewsheds, the area which can be viewed from a particular vantage point such as a roadway, trail, or recreation area. The sensitivity levels of the viewsheds are based primarily on the volume and type of traffic at the vantage point (i.e. how critical is a viewer likely to be to changes in the landscape). Level I (Primary) viewsheds are considered the most important; they have VQO's of "Retention" (equivalent to "High" scenic integrity objective, and "Not Visually Evident" scenic standard in SMS) or "Partial Retention" (equivalent to "Moderate" scenic integrity objective, and "Visually Subordinate" scenic standard in SMS).

Table 3-44: Landscape Settings, Land Use Designations, and Scenic Standards for Invasive Plant Sites in the Scenic Area.

Treatment ID	Location	GMA/ SMA	Landscape Setting	Land Use Designation	Scenic Standard
22-01	Sandy River Delta	SMA	River Bottomlands; River Bottomlands	Open Space; Public Recreation	Not Visually Evident; Visually Subordinate
22-05	Wyeth	SMA	Coniferous Woodland	Forest/Public Recreation	Visually Subordinate
22-07	Wells Island	SMA	River Bottomlands	Open Space	Not Visually Evident
22-08	East Pit	GMA	Oak Woodland	Public Recreation	Visually Subordinate
22-11	Rowena Dell/ Rowena	SMA	Oak Woodland; Residential	Open Space; Residential	Not Visually Evident; Visually Subordinate
22-12	Chenoweth Table	SMA	Oak Woodland; Oak Woodland	Open Space; Agriculture	Not Visually Evident; Visually Subordinate
22-12	Sevenmile Hill	SMA	Gorge Walls/ Canyonlands; Oak Woodlands; Pastoral	Agriculture/ Open Space; Agriculture; Agriculture	Not Visually Evident; Visually Subordinate; Visually Subordinate
22-17	Corbett	SMA	Coniferous Woodland; Coniferous Woodland; Pastoral	Open Space; Public Recreation; Agriculture	Not Visually Evident; Visually Subordinate; Visually Subordinate

Seventy-nine inventoried invasive plant sites in the Forest (approximately 3,404 acres) are either wholly or partially in Level I viewsheds. The most sensitive of these are the sites along Oregon Highways 26 and 35 (Mt. Hood Scenic Byway) and Oregon Highway 224 (West Cascades Scenic Byway) where the VQO is “Retention.” There are also numerous inventoried invasive plant sites in Level II scenic viewsheds which also have visual quality objectives of either Retention or Partial Retention. Portions of 38 sites, totaling 1,023 acres, have a VQO of Retention. Portions of 44 sites (1,113 acres) have a VQO of partial retention.

3.12.2 Effects to Congressionally Designated Areas

Direct/Indirect Effects

Wild & Scenic Rivers

The 1,465.5 acres of invasive plants in Wild and Scenic River corridors would not be treated in the No Action Alternative. This alternative would potentially harm the ecological, fisheries, recreation, scenic, and wildlife habitat ORV in the Wild and Scenic River corridors in the Forest. In the long-run, uncontrolled growth of invasive species would reduce species diversity and possibly even result in the local elimination of some native plant species (for more information, see Section 3.6 – Botany and Treatment Effectiveness). Animals dependent upon native plant species would be negatively affected (for more information, see Section 3.11 – Wildlife). Losses of macroinvertibrates which depend upon native plant species would negatively affect fisheries (for more information, see Section 3.10 – Aquatic Organisms and Habitat). The dense growth of some species, such as knotweed species, may occupy and eliminate streamside fishing spots and block boat launching sites. The scenic pattern, form, and texture of open areas and the forest understory would be altered, and scenic integrity would be reduced in the long-run. In both action alternatives, effects would be more favorable than the No Action Alternative.

Aggressive action proposed to control or eradicate invasive species in the Proposed Action would enhance ecological, fisheries, recreation, scenery, and wildlife habitat ORV's in the long-run. By maintaining native plant diversity, wildlife and fisheries habitats would benefit (see Section 3.11 – Wildlife and Section 3.10 – Aquatic Organisms and Habitat). Since herbicides are the most effective way of treating knotweeds which aggressively colonize along streams (see Section 3.6.2), the Proposed Action offers the best chance of preserving fishing and boating access. As described in the existing conditions section, all of the rivers, except the Clackamas River, have outstandingly remarkable scenic values. The short-term effects to scenic quality would be negative due to slight alterations in the characteristic landscape. Of the four primary landscape elements (line, form, color, texture), color would be altered most by the Proposed Action. All but 0.2 acres would be primarily treated with herbicides (mostly applied by broadcast herbicide applications). The unusual concentrations of dead or dying plants may be evident and unattractive to some people. About 700 acres would be actively restored, slightly altering the landscape texture for a brief period. The minor short-term negative effects (even in the immediate foreground) would last for one growing season, and the positive long-term effect of treatment would be restoration of the natural landscape character. Additional information may be found in Section 3.12.3 which describes effects to scenic integrity.

Table 3-45 describes the areas (1,465.5 acres) within wild and scenic river corridors in the Forest that would be treated for invasive plants in the Proposed Action.

Table 3-45: Proposed Action treatment sites in Wild and Scenic River corridors in the Forest. (Treatment: h = herbicide, mmh = manual, mechanical, and herbicide. Primary method: inject = herbicide injection, broadcast = herbicide application by boom spraying, mow = mechanical owing. Active and passive restoration methods are described in Section 2.1.3 of this document.)

River	Segment Type	Acres	# of Sites	Site Description	Treatment	Method	Priority	Restoration
Clackamas	Scenic	1.5	2	Road	h	inject	1	Active
Clackamas	Scenic	189.2	4	Road	mmh	broadcast	3	Passive
Clackamas	Scenic	0.1	1	Admin	mmh	broadcast	3	Passive
Clackamas	Recreational	167.2	2	Road	mmh	broadcast	1	Active
Clackamas	Recreational	484.7	2	Road	mmh	broadcast	3	Passive
Roaring	Wild	5.0	1	Road	mmh	broadcast	1	Active
Salmon	Wild	0.6	1	Road	mmh	broadcast	3	Passive
Salmon	Recreational	70.7	1	Utility Corridor	mmh	broadcast	2	Active
Salmon	Recreational	0.9	1	Road	mmh	broadcast	3	Passive
Salmon	Recreational	60.3	1	Road	mmh	broadcast	4	Passive
Salmon	Recreational	0.2	1	Road	mm	mow	3	Passive
Sandy	Recreational	157.0	1	Recreation Residences	mmh	broadcast	1	Active
White	Scenic	0.1	1	Road	mmh	broadcast	3	Passive
White	Recreational	9.1	2	Quarry	mmh	broadcast	2	Active
White	Recreational	68.6	1	Utility Corridor	mmh	broadcast	2	Active
White	Recreational	120.2	1	Campground	mmh	broadcast	2	Active
White	Recreational	0.2	1	Pullout	mmh	broadcast	2	Active
White	Recreational	100.4	1	Road	mmh	broadcast	2	Active
White	Recreational	29.4	1	Road	mmh	broadcast	3	Passive

The same areas in wild and scenic river corridors in the Forest would be treated for invasive plants in the Restricted Herbicide Use Alternative; however fewer acres would be treated with herbicides (Table 3-46). Because the probability of controlling invasive plants is lower without herbicides, protection or enhancement of ORV's would take more time and effort, and in the case of knotweeds, may not be achieved. Manual or mechanical treatment of knotweed species would not be very effective at preserving fishing and boating access (see Section 3.6.2).

Table 3-46: Restricted Herbicide Use Alternative treatment sites in Wild and Scenic River corridors in the Forest. (Treatment: h = herbicide, mmh = manual, mechanical, and herbicide, mm = manual and mechanical. Primary method: inject = herbicide injection, backpack = herbicide application by backpack sprayer, mow = mechanical mowing. Active and passive restoration methods are described in Section 2.1.3 of this document.)

River	Segment Type	Acres	# of Sites	Site Description	Treatment	Method	Priority	Restoration
Clackamas	Scenic	1.5	2	Road	c	inject	1	Active
Clackamas	Scenic	189.2	3	Road	mm	mow	3	Passive
Clackamas	Scenic	0.1	1	Admin	mm	mow	3	Passive
Clackamas	Recreational	167.2	2	Road	mmh	backpack	1	Active
Clackamas	Recreational	484.7	2	Road	mm	mow	3	Passive
Roaring	Wild	5.0	1	Road	mmh	backpack	1	Active
Salmon	Wild	0.6	1	Road	mm	mow	3	Passive
Salmon	Recreational	70.7	1	Utility Corridor	mm	mow	2	Active
Salmon	Recreational	0.9	1	Road	mm	mow	3	Passive
Salmon	Recreational	60.3	1	Road	mm	mow	4	Passive
Salmon	Recreational	0.2	1	Road	mm	mow	3	Passive
Sandy	Recreational	157.0	1	Recreation Residence	mmh	backpack	1	Active
White	Scenic	0.1	1	Road	mm	mow	3	Passive
White	Recreational	9.1	2	Quarry	mm	mow	2	Active
White	Recreational	68.6	1	Utility Corridor	mm	mow	2	Active
White	Recreational	120.2	1	Campground	mm	mow	2	Active
White	Recreational	0.2	1	Pullout	mm	mow	2	Active
White	Recreational	100.4	1	Road	mm	mow	2	Active
White	Recreational	29.4	1	Road	mm	mow	3	Passive

Since most sites in the Reduced Herbicide Use Alternative would be treated primarily by mechanical mowing (1,134.8 acres), the texture of the scenic fabric in these areas would be temporarily altered. Treatment would be evident and unattractive to some people. Active restoration on 700 acres would briefly extend the period during which the landscape texture would appear modified. For the 330.7 acres treated primarily by herbicides, effects similar to those described for the Proposed Action would occur. The long-term effect of treatments would be positive because of the restoration of the characteristic landscapes. Additional discussion of effects to scenic integrity may be found in Section 3.12.3.

Neither the Proposed Action nor the Restricted Herbicide Use Alternative would physically alter river banks or channels. Treatment would not cause logs or other large woody debris to enter the rivers. The free-flowing character of the wild and scenic rivers would not be affected. A discussion of the effects to water quality is found in Section 3.9. Cultural resources, geology, and hydrology ORV's would be largely unaffected by any of the alternatives.

Wilderness

Negative effects from No Action and the continued presence and expansion of orange hawkweed in the Mt. Hood Wilderness would include changes to the natural conditions and processes expected in wilderness. Left untreated, the hawkweed populations are predicted to double in size every six to seven years. The orange hawkweed plants would alter the meadow community along Burnt Lake Trail, interact in unknown ways with native wildlife species, and alter ecological processes such as plant community dynamics and disturbance processes (for more information, see Section 3.6.2, Effects on Native Plant Communities). Some visitors' experiences may be diminished if they are aware that orange hawkweed is not a native plant. Taking no action avoids human manipulation of wilderness, but natural conditions would not be restored.

If the No Action Alternative is selected, no herbicides from this project would be introduced into the Mt. Hood Wilderness ecosystem. There would be no risk of herbicide effects to non-target species. Ecosystem adaptations to invasive plants would be free from human interference. Effects of invasive plants would be determined by competitive and other interactions. Wilderness would remain freer from management in the No Action Alternative than in either of the action alternatives.

With the No Action Alternative, localized changes would occur to natural conditions and processes that are expected in a wilderness setting, which would result in a loss or reduction in the sense that the Mt. Hood Wilderness is a predominately natural place. By rejecting treatment, the loss of natural conditions, native species, and natural ecosystem processes would be minor and localized in the short-run. In several decades, these effects would become quite pronounced. Also, the Mt. Hood Wilderness could become a haven of invasive plants and a source of seed to spread to surrounding lands, both National Forest System lands and other ownerships.

There are three sites (15.3 acres) in the Mt. Hood Wilderness that would be treated with herbicides in both the Proposed Action and the Restricted Herbicide Use Alternatives. The target plant is orange hawkweed. Since these are "Priority 1" sites, the prescribed treatment is the same in both the Proposed Action and Restricted Herbicide Use Alternatives: clopyralid or picloram applied by backpack sprayer (aqueous glyphosate for aquatic influence zones) with active restoration. Treatment with herbicides was determined to be the minimum requirement for both action alternatives because there is concern that the hawkweed populations may expand to landscape scale, displace native species, and alter ecosystem processes and because manual control methods are not very successful against orange hawkweed (for more information, see Section 3.6.2 – Botany and Treatment Effectiveness). Because herbicides would be spot-sprayed, unintended effects to species other than orange hawkweed would be negligible.

Implementing either the Proposed Action or the Reduced Herbicide Use Alternative would protect natural conditions, however human manipulation of the wilderness environment is required to do so. Treatment would interfere with ecological dynamics between the native plant communities and the introduced invasive plants, affecting the sense that the wilderness is free from human manipulation.

Because the Burnt Lake and Pacific Crest, and McGee Creek Trails are popular, a few wilderness visitors may observe treatment activities or see the effects of treatment. Even small-scale, localized control methods require crews and activity that would be evident to a few visitors. Immediately after treatment, unusual concentrations of dead or dying vegetation may be seen along short sections of the Burnt Lake, Pacific Crest, and McGee Creek Trails. Active restoration would accelerate the return to a natural landscape, and minimize the time that the treatment would be evident (approximately one growing season). However, such evidence of treatment activities would add to the sense that the Mt. Hood Wilderness is not a place free from human manipulation. Because of snow conditions at the elevation of these trails, the effects of treatments would only be visible for about five months each year.

The action alternatives favor species that are native to wilderness. Orange hawkweed would be less likely to alter natural plant communities, interact in unknown ways with native wildlife species, or alter ecological processes such as plant community dynamics and disturbance processes such as fire. The sense that wilderness is a predominately natural place would be enhanced. Also, wilderness would be less likely to be viewed as a source of invasive plants that threaten surrounding, non-wilderness lands.

Early Detection/Rapid Response Strategy

It is possible that some newly detected invasive plants in wild and scenic river corridors may be accessible only by boat. This would be the only physical effect on the rivers from EDRR. Otherwise, treating additional acres in wild and scenic river corridors would have the same minor short-term effects and the same long-term positive effects as described earlier.

For wilderness, the response to the EDRR of new invasive plant populations would be determined through a site-specific minimum requirements analysis. No Action would be favored where an invasive plant is unlikely to displace native species or to alter ecological processes. Direct action would be initiated when it is determined that an invasive plant species has the ability to expand to landscape scale, displace native species, or to alter ecosystem processes. If new invasive plant populations expand to landscape scale, or if the new invasive plants displace native species and alter ecosystem processes, then wilderness character would be at risk. Under these circumstances, rapid response treatment would likely be implemented. If action is determined to be the minimum requirement, then manual treatment would be preferable if the invasive plant species is responsive to manual control, and if manual control treatments could be implemented in a timely manner and could be repeated as needed. Use of herbicides would be preferable if the invasive plant species is not responsive to manual control methods or if manual control methods are unlikely to be successful.

The effects of EDRR would be similar to the effects described for the treatment of the three known populations of orange hawkweed in the Mt. Hood Wilderness. Early detection of small new population centers may require fewer follow-up treatments and less effect to the wilderness resource.

Cumulative Effects

The affected area analyzed for cumulative effects to wild and scenic rivers and wilderness are the rivers and wilderness areas in the Forest. The timeframe considered was the span of this project (approximately 15 years). The only other likely foreseeable vegetation management treatment in wild and scenic river corridors is hazard tree removal along roadways. Ordinarily, individual tree removal is not evident to forest visitors, and has undetectable environmental effects.

The removal of aggraded sediment at the State Hwy 35 bridge across White River is required every few years. While noticeable to motorists on the highway, effects of this action are seasonal, localized, and attributed more to the bridge structure than to the river environment.

Outfitters and guides are authorized to lead whitewater trips on the Clackamas River during spring and early summer. Recreation is one of the outstandingly remarkable values of the Clackamas, and this activity is compatible with the management direction for the river.

Cumulatively, these actions would not significantly affect the free-flowing nature of the rivers or negatively affect outstandingly remarkable values. The scenic integrity of the wild and scenic river corridors would not be reduced.

Trail reconstruction is being studied for the Burnt Lake Trail within the Mt. Hood Wilderness in this decade. One of the objectives of reconstruction is to move about two miles of the trail out of sensitive areas; the effects to wilderness resulting from this action are expected to be positive. There would be minor cumulative effects with the treatment of orange hawkweed which is also proposed for this trail. If the actions overlap in time, then the effects of treating the hawkweed would likely be cloaked by the trail project. If the projects do not overlap, then wilderness visitors would notice minor disturbances along the trail for a longer period of time. Both projects would have positive long-term effects on the wilderness resource.

Trail reconstruction is also anticipated on The Timberline Trail between Cloud Cap and Elk Cove (Mt. Hood Wilderness), and the Bagby Trail north of Elk Lake (Bull of the Woods Wilderness) in this decade. The Timberline Trail connects to the Pacific Crest Trail, so it is possible that a hiker might be witness to both trail reconstruction and invasive plant treatments in the same trip (but not on the same day). The trail gets a lot of use, a condition that is more likely to negatively affect wilderness visitors than the resource treatments. Use of the Bagby Trail would likely be significantly separated in both time and space from visitor observations of invasive plant treatments; wilderness users would be unlikely to detect a cumulative effect to wilderness conditions in the Mt. Hood National Forest. Also, all long-term effects would be positive.

3.12.3 Effects to Scenic Integrity

Direct/Indirect Effects

It is likely that No Action would not keep up with the aggressive invasion by non-native species. Effects to scenic resources would include changing the landscape character in many areas to a homogeneous species composition in grassland areas and in the forest understory that is inconsistent with the valued landscape character. The No Action Alternative would not be sufficient to maintain the native grass species. Conditions necessary for continued regeneration of oak species may be altered (Carey, 2002). In the long-term, plant species diversity would be reduced. The continued spread of invasive species would increase the risk of large-scale wildfires of great intensity, reducing scenic stability significantly. Knotweed species may overtake riparian vegetation and river banks altering the scenic pattern, form and texture of open areas and the forest understory extensively. The scenic integrity would be reduced.

Aggressive action proposed to control or eradicate invasive species (Proposed Action) would help sustain the landscape character with some short-term effects to scenic integrity. Patches of dead vegetation, including desirable species, for at least one growing season would be a short-term negative effect. The unnatural appearance of mowed and brushed areas seen from immediate foreground distances (300 feet) would also be a short-term negative effect. The sites along I-84, Historic Columbia River Highway, and Oregon Highways 26, 35 and 224 would be seen by a large number of viewers; however, the degree of discernable detail would be small. For example, the visual effects from cultural treatment (goat grazing) in the Sandy River Delta as seen from I-84 would not be noticable. The duration of view from travel corridors would vary. Many treatment areas stretch for miles along the sides of roads. Such treatments would be more noticeable; however, the effect would be short-term.

Direct beneficial effects would include the limitation of invasive plant species in the viewshed, maintenance of diverse community of native grasses, forbs, and shrubs, and maintenance of conditions consistent with the ecological setting that supports the desired landscape character, a mosaic of forested canopy and grassland openings. The Proposed Action would meet the existing visual quality objectives and be beneficial to the landscape character by reducing risks of altered plant species composition and related effects. The scenic integrity and scenic stability would be maintained.

In the Restricted Herbicide Use Alternative, limiting usage of herbicides to Priority 1 sites and minimizing broadcast herbicide application methods would lessen short-term negative effects to scenic integrity. Other herbicide application methods, such as backpack spraying and injection, could more precisely target invasive plants, leaving more native vegetation unharmed, reducing the negative effects to scenic integrity. This alternative’s greater reliance upon manual and mechanical treatment methods (compared to the Proposed Action) which are less effective at controlling some invasive plant species, however, would increase both short-term and long-term negative effects. The unnatural appearance of mowed and brushed areas seen from immediate foreground distances, (300 feet) would be a short-term negative effect. Moreover, if invasive species are not controlled because of a heavier reliance upon less effective treatment methods, scenic integrity and scenic stability would be reduced in the long-term. Direct beneficial effects of this alternative would be the same as those for the Proposed Action, however to a lesser extent.

Early Detection / Rapid Response Strategy

Treating newly-discovered populations of invasive species would not reduce scenic integrity. The visual absorption capacity in virtually all areas of the Forest, and especially in the Scenic Area is great enough to tolerate herbicide, manual, and mechanical treatments on 30,000 acres over 15 years without loss of landscape character or scenic integrity.

Cumulative Effects

No cumulative effects are expected from the proposed invasive plant treatments.

3.12.4 Management Standards and Guidelines

Relevant standards and guidelines contained in the Forest Plan and the Northwest Forest Plan are displayed in Appendix B of this document; relevant standards contained in the Scenic Area Management Plan are displayed in Appendix C. This analysis exhibits that the Proposed Action and Restricted Herbicide Use Alternatives are consistent with all relevant standards and guidelines, when the proposed amendments are incorporated. The Forest Plan amendments are discussed in Section 3.16.

3.12.5 Incomplete and Unavailable Information

Congressionally Designated Areas

The analysis of direct effects in wilderness is based on the dynamic tension between people who believe that it is more important for wilderness to remain free from management and people who believe that protecting natural conditions is more important. There is no data about either the absolute or the relative number of people who hold these views. There is also no quantitative information about the number of people who would likely observe treatment activities or see the effects of treatments.

Scenic Integrity

There is also no quantitative information about the number of people who would likely observe treatment activities or see the effects of treatments.

3.13. Heritage Resources

3.13.1 Existing Conditions

Eradication or treatment of invasive plant species through the application of herbicides and manual treatments (including hand tools such as shovels) falls within the description of activities determined to have no potential to affect heritage resources as determined within the 2004 Programmatic Agreement between Pacific Northwest Region of the USDA Forest Service, the State Historic Preservation Office (SHPO), and the Advisory Council on Historic Preservation (ACHP) (Programmatic Agreement, Appendix C.2). (Programmatic Agreement is included as Appendix Y.) Impacts from the use of "weed wrenches" is similar in scale and extent to impacts from shovels, and the use of this tool also falls within the definition of activities with no potential to affect heritage resources. No heritage resource survey is required for these activities.

Mowing or brushing to control vegetation, including invasive plant treatments, has also been determined within the agreement to have no potential to affect heritage resources (Programmatic Agreement, Appendix C.5). No heritage resource survey is required for these activities.

The proposed project includes two identified traditional gathering areas and six potential gathering areas containing plants that have a cultural significance to Native American peoples. Other areas with culturally significant plants are likely to be included within the remaining treatment areas. Culturally significant plants are collected and used as food, for medicine, or for ceremonies, and are important for American Indian lifestyles. An incomplete list of these plants in found in Table 3-47.

Table 3-47: List of culturally significant plants likely to be found in proposed treatment areas.

Common Name	Scientific Name
Blue Camas	*Camassia quamash*
Bitterroot	*Lewisia rediviva*
Wild Celery	*Lomatium nudicaule*
Biscuit Root	*Lomatium cous*
Canby's Desert Parsley	*Lomatium canbyi*
Indian Carrot of False Caraway	*Perideridia gairdneri*
Field Mint	*Mentha arvensis*
Choke Cherry	*Punus demissa*
Blue Huckleberry	*Vaccinium species*
Black Lichen	*Alectoria species*
Bear Grass	*Xerophyllum tenax*

Especially important among the culturally significant plants are the camas, huckleberry and bitterroot. The plant species targeted for treatment (Table 2-3) do not include any plants identified for cultural uses. However, while the herbicides proposed for use are designed to target invasive plants, many have the potential to effect broadleaf varieties and grasses, including cultural plants (See Section 3-6 – Botany and Treatment Effectiveness).

Restoration of the treated areas is also proposed under each alternative. Restoration would consist of reseeding and/or planting. Reseeding would be accomplished using either hand spreaders or hydro-seeders. The ground surface would be scarified using a rake or other hand tool. Saplings or small foliage would be planted using shovels, hoedads, or other hand tools (See Section 2.1.3 for more information on proposed restoration). Restoration using hand tools within previously disturbed ground falls within the description of activities determined to have little or no potential to affect heritage resources as determined within the 2004 Programmatic Agreement (PA) (Programmatic Agreement, Appendix A.1). Seeding by hand or spray has also been determined within the agreement to have no effect on heritage resources (Programmatic Agreement, Appendix C.1). No heritage resource surveys are required for these activities.

Laws, Regulations and Policy

The National Historic Preservation Act (NHPA) of 1966, as amended: This Act requires Federal agencies to consult with American Indian Tribes, state and local groups before nonrenewable heritage resources, such as archaeological and historic structures, are damaged or destroyed. Section 106 of this act requires federal agencies to review the effects project proposals may have on the heritage resources in the analysis area.

36 CFR Part 800 – Protection of Historic Properties: (a) Purposes of the Section 106 process. Section 106 of the National Historic Preservation Act requires Federal agencies to take into account the effects of their undertakings on historic properties and afford the Council a reasonable opportunity to comment on such undertakings. The procedures in this part define how Federal agencies meet these statutory responsibilities. The Section 106 process seeks to accommodate historic preservation through consultation among the agency official and other parties with an interest in the effects of the undertaking on historic properties, commencing at the early stages of project planning. The goal of consultation is to identify historic properties potentially affected by the undertaking, assess its effects and seek ways to avoid, minimize or mitigate any adverse effects on historic properties.

3.13.2 Direct/Indirect Effects

Alternative 1 – No Action

Invasive plants treatments occur across the Forest and Scenic Area on a smaller scale, as previously analyzed and approved activities. Under Alternative 1, no additional treatments for invasive plants are proposed beyond those activities occurring under existing NEPA. There would be **no effect** under Alternative 1 to heritage resources other than the natural processes that are already occurring.

However, the lack of any additional treatments could result in the proliferation of invasive plant species, which may compete with culturally significant plants. The potential exists for culturally significant plants to be adversely affected under Alternative 1.

Alternatives 2 &3 – Proposed Action and Restricted Herbicide Use Alternatives

Under these alternatives, a combination of herbicide, mechanical (mowing and brushing), manual (hand tools), and cultural (goat grazing) treatments would be applied. These treatment methods are described in Table 2-2. As previously discussed, the application of herbicides, mowing and brushing, and the use of hand tools for the eradication of invasive plant species would have no effect on heritage resources.

The effects of goat grazing within the Scenic Area were previously analyzed under Alternative 5 in the Final Environmental Impact Statement for the Sandy River Delta Plan (Chapter 4-42, USDA Forest Service, 1995a). On December 22, 1994 the Oregon SHPO concurred with the finding that the alternative would cause “no adverse effect” to cultural resources. The Sandy River Delta Plan (Page 48, USDA Forest Service, 1995b) includes livestock grazing with mitigation measures (as described in Alternative 5) and is the current management guideline for this area. No further analysis was conducted on the use of goat grazing for this EIS.

Although the list of herbicides proposed for treating invasive plant species are not designed to target plants desirable to Native American peoples, many of the proposed herbicides have the potential to affect other broadleaf plants and grasses, including culturally significant plants. Spot spraying or selective/hand methods may be employed if necessary to limit unwanted spray drift. PDC and label restrictions limiting nozzle pressure and spray, and restricting herbicide application during high winds or expected precipitation would also limit unwanted spray drift and spread.

The Confederated Tribes of Warm Springs (CTWS), the Yakima Nation, the Confederated Tribes of the Grand Ronde, the Nez Perce Tribe, and the Confederated Tribes of the Umatilla Nation were consulted for concerns over potential effects to culturally significant plants. Tribal specialists from the CTWS agreed that any effects would be short-term, and eradicating or controlling the spread of invasive plants could potentially benefit desirable plant species. No modifications for proposed treatments were recommended by the Tribe~~s~~.

Restoration of the treated areas is also proposed under both alternatives. Restoration would consist of reseeding and/or planting. As previously discussed, the use of hand tools for scarifying, planting and seeding within previously disturbed ground would have no effect on heritage resource.

3.13.3 Cumulative Effects

Additional areas may be treated in the future as part of an EDRR. The EDRR would be designed to identify areas of newly inventoried invasive plant infestation and propose treatments for those areas. The application of mechanical, manual, or herbicide treatment methods as proposed under Alternatives 2 or 3 would have no potential to affect heritage resources. A cultural resource survey and consultation with the Oregon SHPO would not be required.

Although the expected impacts from weed wrenches has been determined to be similar in extent to impacts expected from the use of shovels, the Forest and Scenic Area would ensure that archaeological sites are not impacted by any proposal to utilize a weed wrench.

As part of the continuing consultation process, the USDA Forest Service would meet annually with the Confederated Tribes of Warm Springs, Oregon to discuss treatment areas being proposed each year. Any tribal concerns over the effects of previous treatments and proposed treatments would be considered and may be incorporated into the design of future treatment projects.

The quantity and quality of culturally significant plants have been declining through the years, due to encroaching vegetation. Invasive plant species have been contributing to the decline of these plants as they compete for sunlight, soil, nutrients and water. Continued treatment and suppression of invasive plants would reduce competition for the available resources and provide an opportunity for culturally significant plants to develop and spread. While there may be short-term effects to culturally significant plants, cumulative effects would be beneficial and restorative. The positive effects to native plants are discussed in more detail within Section 3.6 – Botany and Treatment Effectiveness.

Any additional activities occurring or proposed with the potential to affect culturally significant plants were also considered for cumulative effects. These activities include grazing, timber harvest, underburning, quarry expansion, road obliteration or decommissioning, gathering of special forest products, watershed restoration, trail construction, reconstruction of parking areas, and off-highway vehicle (OHV) trails (Schedule of Proposed Actions, January to March 2006). Each of these activities was analyzed separately for environmental effects. None of these projects were found to impact known traditional gathering areas. Each project, however, has the potential for eliminating single plants or isolated pockets of culturally significant plants, with a short-term effect to reduce the overall populations of the plants. Grazing animals are likely to consume all edible plants. Any ground disturbing activities associated with timber harvest, quarry expansion, trail construction and reconstruction, and watershed restoration are likely to destroy plants. Road obliterations and decommissioning would probably destroy plants that have encroached into the open roadbeds. Other ground cover and brush would be consumed by low-temperature underburning. Off-highway vehicles are likely to destroy plants within and immediately adjacent to trails.

While the overall populations of culturally significant plants may be reduced in the short-term, a net increase in plant populations would result over the long-term. Timber harvests have a tendency to open the forest canopy, allowing additional sunlight to reach the forest floor and benefit undergrowth, including culturally significant plants. When conditions are right, underburning could restore populations of huckleberries. As previously discussed, treatment of invasive plant species would also be beneficial and restorative to culturally significant plants. The cumulative effects of the proposed treatments on culturally significant plants are insignificant when compared with other activities occurring across the forests, especially when a long term net increase in those plants is anticipated.

3.13.4 Management Standards and Guidelines

Relevant standards and guidelines contained in the Forest Plan and the Northwest Forest Plan are displayed in Appendix B of this document; relevant standards contained in the Scenic Area Management Plan are displayed in Appendix C. This analysis exhibits that the Proposed Action and Restricted Herbicide Use Alternatives are consistent with all relevant standards and guidelines, when the proposed amendments are incorporated. The Forest Plan amendments are discussed in Section 3.16.

3.13.5 Incomplete and Unavailable Information

No inventory has been completed to determine if culturally significant plants are present in proposed treatment areas.

3.14. Tribal Relations, Civil Rights and Environmental Justice

3.14.1 Existing Condition

Most of the people who would be directly affected by invasive plant treatments live close to the forest and either depend upon or simply visit the forest often. Many live in Multnomah, Clackamas, Hood River, and Wasco Counties. There are some individuals and distinct populations not living adjacent to the forest that may also be affected. The analysis focused on minority or low-income population groups of particular interest: Hispanics, Asians, and American Indians. A sizable number of individuals in these groups have a unique social and economic dependency upon the forest. Hispanic forestry workers do most of the manual labor to maintain Oregon's National Forests. Hispanics and Asians do virtually all of the commercial harvesting of special forest product such as floral greens. Asian groups are particularly interested in wild mushroom harvesting for both personal and commercial use. American Indian Tribes have reserved treaty rights to hunt, fish, and gather plant materials in the areas proposed for treatment.

The Forest and Scenic Area straddle the Cascade Mountains in northern Oregon. The two sides of the mountain range have different social and economic identities and characteristics. The eastside (Hood River and Wasco Counties) features a rural and dispersed human settlement and an economy that is highly dependent on agriculture (livestock, fruit tree cultivation). On the westside, there are also many rural communities and an agricultural component to the economy (landscape plant nurseries) adjacent to the Forest (Multnomah and Clackamas Counties). The social and economic landscape, however, is heavily influenced by the Portland metropolitan area, the region's largest population center.

Table 3-48 displays some pertinent data that help describe the social and economic landscape in the affected area. As Table 3-48 shows, persons of Hispanic or Latino origin comprise 25 percent of the population of Hood River County, an amount significantly higher than any of the other counties, Oregon, or the United States as a whole. In Multnomah and Clackamas Counties, Hispanics make up a smaller percentage of the population than for all of Oregon; however, there are still sizable, localized Hispanic communities (e.g. Woodburn, Oregon). The Asian population is sizable on the westside, especially in Multnomah County. On the eastside, however, it is fairly small. Percentage wise, the American Indian population in Multnomah and Clackamas Counties is below the Oregon average. In Wasco County, largely because of the Warm Springs Indian Reservation, American Indians make up a high percentage of the population compared to Oregon or the United States as a whole.

Table 3-48: Selected Demographic Information for Multnomah, Clackamas, Hood River, and Wasco Counties, Oregon. Source: U.S. Census Bureau.

People Quick Facts	Multnomah County	Clackamas County	Hood River County	Wasco County	Oregon	USA
Population, 2004 estimates	672,161	363,276	21,155	23,669	3,594,586	293,655,404
Population, % change 4/2000 – 7/2004	2%	7%	4%	-1%	5%	4%
Population, 2000	660,486	338,391	20,411	23.791	3,421,399	281,421,906
White persons, %, 2000 [1]	79%	91%	79%	87%	87%	75%
White persons not of Hispanic or Latino origin, %, 2000	77%	89%	71%	84%	84%	69%
Persons of Hispanic or Latino origin, %, 2000 [2]	8%	5%	25%	9%	8%	13%
Black or African American persons, %, 2000 [1]	6%	1%	1%	0%	2%	12%
American Indian and Alaska Native persons, %, 2000 [1]	1%	1%	1%	4%	1%	1%
Asian persons, %, 2000	6%	3%	2%	1%	3%	4%
Native Hawaiian and Other Pacific Islander, %, 2000 [1]	0%	0%	0%	1%	0%	0%
Persons reporting some other race, %, 2000 [1]	4%	2%	15%	6%	4%	6%
Persons reporting two or more races, %, 2000	4%	3%	3%	2%	3%	2%
High School Graduates, % of persons age 25+, 2000	86%	89%	78%	82%	85%	80%
Median Household Income, 1999	$41,278	$52,080	$38,326	$35,959	$40,916	$41,994
Persons Below Poverty, 2002 estimates	12%	8%	12%	13%	11%	12%
Persons per square mile, 2000	1,518	181	39	10	36	80

[1] Includes persons reporting only one race.

[2] Hispanics may be of any race, so also are included in applicable race categories.

Wasco County has the lowest household income and highest poverty rate among the jurisdictions compared in Table 3-48. Clackamas County has the highest household income and lowest poverty rate. Much of that affluence is concentrated in the southern part of the Portland metropolitan area (Lake Oswego, West Linn). Hood River County has the lowest percentage of high school graduates.

Jobs Created by Invasive Plant Treatments

During the past century, Hispanic immigrants have done much of the agricultural labor in the western states (Gates and Crider, 2001). The National Agricultural Workers Survey of 1997-1998 reports that the typical worker tending and harvesting fruits, vegetables, nursery, field and other crops in the United States is young (2 out of 3 are under age 35); male (80 percent); Hispanic (90 percent, mostly from Mexico); poorly educated (median years of education is six); lack year-round employment; and low income (half of the workers earned less than $7,500 a year) (League of Women Voters, 2000).

Latino forestry workers, who do most of the manual labor to maintain Oregon's National Forests (including tree planting, pesticide application, thinning, and prescribed burning), are primarily Mexican immigrants (Sarathy, 2003). They constitute a non-unionized and seasonal workforce which, unlike Anglo forest workers from rural communities, travels throughout the Western United States to find employment in agriculture, non-timber forest products, tree planting, and fire fighting (Sarathy, 2003). In 1997, 5 percent of Oregon workers and 18 percent of Latino Oregon workers were employed in Agriculture and Forestry (Gates and Crider, 2001).

Most farm and forestry work is seasonal and temporary. Working conditions are often hard. Jobs can be in remote locations with workers housed in motels or in isolated camps. Compliance with minimum wage law by labor contractors varies. Non-English speaking workers, new immigrants, and those employed by unlicensed labor contractors may be underpaid. Unauthorized workers usually would not benefit from tax and social security deductions (League of Women Voters, 2000). Many work histories have included unsafe working conditions, and the employers have failed to take responsibility for the medical consequences of workplace accidents. Some workers have described the dangers of chemical exposure in the agriculture industry (Gates and Crider, 2001). Workers reported headaches, nausea, and dizziness after inhaling chemical fumes. One worker also reported a skin rash.

Special Forest Products

The Pacific Northwest may have the most diverse collection of forest workers in the world (Oregon Public Broadcasting, 2005). Wild mushroom harvesting is one of the most ethnically diverse forest products industries in the Pacific Northwest (Sarathy, 2003). This situation is driven by a changing (and increasingly global) economy, large populations of marginalized migrants, changing values toward resources, and growing demand for non-commodity uses of the environment. Research suggests that there is a growing tendency for recent immigrants (Hispanic and Asian) to see the products they remove from Northwest forests as sources of income, with less emphasis upon gathering for traditional subsistence products (Hansis, 1998). Native American tribes are also beginning to be interested in the economic potential of wild products such as mushrooms and huckleberries (Oregon Public Broadcasting, 2005). For example, wild berries, which perish quickly, can have considerable value added by converting them into jam for commercial sale, long shelf-life, and world-wide shipping.

Workers may come to the forest from other parts of the region, particularly the Seattle/Tacoma metropolitan area. The project, therefore, would affect more than just the four counties surrounding the forest. A 1991 study of beargrass permits issued by the Gifford Pinchot National Forest revealed several findings about the demographics of permit holders and product gatherers. First, Latinos and Southeast Asians (Khmer, Khmer Krom, Laotian, and Vietnamese) were virtually the only permit holders. Second, most of the permit holders returned repeatedly to purchase additional permits. Third, permit holders emanated from only a few places. Southeast Asian permit holders were primarily from Tacoma and Aberdeen, Washington. Latino gatherers came mainly from Tacoma, Washington, and from the Hood River valley in Oregon. In the same study, it was found that most mushroom permit holders, both commercial and personal, on the Cowlitz Valley Ranger District in Randle were primarily of Khmer or Vietnamese origin, with a smaller number issued to people of Khmer Krom and Laotian origin (Hansis, 1998).

During the 2003 National Visitor Use Monitoring (NVUM) project for the Forest (Kocis et al., 2004), forest visitors were asked whether or not they gathered forest products (mushrooms, berries, firewood, other) during their National Forest visit. Of the 4,076,119 visitors to the Forest during fiscal year 2003, 42,392 people (1.04 percent) reported that gathering forest products was their primary activity. In all, 137,365 said that they participated in gathering forest products, but for most it was not their primary activity.

Treaty Rights

The United States Government and the Tribes of Middle Oregon (Taih, Wyam, Tenino, and Dock-Spus Bands of the Walla-Walla, and the Dales, Ki-Gal-Twal-La, and the Dog River Bands of the Wasco), now part of the Confederated Tribes of the Warm Springs, entered into a treaty on June 25, 1855 (ratified March 8, 1859). The Forest and Scenic Area east of the Cascade crest are lands ceded by the Tribes to the US Government according to that treaty. Article 1 of the treaty describes hunting, fishing, gathering, and pasturing rights in the ceded lands that were reserved by the Tribes:

> *". . . Provided, also, 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 housing 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 . . ."*

The Yakima, WallaWalla, Cayuse, Umatilla, Nez Perce, and Molala Tribes also entered into treaties with the US Government in 1855 (ratified 1959). Each treaty specified distinct lands to which rights, title, and claim were ceded to the United States. All treaties, except the Treaty with the Molala, include reserved treaty rights for hunting, fishing, and gathering. Wording in each treaty regarding the reserved rights are similar to the citation above from the Treaty with the Tribes of Middle Oregon. Canons of treaty construction, the tools developed by federal courts for interpreting Indian treaties, read such treaty language broadly in favor of the tribe. As such, these tribes have an interest in the effects of the Proposed Action on hunting, fishing, and gathering.

Certain natural foods found in the Forest and Scenic Area are culturally significant to the tribes. All tribes take advantage of assorted wild roots, fruits, and other plant-life. Salmon has long been, and continues to be a staple. The foods, the methods of obtaining them, and many special festivals and rituals that celebrate them are important parts of life on the Warm Springs Reservation. The Warm Springs Indians observe three annual religious feasts of thanksgiving based on native foods: the Root Feast in spring; the First Catch, or Salmon Feast, in spring; the Huckleberry Feast in early fall.

In the short-run, some plants that are culturally significant to tribes may be affected by herbicides, even though they are not the target of herbicide treatments. These plants include blue camas (*Camassia spp*.), huckleberry (*Vaccinium membranaceum*), and bitterroot (*Lewisia rediviva*). Camas, a member of the lily family, grows in mountain meadows from 2,000 to 8,000 feet (Munz, 1963). Huckleberry is widely distributed in forested environments in the Northwest. Bitterroot grows in loose, gravelly slopes and rocky places from 2,000 to 9,000 feet (Munz, 1963).

3.14.2 Direct/Indirect Effects

Executive Order 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (1994) directs federal agencies to identify and address the issue of environmental justice: adverse human health and environmental effects of agency programs that disproportionately impact minority and low income populations. Executive Order 12898 also directs agencies to consider patterns of subsistence hunting and fishing when an agency action may affect fish and wildlife.

Jobs Created by Invasive Plant Treatments

As previously discussed in Section 3.7, more jobs would be created by the Restricted Herbicide Use Alternative than by either the Proposed Action or the No Action Alternatives. Hispanic workers would fill most of those jobs. Both Sarathy (2003) and the League of Women Voters (2000) found that the vast majority of forestry work is being done by Hispanic workers.

Jobs created by the Proposed Action or the Restricted Herbicide Use Alternatives would be seasonal, physical, outdoor work. The work is generally categorized as manual labor or low-skilled work (Sarathy, 2003). As such, wages would generally be low. Currently the minimum wage in Oregon is $7.25/hour. Jobs may be in remote locations, and contractors may house workers in motels or in isolated camps.

Forestry workers, usually disproportionately Hispanic, would have more exposure to the proposed herbicides than the population at large. The Proposed Action would have the greatest effect in this regard; the number of acres treated with herbicides for each job created would be 137 acres (this number would actually be larger since most acre would be treated more than once). The No Action Alternative would create the least exposure per worker; the number or acres treated with herbicides for each job created would be 16 acres. For the Reduced Herbicide Use Alternative, the number of acres treated with herbicides for each job created would be 25 acres (this number would actually be larger since most acre would be treated more than once).

These statistics have little comparative value without also examining measures to ensure applicator safety. In their study of Latinos in the Oregon workforce, Gates and Crider (2001) reported examples of unsafe working conditions, made worse by the failure of employers to take responsibility for the medical consequences of workplace accidents. During interviews with Latino workers in the agriculture industry, more than one worker described the dangers of herbicide exposure (Gates and Crider, 2001). Because of concerns about worker health and anecdotal stories of poor working conditions, several PDC were developed for this project to reduce the exposure and hazard from herbicides for chemical applicators (see Section 2.2, Project Design Criteria for Alternatives 2 and 3). These criteria would apply to all herbicide treatments in the Proposed Action and in the Reduced Herbicide Use Alternative. PDC D.1 would require workers to use appropriate personal protective clothing and equipment at all times during application. Several other PDC that are primarily intended to protect natural resources would also enhance worker safety. PDC A.1 (label instructions), A.2 (compliance with standards in Invasive Plant FEIS, 2005a), A.4 (transportation), A.5 (leak-proof containers), A.6 (transportation routes), and B.1 (pre-operations briefings) would incrementally contribute to worker safety. Together, these criteria would eliminate the kinds of unsafe working conditions reported by Gates and Crider (2001).

Special Forest Products

Harvesters of non-timber forest products tend to come from Asian, Hispanic, and American Indian communities. These groups would be affected by herbicide treatments in areas available for picking their products. Based on the Mt. Hood National Forest Mushroom Harvest map (which includes the Oregon portion of the Scenic Area), more than 50 percent of the Forest (more than 535,000 acres), is ordinarily open to mushroom gathering. Of the 13,000 acres proposed for invasive plant treatment, roughly 9,900 acres are in areas that are open to mushroom gathering. In the Proposed Action, approximately 9,789 acres in areas that are ordinarily open to mushroom picking would be treated with herbicides; in the Restricted Herbicide Use Alternative, approximately 3,282 acres would be treated with herbicides. These acre figures are 1.8 percent and 0.6 percent, respectively, of the portion of the forest open to mushroom picking. See Section 3.5 – Human Health and Safety for more information on the effects to special forest products.

Most non-timber forest products are found in a forested environment. Products such as huckleberries, salal, ferns, and beargrass are not usually found in the disturbed areas along roads or in quarries. In addition, some proposed treatment areas are in areas such as campgrounds, resorts, and administrative sites that are off-limits to forest product gathering at any time. Considering only the forested sites that are not off-limits and where product gathering would likely occur, approximately 4,405 acres would be treated with herbicides in the Proposed Action (roughly 0.4 percent of the entire Forest and Scenic Area). In the Restricted Herbicide Use Alternative, approximately 1,705 acres of such sites would be treated with herbicides (roughly 0.2 percent of the entire Forest and Scenic Area). See Section 3.5 – Human Health and Safety for more information on the effects to special forest products.

Three PDC specifically address protection of forest visitors, especially forest workers and product harvesters, from exposure to herbicides (see Section 2.2). PDC D.2 would require signs to be placed at access points to treatment areas notifying the public of herbicide treatments. PDC D.3. would require announcement of herbicide applications to be published in local newspapers. PDC D.6. would require posting, barricading, or closing of developed campgrounds to prevent inadvertent public contact with herbicides. These criteria would apply to all herbicide treatments in the Proposed Action and in the Reduced Herbicide Use Alternative.

Treaty Rights

The reversal of negative impacts caused by invasive plants and the restoration of ecological communities and functions would benefit tribal interests. The long-term benefits of controlling invasive plants outweigh the short-term risks to localized populations of culturally significant plants. The Confederated Tribes of Warm Springs have been contacted about the proposed treatments. Tribal specialists agreed that any potential effects to culturally significant plants would be short-term, and controlling the spread of invasive plants could potentially benefit desirable plant species. No modifications for proposed treatments were recommended by the Confederated Tribes of Warm Springs; however the Forest Service agreed to meet annually to discuss any concerns about project implementation.

Treating invasive plants with herbicides and the actions taken to protect human health may briefly interrupt traditional root and berry harvesting in some areas where tribes have reserved treaty rights. Periodically during the proposed 15 year project, fewer gathering areas would be available for tribal use for short periods of time (methods for public notification about herbicide treatments are contained in the PDC in Section 2.2). None of the alternatives, however, would abrogate reserved treaty right.

Culturally significant plants are not specifically targeted by any of the proposed treatments; however, some of the herbicides are known to affect a range of broad leaf plants and grasses, potentially including cultural plants. Since it treats more acres with herbicides, the Proposed Action would have the greatest potential effect. The No Action Alternative, because it would treat the fewest acres overall, would have the least effect. The effects would be direct and short-term to localized plant populations. Three of the inventoried treatment areas (approximately 16 acres) are described as being in meadows, so effects to blue camas would be minimal unless early detection finds more invasive plant infestations in meadow environments. Camas may be affected by virtually all prescribed herbicides except clopyralid. Huckleberry may be most affected by chlorsulfuron, dicamba, glyphosate, imazapyr, picloram, and triclopyr. Bitterroot, like camas, may be affected by all the prescribed herbicides except clopyralid. Spot spraying or selective/hand methods may be employed if necessary to limit unwanted spray drift. Other prescriptions limiting herbicide application during high winds or expected precipitation would also limit unwanted spray drift and spread. In the long-run, populations of the desirable, culturally-important plants would re-colonize herbicide treated areas through seed dispersal from adjacent areas. Additional information about the direct and indirect effects to native plant communities is in Section 3.6.2.

Effects to salmon (reserved fishing rights) and game animals (reserved hunting rights) would be indirect. Section 3.10.2 contains a discussion about the effects to salmon. Section contains a discussion of effects to game animals. Additional information about human health and safety is in Section 3.5.

3.14.3 Early Detection/Rapid Response Strategy

Jobs Created by Invasive Plant Treatments

Because the number of jobs created for both the Proposed Action and the Reduced Herbicide Use Alternative would increase proportionately to the number of new acres of invasive plants detected, the number of acres treated with herbicides as a ratio to the number of jobs created would remain constant.

Special Forest Products

Assuming that newly detected invasive plant infestations fall proportionately into the same treatment priority categories as do inventoried areas, the Proposed Action may treat approximately 22,590 acres with herbicides in areas that are ordinarily open to mushroom picking; in the Restricted Herbicide Use Alternative, approximately 7,581 acres may be treated with herbicides. These acre figures are still only 4.2 percent and 1.4 percent, respectively, of the portion of the forest open to mushroom picking.

Considering only the forested sites where non-timber forest product gathering would likely occur, approximately 10,176 acres may be treated with herbicides in the Proposed Action (roughly 1 percent of the entire Forest and Scenic Area). In the Restricted Herbicide Use Alternative, approximately 3,939 acres of such sites may be treated with herbicides (roughly 0.4 percent of the entire Forest and Scenic Area).

Treaty Rights

EDRR may increase the magnitude of effects to culturally significant plants in both space and time. Additional root and berry harvesting areas where tribes have reserved treaty rights may temporarily be affected. Assuming that newly detected invasive plant infestations fall proportionately into the same treatment priority categories as do inventoried areas, the Proposed Action would still have a greatest potential effect on culturally significant plants than the Reduced Herbicide Use Alternative. The effects would be direct and short-term to localized populations of these plants. Over the course of the project, more gathering areas may be unavailable for tribal use for brief periods of time. The No Action Alternative does not include the EDRR.

3.14.4 Cumulative Effects

Most of the National Forests in Oregon and Washington have either proposed aggressive action against invasive plants or plan to declare their intent to do so in the next few years. Invasive plant treatment studies are underway for the Deschutes, Ochoco (including Crooked River National Grassland), Malheur, and Umatilla National Forests, areas where the Confederated Tribes of the Warm Springs have reserved treaty rights. The Deschutes/Ochoco project would treat approximately 52,000 acres (nearly all acres with herbicides). The Malheur project would treat about 3,862 acres (3,333 acres with herbicides). The Umatilla project would treat about 25,000 acres (18,500 acres with herbicides). Also, the Tribe is aggressively treating areas on adjacent reservation lands (CTWS and BIA, 2005). These actions would have cumulative effects on the environmental justice issues discussed above; however, the quantitative effects are unknown until the extent of other proposed treatments are determined.

It is safe to conclude, however, that the reversal of negative impacts caused by invasive plants and the restoration of ecological communities and functions would benefit all minority and low-income forest users in the long-run. These groups may be inconvenienced in the short-term as a small percentage (probably less than 5 percent) of available non-timber forest product harvesting areas are restricted for brief periods.

3.14.5 Management Standards and Guidelines

Relevant standards and guidelines contained in the Forest Plan and the Northwest Forest Plan are displayed in Appendix B of this document; relevant standards contained in the Scenic Area Management Plan are displayed in Appendix C. This analysis exhibits that the Proposed Action and Restricted Herbicide Use Alternatives are consistent with all relevant standards and guidelines, when the proposed amendments are incorporated. The Forest Plan amendments are discussed in Section 3.16.

3.14.6 Incomplete and Unavailable Information

No inventory has been completed to determine if culturally significant plants are present in proposed treatment areas. Also, no analysis has been done to reveal the ethnic make-up of forest product permit holders at the Forest or Scenic Area.

3.15. Specifically Required Disclosures

3.15.1 Adverse Environmental Effects that Cannot be Avoided

Implementation of any action alternative would cause some adverse environmental effects that cannot be effectively mitigated or avoided. Unavoidable adverse effects often result from managing the land for one resource at the expense of the use or condition of other resources. Most adverse effects can be reduced, mitigated or avoided by limiting the extent or duration of effects. The application of Forest Plan standards and guidelines, Best Management Practices, Invasive Plant ROD standards (2005b), PDC, and monitoring are all intended to further limit the extent, severity, and duration of potential effects. Such measures are discussed throughout Chapter 3 and the purpose of this section is to fully disclose these effects.

Table 3-49 below summarizes the unavoidable potential adverse effects to the environment associated with the invasive plant treatment alternatives considered in this EIS.

Table 3-49: Adverse Effects that Cannot be Avoided for Site-Specific Invasive Plant Treatments proposed on Mt. Hood National Forest and Columbia River Gorge National Scenic Area.

Adverse Effect	Reference	Effects without Project Design Criteria	USDA Forest Service Intended Response and Rationale
Effects of invasive plant treatments on non-target plants, including culturally significant plants	Section 3.6, Section 3.13	There is some risk that native plants, including special status species and culturally significant species, may be injured and/or killed by herbicides. Herbicides may impact plants through overspray or drift from herbicide applications, root translocation or surface runoff. Also, manual, mechanical and cultural treatments entail some risk to native plants and plant communities. Any species along roadsides or where activities occur that disturb native plant communities would be threatened by not only invasive plants, but by invasive plant treatments. Adverse effects would most likely be localized and short-term. Without treatment, however, invasive plant infestations would increase and spread, displacing native plants and plant communities.	Short-term adverse effects to non-target plants would be largely offset by long-term benefits of treatment. The adverse effects would be minimized by properly implementing the Invasive Plant ROD standards (2005b) and PDC (Section 2.2). PDC in Subsection E focus on botany resources, including special status species and culturally significant species.
Herbicide effects of eating contaminated products, including deer, elk, fish, and special forest products (e.g., berries or mushrooms)	Section 3.5, Section 3.11	Potential health risks exist from handling or consuming spray-contaminated forest products, including special forest products (e.g., berries or mushrooms), deer, elk and fish. Chewing and eating contaminated plant material cause different exposure and dose patterns, compared to harvesters exposure to contaminated special forest products. The people who both harvest and consume special forest products may be exposed both through handling contaminated plant material and chewing or eating it, and thus may be at the greatest risk for exposure.	By properly implementing the Invasive Plant ROD standards (2005b) and PDC (Section 2.2), exposures would remain below threshold exposure levels developed. As such, no humans would be likely to experience any detectable health effects. The use of riparian restrictions, personal protective equipment, and public notification are examples of how exposures are avoided, or where unavoidable the exposures are greatly reduced. The analysis demonstrated that no human health scenarios analyzed exceed the threshold of concern. No additional PDC are known to eliminate risk to human health associated with herbicide use, with the exception of no herbicide use at all.

Adverse Effect	Reference	Effects without Project Design Criteria	USDA Forest Service Intended Response and Rationale
Economic impacts, including relative costs	Section 3.7	The management of invasive plants is costly, and fiscal resources are limited. Increased operating costs due to expanded invasive plant management may result in direct or indirect increases in costs to users of National Forest System lands. Also, invasive plant management may compete with other land management needs, resulting in opportunity-cost tradeoffs. A cost efficiency analysis, assuming both an unlimited and a constant (limited) budget estimate, is presented. Presently, the average annual cost per acre for the No Action Alternative is $193. The Proposed Action would increase this figure to $324; and the Restricted Herbicide Use Alternative would have an average annual per acre cost of $541.	Cost-effectiveness is integrated as part of the decision framework presented in Section 1.6. The third criteria states: “economic efficiency of treatment.” Tables 3-11 and 3-12 present the numbers of acres years annually and total years of control with total cost of treatments to compare economic situations and choices.
Herbicide effects on soil organisms (e.g., invertebrates, fungi, actinomycetes, bacteria)	Section 3.8	Picloram and sulfometuron methyl are of concern to soil organisms due to their toxicity and persistence. Effect of an herbicide treatment on the soil depends on the particular characteristics of the herbicide used, how it is applied, and soil physical, chemical and biological conditions. 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, are important in the fate of herbicides. Degradation rates generally decrease with increasing soil depth and decreasing temperatures. General characteristics for the proposed herbicides are displayed in Table 3-20, with more detailed information by herbicide contained in Appendix U.	Short-term adverse effects to soil properties would be largely offset by long-term benefits of treatment. Invasive plants can have negative effects on soil properties. Invasive plants may increase the proportion of bare ground, increase or decrease the amount of organic matter in the soil, deplete the soil of nutrients or enrich the soil with certain nutrients, change fire frequency, and produce toxic herbicides that affect soil organisms. Some of these changes may be difficult to reverse, and can lead to long-term soil degradation and difficulty in re-establishing native vegetation. By properly implementing the Invasive Plant ROD standards (2005b) and PDC (Section 2.2), the effects of herbicides should largely be avoided. Soil resources are addressed specifically in Subsection G of the PDC.

Adverse Effect	Reference	Effects without Project Design Criteria	USDA Forest Service Intended Response and Rationale
Herbicide effects on water quality	Section 3.9	Herbicides used to treat invasive plants for the Proposed Action can enter water through spray drift, surface water runoff, percolation, groundwater contamination, and direct application. The potential routes of herbicide entry may result in indirect effects to aquatic organisms, their habitat and water quality. Water runoff during rain events could transport herbicides to waterways and convey them to aquatic species habitat. Soil type as well as chemical stability, solubility, and toxicity can determine the extent to which an herbicide would migrate and impact surface waters and groundwater. Some herbicides, such as glyphosate, strongly adsorb to soil particles which prevents it from excessive leaching. Other herbicides, such as picloram, are highly soluble in water and more mobile.	The amount of herbicide reaching surface water by spray drift is expected to be minimal considering the restrictions of no broadcast spraying within 100-feet of surface water and when wind speeds are outside the range described in the PDC (Section 2.2) as well as the sophistication of newer equipment used for broadcast spraying. Also, herbicides entering surface water through surface runoff are expected to be minimal, since targeted spot spraying techniques would be used to apply herbicide within 100-feet of surface water (PDC F.1.). This would minimize the amount of herbicide reaching the ground surface. The potential for direct application of herbicide to surface water is very low, since hand/selective and spot spraying herbicide techniques would be used to apply herbicides directly to plants within at least 15-feet of the water's edge.
Herbicide effects on terrestrial species, including wildlife, pollinators, reptile, and amphibian species	Section 3.11	All of the alternatives are associated with plausible scenarios that exceed the toxicity indices for birds and mammals that eat grass or insects, acres treated by herbicide that result in exposures exceeding a LOAEL (Lowest Observed Adverse Effect Level) for some species, and herbicides that may adversely affect amphibians. The number of acres treated at one time within one treatment area is likely to influence the likelihood of exposure to herbicides for wildlife.	Short-term adverse effects to terrestrial species would be largely offset by long-term benefits to the habitat resulting from treatment. All the herbicides in this EIS are excreted rapidly (often within 24 to 48 hours), and do not accumulate up the food chain. This reduces, but does not eliminate, the potential for these types of cumulative effects. The herbicides with greatest potential to harm birds and mammals in decreasing severity are: triclopyr, picloram, glyphosate, sulfometuron methyl, and clopyralid.

Adverse Effect	Reference	Effects without Project Design Criteria	USDA Forest Service Intended Response and Rationale
		Indirect mortality is possible from sub-lethal effects that could increase susceptibility to predation. Indirect effects to wildlife from cumulative herbicide exposure also are possible. For example, if a sub-lethal exposure affects an internal organ and the effect is not quickly reversed, then subsequent exposure could cause cumulative damage.	By properly implementing the Invasive Plant ROD standards (2005b) and PDC (Section 2.2), these effects largely should be avoided. Wildlife is addressed specifically in Subsection H of the PDC.
Effects of treatment on designated Wilderness Areas	Section 3.12	Taking action would protect natural conditions, but introduce human manipulation. By taking action, herbicides would be introduced into the Mt. Hood Wilderness. Treatment poses a slight risk of unwanted effects to species other than orange hawkweed. Modern human interference with ecological dynamics between the natural plant communities and the introduced invasive plants would be considered by some to be a negative effect. This interference may affect the sense that the wilderness is free from human manipulation. Those who think it is most important that wilderness be free from biophysical manipulation would likely object to utilization of herbicides and be greatly concerned about any effects they have to wilderness. Other wilderness areas may be impacted in a similar way under the EDRR.	Negative effects from No Action as well as the continued presence and expansion of orange hawkweed in the Mt. Hood Wilderness would include changes to the natural conditions and processes expected as part of the wilderness experience. The orange hawkweed plants could alter the natural meadow community along Burnt Lake Trail, interact in unknown ways with native wildlife species, and alter ecological processes such as plant community dynamics and disturbance processes (i.e., fire). Also, there could be some experiential loss because of unnatural vegetation encountered along the Burnt Lake, McGee Creek and Pacific Crest National Scenic Trails. Taking no action avoids manipulation of wilderness, but natural conditions would not be protected. Similar rationale would have to be constructed if invasive plant infestations were discovered in other wilderness areas under the EDRR. By properly implementing the PDC (Section 2.2), some of the effects could be avoided. PDC B.4. specifically addresses designated Wilderness Areas.

3.15.2 Short-term Uses and Maintenance of Long-term Productivity

NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

The continued expansion of invasive plants within the Forest and Scenic Area would result in serious, long-term adverse effects on a broad range of resources, reducing the long-term productivity of the National Forest System lands. Invasive plants create a host of environmental and other impacts, most of which are harmful to healthy, native ecosystem processes, including: displacement of native plants; reduction in functionality of habitat and forage for wildlife and livestock; increased soil erosion and reduced water quality; alteration of physical and biological properties of soil; loss of long-term riparian area function; loss of habitat for culturally significant plants; high cost (dollars spent) of controlling invasive plants; increased cost to maintaining transportation systems; and loss of recreational opportunities. Neighboring private and other public lands would also be affected. Invasive plants spread across landscapes, unimpeded by ownership boundaries. All land ownerships (private, corporate, tribal, and government) in the Pacific Northwest are affected by invasive plants, which have the potential to spread to neighboring lands. A sustainable solution to the problem would require cooperation and a long-term commitment from all landowners.

The relationship between uses and long-term productivity as it relates to invasive plant management is described throughout this EIS, primarily in each of the resource areas discussed in Chapter 3. Chapter 3 discusses the relationship between land management activities and invasive plants, as well as describes the effects of the proposed invasive plant treatments on the resources.

3.15.3 Irreversible or Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time, such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road.

Implementation of the Proposed Action or Restricted Herbicide Use Alternatives would not produce irreversible or irretrievable commitment of resources. The invasive plant treatment proposed through these actions would be conducted within the constraints of the Invasive Plant ROD standards (2005b), PDC described in Section 2.2, and other national and regional management direction (which incorporate applicable laws, regulations, and policies). Adverse effects described in Chapter 3 are likely to be localized and short-term.

3.15.4 Cumulative Effects

Cumulative effects are addressed in each of the resource areas discussed in Chapter 3. Incremental impacts of the environment from multiple actions over time are assessed for each of the Forest and Scenic Area resources.

3.15.5 Conflicts with Plans or Policies of Other Jurisdictions

NEPA at 40 CRF 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with . . . other environmental review lands and executive orders."

Based on information received during scoping, informal consultation meetings, and analysis in the EIS, none of the alternative under consideration would conflict with the plans or policies of other jurisdictions, including the Confederated Tribes of Warm Springs. This project would not conflict with any other policies and regulations or laws, including the Safe Drinking Water Act, Clean Water Act, Endangered Species Act, Magnuson-Stevens Fishery Conservation and Management Act, Wild and Scenic Rivers Act, Wilderness Act, and National Historic Preservation Act. Refer to the following sections for discussions regarding these laws:

- Section 3.9 – Safe Drinking Water and Clean Water Acts;
- Sections 3.10 and 3.11 – Endangered Species Act;
- Section 3.10 – Magnuson-Stevens Fishery Conservation and Management Act;
- Section 3.12 – Wild and Scenic Rivers and Wilderness Acts; and
- Section 3.13 – National Historic Preservation Act.

3.15.6 Effects on Consumers, Civil Rights, Minority Groups, Women and Environmental Justice

Executive Order #12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*, directs Federal agencies to address effects accruing in a disproportionate way to minority and low income populations. Section 3.14 – Tribal Relations, Civil Rights and Environmental Justice discusses the impacts of this project on these groups.

Additionally, in accordance with USDA Forest Service and BLM policy, contracting procedures would ensure that projects made available to contractors would be advertised and awarded in a manner that give proper consideration to minority and women-owned business groups.

3.15.7 Effects on American Indian Rights

No impacts on American Indian social, economic or subsistence rights are anticipated. No impacts are anticipated related to the American Indian Religious Freedom Act. The Confederated Tribes of Warm Springs, the Yakima Nation, the Confederated Tribes of the Grand Ronde, the Nez Perce Tribe, and the Confederated Tribes of the Umatilla Nation have historic interests in this area and have been contacted in reference to this Proposed Action and environmental analysis, as discussed in Sections 3.13, 3.14 and 4.4.

3.15.8 Prime Farmlands, Rangelands, Forestlands, or Parklands

No prime farmlands, rangelands, forestlands or parklands exist within the project area. Since none of these lands exist, there would be no direct, indirect or cumulative effects would occur.

3.15.9 Wetlands and Floodplains

Floodplains are areas within the riparian areas of Class 1, 2, and 3 streams, and vary from only a few feet, to the entire riparian area in width. Wetlands are areas that regularly are saturated by surface or ground water and subsequently are characterized by a prevalence of vegetation that is adapted for life in saturated soil conditions. Proposed invasive plant treatments within riparian areas are discussed in Sections 3.9 – Water Quality and 3.10 – Aquatic Organisms and Habitat.

The environmental effects are consistent with the standards and guidelines for the Mt. Hood National Forest Land and Resource Management Plan (as amended) and Columbia River Gorge National Scenic Area Management Plan (see Appendices B and C). In addition, the proposed invasive plant treatments would be implemented using the standards from the Invasive Plant ROD (2005b) and PDC (Section 2.2). No adverse effects are anticipated to occur to wetlands and floodplains with any alternatives. As such, no direct, indirect, or cumulative effects to wetlands and floodplains are expected to occur.

3.16. Forest Plan Amendment

Alternatives 2 and 3 in this draft EIS propose an amendment to the Mt. Hood National Forest Land and Resource Management Plan (Forest Plan). The proposed amendment is a minor change to six of the standards and guidelines in the Forest Plan. The proposed changes are described in Table 2-8. These amendments if approved would be effective at the time of the decision and would apply to the respective management areas throughout the Forest and Scenic Area in Oregon.

The regulations for forest planning under the National Forest Management Act (36 CFR Part 219, as of July 1999) provide procedures for the Responsible Officials to amend a Forest Plan. The regulations state: “If the change resulting from the amendment is determined not to be significant for the purposes of the planning process, the Forest Supervisor may implement the amendment following appropriate public notification and satisfactory completion of NEPA procedures” (36 CFR 219.10(f)). The proposal to amend the Forest Plan was described in a scoping notice mailed to the public in September 2005. Analysis of these proposed changes is included in this EIS.

Additional guidance on amending Forest Plans is provided in the Forest Service Manual 1900-Planning. Section 1922.51 describes non significant amendments as:

- Actions that do not significantly alter the multiple-use goals and objectives for long-term land and resource management;

- Adjustments of management area boundaries or management prescriptions resulting form further on-site analysis when the adjustments do not cause significant changes in the multiple-use goals and objectives for long-term land and resource management;

- Minor changes in standards and guidelines; and/or

- Opportunities for additional management practices that would contribute to achievement of the management prescriptions.

The proposed amendment does not propose changes in management area boundaries or prescriptions, but does represent minor changes in standards and guidelines and provides for additional management practices that could contribute to achieving management prescriptions.

The proposed minor changes to the standards and guidelines (A2-082, A12-031, B5-041, B7-070 and A1-WR-064) would not alter any of the multiple use goals or objectives outlined in the Forest Plan for Wilderness Areas (A2), Outdoor Recreation Areas (A12), Pileated Woodpecker/Pine Martin Habitat (B5), General Riparian Areas (B7), or Wild and Scenic Rivers (A1). To the extent that invasive plants may adversely affect the multiple use goals of these management areas, however, allowing for the appropriate use of herbicides to treat invasive plant populations would contribute to achieving multiple use goals.

The minor change to forestwide standard (FW-076) would not change the overall intent of the standard, it just clarifies that the standard does not prohibit the use of herbicides. Therefore, there would be no change in the multiple use goal of protecting water resources forestwide.

CHAPTER 4
Consultation and Coordination

CHAPTER 4: Consultation and Coordination

4.1. Consultation with U.S. Fish and Wildlife Service (FWS)

The FWS has Endangered Species Act (ESA) jurisdiction over non-marine fish, wildlife and plant species, such as the northern spotted owl, Canada lynx, and marbled murrelet that are listed or proposed for listing as threatened or endangered. The USDA Forest Service must consult with FWS concerning the effects of proposed actions on listed species and species proposed for listing under FWS jurisdiction.

Informal consultation was conducted with FWS for Northern Spotted Owl, northern bald eagle, and Canada lynx. Consultation with the FWS was initiated on for the treatment of invasive species in two separate consultation avenues. Disturbance effects of invasive plant treatments were analyzed and consulted on in the *Programmatic Biological Assessment for Activities with the Potential to Disturb Northern Spotted Owls and/or Bald Eagles in the Willamette Province FY2006-2007* and the Willamette Province Level One Team was given a presentation on the effects analysis and subsequent determination made on the effects to the Northern Spotted Owl and its habitat from the treatment of these invasive plants. The Level One Team was informed that the Forest and Scenic Area had determined that the effect from the use of herbicide, manual, mechanical, and cultural treatment of invasive plants was *no effect* to the Northern Spotted Owl and its habitat. The team was reminded that the disturbance effects had been analyzed in the Programmatic Biological Assessment. The Level One Team made no comments on the effects determination. A letter was sent to the U.S. Fish and Wildlife Service amending the Biological Assessment to reflect effects determinations for Northern Spotted Owl based on project alternatives information. The letter was sent the Oregon State Supervisor of U.S. Department of Fish and Wildlife on August 29, 2006.

Based on the effects analysis prepared for the project, there is *no effect* on bald eagles or Canada lynx; therefore, consultation is not required for these species.

4.2. Consultation with National Marine Fisheries Service (NOAA Fisheries)

NOAA Fisheries has Endangered Species Act (ESA) jurisdiction over marine species, such as anadromous fish. This project includes habitat for 12 marine species listed as threatened or endangered under the ESA. As a result, the USDA Forest Service is consulting with NOAA Fisheries under the ESA for this project.

Informal consultation was conducted with NOAA fisheries on listed anadromous fish species and their habitat that occur within or near the proposed invasive plant treatment areas. The Willamette Province Level One Team was given a presentation on the Proposed Action and affected environment. The conversations with the Level One Team continued through the alternative refinement and analysis stages.

A BE and BA was prepared assessing impacts to listed fish species and designated critical habitat. Both are available in the project file located at the Mt. Hood National Forest headquarters in Sandy, Oregon or on-line at http://www.fs.fed.us/r6/mthood/projects/. The fisheries BE/BA determined that invasive plant treatments “May Affect, Not Likely to Adversely Affect” threatened or endangered fish species and habitat. Informal consultation on the Selected Alternative has been conducted and completed with the U.S. Fish and Wildlife Service (FWS) for threatened bull trout and their designated critical habitat. On June 5, 2007, the FWS concurred with the “May Affect, Not Likely to Adversely Affect” findings of the BA (TAILS #13420-2007-I-0107).

The Forest Service initiated informal consultation on the Selected Alternative with the National Marine Fisheries Service (NMFS). NMFS did not concur with the “May Affect, Not Likely to Adversely Affect” findings in the BA for threatened and endangered anadromous fish species and designated critical habitat. NFMS issued a letter of nonconcurrence and request for additional information on April 23, 2007. On June 6, 2007, the Forest Service responded with the additional information and requested formal consultation with NMFS. On January 9, 2008 the NMFS completed a Biological Opinion which determined the Selected Alternative resulted in a “May Affect, Likely to Adversely Affect” finding, but was not likely to jeopardize the continued existence of any listed anadromous fish species or result in the destruction or adverse modification of designated critical habitat. The NMFS also determined the Selected Alternative would have adverse effects on essential fish habitat for coho and Chinook salmon. NFMS also determined that “the Proposed Action is likely to benefit ESA-listed species and their habitat by restoring native vegetation, preventing future weed infestation, and restoring ecosystem and riparian function, and have other beneficial effects as well (page 61).”

Included in the Biological Opinion was a take statement and nondiscretionary terms and conditions that must be followed to meet Endangered Species Act Requirements. The terms and conditions included a variety of treatment and reporting requirements in addition to those included as part of the Selected Alternative, including:

- Additional treatment stipulations in riparian areas designed to further minimize potential effects to listed anadromous fish species and habitat.
- A list of approved additives (i.e. adjuvants) for use in riparian zones.
- Specific field treatment monitoring and application tracking requirements.
- Annual reporting requirements.

The full title and reference number for the Biological Opinion are: Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Mount Hood National Forest and Columbia River Gorge National Scenic Area Invasive Plant Treatments Project, Clackamas County, Oregon (reference number 2007/01524).

4.3. Consultation with Oregon State Historic Preservation Office (SHPO)

The National Historic Preservation Act requires consideration be given to the potential effect of federal undertakings on historic resources. This includes historic and prehistoric cultural resource sites. The guidelines for assessing effects and for consultation are provided in 36 CFR 800. To implement these guidelines, Pacific Northwest Region (Region 6) of the USDA Forest Service entered an agreement in 2004 with the Oregon SHPO and the Advisory Council on Historic Preservation. In accordance with the agreement, the project was determined to have little or no effect to heritage resources, and no cultural resource survey was required. A *no effect* determination has been made for the Proposed Action (Alternative 2) and for the Restricted Herbicide Use Alternative (Alternative 3). No consultation with the Oregon SHPO is required.

4.4. Consultation with Tribal Governments

Consultation was conducted with the Confederated Tribes of Warm Springs. The Tribe expressed strong support for aggressive treatments, including herbicide treatments, to combat invasive plants. Tribal representatives said they believe the long-term benefits of treating and controlling invasive plants outweigh the short-term risks to localized populations of culturally significant plants. Tribal representatives met with members of the interdisciplinary team in August 2005. Also, the Tribe was invited to comment on the draft EIS.

Letters requesting consultation were sent to the Yakama Nation, Confederated Tribes of the Grand Ronde, Nez Perce Tribe, and Confederate Tribes of the Umatilla Indian Reservation. The USDA Forest Service did not receive any responses.

4.5. Consultation with State, County and Municipal Governments

The Oregon Department of Agriculture (ODA) as well as Hood River and Wasco county noxious weed departments have conducted invasive plant treatments in and near the Forest and Scenic Area. Representatives from these departments and the USDA Forest Service have discussed the project throughout the preparation of this draft EIS. These departments were invited to review the PDC and the Proposed Act. In addition, the Department of Environmental Quality (DEQ) was consulted on the PDC to ensure water quality standards were being met. Comments were received from ODA, Hood River county and DEQ. These comments have been incorporated into the draft EIS.

Coordination with municipal water boards would occur as a part of implementation planning to ensure compliance with the PDC and Municipal Watershed Agreements. The potentially affected major municipal water boards and organizations include City of Estacada (Clackamas River), City of Hood River, City of Portland (Bull Run Watershed), City of Sandy (Alder Creek), various Clackamas River Water Providers, Corbett Water District (Gordon Creek), and The City of The Dalles (The Dalles Watershed, South Fork Mill Creek). Other smaller water providers also would be contacted as part of implementation planning if invasive plant treatments would occur above their water intakes.

4.6. Consultation with Columbia River Gorge Commission

The USDA Forest Service presented the project to the Columbia River Gorge Commission as part of the Scenic Area Manager's report in March 2006. The USDA Forest Service presented the project as an agenda item at the October 2006 at a Gorge Commission meeting as well. The Gorge Commission staff and each Commissioner were included in all public notifications.

CHAPTER 5
List of Preparers

CHAPTER 5: List of Preparers

The following is a list of contributors to this EIS. Numerous other Forest Service employees contributed to the completion of this document through their assistance in review and support functions, and/or by providing USDA Forest Service level data and other information needs. Their help was greatly appreciated and recognized.

5.1. Interdisciplinary Team Members – Core Members

Gary Asbridge. Fisheries Biologist, USDA Forest Service, Mt. Hood National Forest, Hood River Ranger District, Parkdale, Oregon. Education: B.S. in Biology, Zoology emphasis; M.S. in Fishery Resources. Experience: Barlow Ranger District fisheries biologist for 4 years, Barlow and Hood River Ranger Districts fisheries program manager for 11 years. Fisheries technical support and analysis for a wide variety of Forest projects, including timber sales, silviculture, watershed restoration, road building/management, and recreation, as well as the design and implementation of watershed restoration projects and fish population/habitat surveys.

Jaimie Bradbury. GIS Analyst, Data Resources Management, USDA Forest Service, Pacific Northwest Region, Sandy, Oregon. Education: B.S. in Geography, Land Management Emphasis; M.S. in Geography, GIS/Cartography/Remote Sensing Emphasis. Experience: GIS analysis, data management and program coordination with the USDA Forest Service since 1988 providing support to all resource areas.

Robin Dobson. Botanist/Ecologist, USDA Forest Service, Columbia River Gorge National Scenic Area, Hood River, Oregon. Education: M.S. and Ph.D. in Plant Pathology. Experience: Land use/natural resource planner, ecology and botany (weeds) program management and field work, environmental documentation, and wetland and forest restoration.

John Dodd. Soil Scientist, USDA Forest Service, Mt. Hood National Forest, Barlow Ranger District, Dufur, Oregon. Education: B.S. in Soil Science, Land Use Emphasis. Experience: Provide technical soils information to managers to assist in making informed decisions. Types of projects information has been provided for include timber sales, ski area management, other recreation-related, grazing allotments, engineering, on and off-Forest small and large scale restoration projects through local watershed councils, irrigation districts, local municipal watersheds, etc. Monitoring projects for implementation and effectiveness. Experience with the USDA Forest Service since June of 1988, 17 of those years on the Mt. Hood National Forest.

Michael Dryden. East Zone Archaeologist, USDA Forest Service, Mt. Hood National Forest, Hood River Ranger District, Parkdale, Oregon. Education: B.S. in Anthropology, undergraduate and graduate work in archaeological excavation. Experience: Heritage resource management, compliance, and consultation with the USDA Forest Service since 1984.

Alan Dyck. Wildlife Biologist, USDA Forest Service, Mt. Hood National Forest**,** Sandy, Oregon. Education: B.S. in Wildlife Management – Humboldt State University. Experience: Six years as Forest Wildlife Biologist on the Mt. Hood National Forest; three years as a Wildlife Biologist with the USDA Natural Resource Conservation Service; nine years as Wildlife Administrator for the U.S. Army at Fort Pickett; and an additional seven years as a biological technician for the Army, USDA Forest Service, and Fish and Wildlife Service. Worked in a variety of jobs dealing with fish and wildlife habitat and population management on public and private lands. Recent experience in analyzing the effects of Forest projects on wildlife habitat and management.

Elisabeth Grinspoon. Social Scientist, USDA Forest Service, Pacific Northwest Region, Portland, Oregon. Education: B.A. in East Asian Studies; Master of Forestry; Ph.D. in Environmental Science, Policy, and Management. Experience: Participatory Rural Appraisal Specialist with United Nations Volunteers, Consultant to Food and Agriculture Organization of the United Nations, Program Specialist and Social Scientist with the USDA Forest Service since 2002

Malcolm Hamilton. Recreation Program Manager, USDA Forest Service, Mt. Hood National Forest, Sandy, Oregon. Education: B.S. in Forest Resource Management, and graduate studies in silviculture and forest ecology. Experience: 30+ years in silviculture and recreation management with National Forests in Oregon, California, and Arizona.

Mark Kreiter. Hydrologist, USDA Forest Service, Columbia River Gorge National Scenic Area and Mt. Hood National Forest, Hood River, Oregon. Education: B.S. and graduate work in Geology, A.A.S. in Water Resources. Experience: Project effects assessments, watershed restoration and monitoring with the USDA Forest Service since 1989.

David Lebo. Ecologist/Botanist. Westside Zone Botanist, USDA Forest Service, Mt. Hood National Forest, Oregon. Education: B.A. General Studies; M.A. English; M.S. Forest Ecology – University of Washington. Experience: Survey and Manage specialist for northwest Oregon and member of regional lichen taxa team (Mt. Hood National Forest and Regional Office, 2001-2004); interagency ecologist for Winema National Forest and BLM-Klamath Falls Resource Area (1995-2000); ecologist, Mt. Baker-Snoqualmie and Olympic National Forests (summer 1993); NEPA writer, forestry and biological technician, seasonal firefighter on Olympic National Forest (1980s).

Jennie O'Connor. Natural Resource Planner, USDA Forest Service, Mt. Hood National Forest, Sandy, Oregon. Education: B.A. in Biological Basis of Behavior and Environmental Studies; Master of Environmental Management, emphasis in Resource Ecology; Master of Forestry, emphasis in Silviculture – Duke University. Experience: Forest Plan implementation, National Environmental Policy Act (NEPA) coordination and writing, Freedom of Information Act (FOIA), and Sustainable Forest Management with the Forest Service since 2001.

Gary K. Smith. Invasive Plants Program Manager and Integrated Weed Management Specialist (former), USDA-Forest Service, Pacific Northwest Regional Office, Portland, Oregon. Education: B.S. in Forestry; M.S. in Silviculture. Experience: Certified silviculturist; timber sale planning and administration; Integrated Pest Management; invasive plant management with USDA Forest Service since 1976.

5.2. Interdisciplinary Team Members – Support Team Members

Shawna Bautista. Wildlife Biologist, USDA Forest Service, Pacific Northwest Region, Portland, Oregon. Education: B.S. in Wildlife Management; M.S. in Zoology and Physiology.

Janet Braymen. GIS Specialist, Data Resources Management, USDA Forest Service, Pacific Northwest Region, Hines, Oregon. Education: B.S. in Interdisciplinary Studies: Natural Science, Social Science and Communications.

Steve Bulkin. Forester, USDA Forest Service, Pacific Northwest Region, Portland, Oregon. Education: B.S. in Biology; M.S. in Natural Resource Management.

Rochelle Desser. NEPA Coordinator, USDA Forest Service, TEAMS Enterprise Unit, Cove Junction, Oregon. Education: A.S. in Geo-technology.

Margaret L. Dryden. Heritage Program Manager**,** USDA Forest Service, Columbia River Gorge National Scenic Area, Hood River, Oregon. Education: B.A. in Anthropology and History – Portland State University; M.A. in Anthropology – Portland State University.

Chuti Fiedler. Fish & Wildlife Biologist, USDA Forest Service, Columbia River Gorge National Scenic Area, Hood River, Oregon. Education: B.S. Fisheries Management and B.S. in Wildlife Management – Oregon State University.

Mike Ferris. Public Affairs Officer, USDA Forest Service, Columbia River Gorge National Scenic Area, Hood River, Oregon. Education: B.A. Psychology and Sociology.

Tracii Hickman. Assistant Forest Fish Biologist and Willamette Fish Level 1 team representative, USDA Forest Service, Mt. Hood National Forest, Sweet Home, Oregon (telecommuter). Education: B.A. in Biology – Lewis and Clark College with graduate work in Fisheries – Oregon State University.

Lance Holmberg. Botanist (former), USDA Forest Service, Mt. Hood National Forest, Barlow Ranger District, Dufur, Oregon. Education: B.S. in Natural Resources; M.A. in Biology – Humboldt State University. District Botanist with USDA Forest Service for 10 years.

Carol Horvath. Botanist (former), USDA Forest Service, Mt. Hood National Forest, Zigzag Ranger District, Zigzag, Oregon. Education: B.S. in Community Health – University of Oregon; B.S. in Biology – Portland State University.

Jeff Jaqua. Archaeologist and Historic Preservation Specialist, USDA Forest Service, Mt. Hood National Forest, Zigzag Ranger District, Zigzag, Oregon. Education: B.A. in Anthropology – University of Montana; B.S. in Zoology – Montana State University.

Linda C. Mazzu. Botanist/Plant Ecologist (former), USDA Forest Service Pacific Northwest Region, Portland, Oregon. Education: B.S. Recreation and Park Management; M.S. Natural Resources.

Mike Redmond. Environmental Coordinator, USDA Forest Service, Mt. Hood National Forest, Sandy, Oregon. Education: B.S. in Forestry; M.S. in Forestry.

David Saiget. Fisheries Biologist**,** USDA Forest Service, Mt. Hood National Forest, Zigzag Ranger District, Zigzag, Oregon. Education: B.S. Biology – Oregon State University.

Marty Stein. Forest Botanist, USDA Forest Service, Siuslaw National Forest, Waldport, Oregon. Education: B.S. in Forest Management.

Ivars Steinblums. Forest Hydrologist, USDA Forest Service, Mt. Hood National Forest, Sandy, Oregon. Education: B.S. in Forestry/Forest Production – Humboldt State University; M.S. Forest Hydrology – Oregon State University.

CHAPTER 6
Distribution List of Draft EIS

CHAPTER 6: Distribution List of Final EIS

This Final Environmental Impact Statement will be distributed to individuals and organizations that responded throughout the development of this process, as well as Federal agencies, federally recognized tribes, State and local governments, and key partners. These organizations and agencies are listed below. Also, the mailing list includes 60 individuals that are not listed here. The complete mailing list is maintained in the project record, available at the Mt. Hood National Forest Headquarters Office in Sandy, Oregon.

Advisory Council on Historic Preservation

Asian Family Center

Asian Pacific American Network of Oregon

BARK

BASG Corporation

Bonneville Power Administration

Bureau of Indian Affairs

Bureau of Land Management

Cambodian American Community of Oregon

Chinese American Citizens Alliance

Church of the Resurrection

Citizens Interested in Bull Run

City of Estacada

City of Hood River

City of Portland

City of Sandy

City of Stevenson

Clackamas Board of Commissioners

Clackamas County Community Health Division

Clackamas River Basin Council

Clackamas River Water

Colorado State University Library

Columbia Gorge Institute

Columbia Helicopters Inc.

Columbia River Gorge Commission

Compliance Service International

Confederated Tribes of the Grande Ronde

Confederated Tribes of Umatilla Indian Reservation

Confederated Tribes of Warm Springs

Congressman David Wu

Congressman Greg Walden

Corbett Water District

Department of Environmental Quality

Department of Fish and Wildlife, Wildlife Division

Department of Geology and Mineral Industries

Department of Land Conservation and Development

Department of State Lands Eastern Region

Deschutes National Forest

Division of State Lands

Economic and Community Development

Environmental Protection Agency, Region 10

Federal Highway Administration

Filipino American Association of Portland and Vicinity

Fremont-Winema National Forest

Freres Lumber Co. Inc.

Friends of Mt. Hood

Friends of the Columbia Gorge

Gifford Pinchot National Forest

Gifford Pinchot Task Force

Glacier View Enterprises

Government Camp Water Company

Grays Harbor County Commission

Greenworks PC Landscape Architecture

Holy Cross Church

Holy Redeemer Church

Hood River County

Hood River County Watershed Group

Hood River Soil and Water Conservation District

Horticultural Services

Immigrant Refugee Community Organization

Japan American Society of Oregon

Japanese American Citizens League

Lewis and Clark College

Loa Association of Oregon

Mt. Hood Skibowl Winter and Summer Resort

Mt. Hood Snowmobile Club

Mt. Hood Study Group

Mt. Scott Water District

Multnomah County Health Department

National Marine Fisheries Service, Habitat Conservation Division, Northwest Region

Native Plant Society of Oregon

Natural Resources Conservation Service, U.S. Department of Agriculture

Governor's Natural Resource Office, State of Oregon

Nelson Tree Farm

Nez Perce Tribe

NOAA (National Oceanic and Atmospheric Administration) Fisheries

NOAA Office of Policy and Strategic Planning

Northwest Asian Weekly

Northwest Coalition for Alternatives to Pesticides

Northwest Environmental Deference Center

Northwest Mountain Region, Federal Aviation Administration

Northwest Oregon Invasive Weed Mgmt Partnership

Northwest Power Planning Council

Northwest Ecosystem Alliance

Oak Lodge Water District

Ochoco Lumber Company

Office of the Maritime Administration

Olympic National Forest

Oregon State Representative District 52

Oregon State Senator District 26

Oregon State Senator District 30

Oregon Department of Agriculture

Oregon Department of Forestry, Resources Library

Oregon Department of Transportation

Oregon National Resource Council

Oregon Senators

Philippine American Chamber of Commerce of Oregon (PACCO)

Physicians for Social Responsibility

PNW 4 Wheel Drive Association

Portland General Electric

Portland Water Bureau

Regional Environmental Officer, U.S. Department of Interior, Office of the Secretary, Office of Environmental Policy and Compliance

Rogue River-Siskiyou National Forest

Sandy River Basin Watershed Council

Schoenfeld & Schoenfeld, P.C.

Scott Water District

South Fork Water Board

Southwest Washington Health Department

St. Alexander Church

St. Andrew Church

St. Cecilia Church

St. Elizabeth Ann Seton

St. James Church

St. John Church

St. Luke Church

St. Mary Church

St. Matthew Church

St. Michael The Archangel

St. Patrick Church

St. Peter Church

St. Pius X Church

State Economist

State Representative District 15

Thai Association of Oregon

The City of The Dalles Watershed

The Korean Society of Oregon

The Nature Conservancy of Oregon

The Research Group

U.S. Army Corps of Engineers. Northwestern Division

U.S. Congressman Brian Baird

U.S. Congressman Earl Blumenauer

U.S. Congressman Greg Walden

U.S. Congressman Richard Hastings

U.S. Congresswoman Darlene Hooley

U.S. Department of Energy

U.S. Department of the Interior

U.S. Environmental Protection Agency

U.S. Fish and Wildlife Service

U.S. Senator Ron Wyden

U.S. Senator Gordon Smith

U.S. Senator Maria Cantwell

U.S. Senator Patty Murray

Umatilla National Forest

USDA, Animal and Plant Health Inspection Service (APHIS)

USDA, National Agricultural Library

Wasco County Planning Dept

Wasco County, Weed & Pest Department

Wasco Soil & Water Conservation District

Washington County Health and Human Service

Washington County Jail

Washington Department of Natural Resources

Water Resources Department

Weed & Pest Department, Hood River County

Western Society of Weed Science

Yakama Tribal Council

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Glossary

GLOSSARY

Abiotic – Not biotic; not pertaining to life.

Active Ingredient (ai) - 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.”

Active Restoration - The deliberate activities related to restoration. As an example, this might include seeding native grasses and planting native scrubs and trees.

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 dependant 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.

Adaptive Management - A continuing process of action-based planning, monitoring, researching, evaluating, and adjusting with the objective of improving implementation and achieving the goals of the standards and guidelines.

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.

Adfluvial – fish that live in a lake or reservoir for most of their adult life but move into a stream or river to spawn.

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 13122, 2/3/99). *(See also exotic species, invasive plant species, introduced species, and noxious weed)*

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 – Land adjacent to perennial and intermittent streams, rivers, ponds, lakes, springs, and wetlands that have a direct or potentially direct influence on the water body and its function where herbicides may enter surface waters. This zone has a default width of 100 feet, realizing that in some areas it may be wider or narrower pending a site-specific review.

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 Herbicide Application Method - 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 Herbicide Application Method - 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.

Canons of Treaty Construction - Tools the federal courts developed for interpreting Indian treaties.

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-pesticidal 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.

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 lasts for the entire life of the exposed organism.

Clipping - To cut or remove seed heads and/or fruiting bodies to prevent germination.

Clipping and Pulling - Cutting a portion of the invasive plant stem and pulling it from its substrate, generally the bole of a tree.

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).

Common Control Measures – A set of commonly used methods to effectively treat specific invasive plants.

Competitive Seeding - Treatment method; most effective after weed populations have been reduced by other control actions.

Congressionally Reserved Areas (CRA) - 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.

Contain - Prevent the spread of the invasive plants beyond the perimeter of the patches or infestation areas mapped from the inventories as of November 2004.

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 13122, 2/3/99).

Cultural Treatment Method / 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 - 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)*

Cut-Stump Herbicide Treatment Method - Used on woody species that normally re-sprout after being cut. Cut down the tree or shrub, and immediately spray or squirt herbicide on the exposed cambium (living inner bark) of the stump.

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.

Early Detection Rapid Response (EDRR) - A process by which new infestations are identified, characterized, evaluated, and by which an effective treatment is designated, all of which are clearly analyzed in this NEPA document.

Effect - Adverse and/or beneficial <u>direct</u> effects occur at the same time and in the same general location as the activity causing the effects. Adverse and beneficial <u>indirect</u> effects are those that occur at a different time or location from the activity causing the effects. Both types of effects are described in terms of increase or decreases, intensity, duration, and timing.

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.

Eradicate – Attempt to totally eliminate an invasive plant species from the Forest and Scenic Area, recognizing that this may not actually be achieved in the short-term since re-establishment/re-invasion may take place initially.

Evolutionary Significant Unit (ESU) – a group of salmon or trout populations that is a distinct population segment. Scientists established two criteria for ESUs: 1) the population must show substantial reproductive isolation; and 2) there must be an important component of the evolutionary legacy of the species as a whole.

Essential Fish Habitat - waters and substrate necessary to fish (specifically chinook and coho salmon) for spawning, breeding, feeding, or growth to maturity.

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.

Exposure of Concern - A level of exposure greater than the level determined to have "no observable adverse effect." This level was made more conservative in the R6 2005 FEIS to add a margin of safety to the risk assessment process.

Exposure Scenario - The mechanism by which an organism (person, animal, fish) may be exposed to herbicides or additives. The application rate and method influences the amount of herbicide to which an organism may be exposed.

Exotic – Non-native species; introduced from elsewhere, but not completely naturalized. *(See also exotic species, invasive plant species, introduced species, and noxious weed)*

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.

Fluvial – Living in a stream or river.

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.

Foliar – Relating to, or applied to leaves.

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.

Frill - Also called the “hack and squirt” treatment. Used to treat woody species with large, thick trunks. The tree is cut using a sharp knife, saw, or ax, or drilled with a power drill or other device. Herbicide is then immediately applied to the cut with a backpack sprayer, squirt bottle, syringe, or similar equipment.

Fry – Recently hatched fish.

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.

Hack and Squirt Herbicide Treatment Method - Also called the "frill" method. Used to treat woody species with large, thick trunks. The tree is cut using a sharp knife, saw, or ax, or drilled with a power drill or other device. Herbicide is then immediately applied to the cut with a backpack sprayer, squirt bottle, syringe, or similar equipment.

Halftime or Half-Life - The time required for the concentration of the chemical to decrease by one-half.

Hand/Selective Herbicide 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.

Herbicide Treatment Method / Control - The use of naturally derived or synthetic chemicals called herbicides to eliminate or control the growth of invasive plants.

Humus - Organic portion of the soil remaining after prolonged microbial decomposition.

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 species, invasive plant species, introduced species, and noxious weed)*

Introduction - “The intentional or unintentional escape, release, dissemination, or placement of a species into an ecosystem as a result of human activity” (Executive Order 13122, 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 13122, 2/3/99). *(See also exotic species, invasive plant species, introduced species, and noxious weed)*

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.

Key Issue – Significant issues identified by the public that are used to formulate alternatives, affect the design of alternative components, prescribe PDC, or describe environmental effects.

LC_{50} (Lethal Concentration$_{50}$) - 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.

LD_{50} (Lethal Dose$_{50}$) - 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 are 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.

Macroinvertebrate – Animals without backbones such as insects, clams, snails, etc.

Macrophyte – Terrestrial or aquatic plant that is large enough to be seen without the aid of a microscope.

Manual Treatment Method/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 Treatment Method/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 Requirement - A determination about whether or not management action is necessary. In context, a determination about whether or not a management action is necessary in wilderness in order to preserve wilderness character.

Minimum Tool - Use of a weed treatment alternative that would accomplish management objectives and have the least impact on resources.

Mitigation Measures - Modifications of actions taken to:

1. avoid impacts by not taking a certain action or parts of an action;
2. minimize impacts by limiting the degree or magnitude of the action and its implementation;
3. rectify impacts by repairing, rehabilitating, or restoring the affected environment;
4. reduce or eliminate impacts over time by preservation and maintenance operations during the life of the action; or,
5. compensate for impacts by replacing or providing substitute resources or environments.

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.

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 13122, 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-Concentration (NOEC) - Synonymous with NOEL.

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). *(See also exotic species, invasive plant species, introduced species, and noxious weed)*

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.

Passive Restoration – Allowing a site to self-restore through natural processes.

Pathogen - A living organism, typically a bacteria or virus that causes adverse effects in another organism.

Pendant, Pendulous - Referring to lichens that hang down from branches and/or stems of trees and shrubs (e.g., *Usnea longissima*).

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.

Phytoplankton – Free floating algae.

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.

Prevention - To detect and ameliorate conditions that establishment, or spread of invasive plants.

Project Design Criteria (PDC) - A set of required, implementation design criteria 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.

Reserved Rights - Rights tribes kept, or reserved, during treaty-making out of a greater number of rights they already owned.

Resolved Issue - significant issues identified by the public that have been fully mitigated through the development of alternatives or project design criteria.

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 Reserves - Areas along live and intermittent streams, wetlands, ponds, lakes, and unstable and potentially unstable areas where riparian-dependent resources receive primary emphasis. Riparian Reserves are important to the terrestrial ecosystem as well, serving as dispersal habitat for certain terrestrial species.

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.

Salmonid – fish belonging to the family Salmonidae (salmon, trout, char).

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 Integrity - State of naturalness or, conversely, the state of disturbance created by human activities or alteration. Integrity is stated in degrees of deviation from the existing landscape character in a national forest.

Scenic Quality - The essential attributes of landscape that when viewed by people, elicit psychological and physiological benefits to individuals and to society in general.

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.

Sensitivity Level - A particular degree or measure of viewer interest in the scenic qualities of the landscape.

Smolt – young salmon or anadromous trout in the process of transforming to a saltwater dwelling fish

Soluble – capable of being loosened or dissolved.

Special Status Species – Federally listed and proposed threatened and endangered species; USDA Forest Service Pacific Northwest Region sensitive species and Survey and Manage species; Mt. Hood National Forest Land and Resource Management Plan management indicator species; and Sensitive Plan and Wildlife Species as defined in the Columbia River Gorge Management Plan.

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 13122, 2/3/99).

Spot Herbicide Treatment 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.

Spring – The point where ground water emerges onto the land surface.

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.

Stem Injection – Herbicide treatment method where herbicides are injected into herbaceous stems using a needle and syringe. Herbicide pellets can also be injected into the trunk of a tree using a specialized tool.

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.

Sub-lethal – A negative effect on an organism that does not cause death.

Substrate - With reference to enzymes, the chemical that the enzyme acts upon.

Suppress – Prevent seed production throughout the target patch and reduce the area coverage. Prevent the invasive species from dominating the vegetation of the area; low levels may be acceptable.

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.

Survey and Manage - Mitigation measure adopted as a set of standards and guidelines within the Northwest Forest Plan Record of Decision and replaced with standards and guidelines in 2001 (Record of Decision) intended to mitigate impacts of land management efforts on those species that are closely associated with Late-Successional or old-growth forests whose long-term persistence is a concern. This mitigation measure applies to all land allocations and requires land managers to take certain actions relative to species of plants and animals, particularly some amphibians, bryophytes, lichens, mollusks, vascular plants, fungi, and arthropods, which are rare or about which little is known. These actions include: (1) manage known sites; (2) survey prior to habitat-disturbing activities; and, (3) conduct extensive and general regional (strategic) surveys.

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)

Thallus – The vegetative body of a lichen.

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.

Tracking Issue – Issues determined to be relevant, but are not used to formulate alternatives. These issues often describe minor or consistent consequences among alternatives considered in detail.

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.

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.

Treaty – A contract or compact between nations. It is an agreement that is binding upon the nations that sign the treaty.

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 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 Absorption Capability - A classification system used to denote relative ability of a landscape to accept human alterations without loss of character of scenic quality.

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.

Water table – The upper surface of an unconfined or "phreatic" aquifer, typically represented by mapping the elevations of the water levels found in production wells.

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.

Wicking or Wiping - Using a sponge or wick on a long handle to wipe herbicide onto foliage and stems

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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Appendices

APPENDIX A
Standards from Preventing and Managing Invasive Plant Record of Decision

APPENDIX A: Standards from Preventing and Managing Invasive Plant Record of Decision

The following standards and implementation guide are taken from Pacific Northwest Region Invasive Plant Program: Preventing and Managing Invasive Plants Record of Decision, page A-3 to A-8 (USDA Forest Service, 2005b).

Standard #	Text of Standard	Implementation Schedule
1	Prevention of invasive plant introduction, establishment and spread will be addressed in watershed analysis; roads analysis; fire and fuels management plans, Burned Area Emergency Recovery Plans; emergency wildland fire situation analysis; wildland fire implementation plans; grazing allotment management plans, recreation management plans, vegetation management plans, and other land management assessments.	This standard will apply to all assessments and analysis documents started or underway as of March 1, 2006; this standard does not apply to assessments and analysis documents signed or completed by February 28, 2006.
2	Actions conducted or authorized by written permit by the Forest Service that will operate outside the limits of the road prism (including public works and service contracts), require the cleaning of all heavy equipment (bulldozers, skidders, graders, backhoes, dump trucks, etc.) prior to entering National Forest System Lands. This standard does not apply to initial attack of wildland fires, and other emergency situations where cleaning would delay response time.	This standard will apply to permits and contracts issued after March 1, 2006. Ongoing permits/contracts issued before this date may be amended, but are not required to be amended, to meet this standard. This standard will apply to Forest Service force account operations starting March 1, 2006.
3	Use weed-free straw and mulch for all projects, conducted or authorized by the Forest Service, on National Forest System Lands. If State certified straw and/or mulch is not available, individual Forests should require sources certified to be weed free using the North American Weed Free Forage Program standards (see Appendix O) or a similar certification process.	Forests are already applying this standard on an informal basis; weed-free straw and mulch will be required as available, starting March 1, 2006.

Standard #	Text of Standard	Implementation Schedule
4	Use only pelletized or certified weed free feed on **all National Forest System lands.** If state certified weed free feed is not available, individual Forests should require feed certified to be weed free using North American Weed Free Forage Program standards or a similar certification process. This standard may need to be phased in as a certification processes are established.	National Forest managers will encourage the use of weed-free feed across the National Forests in the Region. Pelletized feed or certified weed-free feed will be required in all Wilderness areas and Wilderness trailheads starting January 1, 2007. Pelletized or certified weed-free feed will be required on all National Forest System lands when certified feed is available (expected by January 1, 2009). Weed-free (or pelletized) feed requirements will be listed in individual Forest Closure orders.
5	No standard.	N/A
6	Use available administrative mechanisms to incorporate invasive plant prevention practices into rangeland management. Examples of administrative mechanisms include, but are not limited to, revising permits and grazing allotment management plans, providing annual operating instructions, and adaptive management. Plan and implement practices in cooperation with the grazing permit holder.	This standard will apply to grazing permits beginning March 1, 2006.
7	Inspect active gravel, fill, sand stockpiles, quarry sites, and borrow material for invasive plants before use and transport. Treat or require treatment of infested sources before any use of pit material. Use only gravel, fill, sand, and rock that is judged to be weed free by District or Forest weed specialists.	This standard will apply to rock source management beginning March 1, 2006.
8	Conduct road blading, brushing and ditch cleaning in areas with high concentrations of invasive plants in consultation with District or Forest-level invasive plant specialists, incorporate invasive plant prevention practices as appropriate.	This standard will apply to all road blading, brushing and ditch cleaning projects beginning March 1, 2006.

Standard #	Text of Standard	Implementation Schedule
9	No standard.	N/A
10	No standard.	N/A
11	Prioritize infestations of invasive plants for treatment at the landscape, watershed or larger multiple forest/multiple owner scale.	This standard will apply to invasive plant treatment projects with NEPA decisions signed after March 1, 2006.
12	Develop a long-term site strategy for restoring/revegetating invasive plant sites prior to treatment.	This standard will apply to invasive plant treatment projects with NEPA decisions signed after March 1, 2006.
13	Native plant materials are the first choice in revegetation for restoration and rehabilitation where timely natural regeneration of the native plant community is not likely to occur. Non-native, non- invasive plant species may be used in any of the following situations: 1) when needed in emergency conditions to protect basic resource values (e.g., soil stability, water quality and to help prevent the establishment of invasive species), 2) as an interim, non-persistent measure designed to aid in the re-establishment of native plants, 3) if native plant materials are not available, or 4) in permanently altered plant communities. Under no circumstances will non-native invasive plant species be used for revegetation.	This standard will apply to restoration and rehabilitation projects beginning March 1, 2006.
14	Use only APHIS and State-approved biological control agents. Agents demonstrated to have direct negative impacts on non-target organisms would not be released.	This standard will apply to biological control projects beginning March 1, 2006.
15	Application of any herbicides to treat invasive plants will be performed or directly supervised by a State or Federally licensed applicator. All treatment projects that involve the use of herbicides will develop and implement herbicide transportation and handling safety plan.	This standard will apply to herbicide treatment projects as of March 1, 2006.

Standard #	Text of Standard	Implementation Schedule
16	Select from herbicide formulations containing one or more of the following 10 active ingredients: chlorsulfuron, clopyralid, glyphosate, imazapic, imazapyr, metsulfuron methyl, picloram, sethoxydim, sulfometuron methyl, and triclopyr. Mixtures of herbicide formulations containing 3 or less of these active ingredients may be applied where the sum of all individual Hazard Quotients for the relevant application scenarios is less than 1.0. All herbicide application methods are allowed including wicking, wiping, injection, spot, broadcast and aerial, as permitted by the product label. Chlorsulfuron, metsulfuron methyl, and sulfometuron methyl will not be applied aerially. The use of triclopyr is limited to selective application techniques only (e.g., spot spraying, wiping, basal bark, cut stump, injection). Additional herbicides and herbicide mixtures may be added in the future at either the Forest Plan or project level through appropriate risk analysis and NEPA/ESA procedures.	This standard will be applied to invasive plant projects with NEPA decisions signed after March 1, 2006.
17	No standard.	N/A
18	Use only adjuvants (e.g. surfactants, dyes) and inert ingredients reviewed in Forest Service hazard and risk assessment documents such as SERA, 1997a, 1997b; Bakke, 2003b.	This standard will apply to invasive plant treatment projects with NEPA decisions signed after March 1, 2006.
19	To minimize or eliminate direct or indirect negative effects to non-target plants, terrestrial animals, water quality and aquatic biota (including amphibians) from the application of herbicide, use site-specific soil characteristics, proximity to surface water and local water table depth to determine herbicide formulation, size of buffers needed, if any, and application method and timing. Consider herbicides registered for aquatic use where herbicide is likely to be delivered to surface waters.	This standard will apply to invasive plant treatment projects with NEPA decisions signed after March 1, 2006.

Standard #	Text of Standard	Implementation Schedule
20	Design invasive plant treatments to minimize or eliminate adverse effects to species and critical habitats proposed and/or listed under the Endangered Species Act. This may involve surveying for listed or proposed plants prior to implementing actions within unsurveyed habitat if the action has a reasonable potential to adversely affect the plant species. Use site-specific project design (e.g. application rate and method, timing, wind speed and direction, nozzle type and size, buffers, etc.) to mitigate the potential for adverse disturbance and/or contaminant exposure.	This standard will apply to invasive plant treatment projects with NEPA decisions signed after March 1, 2006.
21	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).	This standard will apply to invasive plant treatment projects with NEPA decisions signed after March 1, 2006.
22	Prohibit aerial application of herbicides within legally designated municipal watersheds.	This standard will apply to invasive plant treatment projects with NEPA decisions signed after March 1, 2006.
23	Prior to implementation of herbicide treatment projects, National Forest system staff will ensure timely public notification. Treatment areas will be posted to inform the public and forest workers of herbicide application dates and herbicides used. If requested, individuals may be notified in advance of spray dates.	This standard will apply to invasive plant treatment projects with NEPA decisions signed after March 1, 2006.

1. ATSDR, 2004. Guidance Manual for the Assessment of Joint Toxic Action of Chemical Mixtures. U.S. Department Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry.

APPENDIX B
Compliance with Mt. Hood National Forest Land and Resource management Plan (1990) and Northwest Forest Plan (1994)

APPENDIX B: Compliance with Mt. Hood National Forest Land and Resource Management Plan (1990) and Northwest Forest Plan (1994)

Standards and Guidelines	Is a plan amendment needed?
Mt. Hood Forest Plan Standards and Guidelines	
FW-025 (Soil Productivity) In the first year following surface disturbing activities, the percent effective groundcover by soil erosion hazard class should achieve at least the following levels: **Soil Erosion Hazard Class** — **Effective Ground Cover** Low to Moderate — 60% Severe — 75% Very Severe — 85%	
FW-032 (Soil Productivity) Favorable habitat conditions for soil organisms should be maintained for short and long term soil productivity.	
FW-054 (Water) Water quality associated with management activities shall be in compliance with Oregon State requirements (Oregon Administrative Rules, Chapter 340-41) established in accordance with the Federal Clean Water Act (1977, as amended 1987).	
FW-055 & FW-056 (Water) Compliance with State requirements shall be met through planning, application, and monitoring of Best Management Practices FEIS, (Appendix H). Best Management Practices (BMPs) describe the process which shall be used to implement the State Water Quality management Plan on lands administered by the USDA Forest Service.	
FW-057 & FW-058 (Water) Individual, general Best Management Practices which may be implemented (i.e. on a project by project basis) are described in General Water Quality Best Management Practices, Pacific Northwest Region, 11/88. Evaluations of ability to implement and estimated effectiveness shall be made at the project level.	
FW-060 (Water) Management practices causing detrimental changes water temperature or chemical composition, blockages of water courses, or deposits of sediment shall not be permitted (36 CFR 219.27 e).	
FW-062 (Water) Not more than 35 % of an area available for vegetative manipulation should be in a hydrologically disturbed condition at any one time.	

Standards and Guidelines	Is a plan amendment needed?
Mt. Hood Forest Plan Standards and Guidelines	
FW-066 (Water) Cumulative effects analyses of management activities on water quality shall include lands on all ownerships.	
FW-075 (Water) The disposal or accidental discharge of petroleum products and hazardous materials on National Forest System lands shall be prevented.	
FW-076 (Water) Potentially detrimental materials associated with management activities (e.g. pesticides, fertilizers, and road surface treatments) shall be prevented from entering water or other areas not intended for treatment.	Yes
FW-082 (Riparian Area) At least 95 percent ground cover (e.g. vegetation, duff, or litter) shall be maintained within all project activity areas (within riparian areas).	
FW-083 (Riparian Area) Ground disturbing activities should not occur in saturated soil areas.	
FW-084 (Riparian Area) Activities within and adjacent to riparian areas should not accelerate sediment delivery to streams, lakes, wetlands, seeps, and springs.	
FW-105 (Riparian Area) Fish bearing perennial streams – At least 95 % effective ground cover (e.g. adapted trees, shrubs, sedges, and grasses) in a project activity area should be maintained.	
FW-113 (Riparian Area) State water quality standards for turbidity shall be met.	
FW-123 (Riparian Area) Non-Fish bearing perennial streams (Class 3) – At least 90 % effective ground cover (e.g. adapted trees, shrubs, sedges, grasses, and duff) in a project activity area should be maintained.	
FW-129 (Riparian Area) Sediment loading shall be minimized and stream channel conditions maintained to meet State water quality standards for turbidity.	
FW-138 (Fisheries) Impacts on habitat for the management indicator species group (salmonids) shall be determined for each project affecting fisheries, in terms of habitat quality, quantity, and distribution.	
FW-156 (Forest Diversity) Vegetation management activities shall not result in a permanent loss of any species native to a particular ecosystem.	

Standards and Guidelines	Is a plan amendment needed?
Mt. Hood Forest Plan Standards and Guidelines	
FW-161 (Forest Diversity) Management activities shall contribute to recovery and conservation of Federally listed threatened or endangered species (endangered Species Act, `1973; 36 CEF 219.19)	
FW-162 (Forest Diversity) Habitat Management should provide for maintenance of viable populations of native and desirable non-native wildlife, fish, and plant species.	
FW-174 (Threatened, Endangered and Sensitive Plants and Animals) Threatened, endangered and sensitive plants and animals shall be identified and managed in accordance with the Endangered Species Act (ESA) (1973), Oregon ESA (1987), and FSM 2670.	
FW-175 (Threatened, Endangered and Sensitive Plants and Animals) Habitat for threatened, endangered and sensitive plants and animals shall be protected and/or improved.	
FW-177 & 178 (Threatened, Endangered and Sensitive Plants and Animals) Consultation with FWS shall occur on each program activity or project that the Forest Service determines may effect threatened or endangered species. Consult	
FW-179 (Threatened, Endangered and Sensitive Plants and Animals) Species Management Guides shall be prepared to address effects of management activities and identify opportunities to maintain or enhance habitat for plants frequently in conflict with mgmt. practices.	
FW-180 (Threatened, Endangered and Sensitive Plants and Animals) Lists of threatened, endangered and sensitive plant and animal species shall be maintained and updated periodically as new information is collected.	
FW-182, 183, 184 (Threatened, Endangered and Sensitive Plants and Animals) If habitat allocated for threatened, endangered or sensitive species protection or recovery (i.e. A8 Spotted Owl Habitat Areas and A13 Bald Eagle Recovery Areas) is lost (e.g. due to windthrow or wildfire), replacement habitat of equal or better quality (or the best available) shall be designated and allocated. For A8 Management Areas, replacement habitat shall be allocated if 30 acres or more habitat is lost. Replacement habitat should be located immediately adjacent to the remaining A8 habitat.	
FW-187 (Wildlife) Key habitat areas (e.g. reading areas, mineral licks, and wallows) should be protected.	
FW-189 (Wildlife) Existing natural meadows/openings shall be maintained.	

Standards and Guidelines	Is a plan amendment needed?
Mt. Hood Forest Plan Standards and Guidelines	
FW-213 (Wildlife) Activities within key deer and elk rearing areas may be restricted between May 15 and July 1.	
FW-243 (Wildlife) Plant community integrity of special habitat conditions, e.g. caves, cliffs, talus slopes, meadows, oak, and dry shrub should be protected.	
FW-279 (Hazardous Materials) Project spill contingency plans shall be developed for all project activities where oil or potentially hazardous substances are used by the Forest Service, its permittees, or other users (i.e. contractors) of National Forest lands.	
FW-280 (Hazardous Materials) Employee involvement with, and the use of, hazardous materials shall be in accordance with the USDA Forest Service Health and Safety Code Handbook.	
FW-281 (Hazardous Materials) Employees shall comply with all Forest Service policies as identified in the USDA Forest Service Health and Safety Code Handbook.	
FW-300 (Range Management) Plants identified as pests by Oregon Department of Agriculture (ODA) shall be controlled.	
FW-301 (Range Management) Implementation of control measures should adhere to priorities of prevention, early treatment, maintenance, correction, and no action.	
FW-375 (Timber Management) New provisions for all vegetation management. projects shall be followed for all projects planned with NEPA documents.	
FW-378 & FS-379 (Timber Management) Emphasis shall be on prevention of vegetation management problems and herbicides shall be used only when necessary.	
FW-380 (Timber Management) Competing vegetation shall be controlled when there is possibility that timber harvest areas cannot be reforested within 5-year period [because of invasive plants].	
FW-381 (Timber Management) In timber harvest areas, prevent damage to plantation crop trees, prevent stocking from falling below desired levels, insure reforestation within 5-year period, and maintain Pacific yew.	

Standards and Guidelines	Is a plan amendment needed?
Mt. Hood Forest Plan Standards and Guidelines	
Fw-382 & FW-383 (Timber Management) Silvicultural methods and cultural treatments should be applied to reduce hazards from insects, diseases, and weed species. If normal insect surveillance indicates the threat of an epidemic, project level detection and control operation (including coordination with other land ownerships) should be accomplished on a Forestwide basis (Regional Guide for Pacific Northwest region, 1984)	
FW-463 (Dispersed Recreation Activities) Designated trails, trailheads, associated facilities, and dispersed recreation sites impacted and/or adversely affected by management activities, shall be rehabilitated, restored, and/or relocated.	
FW-470 (Eligible Wild, Scenic, and Recreational Rivers) Outstandingly remarkable values of the identified eligible river segments (FEIS Appendix E) shall be protected and/or enhanced (FSH 1909.12, Chapter 8, 7/87).	
FW-496 (Visual Resource Management) The visual quality objectives (VQOs) for wild segments shall be Preservation as seen from the river, river banks and trails within the B1 river corridor. A VQO of Retention may be allowed for recreational facilities.	
FW-497 (Visual Resource Management) The VQO for scenic segments shall be Retention as seen from the river, river banks, U.S. and State highways, Forest highways and roads, trails, and recreation facilities within the B1 river corridor. A VQO of Partial Retention may be allowed for structural facilities.	
FW-498 (Visual Resource Management) The VQO for recreational segments shall be Partial Retention as seen from the river, river banks, U.S. and State highways, Forest highways and roads, trails, and recreation facilities within the B1 river corridor. Modification may be allowed for structural facilities.	
FW-513 (Eligible Wild, Scenic, and Recreational Rivers) Water quality shall be maintained or enhanced during any management activities.	
FW-552 & 553 (Visual Resource Management) The visual quality objectives (VQO, USDA-Agriculture Handbook 462, National Forest Landscape Management, Vol. 2, Chap. 1, The Visual Management System) prescribed in management direction represent the minimum level that shall be achieved in long term visual resource management. Management Area VQO's shall be prescribed as summarized in Table Four-22. See Management Area Standards and Guidelines.	
FW-554 (Visual Resource Management) Visual quality objectives for "designated viewsheds" shall be prescribed as listed in Table Four-23 Designated Viewsheds.	

Standards and Guidelines	Is a plan amendment needed?
Mt. Hood Forest Plan Standards and Guidelines	
FW-556 & 557 (Visual Resource Management) The prescribed VQO should be achieved within one year after completion of any project activities. Short term deviations from prescribed visual quality objectives may occur due to catastrophic events, e.g. fire, windstorm, earthquake, and insect damage.	
FW-609 & 610 (Cultural Resources Management) All proposed projects which could affect a cultural resource shall be assessed for their effect on National Register, eligible, or unevaluated properties. Assessments shall use the criteria of "effect and adverse effect" (36 CFR 800.9. Projects include all Federally funded undertakings, and undertakings requiring Federal permit (36 CFR 800.9 (a)(b)).	
FW-627 (Human Rights) The Forest shall be managed and administered in such a manner as to provide all persons equal opportunity, regardless of race, color, creed, sex, marital status, age, handicap, religion, or national origin.	
FW-628 (Human Rights) The Forest shall be managed to break down social and institutional barriers to legitimate uses of the Forest by nontraditional groups.	
FW-629 (Human Rights) Consultation with diverse cultural groups shall occur on a regular basis.	
FW-630&631 (Human Rights) The treaty rights and privileges of Native Americans shall be honored. Treaty rights and privileges should supercede other management direction.	
FW-632 (Human Rights) The American Indian Religious Freedom Act (1978) shall be considered in administration of the Forest.	
FW-639-640 (Human Rights) Special efforts shall be made to inform the public, including minorities and underprivileged individuals and groups, of benefits they are eligible to receive from Forest programs. Techniques suited to increase awareness and participation shall be used.	
A1-WR-064 (Vegetation Management) – Amendment #7 Chemicals shall not be used to control noxious weeds in riparian areas.	Yes
A2-070 & A2-071 (Wilderness) Timber harvesting and commercial gathering of forest products shall not be permitted. Vegetation management activities shall produce or enhance wilderness values.	
A2-082 (Wilderness) Pesticide use shall be prohibited.	Yes

Standards and Guidelines	Is a plan amendment needed?
Mt. Hood Forest Plan Standards and Guidelines	
A2-074 (Wilderness) Areas that do not meet Wild and Scenic River bare ground and vegetative cover criteria (B.2, Four-138) shall be revegetated.	
A2-083 (Wilderness) Introduction of non-native plant species should not occur.	
A2-084 (Wilderness) Acceleration of soil displacement and erosion resulting from human activity should not occur.	
A12-031 (Outdoor Education Areas) Herbicides should not be applied outside of roads rights-of-way.	Yes
A12-032 (Outdoor Education Areas) If pesticide application is deemed necessary, biological control measures should be considered.	
B1-048 (Wild, Scenic and Recreational Rivers) Water quality shall be maintained or enhanced d.	
B1-050 (Wild, Scenic and Recreational Rivers) All river segments shall be managed to remain in a free flowing and unpolluted state.	
B2-071 (Scenic Viewsheds) All IPM (integrated pest management) activities shall minimize impacts to scenic quality.	
B5-041 (Pileated Woodpecker/Pine Martin Habitat) Herbicides should not be permitted outside of road rights-of-way.	Yes
B6-026 (Special Emphasis Watersheds) Activities involving fertilization or chemical treatment of vegetation, in municipal or domestic watersheds shall be coordinated with appropriate municipalities or individuals.	
B6-042 (Special Emphasis Watersheds) Activities involving pesticide application in municipal or domestic watersheds shall be coordinated with associated municipalities, groups or individuals.	
B7-070 (General Riparian Area) Application of herbicides shall be discouraged.	Yes
D-021 (Bull Run Watershed Management Unit) Chemical insecticides and herbicides shall be prohibited within the Bull Run physical drainage.	

Standards and Guidelines	Is a plan amendment needed?
Northwest Forest Plan Standards and Guidelines	
General Riparian Area, RA-3 Herbicides, insecticides, and other toxicants, and other chemicals shall be applied only in a manner that avoids impacts that retard or prevent attainment of Aquatic Conservation Strategy objectives.	
C-4 & C-5 Survey and Manage Standards &Guidelines: (1) manage known sites, (2) survey prior to ground-disturbing activities.	
C-6 Manage recreation areas to minimize disturbance to Survey & Manage species.	
Northwest Forest Plan Aquatic Conservation Strategy Objective #9 Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian dependent species.	

APPENDIX C
Columbia River Gorge National Scenic Area Management Plan – Consistency Determination

APPENDIX C: Columbia River Gorge National Scenic Area Management Plan - Consistency Determination (CD-06-11-S) for the Site-Specific Invasive Plant Treatments for the Mt. Hood National Forest and the Columbia River Gorge National Scenic Area in Oregon

Prepared by Robin Dobson, Ecologist, Columbia River Gorge National Scenic Area, September 2006

FINDINGS OF FACT

The following findings of fact contain the applicable standards and guidelines from the Columbia River Gorge National Scenic Area Management Plan (Management Plan). The Management Plan, as revised and adopted in 2004, is in effect. Management Plan policy requires that projects on National Forest lands also be consistent with the Land and Resource Management Plans of the adjacent National Forests. The USDA Forest Service applies the more protective standard of either the Management Plan or the Land and Resource Management Plan. For this project, the applicable Land and Resource Management Plan is the Mt. Hood National Forest, Forest Plan. The applicable Forest Plan Standards and Guidelines are listed in Appendix B.

Project Proposal

The project proposal is described in Chapters 1 and 2 of the EIS. Appendix F – Site and Treatment Information, and Appendix O – Existing Condition Characteristics provide site specific information for the 7 treatment areas in the Scenic Area. The Management Plan does not apply regulations to herbicide use, per Special Management Area (SMA) Wildlife and Plants Policy 4: “County, state and federal regulations for air and water quality and for pesticide use shall be followed.” Herbicides are likewise not regulated by General Management Area (GMA) guidelines. The manual, mechanical and cultural treatment methods are subject to the Management Plan requirements, and are the subject of this review. The following table displays information relevant to the consistency determination.

Table C-1: Scenic Area Consistency Determination, Management Plan Information for Treatment Areas

Treat ID	Area	Co.	Acre	Location	LUD	LS	Scenic Standard (VQO)	Visible from Nearest KVA	Resources Present
22-01	Sandy River Delta	Mult	1573	T1N/R3E/S13 TL 100 T1N/R3E/S24 TL 100, 500 T1N/R3E/S25 TL 100 T1N/R4E/ TL 100, 200, 300	PR/OS	RB	VS/NVE	Fg: I-84, Sandy River, Columbia River	Wetlands, River, TES Fish, Planned Recreation
22-05	Wyeth Bench	Hoo dRiv er	90	T2N/R8E/S5 TL 200, 900 – 31 ac T2N/R8E/S4 TL 201 – 20 ac T3N/R8E/S34 TL 400, 500, 600 – 28 ac T2N/R8E/S2 TL300, T3/R8/S35 TL200,300– 19 ac	UA/OS F PR, F F	CW/UA CW CW CW	NVE/Na NVE VS NVE	Fg: I-84 Fg: Wyeth Bench Road Fg: Wyeth Bench Road Fg: Wyeth Bench Road	Campground Pond none none
22-07	Wells Island	Hoo dRiv er	21	T3N/R10E/S26 TL 200	OS	RB	NVE	Fg: Columbia River	River, TES Fish, Bald Eagle
22-08	East Pit	Hoo dRiv er	24	T2N/R11E/S4 TL 100 T3N/R11E/S33 TL 101	OS GMA	GW – (GMA)	VS	Fg: HCRH	Pond, Bald Eagle, Peregrine, Endemic, Trail
22-11	Memaloose/ Rowena	Wasco	110	T2N/R12E/S5 TL 2400 - 13 ac T2N/R12E/S4 TL 201 - 9 ac T2N/R12E/S4 TL 800, S3C TL 500,600 - 25 ac T2N/R12E/S3 TL 400 - 33 ac T2N/R12E/ TL 400,500 - 24 ac	Ag Ag/OS Ag OS A1/Ag/OS	OW OW OW OW OW/GW	VS VS VS NVE VS/NVE	Fg: HCRH Fg: HCRH Mg: HRCH, Tom McCall Pt Fg: HCRH, Rowena Plateau Mg: HCRH	None Pond Buffer Pond Buffer Pond/Str,Peregrine,Lewis Pond/IntStream, Endemic
22-12	7 Mile Hill Rd Chenoweth Tbl	Wasco	81	T2N/R13E/S19 TL 300 - 55 ac T2N/R13E/S30 TL700, S31 TL200, 300,400 -26 ac	A-1 OS	G OW	VS NVE	Mg: I-84 Bg: Col River, SR14, I-84	Intermittent Stream Pond
22-17	Chamberlain Road/Corbett Women Forum Thors Heights	Mult	139	T1N/R4E/(S30) TL 400 – 19 ac T1N/R4E/S29CC TL 700 – 5 ac T1N/R4E/S29CC TL 300 – 5 ac T1N/R4E/S28D TL 700,600,500,400,100 – 28 ac T1N/R4E/S27 TL 1100,1000,900 – 40 ac T1N/R4E/S25CD TL 700,1100,1200,1000 – 9 ac T1N/R5E/S30C TL400, S30CC TL200,300 – 29 ac	Ag/A1/O S/R Ag Ag Ag/OS Ag/OS PR/OS F	P/CW/RR P P P/ CW P/ CW CW P	VS/NVE VS VS VS / NVE VS / NVE VS / NVE VS	Mg Col/Sandy Rvr, SR 14 Mg Columbia River Mg Columbia River Fg I-84 Fg I-84 Fg Women;s Forum, HCRH Fg Larch Mtn Rd	None None None None Intermittent Stream State Park Adjacent None

Key to Table C-1

LUD – Land Use Designation	**LS** – Landscape Setting	**Scenic Standard**	**KVA - Key Viewing Area**
PR – Public Recreation	RB – River Bottomlands	VS – Visual Subordinance (Partial Retention)	Fg: Foreground: up to ½ mile from KVA
OS – SMA Open Space	P – Pastoral	NVE. – Not Visually Evident (Retention)	Mg: Middleground: ½ to 3 miles from KVA
OS GMA – GMA Open Space	RR in P – Rural Residential in Pastoral (GMA)		Bg: Background: over 3 miles form KVA
Ag – SMA Agriculture	CW – Coniferous Woodland		I-84 – Interstate 84
A-1 GMA Large Scale Agriculture	GW – Gorge Walls, Canyon Lands and Wildlands		HRCH – Historic Columbia River Hwy
F – SMA Forest	OW – Oak Woodlands		Col Rvr – Columbia River
R – Residential (GMA)	G – Grasslands (GMA)		SR14 – Washington State Route 14
UA – Urban Area			

Table C-2: Consistency with Management Plan Guidelines

<table>
<tr><td colspan="2">Land Use Designations
The project is located in SMA Agriculture, Forest, Public Recreation and Open Space; GMA Agriculture and Open Space, and the Cascade Locks Urban Area (see Table C-1). All of these designations allow resource enhancement activities, and contain virtually the same review use language.</td></tr>
<tr><th>Review Uses</th><th>Findings</th></tr>
<tr><td>Resource enhancement projects for the purpose of enhancing scenic, cultural, recreation and/or natural resources, subject to the guidelines in "Resource Enhancement Projects" (Part II, Chapter 7: General Policies and Guidelines). These projects may include new structures (e.g., fish ladders, sediment barriers) and/or activities (e.g., closing and revegetating unused roads, recontouring abandoned quarries).</td><td>☒ Project as described meets guideline

☐ Project requires the following condition to meet this guideline</td></tr>
<tr><td>Resource Enhancement Projects Guidelines - Applicable

1. Applications for resource enhancement projects must describe the goals and benefits of the proposed enhancement project. They must also thoroughly document the condition of the resource before and after the proposed enhancement project.</td><td>☒ Project as described meets guideline. Well described throughout EIS.

☐ Project requires the following condition to meet this guideline</td></tr>
<tr><td>SMA Open Space

1. An Open Space plan shall be completed by the primary managing agency or land owner prior to any new land uses or development, and shall be reviewed by the USDA Forest Service. The Open Space plan shall include the following:

A. Direction for resource protection, enhancement, and management.

B. Review of existing uses to determine compatibility with Open Space values.

C. Consultation with members of the public and with agency and resource specialists.</td><td>☒ Project as described meets guideline.

Applicable Open Space Plans address invasive plant treatment:

▪ Sandy River Delta FEIS: pages 2-15, 2-16 and Chapter 4. Sandy River Delta Plan pages 27-40.
▪ Columbia River Tribs West Watershed Analysis, pg 64-66.
▪ Columbia River Tributaries East Watershed Analysis, pg 69,72.
▪ Wells Island Open Space Plan, pages 9-12
▪ Rowena Plan, page 51

☐ Project requires the following condition to meet this guideline</td></tr>
<tr><td>2. F. Treatment of noxious weeds shall be permitted without completion of an SMA Open Space plan when the following criteria have been met:

(1) Noxious weed infestation is new and eradication is still viable.

(2) Delayed or deferred treatment could have widespread or major adverse impacts to one or more of the following resources:

(a) Displacement of native and traditionally gathered plants;</td><td>☒ Project as described meets guideline. Open Space Plans have not been completed for Chenoweth Table and the Broughton Bluff. The EIS well describes 1) the state of noxious weed infestation, 2) the potential adverse resource impacts from delayed treatment, and 3) the treatment effects are thoroughly evaluated.

☐ Project requires the following condition to meet this guideline</td></tr>
</table>

(b) Degradation of wildlife habitat and forage; (c) Degradation or loss of agricultural uses of land, such as cropland or livestock forage; (d) Limitation of recreational uses. (3) For federal lands, treatment effects have been thoroughly evaluated in an environmental assessment.	

Scenic Resources

Table C-1 displays the scenic standard for each treatment area, and the closest Key Viewing Area. Scenic resources are discussed in Section 3.12, Scenery Management. SMA guidelines apply to most treatment areas. GMA guidelines apply to all of Treatment Area 22-08, about 19 acres of Area 22-11, 55 acres of Area 22-12 and 8 acres of Area 22-17. In addition, about 30 acres of Area 22-05 are in an Urban Area and not subject to Scenic Area guidelines. SMA guidelines are evaluated first, followed by GMA guidelines. Where SMA and GMA guidelines are essentially the same, they are combined.

SMA Scenic Resource Guidelines - Applicable	**Findings**
SMA Design Guidelines Based on Landscape Settings A. Pastoral: Pastoral areas shall retain the overall appearance of an agricultural landscape. (1) The use of plant species common to the landscape setting shall be encouraged. The use of plant species in rows, as commonly found in the landscape setting, is encouraged.	☒ Project as described meets guideline. See Site Restoration Strategies Section 2.1.3, and 2.1.4. ☐ Project requires the following condition to meet this guideline
B. Coniferous Woodland and Oak-Pine Woodland: Woodland areas shall retain the overall appearance of a woodland landscape. New developments and land uses shall retain the overall visual character of the natural appearance of the Coniferous Woodland and Oak-Pine Woodland landscape. (2) Use of plant species native to the landscape setting shall be encouraged. Where non-native plants are used, they shall have native-appearing characteristics.	☒ Project as described meets guideline. See Site Restoration Strategies Section 2.1.3, and 2.1.4. ☐ Project requires the following condition to meet this guideline
D. River Bottomlands: River Bottomlands shall retain the overall visual character of a floodplain and associated islands. (2) Use of plant species native to the landscape setting shall be encouraged. Where non-native plants are used, they shall have native-appearing characteristics.	☒ Project as described meets guideline. See Site Restoration Strategies Section 2.1.3, and 2.1.4. ☐ Project requires the following condition to meet this guideline
E. Gorge Walls, Canyonlands, and Wildlands: New developments and land uses shall retain the overall visual character of the natural-appearing landscape. (4) Use of plant species non-native to the Columbia River Gorge shall not be allowed	☒ Project as described meets guideline. See Site Restoration Strategies Section 2.1.3, and 2.1.4. ☐ Project requires the following condition to meet this guideline

SMA Guidelines for Development and Uses Visible from KVAs	
1. The guidelines in this section shall apply to proposed developments on sites topographically visible from key viewing areas. (GMA KVA Guideline 1)	As described in Table C-1, at least portions of all treatment areas are topographically visible from KVAs (source: GIS KVA layer).
2. New developments and land uses shall be evaluated to ensure that the required scenic standard is met and that scenic resources are not adversely affected, including cumulative effects, based on the degree of visibility from key viewing areas.	☒ Project as described meets guideline. See Section 3.12.3 ☐ Project requires the following condition to meet this guideline
4. In all landscape settings, scenic standards shall be met by blending new development with the adjacent natural landscape elements rather than with existing development	☒ Project as described meets guideline. See Section 3.12.3 ☐ Project requires the following condition to meet this guideline
5. Proposed developments or land uses shall be sited to achieve the applicable scenic standard. Develop-ment shall be designed to fit the natural topography, to take advantage of landform and vegetation screening, and to minimize visible grading or other modifications of landforms, vegetation cover, and natural characteristics. When screening of development is needed to meet the scenic standard from key viewing areas, use of existing topography and vegetation shall be given priority over other means of achieving the scenic standard such as planting new vegetation or using artificial berms.	☒ Project as described meets guideline. See Section 3.12.3 ☐ Project requires the following condition to meet this guideline
6. The extent and type of conditions applied to a proposed development or use to achieve the scenic standard shall be proportionate to its degree of visibility from key viewing areas. (GMA KVA Guideline 4.A. (1) through (5)) A. Decisions shall include written findings addressing the factors influencing the degree of visibility, including but not limited to: (1) The amount of area of the building site exposed to key viewing areas, (2) The degree of existing vegetation providing screening, (3) The distance from the building site to the key viewing areas from which it is visible, (4) The number of key viewing areas from which it is visible, and (5) The linear distance along the key viewing areas from which the building site is visible (for linear key viewing areas, such as roads).	☒ Project as described meets guideline. See Section 3.12.3 ☐ Project requires the following condition to meet this guideline Table C-1 identifies the closest KVA.
B. Conditions may be applied to various elements of proposed developments to ensure they are visually subordinate to their setting as seen from key viewing areas, including but not limited to: (GMA KVA Guideline 4.B. (1) through (4)) (1) Siting (location of development on the subject property, building orientation, and other elements),	☒ Project as described meets guideline. See Section 3.12.3 ☐ Project requires the following condition to meet this guideline

(2) Retention of existing vegetation, (3) Design (color, reflectivity, size, shape, height, architectural and design details and other elements), (4) New landscaping.	
7. Sites approved for new development to achieve scenic standards shall be consistent with guidelines to protect wetlands, riparian corridors, sensitive plant or wildlife sites and the buffer zones of each of these natural resources, and guidelines to protect cultural resources.	☒ Project as described meets guideline. See Section 3.12.3 ☐ Project requires the following condition to meet this guideline
8. Proposed developments shall not protrude above the line of a bluff, cliff, or skyline as seen from key viewing areas.	☒ Project as described meets guideline. See Section 3.12.3 ☐ Project requires the following condition to meet this guideline
SMA Guidelines for KVA Foregrounds and Scenic Routes 1. All new developments and land uses immediately adjacent to scenic routes shall be in conformance with state or county scenic route guidelines.	☒ Project as described meets guideline. See Section 3.12.3 ☐ Project requires the following condition to meet this guideline
GMA Scenic Resource Guidelines - Applicable	**Findings**
Overall Scenic Provisions 5. For all proposed development, the determination of compatibility with the landscape setting shall be based on information submitted in the site plan.	☒ Project as described meets guideline. See Section 3.12.3 ☐ Project requires the following condition to meet this guideline
Key Viewing Areas 2. Each development shall be visually subordinate to its setting as seen from key viewing areas.	☒ Project as described meets guideline. See Section 3.12.3 ☐ Project requires the following condition to meet this guideline
3. Determination of potential visual effects and compliance with visual subordinance policies shall include consideration of the cumulative effects of proposed developments.	☒ Project as described meets guideline. See Section 3.12.3 ☐ Project requires the following condition to meet this guideline
5. New development shall be sited to achieve visual subordinance from key viewing areas, unless the siting would place such development in a buffer specified for protection of wetlands, riparian corridors, sensitive plants, or sensitive wildlife sites or would conflict with guidelines to protect cultural resources. In such situations, development shall comply with this guideline to the maximum extent practicable.-	☒ Project as described meets guideline. See Section 3.12.3 ☐ Project requires the following condition to meet this guideline
6. New development shall be sited using existing topography and/or existing vegetation as needed to achieve visual subordinance from key viewing areas.	☒ Project as described meets guideline. See Section 3.12.3 ☐ Project requires the following condition to meet this guideline

7. Existing tree cover screening proposed development from key viewing areas shall be retained as specified in the Landscape Settings Design Guidelines section of this chapter.	☒ Project as described meets guideline. See Section 2.1.3. and Table 2-3; no existing trees are planned to be removed. ☐ Project requires the following condition to meet this guideline
Landscape Settings GMA Landscape Settings guidelines apply only to new structures and vegetation planted or retained for screening; the guidelines do not apply to this project.	n/a
Scenic Travel Corridors I-84 and the Historic Columbia River Highway are Scenic Travel Corridors in the vicinity of this proposal. The Scenic Travel Corridor guidelines apply only to buildings, view clearing in public rights-of-way, utilities, and quarries and therefore do not apply to this project.	n/a

Cultural Resources

The proposed treatment methods fall within the description of activities found to have no potential to affect heritage resources as determined within the 2004 Programmatic Agreement between the Pacific Northwest Region of the USDA Forest Service, The State Historic Preservation Office, and the Advisory Council on Historic Preservation (Appendix Y). See Section 3.13.1

The SMA and GMA requirements are essentially the same. Findings for the SMA requirements suffice for the GMA.

SMA Cultural Resource Policies – Applicable	Findings
1. New developments or land uses shall not adversely affect significant cultural resources.	☐ Project as described meets guideline ☒ Project requires the following condition to meet this guideline: “Should any historic or prehistoric cultural resources be uncovered during project activities, the applicant shall cease work and immediately notify the Scenic Area office and the Washington Office of Archeology and historical Preservation. The applicant should also notify the Indian Tribal governments within 24 hours if the resources are prehistoric or otherwise associated with Native American Indians.”
7. The USDA Forest Service shall be responsible for performing steps 1 through 5 under guideline 4 for forest practices and National Forest system lands.	☒ Project as described meets guideline – See Section 3.13.1 ☐ Project requires the following condition to meet this guideline
8. The USDA Forest Service shall consult with the Indian tribal governments and other consulting parties in performing steps 1 through 5 under guideline 4.	☒ Project as described meets guideline (will continue throughout EIS process) ☐ Project requires the following condition to meet this guideline

Indian Tribal Treaty Rights and Consultation

The Confederated Tribes of Warm Springs, the Yakama Nation, the Nez Perce Tribe, the Confederate Tribes of the Umatilla Indian Reservation, as well as the Confederated Tribes of the Grand Ronde were given opportunity to comment on the project. USDA Forest Service staff met with members of the Warms Springs Tribe. Further opportunities for tribal consultation and comment will continue throughout the EIS process. Since this is a USDA Forest Service project and most of the affected area is within the SMA, the SMA treaty rights process has been utilized. The GMA sites are not located in the Columbia River or its fishbearing tributaries. Findings for the SMA requirements suffice for the GMA.

SMA Treaty Rights and Consultation Policies - Applicable	Findings
1. The USDA Forest Service shall consult with the Indian tribal governments to determine the effect of all new development or uses in the SMA on treaty rights and shall notify the county or reviewing agency of the determination.	☒ Project as described meets guideline ☐ Project requires the following condition to meet this guideline
6. New uses and development shall not affect or modify any treaty or other rights of the Indian tribal governments.	☒ Project as described meets guideline ☐ Project requires the following condition to meet this guideline
8. New developments or land use shall protect access to usual and accustomed tribal or Indian fishing sites or stations protected under treaty rights, and as established by court interpretations of those treaties	☒ Project as described meets guideline ☐ Project requires the following condition to meet this guideline
10. Federal land management agencies shall not deny Indian tribal governments, or individual members of Indian tribes, access to any area on federal or state land that is traditionally used in connection with tribal treaty or ceremonial rights or for traditional uses.	☒ Project as described meets guideline ☐ Project requires the following condition to meet this guideline

Natural Resources

Appendix O – Existing Condition Characteristics provides site specific information for the 7 treatment areas in the Scenic Area. Natural resources are discussed in Sections 3.6 – Botany; 3.8 – Soils; 3.9 – Water Quality; 3.10 – Aquatic Organisms and Habitats; and 3.11 - Wildlife. SMA guidelines apply to most treatment areas. GMA guidelines apply to all of Treatment Area 22-08, about 19 acres of Area 22-11, 55 acres of Area 22-12 and 8 acres of Area 22-17. In addition, about 30 acres of Area 22-05 are in an Urban Area and not subject to Scenic Area guidelines. The GMA portion of Area 22-17 has no sensitive natural resources. The other GMA areas contain water resources (ponds, streams), an endemic plant and a sensitive wildlife site. SMA guidelines are evaluated first, followed by GMA guidelines. Where SMA and GMA guidelines are essentially the same, they are combined.

SMA Natural Resource Policies – Applicable	Findings
Water Resources (Wetlands, Streams, Ponds, Lakes, and Riparian Areas) A. All Water Resources shall, in part, be protected by establishing undisturbed buffer zones as specified in 2.A.(2)(a) and 2(b) below. These buffer zones are measured horizontally from a wetland, stream, lake, or pond boundary as defined below. (1) All buffer zones shall be retained undisturbed and in their natural condition, except as permitted with a mitigation plan. (2) Buffer zones shall be measured outward from the bank full flow boundary for streams, the high water mark for ponds and lakes, the normal pool elevation for the Columbia River, and the wetland delineation boundary for wetlands on a horizontal scale that is perpendicular to the wetlands, stream, pond or lake boundary. On the main stem of the Columbia River above Bonneville Dam, buffer zones shall be measured landward from the normal pool elevation of the Columbia River. The following buffer zone widths shall be required: (a) A minimum 200 foot buffer on each wetland, pond, lake, and each bank of a perennial or fish bearing stream, some of which can be intermittent. (b) A 50-foot buffer zone along each bank of intermittent (including ephemeral), non-fish bearing streams.	☒ Project as described meets guideline. ☐ Project requires the following condition to meet this guideline Appendix O describes the proximity of the proposed activities to water resource buffers. Buffers will be entered to treat invasive plants and a Practicable Alternative Test and Mitigation Plan have been prepared. The Project Design Criteria (PDC) of Section 2.2 and Standards in Appendix A mitigate impacts to water resources.
3) The buffer width shall be increased for the following: (a) When the channel migration zone exceeds the recommended buffer width, the buffer width shall extend to the outer edge of the channel migration zone. (b) When the frequently flooded area exceeds the recommended riparian buffer zone width, the buffer width shall be extended to the outer edge of the frequently flooded area. (c) When an erosion or landslide hazard area exceeds the recommended width of the buffer, the buffer width shall be extended to include the hazard area.	☒ Project as described meets guideline. ☐ Project requires the following condition to meet this guideline

(4) Buffer zones can be reconfigured if a project applicant demonstrates all of the following: (1) the integrity and function of the buffer zones is maintained, (2) the total buffer area on the development proposal is not decreased, (3) the width reduction shall not occur within another buffer, and (4) the buffer zone width is not reduced more than 50% at any particular location. Such features as intervening topography, vegetation, man made features, natural plant or wildlife habitat boundaries, and flood plain characteristics could be considered.	☒ Project as described meets guideline. The project applicant does not request a buffer reconfiguration. ☐ Project requires the following condition to meet this guideline
B. When a buffer zone is disturbed by a new use, it shall be replanted with only native plant species of the Columbia River Gorge.	☒ Project as described meets guideline. See PDC I.2. ☐ Project requires the following condition to meet this guideline
C. The applicant shall be responsible for identifying all water resources and their appropriate buffers (see above).	☒ Project as described meets guideline. ☐ Project requires the following condition to meet this guideline
D. Wetlands Boundaries shall be delineated using the following: (1) The approximate location and extent of wetlands in the Scenic Area is shown on the National Wetlands Inventory (U. S. Department of the Interior, 1987). In addition, the list of hydric soils and the soil survey maps shall be used as an indicator of wetlands. (2) Some wetlands may not be shown on the wetlands inventory or soil survey maps. Wetlands that are discovered by the local planning staff during an inspection of a potential project site shall be delineated and protected. (3) The project applicant shall be responsible for determining the exact location of a wetlands boundary. Wetlands boundaries shall be delineated using the procedures specified in the '1987 Corps of Engineers Wetland Delineation Manual (on-line Edition)'. (4) All wetlands delineations shall be conducted by a professional who has been trained to use the federal delineation procedures, such as a soil scientist, botanist, or wetlands ecologist.	☒ Project as described meets guideline. Sandy River Delta wetlands have been delineated. ☐ Project requires the following condition to meet this guideline
E. Stream, pond, and lake boundaries shall be delineated using the bank full flow boundary for streams and the high water mark for ponds and lakes. The project applicant shall be responsible for determining the exact location of the appropriate boundary for the water resource.	☒ Project as described meets guideline. ☐ Project requires the following condition to meet this guideline
G. Buffer zones shall be undisturbed unless the following criteria have been satisfied: (1) The proposed use must have no practicable alternative as determined by the practicable alternative test. Those portions of a proposed use that have a practicable alternative will not be located in wetlands, stream, pond, lake, and riparian areas and/or their buffer zone.	☒ Project as described meets guideline. A practicable alternative test has been completed. ☐ Project requires the following condition to meet this guideline

(3) Unavoidable impacts to wetlands and aquatic and riparian areas and their buffer zones shall be offset by deliberate restoration and enhancement or creation (wetlands only) measures as required by the completion of a mitigation plan.	☒ Project as described meets guideline. A mitigation plan has been completed. ☐ Project requires the following condition to meet this guideline
Wildlife and Plants A. Protection of sensitive wildlife/plant areas and sites shall begin when proposed new developments or uses are within 1000 ft of a sensitive wildlife/plant site and/or area. Sensitive Wildlife Areas are those areas depicted in the wildlife inventory and listed in Tables 4 and 7, including all Priority Habitats listed in this Chapter. The approximate locations of sensitive wildlife and/or plant areas and sites are shown in the wildlife and rare plant inventory.	☒ Project as described meets guideline. ☐ Project requires the following condition to meet this guideline Table C-1 and Appendix O describe the proximity of proposed activities to sensitive wildlife/plant areas and sites. Buffers will be entered to treat invasive plants. A Practicable Alternative Test and Mitigation Plan have been prepared. The PDC of Section 2.2 and Standards in Appendix A mitigate impacts to sensitive wildlife/plant areas and sites.
C. The USDA Forest Service wildlife biologists and/or botanists, in consultation with the appropriate state biologists, shall review the site plan and their field survey records. They shall: (1) Identify/verify the precise location of the wildlife and/or plant area or site, (2) Determine if a field survey will be required, (3) Determine, based on the biology and habitat requirements of the affected wildlife/plant species, if the proposed use would compromise the integrity and function of or adverse affects (including cumulative effects) to the wildlife or plant area or site. This would include considering the time of year when wildlife or plant species are sensitive to disturbance, such as nesting, rearing seasons, or flowering season, and	☒ Project as described meets guideline. See Sections 3.6, 3.10, 3.11 ☐ Project requires the following condition to meet this guideline
(4) Delineate the undisturbed 200 ft buffer on the site plan for sensitive plants and/or the appropriate buffer for sensitive wildlife areas or sites, including nesting, roosting and perching sites.	☒ Project as described meets guideline. See Sections 3.6, 3.10,3.11. ☐ Project requires the following condition to meet this guideline
D. The local government, in consultation with the State and federal wildlife biologists and/or botanists, shall use the following criteria in reviewing and evaluating the site plan to ensure that the proposed developments or uses do not compromise the integrity and function of or result in adverse affects to the wildlife or plant area or site: (1) Published guidelines regarding the protection and management of the affected wildlife/plant species. Examples include: the Oregon Department of Forestry has prepared technical papers that include management guidelines for osprey and great blue heron; the Washington Department of Wildlife has prepared similar guidelines for a variety of species, including the western pond turtle, the peregrine falcon, and the Larch Mountain salamander (Rodrick and Milner 1991).	☒ Project as described meets guideline. See Sections 3.6, 3.10,3.11. ☐ Project requires the following condition to meet this guideline

(2) Physical characteristics of the subject parcel and vicinity, including topography and vegetation. (3) Historic, current, and proposed uses in the vicinity of the sensitive wildlife/plant area or site. (4) Existing condition of the wildlife/plant area or site and the surrounding habitat and the useful life of the area or site. (5) In areas of winter range, habitat components, such as forage, and thermal cover, important to the viability of the wildlife must be maintained or, if impacts are to occur, enhancement must mitigate the impacts so as to maintain overall values and function of winter range. (6) The site plan is consistent with the "Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources" (Oregon Department of Fish and Wildlife 2000) and the Washington guidelines when they become finalized. (7) The site plan activities coincide with periods when fish and wildlife are least sensitive to disturbance. These would include, among others, nesting and brooding periods (from nest building to fledgling of young) and those periods specified. (8) The site plan illustrates that new developments and uses, including bridges, culverts, and utility corridors, shall not interfere with fish and wildlife passage. (9) Maintain, protect, and enhance the integrity and function of Priority Habitats (such as old growth forests, talus slopes, and oak woodlands) as listed on the following Priority Habitats Table. This includes maintaining structural, species, and age diversity, maintaining connectivity within and between plant communities, and ensuring that cumulative impacts are considered in documenting integrity and function.	
E. The wildlife/plant protection process may terminate if the local government, in consultation with the USDA Forest Service and state wildlife agency or Heritage program, determines (1) the sensitive wildlife area or site is not active, or (2) the proposed use is not within the buffer zones and would not compromise the integrity of the wildlife/plant area or site, and (3) the proposed use is within the buffer and could be easily moved out of the buffer by simply modifying the project proposal (site plan modifications). If the project applicant accepts these recommendations, the local government shall incorporate them into its development review order and the wildlife/plant protection process may conclude. F. If the above measures fail to eliminate the adverse affects, the proposed project shall be prohibited, unless the project applicant can meet the Practicable Alternative Test and prepare a mitigation plan to offset the adverse effects by deliberate restoration and enhancement.	☒ Project as described meets guideline. See Sections 3.6, 3.10, 3.11. ☐ Project requires the following condition to meet this guideline Buffers will be entered to treat invasive plants and a Practicable Alternative Test and Mitigation Plan have been prepared. The PDC of Section 2.2 and Standards in Appendix A mitigate impacts to sensitive wildlife/plant areas and sites.

Soil Productivity A. Soil productivity shall be protected using the following guidelines: (1) A description or illustration showing the mitigation measures to control soil erosion and stream sedimentation.	☒ Project as described meets guideline. See PDC G.5. ☐ Project requires the following condition to meet this guideline
(2) New developments and land uses shall control all soil movement within the area shown on the site plan.	☒ Project as described meets guideline. See PDC G.5. ☐ Project requires the following condition to meet this guideline
(3) The soil area disturbed by new development or land uses, except for new cultivation, shall not exceed 15 percent of the project area.	☒ Project as described meets guideline. PDC G.5., Section 3.8 ☐ Project requires the following condition to meet this guideline
(4) Within 1 year of project completion, 80 percent of the project area with surface disturbance shall be established with effective native ground cover species or other soil-stabilizing methods to prevent soil erosion until the area has 80 percent vegetative cover.	☒ Project as described meets guideline. PDC G.5., I.1., I.2., Section 3.8 ☐ Project requires the following condition to meet this guideline
GMA Natural Resource Policies - Applicable	**Findings**
Streams, Ponds, Lakes, and Riparian Areas *Approval Criteria for Other Review Uses in Aquatic and Riparian Areas* 1. The uses identified in guideline 2 under "Review Uses," above, may be allowed only if they meet all of the following criteria: A. The proposed use is water-dependent, or is not water-dependent but has no practicable alternative. A local government may conclude that a practicable alternative to the proposed use does not exist if the "Practicable Alternative Test" in the "Wetlands" section of this chapter is satisfied, substituting the term "stream, pond, lake, or riparian area" as appropriate. B. The proposed use is in the public interest. In determining if a proposed use is in the public interest, the guidelines under "Public Interest Test" in the "Wetlands" section of this chapter shall be considered, substituting the term "stream, pond, lake, or riparian area" as appropriate. C. Measures have been applied to ensure that the proposed use results in minimum feasible impacts to water quality, natural drainage, and fish and wildlife habitat of the affected stream, pond, lake, and/or buffer zone. As a starting point, the following mitigation measures shall be considered when new uses are proposed in streams, ponds, lakes, and buffer zones:	☒ Project as described meets guideline. ☐ Project requires the following condition to meet this guideline Table C-1 and Appendix 0 describes the proximity of the proposed activities to water resource buffers. Buffers will be entered to treat invasive plants and a Practicable Alternative Test and Mitigation Plan have been prepared. The PDC of Section 2.2 and Standards in Appendix A mitigate impacts to water resources.

(1) Construction shall occur during periods when fish and wildlife are least sensitive to disturbance. In Oregon, work in streams, ponds, and lakes shall be conducted during the periods specified in *Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources* (Oregon Department of Fish and Wildlife 2000), unless otherwise coordinated with and approved by the Oregon Department of Fish and Wildlife. In Washington, the Washington Department of Fish and Wildlife shall evaluate specific proposals and specify periods for in - water work. (2) All natural vegetation shall be retained to the greatest extent practicable, including aquatic and riparian vegetation. (3) Nonstructural controls and natural processes shall be used to the greatest extent practicable. (6) Temporary and permanent control measures shall be applied to minimize erosion and sedimentation when riparian areas are disturbed, including slope netting, berms and ditches, tree protection, sediment barriers, infiltration systems, and culverts. D. Groundwater and surface water quality will not be degraded by the proposed use. E. Those portions of a proposed use that are not water-dependent or that have a practicable alternative will be located outside of stream, pond, and lake buffer zones. F. The proposed use complies with all applicable federal, state, and local laws. G. Unavoidable impacts to aquatic and riparian areas will be offset through rehabilitation and enhancement.	
Stream, Pond, and Lake Buffer Zones 1. Buffer zones shall generally be measured landward from the ordinary high watermark on a horizontal scale that is perpendicular to the ordinary high watermark. On the main stem of the Columbia River above Bonneville Dam, buffer zones shall be measured landward from the normal pool elevation of the Columbia River. The following buffer zone widths shall be required: A. Streams used by anadromous or resident fish (tributary fish habitat), special streams, intermittent streams that include year-round pools, and perennial streams: 100 feet. B. Intermittent streams, provided they are not used by anadromous or resident fish: 50 feet.	☒ Project as described meets guideline. Buffers will be entered to treat invasive plants. ☐ Project requires the following condition to meet this guideline

C. Ponds and lakes: Buffer zone widths shall be based on the dominant vegetative community and shall use the same guidelines as in the "Wetlands Buffer Zones" section of this chapter, substituting the term "pond or lake" as appropriate. 2. Except as otherwise allowed, buffer zones shall be retained in their natural condition. When a buffer zone is disturbed by a new use, it shall be replanted with native plant species.	☒ Project as described meets guideline. See PDC I.2. ☐ Project requires the following condition to meet this guideline
Wildlife Habitat *Approval Criteria for Review Uses Near Sensitive Wildlife Areas and Sites* 1. Uses that are proposed within 1,000 feet of a sensitive wildlife area or site shall be reviewed by the Oregon Department of Fish and Wildlife or the Washington Department of Fish and Wildlife. The approximate locations of sensitive wildlife areas and sites are shown in the wildlife inventory. State wildlife biologists will help determine if a new use would adversely affect a sensitive wildlife area or site. 2. The local government shall submit site plans to the Oregon Department of Fish and Wildlife or Washington Department of Fish and Wildlife. State wildlife biologists shall review the site plan and their field survey records. They shall (1) identify/verify the precise location of the wildlife area or site, (2) ascertain whether the wildlife area or site is active or abandoned, and (3) determine if the proposed use may compromise the integrity of the wildlife area or site or occur during the time of year when wildlife species are sensitive to disturbance, such as nesting or rearing seasons. In some instances, state wildlife biologists may conduct field surveys to verify the wildlife inventory and assess the potential effects of a proposed use. 3. The following factors may be considered when site plans are reviewed: A. Biology of the affected wildlife species. B. Published guidelines regarding the protection and management of the affected wildlife species. The Oregon Department of Forestry has prepared technical papers that include management guidelines for osprey and great blue heron. The Washington Department of Fish and Wildlife has prepared similar guidelines for a variety of species, including the western pond turtle, the peregrine falcon, and the Larch Mountain salamander (Rodrick and Milner 1991). C. Physical characteristics of the subject parcel and vicinity, including topography and vegetation. D. Historic, current, and proposed uses in the vicinity of the sensitive wildlife area or site.	☒ Project as described meets guideline. Treatments are proposed within 1,000' of sensitive wildlife areas and sites. See Sections 3.10 and 3.11 for a complete description. The USDA Forest Service conducted analysis rather than Oregon Department of Fish and Wildlife. ☐ Project requires the following condition to meet this guideline

E. Existing condition of the wildlife area or site and the surrounding habitat and the useful life of the area or site. 4. The wildlife protection process may terminate if the local government, in consultation with the state wildlife agency, determines (1) the sensitive wildlife area or site is not active, or (2) the proposed use would not compromise the integrity of the wildlife area or site or occur during the time of year when wildlife species are sensitive to disturbance. 5. If the local government, in consultation with the state wildlife agency, determines that the proposed use would have only minor effects on the wildlife area or site that could be eliminated through mitigation measures recommended by the state wildlife biologist, or by simply modifying the site plan or regulating the timing of new uses, a letter shall be sent to the project applicant that describes the effects and measures needed to eliminate them. If the project applicant accepts these recommendations, the local government shall incorporate them into its development review order and the wildlife protection process may conclude. 6. The project applicant shall prepare a wildlife management plan if the local government, in consultation with the state wildlife agency, determines that the proposed use would adversely affect a sensitive wildlife area or site and the effects of the proposed use cannot be eliminated through site plan modifications or project timing.	
Wildlife Management Plans 1. Wildlife management plans shall be prepared when a proposed use is likely to adversely affect a sensitive wildlife area or site. Their primary purpose is to document the special characteristics of a project site and the habitat requirements of affected wildlife species. This information provides a basis for the project applicant to redesign the proposed use in a manner that protects sensitive wildlife areas and sites, maximizes his/her development options, and mitigates temporary impacts to the wildlife area or site and/or buffer zone.	☒ Project as described meets guideline. Per Sections 3.10.2.3 and 3.10.2.4, effects to aquatic organisms of non-herbicide treatments would be minimal. Per Sections 3.11.3 and Appendix X, effects to sensitive wildlife areas or sites of non-herbicide treatments are minimal. Therefore no wildlife management plan is necessary. ☐ Project requires the following condition to meet this guideline
Rare Plants *Approval Criteria for Review Uses Near Sensitive Plants* 1. Uses that are proposed within 1,000 feet of a sensitive plant shall be reviewed by the Oregon or Washington Natural Heritage Program. The approximate locations of sensitive plants are shown in the rare plant species inventory. State heritage staffs will help determine if a new use would invade	☒ Project as described meets guideline. Treatments are proposed within 1,000’ of a sensitive plant. See Sections 3.6 for a complete description. The USDA Forest Service conducted analysis rather than Oregon Department of Fish and Wildlife. ☐ Project requires the following condition to meet this guideline

the buffer zone of sensitive plants. 2. The local government shall submit site plans to the state heritage program. The state heritage staffs will review the site plan and their field survey records. They will identify the precise location of the affected plants and delineate a 200-foot buffer zone on the project applicant's site plan. If the field survey records of the state heritage program are inadequate, the project applicant shall hire a person with recognized expertise in botany or plant ecology to ascertain the precise location of the affected plants. 3. The rare plant protection process may conclude if the local government, in consultation with the state heritage program, determines that the proposed use would be located outside of a sensitive plant buffer zone. 4. New uses shall be prohibited within sensitive plant species buffer zones, except for those uses that are allowed outright. 5. If a proposed use must be allowed within a sensitive plant buffer zone in accordance with the provisions in "Variances for Setbacks and Buffers" in Part II, Chapter 7, the project applicant shall prepare a protection and rehabilitation plan that complies with the guidelines in "Protection and Rehabilitation Plans" in this section. 6. The local government shall submit a copy of all field surveys and protection and rehabilitation plans to the Oregon or Washington Natural Heritage Program. The state heritage program will have 20 days from the date that a field survey is mailed to submit written comments to the local government. The local government shall record and address any written comments submitted by the state heritage program in its development review order. Based on the comments from the state heritage program, the local government will make a final decision on whether the proposed use would be consistent with the rare plant policies and guidelines. If the final decision contradicts the comments submitted by the state heritage program, the local government shall justify how it reached an opposing conclusion. 7. The local government shall submit all requests to reduce sensitive plant species buffer zones to the Oregon or Washington Natural Heritage Program. The state heritage program will have 20 days from the date that such a request is mailed to submit written comments to the local government. The local government shall record and address any written comments submitted by the state heritage program in its development review order. Based on the comments from the state heritage program, the local government will make a final decision on whether the reduced buffer zone is justified. If the final decision contradicts the	

comments submitted by the state heritage program, the local government shall justify how it reached an opposing conclusion.	
Sensitive Plant Buffer Zones 1. A 200-foot buffer zone shall be maintained around sensitive plants. Buffer zones shall remain in an undisturbed, natural condition. 2. Buffer zones may be reduced if a project applicant demonstrates that intervening topography, vegetation, manmade features, or natural plant habitat boundaries negate the need for a 200-foot radius. Under no circumstances shall the buffer zone be less than 25 feet. 3. Requests to reduce buffer zones shall be considered if a professional botanist or plant ecologist hired by the project applicant (1) identifies the precise location of the sensitive plants, (2) describes the biology of the sensitive plants, and (3) demonstrates that the proposed use will not have any negative effects, either direct or indirect, on the affected plants and the surrounding habitat that is vital to their long-term survival. All requests shall be prepared as a written report. Published literature regarding the biology of the affected plants and recommendations regarding their protection and management shall be cited. The report shall include detailed maps and photographs.	☒ Project as described meets guideline. Buffers will be entered to treat invasive plants. ☐ Project requires the following condition to meet this guideline
Protection and Rehabilitation Plans 1. Protection and rehabilitation plans shall minimize and offset unavoidable impacts that result from a new use that occurs within a sensitive plant buffer zone as the result of a variance. All plans shall meet the following guidelines: A. Protection and rehabilitation plans shall be prepared by a professional botanist or plant ecologist hired by the project applicant. B. Construction, protection, and rehabilitation activities shall occur during the time of year when ground disturbance will be minimized and protection, rehabilitation, and replacement efforts will be maximized. C. Sensitive plants that will be destroyed shall be transplanted or replaced, to the maximum extent practicable. Replacement is used here to mean the establishment of a particular plant species in areas of suitable habitat not affected by new uses. Replacement may be accomplished by seeds, cuttings, or other appropriate methods. Replacement shall occur as close to the original plant site as practicable. The project applicant shall ensure that at least 75 percent of the replacement plants survive 3 years after the date	☒ Project as described meets guideline. The PDC of Section 2.2 and Standards in Appendix A minimize and offset unavoidable impacts and fulfill the requirements of a GMA Rare Plant Protection and Rehabilitation Plan. ☐ Project requires the following condition to meet this guideline

they are planted. D. Sensitive plants and their surrounding habitat that will not be altered or destroyed shall be protected and maintained. Appropriate protection and maintenance techniques shall be applied, such as fencing, conservation buffers, livestock management, and noxious weed control. E. Habitat of a sensitive plant that will be affected by temporary uses shall be rehabilitated to a natural condition. F. Protection efforts shall be implemented before construction activities begin. Rehabilitation efforts shall be implemented immediately after the plants and their surrounding habitat are disturbed. 2. Protection and rehabilitation plans shall include maps, photographs, and text. The text shall: A. Describe the biology of sensitive plant species that will be affected by a proposed use. B. Explain the techniques that will be used to protect sensitive plants and their surrounding habitat that will not be altered or destroyed. C. Describe the rehabilitation and enhancement actions that will minimize and offset the impacts that will result from a proposed use. D. Include a 3-year monitoring, maintenance, and replacement program. The project applicant shall prepare and submit to the local government an annual report that documents milestones, successes, problems, and contingency actions.	

Recreation Resources Portland Women's Forum is located about 350' east of a treatment site in Area 22-17. Herman Creek Campground is location in Area 22-05. The Twin Tunnels Trail of the HRCH is adjacent to Area 22-08. Sandy River Delta (22-01), Memaloose/Rowena (22-11) and Chenoweth Table (22-12) have user developed trails. No recreation sites are located in the GMA; GMA guidelines do not apply.	
SMA Recreation Resource Guidelines - Applicable	**Findings**
1. New developments and land uses shall not displace existing recreational use.	☒ Project as described meets guideline (See Section 2.2 PDC D.1., D.2., D.3., D.4., D.5., D.6., and Standards #21, 23 Appendix A) ☐ Project requires the following condition to meet this guideline
2. Recreation resources shall be protected from adverse effects by evaluating new developments and land uses as proposed in the site plan. An analysis of both onsite and offsite cumulative effects shall be required	☒ Project as described meets guideline (See Section 2.2 PDC D.1., D.2., D.3., D.4., D.5., D.6., and Standards #21, 23 Appendix A) ☐ Project requires the following condition to meet this guideline
4. Mitigation measures shall be provided to preclude adverse effects on the recreation resource.	☒ Project as described meets guideline (See Section 2.2 PDC D.1., D.2., D.3., D.4., D.5., D.6., and Standards #21, 23 Appendix A) ☐ Project requires the following condition to meet this guideline

Invasive Plant Treatment within Sensitive Buffer Zones “Practicable” Alternative Test and Mitigation Plan

“Practicable” Alternative Test

As per the Management Plan Guidelines, this test is met because the proposed actions require, in instances where invasive plants are located within buffer zones, that the proposed treatments occur within the buffer zones in order to treat the invasive plants. It would not be possible to treat these invasive plants effectively or safely (especially, in terms of reducing adverse impacts to non-target flora) without entering the buffer zones. Thus, there is no other practicable alternative than to enter the buffer zones to achieve the proposed objectives of the site specific EIS for the Forest and Scenic Area.

This project has no “practicable” alternative and thereby meets this test to enter the buffer zones.

Mitigation Plan

The use of “NEPA” here refers to the Site-Specific Invasive Plant Treatments EIS completed for the Forest and Scenic Area.

1. Mitigation Plan shall be prepared when:

    A. The proposed development or use is within a buffer zone (wetland, pond, lakes, riparian areas, wildlife or plant areas and/or sites).

    B. There is no practicable alternative (see the “practicable alternative” test).

    See Practicable Alternatives Test above.

2. In all cases, Mitigation Plans are the responsibility of the applicant and shall be prepared by an appropriate professional (botanist/ecologist for plant sites, a wildlife/fish biologist for wildlife/fish sites, and a qualified professional for water resource sites).

    Prepared by USDA Forest Service Ecologist

3. The primary purpose of this information is to provide a basis for the project applicant to redesign the proposed use in a manner that protects sensitive water resources, and wildlife/plant areas and sites, that maximizes his/her development options, and that mitigates, through restoration, enhancement, and replacement measures, impacts to the water resources and/or wildlife/plant area or site and/or buffer zones.

    See discussion below.

4. The applicant shall submit the mitigation plan to the local government. The local government shall submit a copy of the mitigation plan to the Forest Service, and appropriate state agencies. If the final decision contradicts the comments submitted by the state and federal wildlife agency/heritage program, the local government shall justify how it reached an opposing conclusion.

   Not applicable to this project.

5. A project applicant shall demonstrate sufficient fiscal, technical, and administrative competence to successfully execute a mitigation plan involving wetland creation.

   Not applicable to this project.

6. Mitigation plans shall include maps, photographs, and text. The text shall:

   A. Describe the biology and/or function of the sensitive resources (e.g. Wildlife/plant species, or wetland) that will be affected by a proposed use. An ecological assessment of the sensitive resource to be altered or destroyed and the condition of the resource that will result after restoration will be required. Reference published protection and management guidelines.

      See Invasive Plant NEPA

   B. Describe the physical characteristics of the subject parcel, past, present, and future uses, and the past, present, and future potential impacts to the sensitive resources. Include the size, scope, configuration, or density of new uses being proposed within the buffer zone.

      See Invasive Plant NEPA

   C. Explain the techniques that will be used to protect the sensitive resources and their surrounding habitat that will not be altered or destroyed (for examples, delineation of core habitat of the sensitive wildlife/plant species and key components that are essential to maintain the long-term use and integrity of the wildlife/plant area or site).

      See Invasive Plant NEPA, and mitigation measures of 6(D) below.

D. Show how restoration, enhancement, and replacement (creation) measures will be applied to ensure that the proposed use results in minimum feasible impacts to sensitive resources, their buffer zones, and associated habitats.

The Invasive Plant NEPA has a large number of Project Design Criteria (PDC) which provide and ensure that sensitive resources shall be impacted to the minimum extent possible. A few examples are given below, but for a complete list the NEPA document should be referenced.

1. ***Comply with herbicide application buffers on "live" streams, intermittent steams, and lakes, ponds or wetlands in the NEPA document.***

2. ***Where an invasive plant species is to be treated within 5-feet of a sensitive plant species, the invasive plant should be either manually treated or the sensitive plant should be covered with a barrier.***

3. ***Restoration would be considered for any site within the treatment area with soil disturbance or vegetative density low enough to allow re-infestation or introduction of other invasive plants…***

The above measures and those in the NEPA document will be followed and with the successful implementation of these measures, the disturbance to the buffer would be adequately mitigated.

E. Show how the proposed restoration, enhancement, or replacement (creation) mitigation measures are NOT alternatives to avoidance. A proposed development/use must first avoid a sensitive resource, and only if this is not possible should restoration, enhancement, or creation be considered as mitigation. In reviewing mitigation plans, the local government, appropriate state agencies, and Forest Service shall critically examine all proposals to ensure that they are indeed last resort options.

See Invasive Plant NEPA and 6(D) above.

7. At a minimum, a project applicant shall provide to the local government a progress report every 3-years that documents milestones, successes, problems, and contingency actions. Photographic monitoring stations shall be established and photographs shall be used to monitor all mitigation progress.

See Monitoring within the NEPA document.

8. A final monitoring report shall be submitted to the local government for review upon completion of the restoration, enhancement, or replacement activity. This monitoring report shall document successes, problems encountered, resource recovery, status of any sensitive wildlife/plant species and shall demonstrate the success of restoration and/or enhancement actions. The local government shall submit copies of the monitoring report to the Forest Service; who shall offer technical assistance to the local government in helping to evaluate the completion of the mitigation plan. In instances where restoration and enhancement efforts have failed, the monitoring process shall be extended until the applicant satisfies the restoration and enhancement guidelines.

   See Monitoring in the NEPA Document.

9. Mitigation measures to offset impacts to resources and/or buffers shall result in no net loss of water quality, natural drainage, fish/wildlife/plant habitat, and water resources by addressing the following:

   A. Restoration and enhancement efforts shall be completed no later than one year after the sensitive resource or buffer zone has been altered or destroyed, or as soon thereafter as is practicable.

      See above mitigation measures 6(D) and other PDC in the NEPA Document.

   B. All natural vegetation within the buffer zone shall be retained to the greatest extent practicable. Appropriate protection and maintenance techniques shall be applied, such as fencing, conservation buffers, livestock management, and noxious weed control. Within five years, at least 75 percent of the replacement vegetation must survive. All plantings must be with native plant species that replicate the original vegetation community.

      See NEPA. There are specific PDC that relate to the restoration after Invasive Plant treatment. Follow-up restoration shall use native plants to the maximum extent possible.

   C. Habitat that will be affected by either temporary or permanent uses shall be rehabilitated to a natural condition. Habitat shall be replicated in composition, structure, and function, including tree, shrub and herbaceous species, snags, pool-riffle ratios, substrata, and structures, such as large woody debris and boulders.

      See NEPA. Treatment of invasive plants will be completed hand-in-hand with restoration to ensure habitat enhancement. The habitat will be impacted to the minimum extent possible when treatment is being considered.

D. If this standard is not feasible or practical because of technical constraints, a sensitive resource of equal or greater benefit may be substituted, provided that no net loss of sensitive resource functions occurs and provided the County, in consultation with the appropriate State and Federal agency, determine that such substitution is justified.

Not applicable to this project.

E. Sensitive plants that will be destroyed shall be transplanted or replaced, to the maximum extent practicable. Replacement is used here to mean the establishment of a particular plant species in areas of suitable habitat not affected by new uses. Replacement may be accomplished by seeds, cuttings, or other appropriate methods.

Replacement shall occur as close to the original plant site as practicable. The project applicant shall ensure that at least 75 percent of the replacement plants survive 3 years after the date they are planted.

Not applicable to this project – Treatments are designed to not impact sensitive plants to the extent that they would be destroyed.

F. Nonstructural controls and natural processes shall be used to the greatest extent practicable.

See NEPA. Within the NEPA, treatments are designed using the least intrusive methods first and only if effectiveness is not achievable, will more impacting designs be considered.

(1) Bridges, roads, pipeline and utility corridors, and other water crossings shall be minimized and should serve multiple purposes and properties.

Not applicable to this project.

(2) Stream channels shall not be placed in culverts unless absolutely necessary for property access. Bridges are preferred for water crossings to reduce disruption to hydrologic and biologic functions. Culverts shall only be permitted if there are no practicable alternatives as demonstrated by the ‘Practical Alternative Test’.

Not applicable to this project.

(3) Fish passage shall be protected from obstruction.

Not applicable to this project.

(4) Restoration of fish passage should occur wherever possible.

Not applicable to this project.

.(5) Show location and nature of temporary and permanent control measures that shall be applied to minimize erosion and sedimentation when riparian areas are disturbed, including slope netting, berms and ditches, tree protection, sediment barriers, infiltration systems, and culverts.

Not applicable to this project.

(6) Groundwater and surface water quality will not be degraded by the proposed use. Natural hydrologic conditions shall be maintained, restored, or enhanced in such a manner that replicates natural conditions, including current patterns (circulation, velocity, volume, and normal water fluctuation), natural stream channel and shoreline dimensions and materials, including slope, depth, width, length, cross-sectional profile, and gradient.

See NEPA and PDC. There are specific PDC related to protecting water quality.

(7) Those portions of a proposed use that are not water-dependent or that have a practicable alternative will be located outside of stream, pond, and lake buffer zones.

Not applicable to this project.

(8) Streambank and shoreline stability shall be maintained or restored with natural revegetation.

See NEPA, PDC, and 6(D) above.

(9) The size of restored, enhanced, and replacement (creation) wetlands shall equal or exceed the following ratios. The first number specifies the required acreage of replacement wetlands, and the second number specifies the acreage of wetlands altered or destroyed.

Restoration: 2: l

Creation: 3: l

Enhancement: 4: l

Not applicable to this project.

G. Wetland creation mitigation shall be deemed complete when the wetland is self-functioning for 5 consecutive years. Self-functioning is defined by the expected function of the wetland as written in the mitigation plan. The monitoring report shall be submitted to the local government to ensure compliance. The Forest Service, in consultation with appropriate state agencies, shall extend technical assistance to the local government to help evaluate such reports and any subsequent activities associated with compliance.

Not applicable to this project.

H. Wetland restoration/enhancement can be mitigated successfully by donating appropriate funds to a non-profit wetland conservancy or land trust with explicit instructions that those funds are to be used specifically to purchase protection easements or fee title protection of appropriate wetlands acreage in or adjacent to the Columbia River Gorge meeting the ratios given above in guideline. These transactions shall be explained in detail in the Mitigation Plan and shall be fully monitored and documented in the monitoring report.

Not applicable to this project.

Additional GMA Guidelines

Key guidelines not covered by the SMA guidelines are covered below and are predominantly related to entering protected buffer zones.

Wetlands

1. No Practicable Alternative Test.

   (See SMA section)

2. Public Interest Test.

   The following factors shall be considered when determining if a proposed use is in the public interest:

   A. The extent of public need for the proposed use

      The treatment of invasive plants within the buffer zones of wetlands is decidedly within the public interest. Without treatment, the functionality of these wetlands could be compromised and those same invasive plants could become detrimental to the adjacent uplands. Invasive plant (aka noxious weed) control is widely practiced by most county governments.

   B. The extent and permanence of the beneficial or detrimental effects that the proposed use may have on the public and private uses for which the property is suited.

      Impacts from non-herbicide treatments are minimal. The long-term beneficial effects of treatment could last for years with prolonged increases in wetland function.

   C. The functions and size of the wetland that may be affected

      In this particular case, the size and function of the wetland will vary depending on the wetland to be treated.

   D. The economic value of the proposed use to the general area.

      The economic value could come in terms of enhanced recreation, increase in wetland function (flood control), or in terms of plant diversity, to mention a few. The value of these is highly variable and difficult to enumerate; but is generally given a high value by the public.

E. The ecological value of the wetland and probable effect on public health and safety, fish, plants, and wildlife.

The ecological value is extremely high for most wetlands, but generally increases with size and function of the wetland. In most cases, wetlands are becoming recognized for their very high value in maintaining viable natural resources.

In all cases where this guideline is invoked, the values associated with the wetland, stream, pond or lake clearly meet all of the above guidelines and thus meet the Public Interest Test.

3. Measures will be applied to ensure that the proposed use results in the minimum feasible alteration or destruction of the wetland's functions, existing contour, vegetation, fish, and wildlife resources, and hydrology.

The inclusion and development of the PDC and Standards in Appendix A were specifically developed to minimize all impacts to wetlands, native plants, fish, wildlife, and hydrological systems. No grading or loss of contours will occur in this project.

4. Groundwater and surface-water quality will not be degraded by the proposed use.

The inclusion and development of the PDC and Standards in Appendix A were specifically developed to protect groundwater and surface-water quality.

5. Those portions of a proposed use that are not water-dependent or that have a practicable alternative will not be located in wetlands or wetlands buffer zones.

Treatment is proposed where invasive plants occur; both within and outside of buffers.

6. The proposed use complies with all applicable federal, state, and local laws.

The invasive plant treatments are design to comply with all applicable federal laws.

7. Areas that are disturbed during construction of the proposed use will be rehabilitated to the maximum extent practicable.

Restoration with native species is required on treated areas.

8. Unavoidable impacts to wetlands will be offset through the deliberate restoration, creation, or enhancement of wetlands. Wetlands restoration, creation, and enhancement are not alternatives to the guidelines listed above; they shall be used only as a last resort to offset unavoidable wetlands impacts.

A Wetlands Compensation Plan is not necessary because effects to wetlands are minimal.

Streams, Ponds, Lakes and Riparian Areas

1. No Practicable Alternative Test.

   See "Wetlands" above.

2. Public Interest Test.

   See "Wetlands" above.

3. Measures have been applied to ensure that the proposed use results in minimum feasible impacts to water quality, natural drainage, and fish and wildlife habitat of the affected stream, pond, lake, and/or buffer zone.

   As a starting point, the following mitigation measures shall be considered when new uses are proposed in streams, ponds, lakes, and buffer zones:

   (1) Construction shall occur during periods when fish and wildlife are least sensitive to disturbance. In Oregon, work in streams, ponds, and lakes shall be conducted during the periods specified in *Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources* (Oregon Department of Fish and Wildlife 2000), unless otherwise coordinated with and approved by the Oregon Department of Fish and Wildlife. In Washington, the Washington Department of Fish and Wildlife shall evaluate specific proposals and specify periods for in water work.

   No in-water work is proposed in this project.

   (2) All natural vegetation shall be retained to the greatest extent practicable, including aquatic and riparian vegetation.

   The PDC and Standards in Appendix A require native vegetation to be retained to the greatest extent practicable.

   (3) Nonstructural controls and natural processes shall be used to the greatest extent practicable.

   No structural controls are proposed.

   (4) Bridges, roads, pipeline and utility corridors, and other water crossings shall be minimized and should serve multiple purposes and properties.

   Not applicable to this project.

(5) Stream channels shall not be placed in culverts unless absolutely necessary for property access. Bridges are preferred for water crossings to reduce disruption to streams, ponds, lakes, and their banks. When culverts are necessary, oversized culverts with open bottoms that maintain the channel's width and grade should be used.

Not applicable to this project.

(6) Temporary and permanent control measures shall be applied to minimize erosion and sedimentation when riparian areas are disturbed, including slope netting, berms and ditches, tree protection, sediment barriers, infiltration systems, and culverts.

Bare soils, which do not vegetate naturally, will be seeded with native plants.

4. Groundwater and surface water quality will not be degraded by the proposed use.

   The inclusion and development of the PDC and Standards in Appendix A were specifically developed to protect groundwater and surface-water quality.

5. Those portions of a proposed use that are not water-dependent or that have a practicable alternative will be located outside of stream, pond, and lake buffer zones.

   Treatment is proposed where invasive plants occur; both within and outside of buffers.

6. The proposed use complies with all applicable federal, state, and local laws.

   The invasive plant treatments are designed to comply with all applicable federal laws.

7. Unavoidable impacts to aquatic and riparian areas will be offset through rehabilitation and enhancement.

   A Rehabilitation and Enhancement Plan is not necessary because effects to water resources are minimal.

Wildlife Habitat

All GMA guidelines are covered under the SMA guidelines. The development and design of the PDC and Standards in Appendix A were completed to ensure that this project would not adversely affect, as defined by the Management Plan, any sensitive wildlife areas and sites. Thus a 'Wildlife Management Plan', as described in the GMA Guidelines is not required.

Rare Plants

Again the PDC and Standards in Appendix A were specifically designed to ensure that this project would not adversely affect any sensitive flora and, thus, no 'Protection and Rehabilitation Plan', as defined in the Management Plan, is required.

Natural Areas

There are no lands under USDA Forest Service control within the Scenic Area that are designated "Agricultural—Special", as defined by the Management Plan.

/s/ *Robin Dobson* 9/15/2006

Prepared by:
Robin Dobson
Ecologist, Columbia River Gorge National Scenic Area

APPENDIX D
Prevention of Invasive Plants – A Strategic and Collaborative Effort

APPENDIX D: Prevention of Invasive Plants – A Strategic and Collaborative Effort

Prevention is the cornerstone of an effective invasive species program.

The following are actions that are currently in place to prevent the invasion and/or the spread of invasive plants on the Mt. Hood National Forest and the Columbia Gorge National Scenic Area in Oregon. Many of these actions are fully in place and operational, while others are still in transition as materials and/or procedures are finalized (e.g., some information/education materials are still in the development phase). Additional prevention measures are also being "invented" as we work collaboratively with partners and interested publics. As such, prevention is a work in progress and requires continual updates and new considerations.

- Collaborate with federal, state, county, and local agencies, Tribal governments, communities, public organizations and interested publics to develop and refine strategies for prevention and treatment across multiple ownership boundaries

- In partnership with others, develop and distribute informational materials at key locations (e.g., campgrounds, picnic areas, parking lot/staging areas, trailheads, boat launches, Visitor Centers, and District Offices). Information should include "tips" for recreation users on ways to minimize the risk of introducing or spreading invasive plants, and a contact name or agency.

- Train key Forest Service personnel how to recognize species of concern and how to take measures to reduce the risk of weed establishment and spread on national forest lands

- Conduct a risk assessment for invasive plants in NEPA planning as well as routine maintenance activities, documenting occurrence where it exists and incorporating appropriate prevention and/or treatment measures for the activity proposed

- Require appropriate contracts and permits to specify the cleaning of 'off-road' equipment prior to the arrival at a job site, and/or before leaving a weed infested area to reduce the risk of carrying and spreading weeds and seeds of invasive plants (e.g., timber sales, road decommissioning or maintenance, natural resource restoration activities, etc.)

- Where feasible and available, utilize weed-free plant materials (such as weed-free straw, etc.) for re-vegetation activities, erosion control, and/or wildlife forage enhancement. Communicate with state and county agencies and plant growers regarding availability of weed-free plant material sources

- Ensure that areas of soil disturbance re-vegetate promptly to minimize the risk of invasion of undesirable plants

- Inspect stockpiled gravel or rock, and on-Forest rock quarries and borrow pits for invasive plants, and if species of concern are present, treat area before material from the area is used on the Forest

- In range administration annual operating plans, specify appropriate actions and practices to minimize the invasion and/or spread of invasive plants

One example of information distributed:

INVASIVE NONNATIVE PLANTS ARE A SERIOUS THREAT TO HEALTHY FOREST ECOSYSTEMS

SIMPLE THINGS YOU CAN DO TO HELP
STOP THE SPREAD OF INVASIVE NONNATIVE PLANTS (WEEDS)

1. LEARN TO IDENTIFY WEEDS. One Source: http://egov.oregon.gov/ODA/PLANT/weed_weedlistcommon.shtml

2. CONTROL WEEDS WHERE YOU LIVE.

3. IF YOU'VE BEEN WALKING IN AN AREA WITH WEEDS, CHECK YOUR SOCKS, SHOES, AND PANTS FOR SEEDS AND DISPOSE OF THEM IN THE GARBAGE BEFORE LEAVING THE SITE AND BEFORE ENTERING THE NATIONAL FOREST.

4. KEEP VEHICLES AND EQUIPMENT OUT OF WEED PATCHES.

5. IF YOU DID DRIVE THROUGH WEEDS, WASH YOUR VEHICLE'S UNDERCARRIAGE, RADIATOR, TIRES, AND WHEELS, BEFORE ENTERING THE NATIONAL FOREST.

6. KEEP YOUR PETS AND PACK ANIMALS OUT OF WEED PATCHES.

7. FEED PACK ANIMALS PROCESSED FOOD PELLETS BEFORE AND DURING BACKCOUNTRY TRIPS.

8. CLEAN YOUR BOAT, MOTOR, TRAILER, TACKLE, AND GEAR BEFORE LEAVING A LAKE OR RIVER INFESTED WITH AQUATIC WEEDS.

9. BE AN INFORMED GARDENER AND DON'T BUY PLANTS THAT MAY MOVE OFF YOUR PROPERTY.

APPENDIX E
Pesticide – Use Proposal (FW-2100-2)

APPENDIX E: Pesticide – Use Proposal Form (FS-2100-2)

<table>
<tr><td rowspan="4">PESTICIDE - USE PROPOSAL

(Reference FSM 2150)</td><td>DEPARTMENT/ AGENCY</td><td colspan="2">CONTACT/PHONE NO.</td></tr>
<tr><td></td><td colspan="2"></td></tr>
<tr><td>REGION</td><td>FOREST</td><td>DATE SUBMITTED</td></tr>
<tr><td></td><td></td><td></td></tr>
</table>

1) OBJECTIVE a) Project No. b) Specific Target Pest c) Purpose	____________ ____________ ____________
2) PESTICIDE a) Common Name b) Formulation c) % AI,AE,or lb / Gal. d) Registration No.	____________ ____________ ____________ ____________
3) a) Form Applied b) Use Strength (%) or Dilution Rate c) Diluent	____________ ____________ ____________
4) lbs. AI Per Acre or Other Rate	____________
5) APPLICATION a) Method b) Equipment	____________ ____________
6) a) Acres or Other Unit to be Treated b) Number of Applications c) Number of Sites d) Specific Description of Sites	____________ ____________ ____________ ____________
7) a) Month(s) of Year b) States	____________ ____________
8) SENSITIVE AREAS a) Areas to be Avoided b) Areas to be Treated with Caution	____________ ____________

9) REMARKS a) Precautions to be Taken b) Use of Trained / Certified Personnel c) State and Local Coordination d) Other Pesticides Being Applied to Same Site e) Monitoring f) Other	____________ ____________ ____________ ____________ ____________ ____________

Approval (Signatures of Approving Official)	Date (mm/dd/yy):

Instructions for Completing Form FS-2100-2, Pesticide Use Proposal

HEADING - Provide requested information.

OBJECTIVE (Block 1)
a) Project Number - Assign in accordance with field IPMWG procedures.
b) Specific Target Pest - Identify the target pest by common and scientific name. Identify life cycle stage for animals or stage of growth for plants (e.g. emergent or pre-emergent, seedling, sapling, etc.)
c. Purpose - State exact purpose of pesticide use.

PESTICIDE (Block 2)
a) Common name of active ingredient(s) as indicated on the pesticide label. When a combination of pesticides are to used on a single pest, use the word "AND" in listing the pesticide names. When alternate materials are proposed, use the word "OR" in listing the names.
b) Indicate product formulation (i.e., amine, ester, emulsifiable concentrate, granules, solution, etc.).
c) Percentage active ingredient, acid equivalent, or pounds per gallon (as indicated on the pesticide label).
d) List the EPA registration number from the pesticide label.

PESTICIDE - continued (Block 3)
a) Form Applied - e.g., dust, granule, emulsion, bait, solution, gas, etc.
b) Use strength or Dilution Rate - List the quantity of concentrate mixed with the quantity of diluent or indicate the percentage strength of the formulation.
c) Diluent - Identify the pesticide carrier, i.e., water, oil, talc, kerosene, etc.

PESTICIDE - continued - (Block 4)
Pounds of Active Ingredient Per Acre or Other Rate - State pounds of active ingredient per acre to be applied, unless some other unit is indicated. If reporting in acreage is not appropriate, indicate units used. Indoor applications of residual sprays may be expressed as percent of actual ingredient in the prepared spray in gallons per M (1,000) square feet. Point of runoff, which may appear on a label is generally considered to be 1 gallon per 1,ooo square feet on most indoor surfaces. If dusts are used instead of sprays, express as ounces or pounds of prepared dust per M (1,000) square feet. Treatment of trees is listed by number of trees or is application is by hydraulic sprayer, is expressed as pounds or quarts of concentrate per 100 gallons of diluent - oil or water, whichever is used. If the pesticide for trees or brush is applied by air or mist blower, express as pounds of active ingredient per acre. Fumigants or inside aerosols are expressed as pounds of the fumigant or aerosol per M (1,000) cubic feet. Rodent baits should be listed as ounces or pounds of the prepared bait per bait station. Treatments in water may be expressed in parts per million (ppm) by weight or volume - specify. In spot applications, the rate of application is expressed in pounds or gallons per 1,000 square feet indoors or pounds per acre of active ingredient outdoors applied to the spot area treated.

APPLICATION - (Block 5)
Indicate as specifically as possible the method (i.e., aerial, ground, etc.) of application and the type of equipment such as helicopter, hand compression sprayer, mist-dust blower, hydraulic sprayer, injector, etc.

APPLICATION - (Block 6)
a) Acres or Other Unit to be Treated. State in terms of acres, unless otherwise indicated. Some projects may require repeat applications. Report only the units to be treated for the first application.
b) Number of Applications - For projects that require repeat applications to the same area, indicate their estimated number and their timing.
c) Number of Sites - If the reported figures are a consolidation from several locations, indicate the number of locations.
d) Specific Descriptions of Sites - Indicate the type of area and pertinent portion of the area to be treated; such as ditchbank, rangeland, powerline right-of-way, tree nursery, etc. Specify if pesticide is to be applied in or around water and whether it will be applied directly to water or to the shore. Where applicable, indicate the slope of the treated area. For aquatic use, indicate water quality (hardness and pH) if available or applicable.

APPLICATION (Block 7)
a) Month(s) of Year - State month(s) of year.
b) State(s) - Indicate State and other designation that identifies the area geographically.

SENSITIVE AREAS (Block 8)
a) Areas to be Avoided - Identify sensitive areas to be avoided. Indicate if the area is subject to inadvertent treatment as a result of drift. Describe fully in "remarks" (Block 9) what protective measures are to be taken.
b) Areas to be Treated with Caution - Identify sensitive areas to be treated with special precautions to avoid contamination.

REMARKS (Block 9)
Use this line for information which will be helpful to the field IPMWG in evaluating the project.

a) Precautions to be Taken - Describe specific precautions be taken to protect sensitive areas; for example, no application within 100 feet of streams.
b) Use of Trained / Certified Personnel - Provide information on the status of training and/or certification of personnel doing the actual work and of those supervising. Has project been reviewed by a field biologist, agronomist, entomologist, or other appropriate subject matter specialist?
c) State and Local Coordination - Indicate coordination on the project at a State or local level.
d) Other Pesticides Being Applied to Same Site - Indicate what other pesticides are being or will be applied on the same site within the year.
e) Monitoring - Describe any monitoring of the operation be to conducted. Indicate effectiveness of prior projects and mention undesirable side effects observed.
f) Other - Indicate if the project is to be accomplished by contract.

Environmental analyses (EA's and/or EIS's) may be referred for additional information.

APPROVAL (Block 10)
a) Signature of Approving Official
b) Date of Signature

APPENDIX F
Site and Treatment Information

APPENDIX F: Site and Treatment Information

Site information and treatment information for Proposed Action Alternative, including overall treatment prescription and treatment methods for each site. Invasive Plant Species abbreviations are defined in Table 2-3.

Treat ID	District	Acres	Site Description	Site Objective	Overall Treatment	Invasive Plant Species	Treatment Strategy	Herbicide Methods	Cultural Methods	Manual Methods	Mechanical Methods
22-01	Scenic Area	1,573	Forested Site (not covered by other category)	Active Restoration	Herbicide plus Manual, Mechanical & Cultural	CIAR4, CYSC4, PHAR3, RUDI2, TAVU	Control, Contain, Suppress	Broadcast Application, Backpack Sprayer	Goat Grazing		Brush, Mow
22-05	Scenic Area	90	Manmade Opening	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3, CIAR4, PHAR3, RUDI2	Contain, Tolerate	Backpack Sprayer		Hand Pull	Brush, Mow
22-07	Scenic Area	21	Flood Plain	Active Restoration	Herbicide plus Manual, Mechanical & Cultural	CIAR4, CYSC4, RUDI2	Control	Backpack Sprayer	Goat Grazing	Hand Pull	Brush, Mow
22-08	Scenic Area	24	Quarry	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3, RUDI2	Control	Backpack Sprayer		Hand Pull	Brush, Mow
22-11	Scenic Area	110	Forested Site (not covered by other category)	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3, CHJU, CYOF	Eradicate, Control	Backpack Sprayer		Hand Pull	Brush, Mow
22-12	Scenic Area	82	Forested Site (not covered by other category)	Passive Restoration	Herbicide plus Manual	CEDI3	Control	Backpack Sprayer		Hand Pull	
22-17	Scenic Area	139	Manmade Opening	Passive Restoration	Herbicide plus Mechanical	RUDI2	Control	Broadcast Application, Backpack Sprayer			Brush, Mow
61-002	Barlow Ranger District	134.90	Road Prism	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow

Treat ID	District	Acres	Site Description	Site Objective	Overall Treatment	Invasive Plant Species	Treatment Strategy	Herbicide Methods	Cultural Methods	Manual Methods	Mechanical Methods
61-003	Barlow Ranger District	55.00	Road Prism	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-005	Barlow Ranger District	72.20	Road Prism	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-006	Barlow Ranger District	92.70	Road Prism	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-007	Barlow Ranger District	5.40	Quarry	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3	Eradicate	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-009	Barlow Ranger District	43.20	Road Prism	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-017	Barlow Ranger District	96.50	Road Prism	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-018	Barlow Ranger District	48.20	Road Prism	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-019	Barlow Ranger District	264.70	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-020	Barlow Ranger District	0.50	Quarry	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3	Eradicate	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow

Treat ID	District	Acres	Site Description	Site Objective	Overall Treatment	Invasive Plant Species	Treatment Strategy	Herbicide Methods	Cultural Methods	Manual Methods	Mechanical Methods
61-021	Barlow Ranger District	46.30	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-022	Barlow Ranger District	11.30	Road & Adjacent Disturbed Area	Active Restoration	Herbicide plus Manual & Mechanical	LIVU2	Eradicate	Broadcast Application, Backpack Sprayer		Clip	Brush, Mow
61-023	Barlow Ranger District	10.90	Quarry	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-024	Barlow Ranger District	30.10	Road Prism	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-025	Barlow Ranger District	54.10	Road Prism	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-026	Barlow Ranger District	34.70	Road Prism	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-027	Barlow Ranger District	26.80	Road Prism	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-028	Barlow Ranger District	51.60	Road Prism	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-029	Barlow Ranger District	40.20	Road Prism	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow

Treat ID	District	Acres	Site Description	Site Objective	Overall Treatment	Invasive Plant Species	Treatment Strategy	Herbicide Methods	Cultural Methods	Manual Methods	Mechanical Methods
61-030	Barlow Ranger District	6.00	Road & Adjacent Disturbed Area	Active Restoration	Herbicide plus Manual & Mechanical	SEJA	Eradicate	Broadcast Application, Backpack Sprayer		Clip & Pull	Brush, Mow
61-034	Barlow Ranger District	58.50	Road Prism	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-036	Barlow Ranger District	25.80	Road Prism	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-039	Barlow Ranger District	75.90	Road & Adjacent Plantation	Active Restoration	Herbicide plus Manual & Mechanical	CYOF, CYSC4, SEJA	Eradicate, Control	Broadcast Application, Backpack Sprayer		Clip & Pull, Grub	Brush, Mow
61-040	Barlow Ranger District	10.40	Road Prism	Passive Restoration	Herbicide plus Manual & Mechanical	CYOF	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-041	Barlow Ranger District	59.20	Utility corridor	Active Restoration	Herbicide plus Manual & Mechanical	CYOF, CYSC4, SEJA	Eradicate, Control	Broadcast Application, Backpack Sprayer		Clip & Pull, Grub	Brush, Mow
61-042	Barlow Ranger District	52.10	Road Prism	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3, CYOF	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-043	Barlow Ranger District	15.70	Road & Adjacent Plantation	Active Restoration	Herbicide plus Manual	SEJA	Eradicate	Backpack Sprayer		Clip & Pull	
61-044	Barlow Ranger District	20.20	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3, CYOF	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow

Treat ID	District	Acres	Site Description	Site Objective	Overall Treatment	Invasive Plant Species	Treatment Strategy	Herbicide Methods	Cultural Methods	Manual Methods	Mechanical Methods
61-045	Barlow Ranger District	33.20	Administrative Site	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3, CYOF	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-046	Barlow Ranger District	2.90	Plantation	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3, CYOF	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-047	Barlow Ranger District	1.50	Corral	Active Restoration	Herbicide plus Manual	CEDI3, CYOF	Control	Backpack Sprayer		Hand Pull	
61-048	Barlow Ranger District	38.80	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3, CYOF	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-049	Barlow Ranger District	19.60	Road & Adjacent Plantation	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3, CYOF	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-050	Barlow Ranger District	111.80	Harvest Unit	Active Restoration	Herbicide plus Manual	CEDI3, CYOF	Control	Backpack Sprayer		Hand Pull	
61-051	Barlow Ranger District	0.40	Landing	Passive Restoration	Herbicide plus Manual	CEDI3, CYOF	Control	Broadcast Application, Backpack Sprayer		Hand Pull	
61-053	Barlow Ranger District	3.70	Plantation	Passive Restoration	Herbicide plus Manual	CEDI3, CYOF	Control	Backpack Sprayer		Hand Pull	
61-055	Barlow Ranger District	6.90	Road & Adjacent Plantation	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3, CYOF	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-057	Barlow Ranger District	0.60	Administrative Site	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3, CYOF	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow

Treat ID	District	Acres	Site Description	Site Objective	Overall Treatment	Invasive Plant Species	Treatment Strategy	Herbicide Methods	Cultural Methods	Manual Methods	Mechanical Methods
61-058	Barlow Ranger District	9.90	Plantation	Passive Restoration	Herbicide plus Manual	CEDI3, CYOF	Control	Backpack Sprayer		Hand Pull	
61-059	Barlow Ranger District	22.80	Plantation	Passive Restoration	Herbicide plus Manual	CEDI3, CYOF	Control	Backpack Sprayer		Hand Pull	
61-062	Barlow Ranger District	3.80	Plantation	Passive Restoration	Herbicide plus Manual	CEDI3, CYOF	Control	Backpack Sprayer		Hand Pull	
61-064	Barlow Ranger District	0.40	Manmade Opening	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3, CYOF	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-065	Barlow Ranger District	18.90	Plantation	Passive Restoration	Herbicide plus Manual	CEDI3, CYOF	Control	Broadcast Application, Backpack Sprayer		Hand Pull	
61-066	Barlow Ranger District	8.40	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3, CYOF	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-071	Barlow Ranger District	40.80	Plantation	Active Restoration	Herbicide plus Manual	CYOF, CYSC4, SEJA	Eradicate, Control	Broadcast Application, Backpack Sprayer		Clip & Pull, Grub	
61-073	Barlow Ranger District	31.10	Campground	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3, CYOF	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-074	Barlow Ranger District	45.70	Plantation	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3, CYOF	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-075	Barlow Ranger District	12.50	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3, CYOF	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow

Treat ID	District	Acres	Site Description	Site Objective	Overall Treatment	Invasive Plant Species	Treatment Strategy	Herbicide Methods	Cultural Methods	Manual Methods	Mechanical Methods
61-076	Barlow Ranger District	15.40	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3, CYOF	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-077	Barlow Ranger District	44.80	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3, CYOF	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-078	Barlow Ranger District	22.40	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3, CYOF	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-079	Barlow Ranger District	37.20	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3, CYOF	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-080	Barlow Ranger District	18.00	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3, CYOF	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-081	Barlow Ranger District	3.50	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3, CYOF	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-082	Barlow Ranger District	0.30	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3, CYOF	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-083	Barlow Ranger District	19.00	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3, CYOF	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-084	Barlow Ranger District	32.40	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEBI2, CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow

Treat ID	District	Acres	Site Description	Site Objective	Overall Treatment	Invasive Plant Species	Treatment Strategy	Herbicide Methods	Cultural Methods	Manual Methods	Mechanical Methods
61-085	Barlow Ranger District	15.90	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3, CYOF	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-086	Barlow Ranger District	66.40	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3, CYOF	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-087	Barlow Ranger District	30.20	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3, CYOF	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-088	Barlow Ranger District	59.70	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-089	Barlow Ranger District	88.60	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-090	Barlow Ranger District	0.50	Plantation	Active Restoration	Herbicide plus Manual	SEJA	Eradicate	Backpack Sprayer		Clip & Pull	
61-091	Barlow Ranger District	3.70	Quarry	Active Restoration	Herbicide plus Manual & Mechanical	CEBI2, CEDI3, SEJA	Eradicate, Control	Broadcast Application, Backpack Sprayer		Clip & Pull	Brush, Mow
61-092	Barlow Ranger District	6.00	Plantation	Passive Restoration	Herbicide plus Manual	CEDI3, CYOF	Control	Backpack Sprayer		Hand Pull	
61-093	Barlow Ranger District	19.10	Utility corridor	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3, CYOF	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
61-095	Barlow Ranger District	104.30	Road Prism	Passive Restoration	Herbicide plus Manual & Mechanical	SEJA	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow

Treat ID	District	Acres	Site Description	Site Objective	Overall Treatment	Invasive Plant Species	Treatment Strategy	Herbicide Methods	Cultural Methods	Manual Methods	Mechanical Methods
65-001	Clackamas River Ranger District	33.80	Road & Adjacent Streamside	Passive Restoration	Herbicide plus Manual & Mechanical	CEBI2, CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
65-002	Clackamas River Ranger District	61.60	Road Prism	Active Restoration	Herbicide plus Manual & Mechanical	HIAU, HIPR	Eradicate	Broadcast Application, Backpack Sprayer		Hand Pull, Grub	Brush, Mow
65-003	Clackamas River Ranger District	64.90	Road Prism	Passive Restoration	Herbicide plus Manual & Mechanical	CEBI2, CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
65-005	Clackamas River Ranger District	0.10	Road Prism	Active Restoration	Herbicide	POCU6	Eradicate	Stem Injection, Backpack Sprayer			
65-006	Clackamas River Ranger District	0.20	Road Prism	Active Restoration	Herbicide	POCU6	Eradicate	Stem Injection, Backpack Sprayer			
65-007	Clackamas River Ranger District	3.40	Road & Adjacent Disturbed Area	Active Restoration	Herbicide plus Manual & Mechanical	CEBI2	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
65-008	Clackamas River Ranger District	0.20	Road Prism	Active Restoration	Herbicide	POCU6	Eradicate	Stem Injection, Backpack Sprayer			
65-009	Clackamas River Ranger District	1.00	Road Prism	Active Restoration	Herbicide	POCU6	Eradicate	Stem Injection, Backpack Sprayer			
65-010	Clackamas River Ranger District	13.00	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow

Treat ID	District	Acres	Site Description	Site Objective	Overall Treatment	Invasive Plant Species	Treatment Strategy	Herbicide Methods	Cultural Methods	Manual Methods	Mechanical Methods
65-011	Clackamas River Ranger District	1.10	Hiking Trail	Active Restoration	Herbicide	POCU6	Eradicate	Stem Injection, Backpack Sprayer			
65-012	Clackamas River Ranger District	12.60	Road - Closed or Decommissioned	Active Restoration	Herbicide plus Manual & Mechanical	CEBI2, CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
65-013	Clackamas River Ranger District	48.40	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEBI2, CEDI3, HIPR	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
65-014	Clackamas River Ranger District	4.50	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEBI2	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
65-015	Clackamas River Ranger District	18.70	Road Prism	Active Restoration	Herbicide	PHAR3	Control	Broadcast Application, Backpack Sprayer			
65-016	Clackamas River Ranger District	4.00	Road & Adjacent Disturbed Area	Active Restoration	Herbicide plus Manual & Mechanical	LIVU2	Eradicate	Broadcast Application, Backpack Sprayer		Clip	Brush, Mow
65-017	Clackamas River Ranger District	4.10	Meadow	Passive Restoration	Herbicide plus Manual & Mechanical	CEBI2	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
65-018	Clackamas River Ranger District	1.10	Road Prism	Passive Restoration	Manual & Mechanical	HEHE	Control			Hand Pull	Brush, Mow
65-019	Clackamas River Ranger District	5.00	Plantation	Active Restoration	Herbicide	POCU6	Eradicate	Stem Injection, Backpack Sprayer			

Treat ID	District	Acres	Site Description	Site Objective	Overall Treatment	Invasive Plant Species	Treatment Strategy	Herbicide Methods	Cultural Methods	Manual Methods	Mechanical Methods
65-020	Clackamas River Ranger District	422.90	Road Prism	Passive Restoration	Herbicide plus Manual & Mechanical	CEBI2, CEDI3, HEHE	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
65-021	Clackamas River Ranger District	3.20	Road Prism	Active Restoration	Herbicide	POCU6	Eradicate	Stem Injection, Backpack Sprayer			
65-022	Clackamas River Ranger District	5.20	Road Prism	Passive Restoration	Herbicide plus Manual & Mechanical	CEBI2	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
65-023	Clackamas River Ranger District	416.40	Road Prism	Passive Restoration	Herbicide plus Manual & Mechanical	CEBI2, CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
65-024	Clackamas River Ranger District	4.60	Road Prism	Active Restoration	Herbicide plus Manual & Mechanical	CYSC4	Eradicate	Broadcast Application, Backpack Sprayer		Clip, Hand Pull	Brush, Mow
65-025	Clackamas River Ranger District	2.80	Road - Closed or Decommissioned	Active Restoration	Herbicide plus Manual & Mechanical	CYSC4	Control	Broadcast Application, Backpack Sprayer		Clip, Hand Pull	Brush, Mow
65-026	Clackamas River Ranger District	4.70	Road - Closed or Decommissioned	Active Restoration	Herbicide plus Manual	CIAR4	Eradicate	Backpack Sprayer		Clip	
65-027	Clackamas River Ranger District	0.70	Road & Adjacent Disturbed Area	Active Restoration	Herbicide plus Manual	CIAR4	Eradicate	Backpack Sprayer		Clip	
65-028	Clackamas River Ranger District	0.80	Road Prism	Active Restoration	Herbicide plus Manual & Mechanical	CEBI2	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow

Treat ID	District	Acres	Site Description	Site Objective	Overall Treatment	Invasive Plant Species	Treatment Strategy	Herbicide Methods	Cultural Methods	Manual Methods	Mechanical Methods
65-029	Clackamas River Ranger District	11.60	Meadow	Passive Restoration	Herbicide plus Manual & Mechanical	CEBI2	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
65-030	Clackamas River Ranger District	11.40	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEBI2	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
65-031	Clackamas River Ranger District	14.30	Road Prism	Passive Restoration	Herbicide plus Manual & Mechanical	CEBI2	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
65-032	Clackamas River Ranger District	2.70	Road Prism	Active Restoration	Herbicide plus Manual & Mechanical	CEBI2	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
65-033	Clackamas River Ranger District	9.60	Road Prism	Passive Restoration	Herbicide plus Manual & Mechanical	CEBI2	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
65-034	Clackamas River Ranger District	5.20	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
65-035	Clackamas River Ranger District	5.30	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEBI2	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
65-036	Clackamas River Ranger District	3.60	Lake	Active Restoration	Herbicide plus Manual & Mechanical	CEBI2, CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
65-037	Clackamas River Ranger District	0.40	Road Prism	Passive Restoration	Herbicide plus Manual & Mechanical	CEBI2, CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow

Treat ID	District	Acres	Site Description	Site Objective	Overall Treatment	Invasive Plant Species	Treatment Strategy	Herbicide Methods	Cultural Methods	Manual Methods	Mechanical Methods
65-038	Clackamas River Ranger District	1.10	Road Prism	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
65-039	Clackamas River Ranger District	0.30	Meadow	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
65-040	Clackamas River Ranger District	1.70	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
65-041	Clackamas River Ranger District	4.20	Administrative Site	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
65-042	Clackamas River Ranger District	9.60	Road Prism	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
65-043	Clackamas River Ranger District	18.50	Lake	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
65-044	Clackamas River Ranger District	23.00	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
65-045	Clackamas River Ranger District	0.10	Administrative Site	Passive Restoration	Herbicide plus Manual & Mechanical	CEBI2	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
65-046	Clackamas River Ranger District	8.30	Road Prism	Active Restoration	Herbicide plus Manual & Mechanical	HIVU	Eradicate	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow

Treat ID	District	Acres	Site Description	Site Objective	Overall Treatment	Invasive Plant Species	Treatment Strategy	Herbicide Methods	Cultural Methods	Manual Methods	Mechanical Methods
66-001	Hood River Ranger District	20.80	Road & Adjacent Disturbed Area	Active Restoration	Herbicide plus Manual & Mechanical	HIAU	Eradicate	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
66-003	Hood River Ranger District	42.80	Road & Adjacent Disturbed Area	Active Restoration	Herbicide plus Manual & Mechanical	HIAU	Eradicate	Backpack Sprayer		Hand Pull	Brush, Mow
66-004	Hood River Ranger District	18.90	Road & Adjacent Disturbed Area	Active Restoration	Herbicide plus Manual & Mechanical	HIAU	Eradicate	Backpack Sprayer		Hand Pull	Brush, Mow
66-005	Hood River Ranger District	43.70	Road & Adjacent Disturbed Area	Active Restoration	Herbicide plus Manual & Mechanical	HIAU	Eradicate	Backpack Sprayer		Hand Pull	Brush, Mow
66-006	Hood River Ranger District	58.60	Road & Adjacent Disturbed Area	Active Restoration	Herbicide plus Manual & Mechanical	HIAU	Eradicate	Backpack Sprayer		Hand Pull	Brush, Mow
66-007	Hood River Ranger District	449.10	Road & Adjacent Disturbed Area	Active Restoration	Herbicide plus Manual & Mechanical	HIAU	Eradicate	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
66-008	Hood River Ranger District	551.60	Utility corridor	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3, CYSC4, SEJA	Eradicate, Control	Broadcast Application, Backpack Sprayer		Clip & Pull, Grub	Brush, Mow
66-009	Hood River Ranger District	9.30	Quarry	Passive Restoration	Herbicide plus Manual & Mechanical	CEPR2	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
66-010	Hood River Ranger District	10.00	Road & Adjacent Disturbed Area	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3	Eradicate	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow

Treat ID	District	Acres	Site Description	Site Objective	Overall Treatment	Invasive Plant Species	Treatment Strategy	Herbicide Methods	Cultural Methods	Manual Methods	Mechanical Methods
66-011	Hood River Ranger District	3.00	Road - Closed or Decommissioned	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3	Eradicate	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
66-012	Hood River Ranger District	0.70	Quarry	Active Restoration	Herbicide plus Manual & Mechanical	CEPR2	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
66-013	Hood River Ranger District	10.80	Quarry	Active Restoration	Herbicide plus Manual & Mechanical	CEPR2	Eradicate	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
66-016	Hood River Ranger District	78.80	Utility corridor	Active Restoration	Herbicide plus Manual & Mechanical	CEBI2, HIAU, SEJA	Eradicate, Control	Broadcast Application, Backpack Sprayer		Clip & Pull	Brush, Mow
66-017	Hood River Ranger District	66.60	Quarry	Active Restoration	Herbicide plus Manual & Mechanical	CEBI2, SEJA	Eradicate, Control	Broadcast Application, Backpack Sprayer		Clip & Pull	Brush, Mow
66-018	Hood River Ranger District	51.20	Quarry	Active Restoration	Herbicide plus Manual & Mechanical	CEPR2, SEJA	Eradicate, Control	Broadcast Application, Backpack Sprayer		Clip & Pull	Brush, Mow
66-020	Hood River Ranger District	1014.30	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	SEJA	Control	Broadcast Application, Backpack Sprayer		Clip & Pull	Brush, Mow
66-023	Hood River Ranger District	355.70	Major Resort/Permit Area	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3, CEPR2, SEJA	Eradicate, Control	Broadcast Application, Backpack Sprayer		Clip & Pull	Brush, Mow
66-025	Hood River Ranger District	1.60	Quarry	Active Restoration	Herbicide plus Manual & Mechanical	CEPR2	Eradicate	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow

Treat ID	District	Acres	Site Description	Site Objective	Overall Treatment	Invasive Plant Species	Treatment Strategy	Herbicide Methods	Cultural Methods	Manual Methods	Mechanical Methods
66-026	Hood River Ranger District	0.10	Quarry	Active Restoration	Herbicide plus Manual & Mechanical	CEBI2	Eradicate	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
66-027	Hood River Ranger District	4.00	Quarry	Passive Restoration	Herbicide plus Manual	CEDI3	Control	Backpack Sprayer		Hand Pull	
66-028	Hood River Ranger District	0.80	Quarry	Active Restoration	Herbicide plus Manual & Mechanical	CEPR2	Eradicate	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
66-029	Hood River	0.70	Major Resort/Permit Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEBI2	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
66-030	Hood River Ranger District	0.30	Road & Adjacent Disturbed Area	Active Restoration	Herbicide plus Manual & Mechanical	CEPR2, CYOF, HYPE, SEJA	Eradicate, Control	Broadcast Application, Backpack Sprayer		Clip & Pull	Brush, Mow
66-033	Hood River Ranger District	17.50	Campground	Active Restoration	Herbicide plus Manual	CEDI3	Control	Backpack Sprayer		Hand Pull	
66-035	Hood River Ranger District	6.90	Major Resort/Permit Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
66-037	Hood River Ranger District	9.60	Road & Adjacent Disturbed Area	Active Restoration	Herbicide plus Manual	CEDI3	Control	Backpack Sprayer		Hand Pull	
66-038	Hood River Ranger District	261.50	Quarry	Passive Restoration	Herbicide plus Manual & Mechanical	CEBI2	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow

Treat ID	District	Acres	Site Description	Site Objective	Overall Treatment	Invasive Plant Species	Treatment Strategy	Herbicide Methods	Cultural Methods	Manual Methods	Mechanical Methods
66-039	Hood River Ranger District	3.50	Quarry	Active Restoration	Herbicide plus Manual & Mechanical	CEBI2, SEJA	Eradicate	Broadcast Application, Backpack Sprayer		Clip & Pull	Brush, Mow
66-040	Hood River Ranger District	1.10	Road & Adjacent Disturbed Area	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3	Eradicate	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
66-041	Hood River Ranger District	1.00	Road & Adjacent Disturbed Area	Active Restoration	Herbicide plus Mechanical	LIVU2	Eradicate	Backpack Sprayer			Brush, Mow
66-042	Hood River Ranger District	2.80	Road & Adjacent Disturbed Area	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3	Eradicate	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
66-043	Hood River Ranger District	1.40	Road & Adjacent Plantation	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3	Eradicate	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
66-044	Hood River Ranger District	0.40	Road & Adjacent Disturbed Area	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3	Eradicate	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
66-046	Hood River Ranger District	1.80	Road & Adjacent Plantation	Active Restoration	Herbicide plus Manual & Mechanical	CYSC4	Eradicate	Backpack Sprayer		Hand Pull, Grub	Brush, Mow
66-047	Hood River Ranger District	7.10	Road & Adjacent Plantation	Active Restoration	Herbicide plus Manual & Mechanical	CESO3	Eradicate	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
66-048	Hood River Ranger District	3.60	Quarry	Active Restoration	Herbicide plus Manual & Mechanical	CEBI2	Eradicate	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow

Treat ID	District	Acres	Site Description	Site Objective	Overall Treatment	Invasive Plant Species	Treatment Strategy	Herbicide Methods	Cultural Methods	Manual Methods	Mechanical Methods
66-049	Hood River Ranger District	3.70	Road & Adjacent Disturbed Area	Active Restoration	Herbicide plus Manual & Mechanical	CEBI2	Eradicate	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
66-051	Hood River Ranger District	5.70	Quarry	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3	Eradicate	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
66-052	Hood River Ranger District	8.80	Quarry	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3	Eradicate	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
66-053	Hood River Ranger District	4.20	Road & Adjacent Plantation	Active Restoration	Herbicide plus Manual & Mechanical	CEPR2, CYOF	Eradicate	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
66-055	Hood River Ranger District	41.20	Lake	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3, LIVU2	Eradicate, Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
66-057	Hood River Ranger District	80.30	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	SEJA	Control	Broadcast Application, Backpack Sprayer		Clip & Pull	Brush, Mow
66-058	Hood River Ranger District	14.90	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	SEJA	Control	Broadcast Application, Backpack Sprayer		Clip & Pull	Brush, Mow
66-059	Hood River Ranger District	39.70	Road & Adjacent Disturbed Area	Active Restoration	Herbicide plus Manual & Mechanical	LIVU2, SEJA	Eradicate, Control	Broadcast Application, Backpack Sprayer		Clip & Pull	Brush, Mow
66-060	Hood River Ranger District	132.20	Multi-use Trail	Passive Restoration	Herbicide plus Manual & Mechanical	CEBI2, SEJA	Control	Broadcast Application, Backpack Sprayer		Clip & Pull	Brush, Mow

Treat ID	District	Acres	Site Description	Site Objective	Overall Treatment	Invasive Plant Species	Treatment Strategy	Herbicide Methods	Cultural Methods	Manual Methods	Mechanical Methods
66-062	Hood River Ranger District	151.90	Quarry	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3, SEJA	Eradicate, Control	Broadcast Application, Backpack Sprayer		Clip & Pull	Brush, Mow
66-063	Hood River Ranger District	631.40	Multi-use Trail	Active Restoration	Herbicide plus Manual & Mechanical	CEBI2, CEPR2, SEJA	Eradicate, Control	Broadcast Application, Backpack Sprayer		Clip & Pull	Brush, Mow
66-067	Hood River Ranger District	133.60	Multi-use Trail	Active Restoration	Herbicide plus Manual & Mechanical	CEBI2, CYSC4, SEJA	Eradicate, Control	Broadcast Application, Backpack Sprayer		Clip & Pull	Brush, Mow
66-069	Hood River Ranger District	50.50	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	SEJA	Control	Broadcast Application, Backpack Sprayer		Clip & Pull	Brush, Mow
66-071	Hood River Ranger District	64.70	Multi-use Trail	Active Restoration	Herbicide plus Manual & Mechanical	CEBI2, CYSC4, SEJA	Eradicate, Control	Broadcast Application, Backpack Sprayer		Clip & Pull	Brush, Mow
66-074	Hood River Ranger District	109.10	Road Prism	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3, CEPR2, SEJA	Eradicate, Control	Broadcast Application, Backpack Sprayer		Clip & Pull	Brush, Mow
66-081	Hood River Ranger District	22.20	Road & Adjacent Disturbed Area	Active Restoration	Herbicide plus Mechanical	LIVU2	Eradicate	Broadcast Application, Backpack Sprayer			Brush, Mow
66-082	Hood River Ranger District	93.10	Road & Adjacent Disturbed Area	Active Restoration	Herbicide plus Mechanical	LIVU2	Eradicate	Broadcast Application, Backpack Sprayer			Brush, Mow
66-083	Hood River Ranger District	27.70	Road & Adjacent Disturbed Area	Active Restoration	Herbicide plus Mechanical	LIVU2	Eradicate	Broadcast Application, Backpack Sprayer			Brush, Mow

Treat ID	District	Acres	Site Description	Site Objective	Overall Treatment	Invasive Plant Species	Treatment Strategy	Herbicide Methods	Cultural Methods	Manual Methods	Mechanical Methods
66-084	Hood River Ranger District	73.20	Road & Adjacent Disturbed Area	Active Restoration	Herbicide plus Mechanical	LIVU2	Eradicate	Broadcast Application, Backpack Sprayer			Brush, Mow
66-085	Hood River Ranger District	148.10	Pullout Area Along a Road	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3, SEJA	Eradicate, Control	Broadcast Application, Backpack Sprayer		Clip & Pull	Brush, Mow
66-086	Hood River Ranger District	296.40	Road & Adjacent Plantation	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3, SEJA	Control	Broadcast Application, Backpack Sprayer		Clip & Pull	Brush, Mow
66-087	Hood River Ranger District	76.80	Natural Opening	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3, SEJA	Eradicate, Control	Broadcast Application, Backpack Sprayer		Clip & Pull	Brush, Mow
66-089	Hood River Ranger District	154.40	Utility corridor	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3, SEJA	Eradicate, Control	Broadcast Application, Backpack Sprayer		Clip & Pull	Brush, Mow
66-091	Hood River Ranger District	120.20	Campground	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3, SEJA	Eradicate, Control	Broadcast Application, Backpack Sprayer		Clip & Pull	Brush, Mow
69-001	Hood River Ranger District	7.50	Road Prism	Passive Restoration	Herbicide plus Manual & Mechanical	CEBI2	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
69-002	Zigzag Ranger District	0.10	Road & Adjacent Forest	Active Restoration	Herbicide	POCU6	Eradicate	Stem Injection, Backpack Sprayer			
69-003	Zigzag Ranger District	44.90	Recreational Residences	Active Restoration	Herbicide plus Manual & Mechanical	HIVU	Eradicate	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow

Treat ID	District	Acres	Site Description	Site Objective	Overall Treatment	Invasive Plant Species	Treatment Strategy	Herbicide Methods	Cultural Methods	Manual Methods	Mechanical Methods
69-004	Zigzag Ranger District	24.10	Road & Adjacent Disturbed Area	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
69-005	Zigzag Ranger District	42.70	Recreational Residences	Passive Restoration	Manual & Mechanical	CEBI2, CEDI3, HIVU	Control, Suppress			Hand Pull	Brush, Mow
69-006	Zigzag Ranger District	0.10	Recreational Residences	Active Restoration	Herbicide plus Manual & Mechanical	CEPR2, HIPR	Eradicate, Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
69-007	Zigzag Ranger District	0.50	Road & Adjacent Disturbed Area	Passive Restoration	Manual & Mechanical	CEBI2, HIVU	Control, Suppress			Hand Pull	Brush, Mow
69-008	Zigzag Ranger District	1067.80	Recreational Residences	Active Restoration	Herbicide plus Manual & Mechanical	CEBI2, CEPR2, CYSC4, HIAU, HIPR, HIVU, RUDI2	Eradicate, Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
69-010	Zigzag Ranger District	0.10	Recreational Residences	Active Restoration	Herbicide	POCU6	Eradicate	Stem Injection, Backpack Sprayer			
69-011	Zigzag Ranger District	0.10	Quarry	Active Restoration	Herbicide	POCU6	Eradicate	Stem Injection, Backpack Sprayer			
69-012	Zigzag Ranger District	0.20	Road & Adjacent Disturbed Area	Active Restoration	Herbicide	POCU6	Eradicate	Stem Injection, Backpack Sprayer			
69-013	Zigzag Ranger District	0.10	Utility corridor	Active Restoration	Herbicide	POCU6	Eradicate	Stem Injection, Backpack Sprayer			

Treat ID	District	Acres	Site Description	Site Objective	Overall Treatment	Invasive Plant Species	Treatment Strategy	Herbicide Methods	Cultural Methods	Manual Methods	Mechanical Methods
69-014	Zigzag Ranger District	0.10	Hiking Trail	Active Restoration	Herbicide	POCU6	Eradicate	Stem Injection, Backpack Sprayer			
69-015	Zigzag Ranger District	0.10	Road & Adjacent Disturbed Area	Active Restoration	Herbicide	POCU6	Eradicate	Stem Injection, Backpack Sprayer			
69-016	Zigzag Ranger District	444.60	Road Prism	Passive Restoration	Herbicide plus Manual & Mechanical	CEDI3, HEHE	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
69-017	Zigzag Ranger District	0.90	Road & Adjacent Disturbed Area	Passive Restoration	Manual & Mechanical	HEHE	Control			Hand Pull	Brush, Mow
69-018	Zigzag Ranger District	1.10	Road & Adjacent Streamside	Passive Restoration	Manual & Mechanical	HEHE	Control			Hand Pull	Brush, Mow
69-019	Zigzag Ranger District	0.70	Streamside	Active Restoration	Manual & Mechanical	HEHE	Control			Hand Pull	Brush, Mow
69-020	Zigzag Ranger District	0.40	Recreational Residences	Active Restoration	Manual & Mechanical	HEHE	Control			Hand Pull	Brush, Mow
69-021	Zigzag Ranger District	1.40	Road & Adjacent Disturbed Area	Passive Restoration	Manual & Mechanical	HEHE	Control			Hand Pull	Brush, Mow
69-022	Zigzag Ranger District	0.80	Recreational Residences	Active Restoration	Manual & Mechanical	HEHE	Control			Hand Pull	Brush, Mow
69-023	Zigzag Ranger District	0.60	Streamside	Active Restoration	Manual & Mechanical	HEHE	Control			Hand Pull	Brush, Mow
69-024	Zigzag Ranger District	0.20	Road & Adjacent Disturbed Area	Passive Restoration	Manual & Mechanical	HEHE	Control			Hand Pull	Brush, Mow

Treat ID	District	Acres	Site Description	Site Objective	Overall Treatment	Invasive Plant Species	Treatment Strategy	Herbicide Methods	Cultural Methods	Manual Methods	Mechanical Methods
69-025	Zigzag Ranger District	3.30	Road & Adjacent Disturbed Area	Active Restoration	Herbicide plus Manual & Mechanical	CEDI3	Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
69-026	Zigzag Ranger District	1.10	Road & Adjacent Disturbed Area	Active Restoration	Herbicide plus Manual & Mechanical	CYSC4	Eradicate	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
69-027	Zigzag and Clackamas Ranger Districts	216.80	Utility corridor	Active Restoration	Herbicide plus Manual & Mechanical	CYSC4, HIAU, RUDI2	Eradicate, Control	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow
69-028	Zigzag Ranger District	3.70	Recreational Residences	Active Restoration	Herbicide plus Manual & Mechanical	HIAU	Eradicate	Backpack Sprayer		Clip, Hand Pull	Brush, Mow
69-029	Zigzag Ranger District	0.40	Road Prism	Active Restoration	Herbicide plus Manual & Mechanical	HEHE, POCU6	Eradicate, Control	Stem Injection, Backpack Sprayer		Hand Pull	Brush, Mow
69-030	Zigzag Ranger District	3.10	Recreational Residences	Active Restoration	Herbicide plus Manual & Mechanical	HIAU	Eradicate	Broadcast Application, Backpack Sprayer		Hand Pull	Brush, Mow

APPENDIX G
Common Control Measures Summary

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Common Control Measures

The following table summarizes common control methods applied target invasive species found in, or in close proximity to, the Forest or Scenic Area. The table provides information about specific herbicides and other control methods that are effective on the target species. These prescriptions would be applied using the Project Design Criteria (PDC) in Section 2.2. These recommendations serve as the basis for all treatment methods proposed and analyzed in this EIS for both known treatment areas as well as treatment areas that will be identified through the Early Detection / Rapid Response Strategy (EDRR). The table was prepared by Linda Mazzu (BLM Botanist) May 2005 and updated by David Lebo (Forest Botanist) and Robin Dobson (Scenic Area Biologist/Ecologist), January/February 2006.

Target Species	General Prescription	Herbicide Options	When/How to Treat with Herbicides
Bohemian knotweed (POBO) Japanese knotweed (POCU6) Giant knotweed (POSA4) Himalayan knotweed (POPO5) Perennials	• Herbicide treatment most effective. Use stem injection or foliar spray. Dead canes can be left. • Some manual removal possible for small infestation (1-5 plants). All plant parts should be removed. • Re-vegetate with desirable species if surrounding cover is primarily non-native.	• Glyphosate • Imazapyr • Triclopyr	• Stems > 3/4": Stem injection Stems < 3/4": Foliar spray • Foliar spray for all stems when using imazapyr and follow-up with stem injection. • Treat June through September • Stem injection should not require revisit, but foliar spray should require at least one.

Target Species	General Prescription	Herbicide Options	When/How to Treat with Herbicides
Bull thistle (CIVU) Spiny plumeless thistle (CAAC) Musk thistle (CANU4) Biennial (musk thistle can be a winter annual, annual, or biennial)	• Use manual, mechanical or herbicide control or a combination. • 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. Repeated visits at weekly intervals over the 4 to 7 week blooming period provide most effective control. • Timing of mowing is critical (within 2 days of full flowering for musk thistle). • If herbicides are used, manual treatments could be used for follow-up. Relative amounts of herbicide to manual treatments would decline over time. • Biological controls may be helpful to suppress populations in combination with other methods. • Re-vegetate with desirable species.	• Clopyralid • Picloram • Chlorsulfuron • Glyphosate • Metsulfuron methyl • Triclopyr	• Backpack spray whenever possible. • Apply to rosettes in either the spring or fall. • Yearly revisits will be necessary; the number of which is dependent on the herbicide used and the seed bank.
Butter and eggs (LIVU2) Dalmation toadflax (LIGEDA) Perennials	• Hand pull or dig small populations or when regular volunteers are available. Plants can be left on site, but may reduce germination of desirable species due to mulching effect. • Cutting stands in spring or early summer will eliminate plant reproduction, but not the infestation. • These treatments may take up to ten years due to long term seed viability. • If herbicides are used, manual treatments could be used for follow-up. Relative amounts of herbicide to manual treatments would decline over time. • Re-vegetate with desirable species. Plant communities in good condition may recover without replanting.	• Metsulfuron methyl • Glyphosate	• Backpack spray. This species tends to be scattered. • Apply during active growth in spring before bloom or in late summer or fall during re-growth. • Revisits will be necessary; the number of which is dependent on the herbicide used and the seed bank. This control could vary by site. Even after three years of consecutive treatments, control may range widely.

Target Species	General Prescription	Herbicide Options	When/How to Treat with Herbicides
Canada thistle (CIAR4) Perennial sowthistle (SOAR2) Perennial	• Herbicide treatment is most effective. • 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 (this intensity would damage native species). • Covering with plastic tarp may also work for small infestations. • Re-vegetate with desirable species.	• Clopyralid • Picloram • Glyphosate • Chlorsulfuron	• Broadcast spray in dense cover, where dominant plant community is non-native. • Backpack spray whenever possible. • Apply in spring before to rosettes and prior to flowering. • Or apply in fall to rosettes; season is dependent upon herbicide used. • Yearly revisits will be necessary; the number of which is dependent on the herbicide used and the seed bank.
Dyer's woad (ISTI) Biennial or perennial	• Hand pulling is an effective control in difficult terrain; otherwise, herbicide treatment is most effective.	• Chlorsulfuron • Metsulfuron • Imazapic • Aquatic Label Glyphosate	• If infestation is large, broadcast spray in early spring after emergence. • Backpack spray in spring when plants are actively growing.
English ivy (HEHE) Perennial	• Manually remove infestations by removing vines first, than digging root mats from the soil. Vines must be cut at both the shoulder and ankle height, then stripped away from the tree. Work away from the tree pulling out the entire root mat for at least six feet. – Apply herbicide where manual techniques are unsuccessful. Most successful in combination with string trimming. • If herbicides are used, manual treatments could be used for follow-up. Relative amounts of herbicide to manual treatments would decline over time.	• Triclopyr • Glyphosate	• Larger stems: Cut and paint anytime. • Foliar spray requires cracking the cuticle of the leaf or string trimming. • Yearly revisits will be necessary; the number of which is dependent on the herbicide used and the seed bank.

Target Species	General Prescription	Herbicide Options	When/How to Treat with Herbicides
False brome (BRSY) Perennial	• Control can be difficult since young plants tend to sprout under salal, braken fern, and other vegetation in many types of forest habitats, including dense conifer forest with closed canopies. False brome is a prolific seed producer, but may produce only a short-lived seed bank (1 year) although further research is needed to verify. • Repeated mowing each season (2-3 times) along trails and roads before seed set occurs (in July) can effectively control the spread of existing populations. Repeated mowing each season is needed to remove all seed heads. • Repeated grazing can effectively control populations. • Herbicide applications are currently the most effective control treatment.	• Glyphosate formulation without surfactant	• Glyphosate formulation with surfactant, surprisingly, was **not** effective in treatments done at Oregon State University Research Forests. Difference in results for the two glyphosate formulations may have been due to different application rates and timing of application. • Treat before seed set occurs (usually in July). Seed heads can remain on plants through November or December.
Garlic mustard (ALPE4) Biennial (sometimes flowers first season)	• Hand pulling is the simplest and most effective approach for managing small or isolated infestations. It is important to remove the entire plant since new plants can sprout from root fragments. All pulled plants should be removed from the site, placed in bags, and disposed of as seed ripening continues even after plants are pulled. Seeds can remain viable in the soil for up to five years, so it is important to pull out **all** garlic mustard plants in an area every year until the seed bank is exhausted and seedlings no longer appear. • Herbicide treatment is the most effective control for larger populations. • Researchers are investigating the potential effectiveness of biological control agents (weevils and leaf-feeding beetles).	• Glyphosate • Triclopyr	• Glyphosate can be applied at any time of the year, but is most effective when applied in the spring or fall when the plant is actively growing and absorbs the herbicide through growing leaf tissue or bark. • Glyphosate is a non-selective herbicide and kills all plants. Applications in the fall may reduce harm to native herbaceous plants, which tend to be more dormant at that time of year.

Target Species	General Prescription	Herbicide Options	When/How to Treat with Herbicides
Himalayan blackberry (RUDI2) Cutleaf blackberry (RULA) Perennial (canes die off annually)	• Use a combination of herbicides and manual and/or mechanical treatments. Usually mechanical removal of large biomass in the summer (using a mower, brush hog or brush claw), followed by manual removal of re-sprouting canes and roots, then herbicide treatment of new growth in the fall/winter is most effective. The massive root crown must be fully dug out at some point if using only manual/mechanical techniques. The cultural technique of grazing with goats is also a technique proving successful if goats can be confined to the blackberry area. • If herbicides are used, manual treatments could be used for follow-up. Relative amounts of herbicide to manual treatments would decline over time. • Re-vegetate with desirable species.	• Triclopyr • Glyphosate	• Cut and paint larger canes. • Broadcast spray is possible after canes are cut if non-targets are not an issue. • Backpack spray whenever possible. • Yearly revisits will be necessary; the number of which is dependent on the herbicide used and the seed bank.
Houndstongue (CYOF) Perennial	• Hand pull or dig for small populations. Entire root system must be removed. Plants could be left on site if no seed pods are present (seed can remain viable for more than one year). • These treatments may take up to five years. • If herbicides are used, manual treatments could be used for follow-up. Relative amounts of herbicide to manual treatments would decline over time. • Re-vegetate with desirable species.	• Metsulfuron methyl • Imazapic • Picloram • Chlorsulfuron • Glyphosate	• Roadsides: Broadcast spray in dense cover, where dominant plant community is non-native. • Large non-sensitive sites: ATV broadcast spray • Other sites: Backpack spray • Apply during active growth, preferably basal rosette stage. • Revisits will be necessary; the number of which is dependent on the herbicide used and the seed bank.

Target Species	General Prescription	Herbicide Options	When/How to Treat with Herbicides
Leafy spurge (EUES) Perennial	• Leafy spurge is one of the first plants to emerge in the spring. Seed germination is high and seeds can remain dormant for 5-8 years in soils, although most seeds germinate within 2 years. Seeds are dispersed from mid- to late-July. They are explosively discharged (up to 16 feet), can float in and spread by water, and be dispersed by birds. • Repeated herbicide treatment (for 5-10 years or possibly longer) is the most effective control. • Prescribed fire in conjunction with herbicide treatment can be an excellent control in open areas. Results are very good whether burning is followed by spraying or vice versa, but, as with herbicide application alone, repeated treatments are needed for 5-10 years or longer. • Some weed extension services support repeated mowing or hand cutting, in conjunction with herbicide application to control leafy spurge; however, others consider mechanical and manual treatment ineffective because of the plant's extensive root system and ability to resprout. It is also capable of regrowing from belowground vegetative tissue. • Repeated sheep grazing, reportedly, has proven effective on ranches in Montana. • Biological controls (e.g., spurge hawkmoth) have been released, but are not effective by themselves in controlling leafy spurge.	• Glyphosate • Picloram	• Timing of application is important and varies by herbicide. Apply glyphosate in spring to prevent flowering and then again in early fall. An alternative recommendation is to apply glyphosate after seed set (mid-summer) **or** after fall regrowth but before a killing frost. • Apply picloram in spring (mid to late June) during seed development and then again in the fall (late September) during fall re-growth. Some research stresses the importance of two herbicide applications in one season: once in the spring to prevent seed development and again in the fall to promote translocation of the herbicide to the roots. • Leafy spurge cannot be controlled with a single herbicide treatment. Continuous monitoring and reapplication of herbicide(s) must continue for at least 5-10 years and, possibly, longer.

Target Species	General Prescription	Herbicide Options	When/How to Treat with Herbicides
Meadow hawkweed (HIPR) Orange hawkweed (HIAU) Common hawkweed (HIVU) Perennials	• Herbicide treatment is most effective. • Some manual removal possible for small infestations. All plant parts should be removed. • Covering with plastic tarp may also work for small infestations. • Nitrogen fertilization after treatment will encourage native plant growth if done in the spring. • Re-vegetate with desirable species.	• Clopyralid • Picloram • Glyphosate	• Backpack spray whenever possible. • Broadcast spray in areas of dense cover, where dominant plant community is non-native. • Treat in spring after most basal leaves emerge but before buds form. Fall treatment may also be effective, but research is limited. • Yearly revisits will be necessary; the number of which is dependent on the herbicide used and the seed bank.
Mediterranean sage (SAAE) Biennial	• Best control is with current biological control; otherwise, herbicide treatment is effective.	• Clopyralid • Picloram • Aquatic Label Glyphosate for riparian/high water areas	• Backpack spray in late spring.
Medusahead rye (TACA8) Winter annual	• 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 • Grazing supplemented by herbicide application and reseeding can also be effective. • No known or approved biological control agents. • Active restoration (seeding of a competitive desirable species) is important.	• Glyphosate • Imazapic	• Treatment should be done before seed formation or during the fall through early winter.

Target Species	General Prescription	Herbicide Options	When/How to Treat with Herbicides
Perennial peavine (LALA4) Herb robert (GERO) Perennial	• Hand pulling is most effective if the entire plant is pulled. Can be left on site. • Care must be taken not to pull desirable vegetation which is intermingled usually. • If herbicides are used, manual treatments could be used for follow-up. Relative amounts of herbicide to manual treatments would decline over time.	• Glyphosate	• On large infestations: Backpack spray in the early spring. • Yearly revisits will be necessary; the number of which is dependent on the herbicide used and the seed bank.
Perennial pepperweed (LELA2) Perennial	• Manual removal is not effective because of the extent of the plant's underground rooting system. • Tillage spreads rhizomes that form new plants. • Mowing at the flower bud growth stage can be effective when integrated with herbicide treatment(s). • Biological control is limited because of the inability of biological control insects to select between *Lepidium* species, several of which are endangered. • Herbicide use is the most effective treatment.	• Glyphosate • Metsulfuron methyl • Chlorsulfuron	• Glyphosate is most effective when applied to budding plants in the fall but before the first hard frost. Fall and spring applications are more effective than fall applications alone for large or severe infestations. • Metsulfuron and chlorsulfuron are effective when applied from flower bud to early flowering.
Policeman's helmet (also known as ornamental jewelweed) (IMGL) Annual	• Hand pulling is effective for small infestations of this shallow-rooted plant. • Mechanical treatment (mowing and cutting) is an effective control measure, but plants can resprout later, so mechanical treatment is not a long-term solution. • Herbicide treatment should only be considered for larger infestations.	• Aquatic Labeled Glyphosate • Triclopyr	• Herbicide treatment should be done before plants flower and produce seeds. • It's important to practice active restoration and re-vegetate the site following herbicide treatment (especially with the use of glyphosate, which is a non-selective herbicide that kills all vegetation) to prevent re-infestation.
Puncturevine (TRTE) Annual	• Herbicide treatment is the most effective control. • Biological control agents (insects) may be effective against puncturevine and are being tested.	• Chlorsulfuron • Picloram • Imazapic • Aquatic Label Glyphosate for riparian/high water areas	• Backpack spray young plants.

Target Species	General Prescription	Herbicide Options	When/How to Treat with Herbicides
Purple loosestrife (LYSA2) Perennial	• Hand removal of small populations or isolated stems is possible, but only if entire rootstock is removed. All plant parts must be removed from site. • The only other technique would be hand cutting of flower heads, which only suppresses seed production. • Herbicide treatment is most effective. • Re-vegetate with desirable species.	• Glyphosate	• Larger stems: Cut and paint high up stem under inflorescence. • A glove technique for hand wiping could be used. Wick up the top 1/3 of plant after flower heads are removed. • Yearly revisits will be necessary; the number of which is dependent on the herbicide used and the seed bank.
Reed canarygrass (PHAR3) Perennial	• Use a combination of herbicides and manual, mechanical, cultural or prescribed fire treatments. Manual treatments or mowing are only practical for small stands when multiple entries per year can be made. The entire population must be removed 2 to 3 times per year for at least five years. • Discing or plowing can be effective especially after herbicide treatment. • Prescribed burning several weeks after herbicide treatment or in the late fall could also be effective. • Covering populations with black plastic may be effective if shoots are not allowed to grow beyond tarps. This technique could take over two years to be effective.	• Sulfometuron methyl • Glyphosate	• Backpack spray whenever possible. • Broadcast spray in dense cover, where dominant plant community is non-native. • Apply in early spring when just sprouting before other wetland species have emerged. • Yearly revisits will be necessary; the number of which is dependent on the herbicide used and the seed bank.
Rush Skeletonweed (CHJU) Perennial	• No manual techniques recommended. • Frequent mowing of plants infested with gall mites by decrease the rate of spread. • Re-vegetate with desirable species.	• Clopyralid • Picloram • Glyphosate	• Broadcast spray in dense cover, where dominant plant community is non-native. • Backpack spray whenever possible. • Apply to rosette in late fall or up to early bolting stage in spring. • Application may be difficult due to lack of leaf surface. • Plants less than 5 years old respond best. • Aggressive repeated treatments will be necessary. • The number will be dependent on the herbicide used and the seed bank.

Target Species	General Prescription	Herbicide Options	When/How to Treat with Herbicides
Scotch broom (CYSC4) Perennial	• 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 (seed can remain viable for more than one year). Cutting will require multiple visits in one year. • These treatments may take up to ten years due to long term seed viability. • If herbicides are used, manual treatments could be used for follow-up. Relative amounts of herbicide to manual treatments would decline over time. • Re-vegetate with desirable species.	• Triclopyr • Glyphosate • Clopyralid • Picloram	• Larger plants: Cut and paint • Smaller plants: Backpack spray where hand pulling or weed wrenching is not feasible. • Apply during active growth preferably in the spring to young plants. • Yearly revisits will be necessary; the number of which is dependent on the herbicide used and the seed bank.
Scotch thistle (also known as Scotch cottonthistle) (ONAC) Biennial	• Herbicide treatment is the most effective control.	• Picloram • Chlorsulfuron • Clopyralid • Metsulfuron • Aquatic Label Glyphosate for riparian/high water areas	• Backpack spray in the spring before plants bolt or during the fall on the rosettes.
Shining geranium (GELU) Annual	• Hand pulling can be effective if the entire plant is pulled. Can be left on site. • Care must be taken not to pull desirable vegetation which is intermingled usually. • If herbicides are used, manual treatments could be used for follow-up. Relative amounts of herbicide to manual treatments would decline over time.	• Glyphosate	• On large infestations: Backpack spray in the early spring. • Yearly revisits will be necessary; the number of which is dependent on the herbicide used and the seed bank.

Target Species	General Prescription	Herbicide Options	When/How to Treat with Herbicides
Spotted knapweed (CEBI2) Diffuse knapweed (CEDI3) Meadow knapweed (CEPR2) Brownray knapweed (CEJA5) Black knapweed (CENI2) Russian knapweed (CERE6) Squarrosa knapweed (CESQ) Yellow star thistle (CESO3) Biennials or perennials	• Hand pull or dig small populations or when regular volunteers are available. • Remove all plant parts from the site. Multiple entries per year are required. • Mowing is possible, but timing is critical. • These treatments may take up to ten years due to long term seed viability. • If herbicides are used, manual treatments could be used for follow-up. Relative amounts of herbicide to manual treatments would decline over time. • Re-vegetate with desirable species.	• Clopyralid • Picloram • Glyphosate	• Roadsides: Broadcast spray in dense cover, where dominant plant community is non-native. • Other sites: Backpack spray • Treat in spring before bud stage. • Yearly revisits will be necessary; the number of which is dependent on the herbicide used and the seed bank.
St. Johnswort (HYPE) Perennial	• 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. • Biological controls will most likely not be effective in damp, cool climates. • Re-vegetate with desirable species.	• Metsulfuron methyl • Picloram • Glyphosate	• Backpack spray whenever possible. • Broadcast spray larger areas of dense cover, where dominant plant community is non-native. • Apply metsulfuron methyl when plants are fully emerged and in active growth. • Apply picloram in early growth stages before bloom. • Yearly revisits will be necessary; the number of which is dependent on the herbicide used and the seed bank.

Target Species	General Prescription	Herbicide Options	When/How to Treat with Herbicides
Tansy ragwort (SEJA) Common tansy (TAVU) Biennial or perennial	• 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. • Ensure biological controls are present nearby or request their introduction. • If herbicides are used, manual treatments could be used for follow-up. Relative amounts of herbicide to manual treatments would decline over time. • Re-vegetate with desirable species.	• Metsulfuron methyl • Picloram • Clopyralid • Glyphosate	• Roadsides: Braodcast spray in dense cover, where dominant plant community is non-native • Large non-sensitive sites: ATV broadcast spray • Other sites: Backpack spray • During active growth, up through flowering stage. • Revisits will be necessary; the number of which is dependent on the herbicide used and the seed bank.
Water hemlock (CIMA2) Biennial or perennial	• Hand grubbing (digging and pulling) and herbicide treatment are the best control methods.	• Aquatic Labeled Glyphosate • Picloram	• Backpack spraying plants in the late spring or early summer, when plants are growing, is the best time to apply herbicide(s).
Whitetop (CADR) Perennial	• Diligent 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. • If herbicides are used, manual treatments could be used for follow-up. Relative amounts of herbicide to manual treatments would decline over time. • Re-vegetate with desirable species.	• Metsulfuron methyl • Chlorsulfuron • Sulfometuron methyl • Glyphosate • Picloram	• Backpack spray whenever possible. • Broadcast spray in dense cover, where dominant plant community is non-native. • Apply at pre-bloom to bloom growth stage or to rosettes in the fall • Yearly revisits will be necessary; the number of which is dependent on the herbicide used and the seed bank.

APPENDIX H
Proposed Herbicide Use at Treatment Sites in the Proposed Action

APPENDIX H: Proposed Herbicide Use at Treatment Sites in the Proposed Action

Selected herbicides are based on the prescriptions described in *Common Control Measures* (Mazzu, 2005). Eleven sites (highlighted in light gray) have no herbicides prescribed.

Treatment ID	Clopyralid	Chlorsulfuron	Glyphosate	Imazapic	Imazapyr	Metsulfuron methyl	Picloram	Sethoxydim	Sulfometuron methyl	Triclopyr
22-01										
22-05										
22-07										
22-08										
22-11										
22-12										
22-17										
61-002										
61-003										
61-005										
61-006										
61-007										
61-009										
61-017										
61-018										
61-019										
61-020										
61-021										
61-022										
61-023										
61-024										
61-025										
61-026										
61-027										
61-028										
61-029										
61-030										
61-034										
61-036										
61-039										
61-040										

Treatment ID	Clopyralid	Chlorsulfuron	Glyphosate	Imazapic	Imazapyr	Metsulfuron methyl	Picloram	Sethoxydim	Sulfometuron methyl	Triclopyr
61-041										
61-042										
61-043										
61-044										
61-045										
61-046										
61-047										
61-048										
61-049										
61-050										
61-051										
61-053										
61-055										
61-057										
61-058										
61-059										
61-062										
61-064										
61-065										
61-066										
61-071										
61-073										
61-074										
61-075										
61-076										
61-077										
61-078										
61-079										
61-080										
61-081										
61-082										
61-083										
61-084										
61-085										
61-086										
61-087										
61-088										

Treatment ID	Clopyralid	Chlorsulfuron	Glyphosate	Imazapic	Imazapyr	Metsulfuron methyl	Picloram	Sethoxydim	Sulfometuron methyl	Triclopyr
61-089										
61-090										
61-091										
61-092										
61-093										
61-095										
65-001										
65-002										
65-003										
65-005										
65-006										
65-007										
65-008										
65-009										
65-010										
65-011										
65-012										
65-013										
65-014										
65-015										
65-016										
65-017										
65-018										
65-019										
65-020										
65-021										
65-022										
65-023										
65-024										
65-025										
65-026										
65-027										
65-028										
65-029										
65-030										
65-031										
65-032										

Treatment ID	Clopyralid	Chlorsulfuron	Glyphosate	Imazapic	Imazapyr	Metsulfuron methyl	Picloram	Sethoxydim	Sulfometuron methyl	Triclopyr
65-033										
65-034										
65-035										
65-036										
65-037										
65-038										
65-039										
65-040										
65-041										
65-042										
65-043										
65-044										
65-045										
65-046										
66-001										
66-003										
66-004										
66-005										
66-006										
66-007										
66-008										
66-009										
66-010										
66-011										
66-012										
66-013										
66-016										
66-017										
66-018										
66-020										
66-023										
66-025										
66-026										
66-027										
66-028										
66-029										
66-030										

Treatment ID	Clopyralid	Chlorsulfuron	Glyphosate	Imazapic	Imazapyr	Metsulfuron methyl	Picloram	Sethoxydim	Sulfometuron methyl	Triclopyr
66-033										
66-035										
66-037										
66-038										
66-039										
66-040										
66-041										
66-042										
66-043										
66-044										
66-046										
66-047										
66-048										
66-049										
66-051										
66-052										
66-053										
66-055										
66-057										
66-058										
66-059										
66-060										
66-062										
66-063										
66-067										
66-069										
66-071										
66-074										
66-081										
66-082										
66-083										
66-084										
66-085										
66-086										
66-087										
66-089										
66-091										

Treatment ID	Clopyralid	Chlorsulfuron	Glyphosate	Imazapic	Imazapyr	Metsulfuron methyl	Picloram	Sethoxydim	Sulfometuron methyl	Triclopyr
69-001										
69-002										
69-003										
69-004										
69-005										
69-006										
69-007										
69-008										
69-010										
69-011										
69-012										
69-013										
69-014										
69-015										
69-016										
69-017										
69-018										
69-019										
69-020										
69-021										
69-022										
69-023										
69-024										
69-025										
69-026										
69-027										
69-028										
69-029										
69-030										

APPENDIX I
Oregon State Class A & B Noxious Weeds

APPENDIX I: Oregon State Class A & B Noxious Weeds

Taken from Oregon Department of Agriculture Noxious Weed Control Program, 2006 Noxious Weed Policy and Classification System (http://www.oregon.gov/ODA/PLANT/WEEDS/docs/weed_policy.pdf).

Noxious weeds, for the purpose of this system, shall be designated "A" or "B" and may be given the additional designation of "T" according to the Oregon Department of Agriculture Noxious Weed Rating System.

- **"A" Designated Weed**
  A weed of known economic importance which occurs in the state in small enough infestations to make eradication or containment possible; or is not know to occur, but its presence in neighboring states make future occurrence in Oregon seem imminent.

  Recommended Action: Infestations are subject to eradication or intensive control when and where found.

- **"B" Designated Weed**
  A weed of economic importance which is regionally abundant, but which may have limited distribution in some counties.

  Recommended Action: Limited to intensive control at the state, county or regional level as determined on a case-by-case basis. Where implementation of a fully integrated statewide management plan is not feasible, biological control (when available) shall be the main control approach. ("B" weeds targeted for biological control are identified with an asterisk).

- **"T" Designated Weed**
  A priority noxious weed designated by the Oregon State Weed Board as a target on which the Oregon Department of Agriculture will develop and implement a statewide management plan. "T" designated noxious weeds are species selected from either the "A" or "B" list.

Weed Class	Common Name	Family	Scientific Name
A	African rue	Caltrop	*Peganum harmala*
B	Austrian peaweed	Fabaceae	*Sphaerophysa salsula*
A, T	Barbed goatgrass	Poaceae	*Aegilops triuncialis*
B	Bearded creeper (Common crupina)	Asteraceae	*Crupina fulgaris*
B	Biddy-biddy	Zygophyllaceae	*Acaena novae-zelandiae*
B	Buffalobur	Solanaceae	*Solanum rostratum*
B	Bull thistle *	Asteraceae	*Cirsium vulagre*
B	Butterfly bush	Buddlejaceae	*Buddleja davidii*
A	Camelthorn	Fabaceae	*Alhagi pseudalhagi*
B	Canada thistle *	Asteraceae	*Cirsium arvense*
A	Coltsfoot	Asteraceae	*Tussilago farara*
B, T	Common bugloss	Boraginaceae	*Anchusa officinalis*
A, T	Common cordgrass	Poaceae	*Spartina anglica*
B	Creeping yellow cress	Brassicaceae	*Rorippa sylvestris*
B	Cutleaf teasel	Dipsacaceae	*Dipsacus laciniatus*
B	Dalmatian toadflax *	Scrophulariaceae	*Linaria dalmatica*
A, T	Dense flowered cordgrass	Poaceae	*Spartina densiflora*
B	Diffuse knapweed *	Asteraceae	*Centaurea diffusa*
B	Dodder	Cuscutaceae	*Suscuta spp.*
B	Dyers woad	Brassicaceae	*Isatis tinctoria*
B	English ivy	Araliaceae	*Hedera helix*
B	Eurasian watermilfoil	Haloragaceae	*Myriophyllum spicatum*
A	European water chestnut	Trapaceae	*Trapa natans*
B	False brome	Poaceae	*Brachypodium sylvaticum*
B	Field bindweed *	Convolvulaceae	*Convolvulus arvensis*
B	French broom *	Fabaceae	*Cytisus monspessulanas*
A, T	Giant hogweed	Apiaceae	*Heracleum mantegazzianum*
B	Giant horsetail	Equietaceae	*Equisetum telmateia*
B, T	Giant knotweed	Polygonaceae	*Polygonum sachalinense*
B, T	Gorse *	Fabaceae	*Ulex europaeus*
B	Hairy white top	Brassicaceae	*Cardaria pubescens*
B	Halogeton	Chenopodiac	*Halogeton glomeratus*
B	Himalayan blackberry	Rosaceae	*Rubus discolor(precerus)*
B, T	Himalayan knotweed	Polygonaceae	*Polygonum polystachyum*
B	Houndstongue	Boraginaceae	*Cynoglossum officinale*
A	Hydrilla	Hydrocharitaceae	*Hydrilla verticillata*
A, T	Iberian starthistle	Asteraceae	*Centaurea iberica*
B	Italian thistle *	Asteraceae	*Carduus phycnocephalus*
B, T	Japanese knotweed	Polygonaceae	*Polygonum cuspidatum*
B	Johnsongrass	Poaceae	*Sorghum halepense*
B	Jointed goatgrass	Poaceae	*Aegilops cylindrica*
B	Jubata grass	Poaceae	*Cortaderia jubata*

Weed Class	Common Name	Family	Scientific Name
A	King-devil hawkweed	Asteraceae	*Hieracium piloselloides*
B	Kochia	Chenopodiaceae	*Kochia scoparia*
A, T	Kudzu	Fabaceae	*Pueraria lobata*
B, T	Leafy spurge *	Euphorbiaceae	*Euphorbia esula*
B	Lens-podded white top	Brassicaceae	*Cardaria chalapensis*
A	Matgrass	Poaceae	*Nardus stricta*
A, T	Meadow hawkweed	Asteraceae	*Hieracium pratense*
B	Meadow knapweed *	Asteraceae	*Centaurea pratensis*
B	Mediterranean sage	Lamiaceae	*Salvia aethiopis*
B	Medusahead rye	Poaceae	*Taeniatherum canput-medusae*
B	Milk thistle *	Asteraceae	*Silyburn marianum*
A	Mouse-ear hawkweed	Asteraceae	*Hieracium pilosella*
B	Musk thistle *	Asteraceae	*Carduss nutans*
B	Myrtle spurge	Euphorbiaceae	*Euphorbia myrsinites*
B	Old man´s beard	Ranunculaceae	*Clematis vitalba*
A, T	Orange hawkweed	Asteraceae	*Hieracium aurantiacum*
A	Ovate goatgrass	Poaceae	*Aegilops ovata*
A	Paterson’s curse	Boraginaceae	*Echium plantagineum*
B	Perennial pepperweed	Brassicaceae	*Lepidium latifolium*
A	Plumeless thistle	Asteraceae	*Carduus alanthoides*
B	Poison hemlock	Apiaceae	*Conium maculatum*
B	Policeman’s helmet	Balsaminaceae	*Impatiens glandulifera*
B	Portuguese broom	Fabaceae	*Cytisus striatus*
B, T	Portuguese broom	Fabaceae	*Cytisus striatus*
B	Puncturevine *	Zygophyllaceae	*Tribulus terrestris*
B, T	Purple loosestrife *	Lythraceae	*Lythrum salicaria*
A	Purple nutsedge	Cyperaceae	*Cyperus rotundus*
A, T	Purple starthistle	Asteraceae	*Centaurea calcitrapa*
B	Quackgrass	Poaceae	*Agropyron repens*
B	Ragweed	Asteraceae	*Ambrosia artemisiifolia*
B, T	Rush skeletonweed *	Asteraceae	*Chondrilla juncea*
B	Russian knapweed *	Asteraceae	*Acroptilon repens*
B	Saltcedar *	Tamaricaceae	*Tamarix ramosissima*
A, T	Saltmeadow cordgrass	Poaceae	*Spartina patens*
B, T	Saltmeadow Cordgrass	Poaceae	*Spartina patens*
B	Scotch broom *	Fabaceae	*Cytisus scoparius*
B	Scotch thistle	Asteraceae	*Onopordum acanthium*
A	Silverleaf nightshade	Solanaceae	*Solanum elaegnifolium*
A	Skeletonleaf bursage	Asteraceae	*Ambrosia tomentosa*
B	Slender flowered thistle *	Asteraceae	*Carduus tenuiflorus*
B	Small broomrape	Orbanchaceae	*Orobanche minor*
A, T	Smooth cordgrass	Poaceae	*Spartina alterniflora*
A	Smooth distaff thistle	Asteraceae	*Carthamus baeticus*
B	South American waterweed(Elodea)	Hydrocharitaceae	*Elodea (egeria)densa*

Weed Class	Common Name	Family	Scientific Name
B	Spanish broom	Leguminosae	*Spartium junceum*
B	Spikeweed	Asteraceae	*Hemizonia pungens*
B	Spiny cocklebur	Asteraceae	*Xanthium spinosum*
B, T	Spotted knapweed *	Asteraceae	*Centaurea maculosa*
A, T	Squarrose knapweed	Asteraceae	*Centaurea virgata*
B	St.Johnswort (Klamath weed)	Hypericaceae	*Hypericum perforatum*
B	Sulfur cinquefoil	Rosaceae	*Potentilla recta*
A	Syrian bean caper	Zygophyllaceae	*Zygophyllum fabago*
B, T	Tansy ragwort *	Asteraceae	*Senecio jacobaea*
A	Texas blueweed	Asteraceae	*Helianthus ciliaris*
B	Velvetleaf	Malvaceae	*Abutilon theophrasti*
B	White top (Hoary cress)	Brassicaceae	*Cardaria draba*
A, T	Wolly distaff thistle	Asteraceae	*Carthamus lanatus*
B	Yellow flag iris	Iridaceae	*Iris pseudacorus*
A	Yellow floating heart	Menyanthaceae	*Nymphoides peltata*
A, T	Yellow hawkweed	Scrophulariaceae	*Hieracium floribundum*
B	Yellow nutsedge	Cyperacea	*Cyperus esulentus*
B, T	Yellow starthistle *	Asteraceae	*Centaurea solstitialis*
B	Yellow toadflax *	Scrophulariaceae	*Linaria vulgaris*

APPENDIX J
Invasive Plant Treatments by Fifth Field Watersheds

APPENDIX J: Invasive Plant Treatments by Fifth Field Watershed

Acres of proposed treatments and percentage of total watershed proposed for treatment by 5th field watersheds. The table describes 5th fields either partially or wholly contained within the Forest and Scenic Area that include treatment areas.

Watershed #	Watershed Name	Watershed Acres	Treatment ID	Treatment Acres	Percent Treated in Watershed
1707010502	Fifteenmile Creek	157237.53	61-009	0.10	0.00%
			61-017	96.09	0.06%
			61-018	7.99	0.01%
			61-089	84.56	0.05%
			61-095	39.07	0.02%
Subtotal		**157237.53**		**227.81**	**0.14%**
1707010503	Fivemile Creek	78190.47	61-002	119.38	0.15%
			61-003	55.02	0.07%
			61-005	72.23	0.09%
			61-006	92.15	0.12%
			61-007	5.44	0.01%
			61-009	43.11	0.06%
			61-088	59.71	0.08%
			61-095	64.79	0.08%
Subtotal		**78190.47**		**511.83**	**0.65%**
1707010504	Middle Columbia/ Mill Creek	130697.64	22-12	81.89	0.06%
			66-033	17.30	0.01%
			66-042	2.74	0.00%
			66-055	36.70	0.03%
			66-074	53.18	0.04%
			66-081	22.23	0.02%
Subtotal		**130697.64**		**214.04**	**0.16%**
1707010506	East Fork Hood River	100953.29	61-095	0.10	0.00%
			66-008	331.13	0.33%
			66-010	10.01	0.01%
			66-011	3.03	0.00%
			66-013	10.81	0.01%
			66-018	51.22	0.05%
			66-025	1.61	0.00%
			66-027	4.00	0.00%
			66-028	0.82	0.00%

Watershed #	Watershed Name	Watershed Acres	Treatment ID	Treatment Acres	Percent Treated in Watershed
			66-030	0.26	0.00%
			66-035	5.52	0.01%
			66-038	85.74	0.08%
			66-041	1.03	0.00%
			66-042	0.08	0.00%
			66-043	1.36	0.00%
			66-047	7.08	0.01%
			66-053	4.24	0.00%
			66-062	145.79	0.14%
			66-063	412.97	0.41%
			66-074	11.01	0.01%
			66-082	93.09	0.09%
			66-084	73.17	0.07%
Subtotal		**100953.29**		**1254.07**	**1.24%**
1707010507	West Fork Hood River	65466.30	66-003	34.57	0.05%
			66-004	18.88	0.03%
			66-005	25.02	0.04%
			66-006	58.62	0.09%
			66-007	448.78	0.69%
			66-009	9.31	0.01%
			66-012	0.67	0.00%
			66-016	78.79	0.12%
			66-017	66.57	0.10%
			66-023	350.89	0.54%
			66-026	0.07	0.00%
			66-029	0.69	0.00%
			66-040	1.08	0.00%
			66-048	3.59	0.01%
			66-049	3.65	0.01%
			66-060	105.24	0.16%
			66-063	217.98	0.33%
			66-067	103.70	0.16%
			66-071	64.71	0.10%
			66-083	27.70	0.04%
			69-008	0.00	0.00%
Subtotal		**65466.30**		**1620.51**	**2.48%**
1707010508	Lower Hood River	51289.31	66-035	1.38	0.00%
			66-038	175.75	0.34%

Watershed #	Watershed Name	Watershed Acres	Treatment ID	Treatment Acres	Percent Treated in Watershed
			66-044	0.40	0.00%
			66-046	1.82	0.00%
			66-055	4.53	0.01%
			66-067	21.49	0.04%
			66-074	44.95	0.09%
Subtotal		**51289.31**		**250.32**	**0.49%**
1707010512	Middle Columbia/ Grays Creek	92722.76	22-05	10.44	0.01%
			22-07	21.19	0.02%
			22-08	23.53	0.03%
			22-11	109.86	0.12%
			66-067	8.33	0.01%
Subtotal		**92722.76**		**173.35**	**0.19%**
1707010513	Middle Columbia/ Eagle Creek	84495.22	22-05	79.16	0.09%
Subtotal		**84495.22**		**79.16**	**0.09%**
1707030605	Beaver Creek	106742.00	61-041	4.21	0.00%
			61-055	6.91	0.01%
			61-057	0.59	0.00%
			61-083	0.31	0.00%
			61-087	19.84	0.02%
			61-093	13.66	0.01%
Subtotal		**106742.00**		**45.52**	**0.04%**
1707030607	Middle Deschutes River	195384.59	61-048	19.81	0.01%
			61-050	93.99	0.05%
			61-058	9.94	0.01%
			61-059	22.77	0.01%
			61-062	3.80	0.00%
			61-064	0.44	0.00%
			61-065	18.92	0.01%
			61-066	8.34	0.00%
			61-073	31.09	0.02%
			61-079	21.57	0.01%
			61-080	17.98	0.01%
			61-081	3.52	0.00%
			61-082	0.29	0.00%
			61-083	18.61	0.01%
			61-085	10.13	0.01%
			61-086	24.33	0.01%

Watershed #	Watershed Name	Watershed Acres	Treatment ID	Treatment Acres	Percent Treated in Watershed
			61-087	10.12	0.01%
Subtotal		**195384.59**		**315.65**	**0.16%**
1707030609	Tygh Creek	81558.38	61-018	40.19	0.05%
			61-019	246.49	0.30%
			61-020	0.49	0.00%
			61-021	6.82	0.01%
			61-089	4.07	0.00%
Subtotal		**81558.38**		**298.06**	**0.37%**
1707030610	White River	176272.25	61-019	18.02	0.01%
			61-021	39.43	0.02%
			61-022	11.27	0.01%
			61-023	10.93	0.01%
			61-024	30.12	0.02%
			61-025	54.12	0.03%
			61-026	34.72	0.02%
			61-027	26.81	0.02%
			61-028	51.60	0.03%
			61-029	40.20	0.02%
			61-030	5.98	0.00%
			61-034	58.46	0.03%
			61-036	25.80	0.01%
			61-039	75.93	0.04%
			61-040	10.40	0.01%
			61-041	54.98	0.03%
			61-042	52.14	0.03%
			61-043	15.74	0.01%
			61-044	20.16	0.01%
			61-045	33.17	0.02%
			61-046	2.89	0.00%
			61-047	1.47	0.00%
			61-048	19.02	0.01%
			61-049	19.55	0.01%
			61-050	17.81	0.01%
			61-051	0.36	0.00%
			61-053	3.74	0.00%
			61-071	40.82	0.02%
			61-074	45.73	0.03%
			61-075	12.53	0.01%

Watershed #	Watershed Name	Watershed Acres	Treatment ID	Treatment Acres	Percent Treated in Watershed
			61-076	15.39	0.01%
			61-077	44.66	0.03%
			61-078	22.43	0.01%
			61-079	15.63	0.01%
			61-084	32.39	0.02%
			61-085	5.79	0.00%
			61-086	39.88	0.02%
			61-087	0.20	0.00%
			61-090	0.51	0.00%
			61-091	3.65	0.00%
			61-092	5.99	0.00%
			61-093	5.40	0.00%
			66-001	20.75	0.01%
			66-008	112.08	0.06%
			66-020	1014.29	0.58%
			66-037	9.63	0.01%
			66-039	3.52	0.00%
			66-051	5.67	0.00%
			66-052	8.78	0.00%
			66-057	80.31	0.05%
			66-058	14.94	0.01%
			66-059	39.70	0.02%
			66-069	50.45	0.03%
			66-085	145.55	0.08%
			66-086	296.42	0.17%
			66-087	67.97	0.04%
			66-089	154.45	0.09%
			66-091	120.19	0.07%
			69-026	1.12	0.00%
Subtotal		**176272.25**		**3171.64**	**1.80%**
1708000101	Salmon River	73716.08	66-008	66.12	0.09%
			66-085	2.51	0.00%
			69-001	7.50	0.01%
			69-004	24.14	0.03%
			69-006	0.09	0.00%
			69-016	72.25	0.10%
			69-024	0.19	0.00%
Subtotal		**73716.08**		**172.80**	**0.23%**

Watershed #	Watershed Name	Watershed Acres	Treatment ID	Treatment Acres	Percent Treated in Watershed
1708000102	Zigzag River	37763.73	69-002	0.01	0.00%
			69-008	3.72	0.01%
			69-010	0.02	0.00%
			69-011	0.01	0.00%
			69-012	0.20	0.00%
			69-013	0.07	0.00%
			69-014	0.03	0.00%
			69-015	0.03	0.00%
			69-016	348.62	0.92%
			69-017	0.93	0.00%
			69-018	1.08	0.00%
			69-019	0.72	0.00%
			69-020	0.43	0.00%
			69-021	1.39	0.00%
			69-022	0.77	0.00%
			69-023	0.61	0.00%
			69-025	3.25	0.01%
			69-028	3.73	0.01%
			69-030	3.10	0.01%
Subtotal		**37763.73**		**368.72**	**0.98%**
1708000103	Upper Sandy River	34200.89	66-003	8.22	0.02%
			66-005	18.71	0.05%
			66-007	0.04	0.00%
			66-016	0.01	0.00%
			69-008	1033.74	3.02%
Subtotal		**34200.89**		**1060.72**	**3.10%**
1708000104	Middle Sandy River	40956.70	69-008	16.36	0.04%
			69-016	23.72	0.06%
			69-029	0.40	0.00%
Subtotal		**40956.70**		**40.48**	**0.10%**
1708000105	Bull Run River	88984.99	69-008	2.35	0.00%
Subtotal		**88984.99**		**2.35**	**0.00%**
1708000107	Columbia Gorge Tributaries	103926.08	22-01	778.27	0.75%
			22-17	138.10	0.13%
			69-003	14.88	0.01%
			69-005	11.00	0.01%
Subtotal		**103926.08**		**942.25**	**0.91%**
1708000108	Lower Sandy River	47155.16	22-01	794.81	1.69%

Watershed #	Watershed Name	Watershed Acres	Treatment ID	Treatment Acres	Percent Treated in Watershed
			22-17	0.95	0.00%
			69-003	28.69	0.06%
			69-005	31.71	0.07%
			69-007	0.48	0.00%
Subtotal		**47155.16**		**856.63**	**1.82%**
1709001101	Collawash River	97421.08	65-017	4.05	0.00%
			65-026	4.72	0.00%
			65-027	0.73	0.00%
			65-028	0.77	0.00%
			65-029	11.63	0.01%
			65-030	11.39	0.01%
			65-031	14.27	0.01%
			65-032	2.74	0.00%
			65-033	9.64	0.01%
			65-041	4.18	0.00%
Subtotal		**97421.08**		**64.12**	**0.07%**
1709001102	Upper Clackamas River	100496.76	65-014	4.54	0.00%
			65-016	4.01	0.00%
			65-023	415.11	0.41%
			65-040	1.67	0.00%
			65-042	9.65	0.01%
			65-043	18.51	0.02%
			65-044	23.02	0.02%
			65-045	0.11	0.00%
			65-046	8.31	0.01%
Subtotal		**100496.76**		**484.93**	**0.48%**
1709001103	Oak Grove Fork Clackamas River	90542.01	65-001	33.30	0.04%
			65-003	64.81	0.07%
			65-009	1.03	0.00%
			65-010	12.99	0.01%
			65-011	1.07	0.00%
			65-015	18.69	0.02%
			65-018	1.09	0.00%
			65-024	4.58	0.01%
			65-034	5.20	0.01%
			65-035	5.30	0.01%
			65-037	0.39	0.00%
			65-038	1.08	0.00%

Watershed #	Watershed Name	Watershed Acres	Treatment ID	Treatment Acres	Percent Treated in Watershed
			65-039	0.28	0.00%
			69-027	25.95	0.03%
Subtotal		**90542.01**		**175.76**	**0.19%**
1709001104	Middle Clackamas River	138506.60	65-002	61.59	0.04%
			65-005	0.06	0.00%
			65-006	0.24	0.00%
			65-008	0.20	0.00%
			65-012	12.38	0.01%
			65-013	46.77	0.03%
			65-019	4.95	0.00%
			65-020	414.39	0.30%
			65-021	3.22	0.00%
			65-022	5.18	0.00%
			65-023	1.28	0.00%
			65-025	2.80	0.00%
			65-036	3.62	0.00%
			69-027	190.75	0.14%
Subtotal		**138506.60**		**747.43**	**0.54%**
1709001106	Lower Clackamas River	117660.69	65-007	3.38	0.00%
Subtotal		**117660.69**		**3.38**	**0.00%**

APPENDIX K
Proposed Herbicide Treatments for Alternative 3

APPENDIX K: Proposed Herbicide Treatments for Alternative 3

Proposed herbicide treatments and selected herbicides for Alternative 3 – Restricted Herbicide Alternative are based on the prescriptions described in *Common Control Measures* (Mazzu, 2005). No sites have sethoxydim, listed as a potential herbicide. All treatment sites not listed in this table have the same manual and mechanical treatments prescribed under Alternative 2 – Proposed Action Alternative.

Treatment ID	Overall Treatment	Herbicide Methods	Clopyralid	Chlorsulfuron	Glyphosate	Imazapic	Imazapyr	Metsulfuron methyl	Picloram	Sulfometuron methyl	Triclopyr
22-01	Herbicide plus Manual, Mechanical & Cultural	Broadcast Application, Backpack Sprayer									
22-08	Herbicide plus Manual & Mechanical	Backpack Sprayer									
61-022	Herbicide plus Manual & Mechanical	Backpack Sprayer									
61-050	Herbicide plus Manual	Backpack Sprayer									
65-002	Herbicide plus Manual & Mechanical	Backpack Sprayer									
65-005	Herbicide	Stem Injection									
65-006	Herbicide	Stem Injection									
65-008	Herbicide	Stem Injection									
65-009	Herbicide	Stem Injection									
65-011	Herbicide	Stem Injection									

Treatment ID	Overall Treatment	Herbicide Methods	Clopyralid	Chlorsulfuron	Glyphosate	Imazapic	Imazapyr	Metsulfuron methyl	Picloram	Sulfometuron methyl	Triclopyr
65-016	Herbicide plus Manual & Mechanical	Backpack Sprayer									
65-019	Herbicide	Stem Injection									
65-021	Herbicide	Stem Injection									
65-046	Herbicide plus Manual & Mechanical	Backpack Sprayer									
66-001	Herbicide plus Manual & Mechanical	Backpack Sprayer									
66-003	Herbicide plus Manual & Mechanical	Backpack Sprayer									
66-004	Herbicide plus Manual & Mechanical	Backpack Sprayer									
66-005	Herbicide plus Manual & Mechanical	Backpack Sprayer									
66-006	Herbicide plus Manual & Mechanical	Backpack Sprayer									
66-007	Herbicide plus Manual & Mechanical	Broadcast Application, Backpack Sprayer									
66-016	Herbicide plus Manual & Mechanical	Broadcast Application, Backpack Sprayer									

Treatment ID	Overall Treatment	Herbicide Methods	Clopyralid	Chlorsulfuron	Glyphosate	Imazapic	Imazapyr	Metsulfuron methyl	Picloram	Sulfometuron methyl	Triclopyr
66-041	Herbicide plus Mechanical	Backpack Sprayer									
66-047	Herbicide plus Manual & Mechanical	Backpack Sprayer									
66-059	Herbicide plus Manual & Mechanical	Backpack Sprayer									
66-081	Herbicide plus Mechanical	Backpack Sprayer									
66-082	Herbicide plus Mechanical	Backpack Sprayer									
66-083	Herbicide plus Mechanical	Backpack Sprayer									
66-084	Herbicide plus Mechanical	Backpack Sprayer									
69-002	Herbicide	Stem Injection									
69-003	Herbicide plus Manual & Mechanical	Backpack Sprayer									
69-006	Herbicide plus Manual & Mechanical	Backpack Sprayer									
69-008	Herbicide plus Manual & Mechanical	Backpack Sprayer									
69-010	Herbicide	Stem Injection									

Treatment ID	Overall Treatment	Herbicide Methods	Clopyralid	Chlorsulfuron	Glyphosate	Imazapic	Imazapyr	Metsulfuron methyl	Picloram	Sulfometuron methyl	Triclopyr
69-011	Herbicide	Stem Injection									
69-012	Herbicide	Stem Injection									
69-013	Herbicide	Stem Injection									
69-014	Herbicide	Stem Injection									
69-015	Herbicide	Stem Injection									
69-026	Herbicide plus Manual & Mechanical	Backpack Sprayer									
69-027	Herbicide plus Manual & Mechanical	Backpack Sprayer									
69-028	Herbicide plus Manual & Mechanical	Backpack Sprayer									
69-029	Herbicide plus Manual & Mechanical	Stem Injection									
69-030	Herbicide plus Manual & Mechanical	Backpack Sprayer									

APPENDIX L
Sample Public Notifications

APPENDIX L: Sample Public Notifications, Taken from 2005 Mt. Hood National Forest Herbicide Applications

SAMPLE #1

PUBLIC NOTICE
Mt. Hood National Forest Integrated Weed Management Program

An integrated Weed Management Program which includes the use of herbicides, hand-pulling, and biological control will be implemented on the Barlow Ranger District of the Mt. Hood National Forest. The use of herbicides will only be applied from April 1 to October 30, 2005. The total area to be treated with the use of herbicides will not exceed 350 acres; listed below:

Diffuse knapweed/Spotted knapweed:

T1S; R11E; Sec., 15, 21, 22, 23, 24, 25, 26, 27, 28, 29, 31, 32, 33, 34, 34, 35, 36.

T2S; R10E; Sec., 13, 24

T2S; R11E; Sec., 1, 2, 3, 4, 5, 6, 8, 9, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 24, 25, 26, 27, 28, 30, 31, 32, 33, 34, 35, 36.

T2S; R12E; Sec., 3, 8, 9, 10, 18, 19, 20.

T3S; R11E; Sec., 1, 2, 3, 4, 12, 13, 21, 22, 23, 24, 25, 26, 27, 28, 30, 31, 32, 33, 35, 36.

T3S; R12E; Sec., 6, 7, 18, 19, 20, 28, 29, 30, 31.

T4S; R9E; Sec., 24, 25, 35, 36.

T4S; R10E; Sec., 1, 2, 3, 4, 5, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 31, 32, 33, 34, 35, 36.

T4S; R11E; Sec., 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 21, 22, 23, 26, 27, 29, 30, 31, 32, 33, 34, 35, 36.

T5S; R9E; Sec., 1, 2, 3, 10, 11, 12, 13, 14.

T5S; R10E; Sec., 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 21, 22, 23, 24, 25, 26..

T5S; R11E; Sec., 17, 18, 19, 20, 30, 33, 34.

T6S; R11E; Sec., 1.

Common hound's-tongue:

T5S; R10E; Sec., 10, 11, 14, 15, 16, 22, 23, 24, 25, 26.

T5S; R11E; Sec., 17, 25, 30.

Tansy ragwort:

T3S; R11E; Sec., 31, 32.

T4S; R11E; Sec., 5, 6, 7, 8, 17, 18.

T5S; R9E; Sec., 2, 10, 11, 15.

Scotch broom:

T2S; R12E; Sec., 19.

T4S; R11E; Sec., 23.

T4S; R10E; Sec., 20.

All restrictions and regulations regarding the use of herbicides will be followed as stated in the Region 6 Environmental Impact Statement for Managing Competing and Unwanted Vegetation, its accompanying Mediated Agreement, A Guide to Conducting Vegetation Management Projects in the Pacific Northwest Region, the Environmental Assessment for the Management of Noxious Weeds on the Barlow Ranger District, Mt. Hood National Forest, and the Modification to Design Features for Noxious Weed Treatment on the Barlow Ranger District.

Herbicides will be applied directly to target weeds. Application dates are weather dependent. All areas where herbicides are to be used will be posted prior, during, and after application.

Persons who know or suspect that they are hypersensitive to herbicides may contact the Forest Service to determine appropriate risk management measures.

Questions regarding specific project areas, timing, and treatment may be obtained by calling Dan Fissell at the Barlow RD at (541) 467-5117.

SAMPLE #2

PUBLIC NOTICE
Bonneville Power Administration Vegetation Management Program

A vegetation management program to keep vegetation a safe distance away from electric power facilities and control noxious weeds will be implemented within a portion of the Big Eddy-Ostrander Transmission Corridor. Methods will include manual, mechanical, and herbicide use. The project will be implemented from May 22 to October 30, 2005. The location of the sites to be treated are as follows:

Willamette Meridian Township 2 South, Range 8 East, Sections 3, 4, 8, 9, 17, 18 and 19. There are approximately 2000 gross acres within the project area, of which about 200 acres will actually be treated.

All restrictions and regulations regarding the use of herbicides will be followed as stated in the Transmission System Vegetation Management Program Final Environmental Impact Statement (FEIS), the Supplemental Analysis for the Transmission System Vegetation Management Program (SA-113), Forest Service Region 6 Environmental Impact Statement for Managing Competing and Unwanted Vegetation, its accompanying Mediated Agreement, and A guide to Conducting Vegetation Management Projects in the Pacific Northwest Region.

Herbicides will be applied directly to target vegetation. Application dates are weather dependent. All areas where herbicide is to be used will posted prior, during and after application.

Persons who are known to be or suspect that they are hypersensitive to herbicides may contact the Bonneville Power Administration to determine the appropriate risk management measures.

Questions regarding specific project areas, timing and treatment may be obtained by contacting Bill Erickson at (509) 527-6249 or wterickson@bpa.gov.

SAMPLE #3

PUBLIC NOTICE
Mt. Hood National Forest Integrated Weed Management Program

An integrated weed management program which includes the use of herbicides, hand pulling, and biological controls will be implemented on the Mt. Hood National Forest from June 1 to September 30, 2005. The locations and acreages of sites to be treated with herbicides are listed below:

Clackamas River Ranger District: Road 46, milepost 21 to Squirrel Quarry, ¼ acre; Road 4730-135, 1/8 acre; Road 4651, ¼ acre; Roads 57/5810 junction, 1/16 acre; Road 45/Highway 224 junction, 1/8 acre; Road 45 from Oz Quarry to Road 4520 junction, ½ acre.

Zigzag Ranger District: Highway 26, Laurel Hill Quarry to Ski Bowl, 20 acres.

All restrictions and regulations regarding the use of herbicides will be followed as stated in the Region 6 Environmental Impact Statement for Managing Competing and Unwanted Vegetation, its accompanying Mediated Agreement, A guide to Conducting Vegetation Management Projects in the Pacific Northwest Region, and the Environmental Assessment for the Management of Noxious Weeds on the Mt. Hood National Forest.

Herbicides will be applied directly to target weeds. Application dates are weather dependent. All areas where herbicide is to be used will be posted prior, during and after application.

Persons who are known to be or suspect that they are hypersensitive to herbicides may contact the Forest Service to determine the appropriate risk management measures.

Questions regarding specific project areas, timing and treatment may be obtained by calling Duane Bishop at Zigzag Ranger District, (503) 622-3191 or Tom Forney at Oregon Department of Agriculture, (503) 986-4621.

APPENDIX M
Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources

OREGON GUIDELINES FOR TIMING OF IN-WATER WORK TO PROTECT FISH AND WILDLIFE RESOURCES

June, 2000

Purpose of Guidelines - The Oregon Department of Fish and Wildlife, (ODFW), under its authority to manage Oregon's fish and wildlife resources has updated the following guidelines for timing of in-water work. The guidelines are to assist the public in minimizing potential impacts to important fish, wildlife and habitat resources.

"The guidelines are to assist the public in minimizing potential impacts...".

Developing the Guidelines - The guidelines are based on ODFW district fish biologists' recommendations. Primary considerations were given to important fish species including anadromous and other game fish and threatened, endangered, or sensitive species (coded list of species included in the guidelines). Time periods were established to avoid the vulnerable life stages of these fish including migration, spawning and rearing. The preferred work period applies to the listed streams, unlisted upstream tributaries, and associated reservoirs and lakes.

"The guidelines are based on ODFW district fish biologists' recommendations".

Using the Guidelines - These guidelines provide the public a way of planning in-water work during periods of time that would have the least impact on important fish, wildlife, and habitat resources. ODFW will use the guidelines as a basis for commenting on planning and regulatory processes. There are some circumstances where it may be appropriate to perform in-water work outside of the preferred work period indicated in the guidelines. ODFW, on a project by project basis, may consider variations in climate, location, and category of work that would allow more specific in-water work timing recommendations. These more specific timing recommendations will be made by the appropriate ODFW district office through the established planning and regulatory processes.

"These guidelines provide the public a way of planning in-water work during periods of time that would have the least impact on important fish, wildlife and habitat resources".

Modification of Guidelines - There may be limited situations where minor modification of the timing guidelines is warranted. ODFW may consider new information, the need for greater detail, or other factors that would generally improve the quality and usefulness of these guidelines. ODFW through the appropriate district office may modify or clarify timing guidelines within the district as needed. Statewide updates to guidelines will occur on a periodic basis.

"ODFW through the appropriate district office may modify or clarify timing guidelines within the district as needed".

Public Comments - A limited technical public review of these updated guidelines was conducted. A few responses provided specific biological information and recommendations for changing in-water work periods. Applicable ODFW districts reevaluated their timing recommendations based on this public response. Other comments concerned format and application of the timing guidelines. Some responses stated that different types of in-water activities should have different timing guidelines. ODFW recognizes there will be occasions that more specific timing guidelines may need to be established for specific activities. The established planning and regulatory processes can accommodate that need.

"A limited technical public review of these updated guidelines was conducted".

<u>Northwest Region</u>

WATERWAY	PREFERRED WORK PERIOD [1]

North Coast Watershed District

Astoria Office - (503) 338-0106

Pacific	
Columbia	
Columbia River Estuary (Mouth to Tongue Pt.)	November 1 - February 28 *(MAR,SHL,CHF,CHS,SS,CO,STW,STS ,CT*)*
Youngs River	July 15 - September 30 *(CO,STW *)*
Young's Bay Tributaries	July 1 – September 15 (*CO,CT,STW*)
Wallooskee River	June 1 - September 30 *(CO,CT*)*
Other Columbia R. Est. Tribs. (Mouth to Tongue Pt.)	July 1 - September 15 *(CHF,STW*)*
Necanicum	
Necanicum River & tributaries	July 1 - September 15 *(CO,CHF,STW*)*
Necanicum and Neawanna Estuary	November 1-February 15 (*MAR,SHL,CO,CHF,STW*)
Ecola Creek and Tributaries	July 1-September 15 (*CO,CT,STW*)
Nehalem	
Nehalem Bay	November 1 - February 15 *(MAR,SHL,CHS,CHF,CO,STW,*)*
Lower Nehalem River (below Hwy 26)	July 1 - September 15 *(CHF*)*
N. Fk. Nehalem River	July 1 - September 15 *(CHF,STW*)*
Cook Creek	July 1 - September 15 *(CHF,STW*)*
Salmonberry River	August 15 - September 15 *(CHS,STW*)*
Other Lower Nehalem River Tributaries	July 1 - September 15 *(CHF,CO,STW*)*
Upper Nehalem River (above Hwy 26)	July 1 - August 31 *(CHS,STW*)*
Other North Coastal tributaries (Columbia R. to Nehalem)	July 1 – September 15 *(CO,CT*)*
Coastal Lakes	October 1-February 15 (*CT*)
Coastal Lake Tributaries	July 1- September 15 (*CT*)

Tillamook Office - (503) 842-2741

Pacific	
Tillamook	
Tillamook Bay	November 1 - February 15 *(MAR,SHL,CHF,CHS,STW,CO,CS*)*
Miami,Kilchis,Wilson,Trask,Tillamook Rivers & Tribs.	July 1 - September 15 *(CHF,CHS,STW,CO,CS*)*
Other Tillamook Bay Tributaries	July 1 – September 15 (*CO,CT*)
Netarts Bay	November 1 - February 15 *(MAR,SHL,CHF,STW,CO,CS*)*
Sand Lake	November 1 - February 15 *(MAR,SHL,CHF,STW,CO,CS*)*
Nestucca	

[1] Work period is established for named stream, all upstream tributaries, and associated lakes within the watershed unless otherwise indicated.

WATERWAY	PREFERRED WORK PERIOD[1]
Nestucca Bay	November 1 - February 15 *(MAR,SHL,CHF,CHS,STW,CO,CS*)*
Nestucca River & Tributaries	July 1 - September 15 *(CO,CHS,CHF,CS,STW*)*
Little Nestucca River & Tributaries	July 1 – September 15 (*CO,CHS,CHF,CS,STW*)
Neskowin Creek and Tributaries	July 1 - September 15 *(CO,CS,STW*)*
Other North Coastal Tributaries (Nehalem to Neskowin Cr.)	July 1 – September 15 (*CO,CT*)
Coastal Lakes	October 1 – February 15 (*CT*)
Coastal lake Tributaries	July 1 – September 15 (*CT*)
<u>Newport Office - (541)-867-4741</u>	
Pacific	
Salmon	
Salmon River Estuary	November 1 - February 15 *(MAR,SHL*)*
Salmon River	July 1 - September 15 *(CHF,CO,CS,STW,CT*)*
Siletz	
Siletz Bay	November 1 - February 15 *(MAR,SHL*)*
Siletz River	July 1 - August 31 *(CHF,CHS,CO,CS,STW,STS,CT*)*
Yaquina	
Yaquina Bay	November 1 - February 15 *(MAR,SHL*)*
Yaquina River	July 1 - September 15 *(CHF,CO,STW,CT*)*
Alsea	
Alsea Bay	November 1 - February 15 *(MAR,SHL*)*
Alsea River	July 1 - August 31 *(CHF,CHS,CO,STW,CT*)*
Yachats River	July 1 - September 15 *(CHF,CO,STW,CT*)*
Siuslaw	
Siuslaw Bay	November 1 - February 15 *(MAR,SHL,CHF,CO,STW,CT*)*
Siuslaw River	July 1 - September 15 *(CHF,CO,STW,CT*)*
Other Coastal Tributaries	July 1 - September 15 *(CO,STW,CT*)*
Coastal Lakes	October 1 – February 15 (*STW,CO,CT*)
Coastal Lake Tributaries	July 1 – September 15 (STW,CO,CT)
<u>North Willamette Watershed District</u>	
<u>Clackamas Office (503) 657-2000</u>	
Columbia	
Columbia River (Big Creek to Bonneville Dam)	November 1 - February 28 *(CHF,CHS,CHR,SS,CO,CS,STW,STS, CTS*)*
Columbia River (Within District above Bonneville Dam)	November 15 - March 15 *(CHF,CHS,CHR,SS,CO,CS,STW,STS, CTS*)*
Columbia R. Tribs. (Big Creek to St. Helens)	July 1 - September 15 *(CHF,STW*)*
Clatskanie River	July 15 - September 15 *(CHF,STW*)*

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WATERWAY	PREFERRED WORK PERIOD [1]
Willamette	
Multnomah Channel (including Scappoose Bay)	July 1 - October 31 & December 1 - January 31 *(CHF,CHS,CO,STW,STS,CT,WW *)*
Milton Cr. & Scappoose Cr.	July 15 - August 31 *(CO,STW,JUV,WW*)*
Willamette River (mouth to Willamette Falls)	July 1 - October 31 & December 1 - January 31 *(CHF,CHS,CO,STW,STS,CT,WW *)*
Columbia Slough	June 15 - September 15 *(JUV,WW)*
Johnson	
Johnson Creek (below Gresham)	June 1 - August 31 *(STW,CO,CT,CHF*)*
Johnson Creek (above Gresham)	July 15 - August 31 *(STW,CO,CT,CHF*)*
Johnson Cr. Tribs.	July 15 - August 31 *(CT,STW,CO*)*
Kellogg Creek	July 1 - September 30 *(STW,CO,CT*)*
Tryon Creek	July 15 - September 30 *(STW,CO,CT*)*
Clackamas River	July 15 - August 31 *(CHF,CHS,STW,CO,STS,CT*)*
Abernethy Creek	July 15 - September 30 *(CO,STW,CT*)*
Other Willamette River tribs.	July 1 – October 15 (*CT**)
Willamette River (Will. Falls to Newberg)	June 1 - October 31 & December 1 - January 31 *(CHS,STW*)*
Tualatin	
Tualatin River (below Scoggins Cr.)	June 1 - September 30 *(CO,STW,CT,WW*)*
Tualatin River (above Scoggins Cr.)	July 1 - September 30 *(CO,STW,CT,WW*)*
Tributaries	July 1 - September 30 *(CO,STW,CT,WW*)*
Beaver Creek	July 1 - September 30 *(CT*)*
Molalla/Pudding River	
Molalla River (below Molalla)	June 1 – September 30 *(STW,CT*)*
Other Molalla River Tributaries (below Molalla)	June 1 - September 30 *(CT*)*
Molalla River (above Molalla)	July 15 - August 31 *(CHS,STW,CT,RB*)*
N. Fk & M. Fk Molalla	July 15 - August 31 *(CHS,STW,CT,RB*)*
Other Molalla River Tributaries (above Molalla)	July 15 - September 30 *(STW,CT*)*
Pudding River	June 1 - September 15 *(CHS,STW,CT*)*
Butte Creek	July 15 - September 30 *(STW,CT*)*
Abiqua Creek	July 15 - August 31 *(CHS,STW,CT,RB*)*
Silver Creek	July 15 - September 30 *(STW,CT*)*
Other Pudding River Tributaries	June 1 - September 30,*STW,CT,RB*)*
Other Willamette River tribs.	July 1 – October 15 (*CT**)
Willamette River (Newberg to Yamhill River)	June 1 – September 30 *(CHS,STW,CT,RB*)*
Chehalem Creek	July 1 - October 15 *(CT*)*
Yamhill River	July 1 - October 15 *(STW,CT*)*
Other Willamette River tribs.	July 1 – October 15 (*CT**)
Fairview Cr.,Arata Cr., Salmon Cr.	June 15 - September 15 *(CT,WW*)*
Sandy River	July 15 - August 31 *(CHS,CHF,CO,STW*)*
Tanner Creek	July 15 - August 15 *(CHF,CHS,CO,STW*)*
Columbia River Tributaries (St. Helens to Sandy River)	July 15 - August 31 *(CHF,CO,STW,CT *)*
Columbia River Tributaries (Sandy River to Herman Cr.)	July 15 - August 31 *(CO,STW,STS,CT *)*

[1] Work period is established for named stream, all upstream tributaries, and associated lakes within the watershed unless otherwise indicated.

WATERWAY	PREFERRED WORK PERIOD [1]
South Willamette Watershed District	
Corvallis Office - (541) 757-4186	
Willamette	
Willamette River (Yamhill River to McKenzie River)	June 1 – September 30 *(CHS,STW,CT,RB*)*
Spring Valley Creek	July 1 - September 30 *(CT*)*
Glenn Creek	July 1 - September 30 *(CT*)*
Mill Creek	June 1 – September 30 *(STW,CT,RB*)*
Rickreall Creek	July 1 – September 30 *(STW,CT*)*
Luckiamute River	July 1 - September 30 *(STW,CT*)*
Santiam	
Santiam River	June 1 – September 30 *(STW,CT*)*
North Santiam River (below Big Cliff Dam)	July 15 - August 31 *(CHS,STW,CT,RB*)*
Stout Cr., Rock Cr., & Mad Cr.	July 15 - September 30 *(STW,CT,RB*)*
Lt. N. Fk. Santiam River	July 15 - August 31 *(CHS,STW,CT,RB*)*
Sinker, Elkhorn Cedar Creeks & tributaries	July 15 - September 30 *(STW,CT,RB*)*
Other Tributaries	June 1 - September 30 *(CT*)*
Other Santiam River Tributaries (below Big Cliff Dam)	June 1 - September 30 *(CT*)*
North Santiam River (above Detroit Dam)	June 1 - September 30 *(K,CT,RB*)*
Breitenbush River	June 1 - September 30 *(K,CT,RB*)*
South Santiam River (below Foster Dam)	June 1 - August 31 *(CHS,CT,RB*)*
Crabtree Cr., & Thomas Cr.	July 15 - August 31 *(CHS,STW,CT,RB*)*
McDowell Cr., Wiley Cr.	July 15 - September 30 *(STW,CT*)*
Other South Santiam River Tributaries (below Foster Dam)	June 1 - September 30 *(CT*)*
South Santiam River (above Foster Dam)	July 15 - August 31 *(CHS,STW,CT,RB*)*
Middle Santiam River & Quartzville Creek	June 1 - September 30 *(K,CT,RB*)*
Marys River	July 1 - September 30 *(CT*)*
Long Tom River	July 1 - September 30 *(CT*)*
Other West Bank Will. R. Tribs. (Will. Falls to McKenzie R.)	July 1 - September 30 *(CT*)*
Calapooia	
Calapooia River (below Holley)	June 1 - September 30 *(CHS,STW,CT*)*
Calapooia River (above Holley)	July 15 - August 31 *(CHS,STW,CT,RB*)*
Other East Bank Will. R. Tribs. (Will. Falls to Harrisburg)	June 1 - September 30 *(CT*)*
Springfield Office - (541) 726-3515	
Willamette	
Willamette River (above McKenzie River)	June 1 - October 31 *(CHS,RB*)*
McKenzie	
McKenzie River (below Blue River)	July 1 - August 31 *(CHS,STW,CT,RB*)*
Tribs. McKenzie River (below Blue River)	July 1 - October 15 *(CT,RB*)*
McKenzie River (above Blue River)	July 1 - August 15 *(CHS,BUT,CT,RB*)*
Middle Fork Willamette	
Middle Fork Willamette River (to Rattlesnake Cr)	July 1 - August 31 *(CHS,STW,CT,RB*)*
Middle Fork Willamette river (Rattlesnake to Hills Cr. Res.)	by specific arrangement *(CHS,STW,CT,RB,OC*)*
Fall Creek	July 1 - August 31 *(CHS,STW,CT,RB*)*
Middle Fork Willamette River tributaries	July 1 - October 15 *(CT,RB*)*
Middle Fork Willamette River (above Hills Creek Reservoir)	July 1 - August 15 *(CHS,BUT,CT,RB*)*
Coast Fork Willamette	

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WATERWAY	PREFERRED WORK PERIOD [1]
Coast Fork Willamette River	June 1 - October 31 *(CHS,RB*)*
Row River (below Dorena Res.)	June 1 - October 31 *(CHS,RB*)*
Row River (above Dorena Res.)	July 1 - October 15 *(CT,RB*)*

Southwest Region

Umpqua Watershed District

Roseburg Office - (541) 440-3353

Pacific	
Umpqua River	
Umpqua Bay & Smith Est.	November 1 - January 31 *(MAR,SHL,CHS,CHF,CO,STW,STS,,CT*)*
Umpqua River (Scottsburg and above)	July 1 - August 31 *(CHS,CHF,CO,STW,STS,CT*)*
Umpqua River Tribs.	July 1 - September 15 *(CHF,CO,STW,CT*)*
North Umpqua	
North Umpqua River (below Soda Springs Dam)	by specific arrangement *(CHF,CHS,CO,STW,STS,CT*)*
Tribs. North Umpqua (below Soda Springs)	July 1 - September 15 *(CHS,CO,STW,STS,CT*)*
North Umpqua River (above Soda Springs Dam)	June 15 - October 15 *(RB,BT,BR*)*
South Umpqua	
South Umpqua River	July 1 - August 31*(CHF,CHS,CO,STW,CT*)*
South Umpqua Tribs.	July 1 - September 15 *(CHF,CO,STW,CT*)*

Charleston Office - (541) 888-5515

Pacific	
Coos	
Coos Bay and River (to Millicoma R./S. Coos R. confluence)	October 1 - February 15 *(MAR,SHL,JUV,CHF,CO,STW,CT *)*
Millicoma River, S. Coos R. and tribs.	July 1 – September 15 *(CHF,CO,STW,CT,MD*)*
Coquille	
Coquille River Estuary (Mouth to Bear Creek)	October 1 - February 15 *(MAR,SHL,JUV,CHF,CO,STW,CT *)*
Coquille River and tribs. (Bear Creek and above)	July 1 - September 15 *(CHF,CO,STW,CT*)*
Other Coastal Tributaries	July 1 – September 15 *(CHF,CO,STW,CT*)*
Coastal Lakes	October 1 – February 15 *(CO,STW,CT*)*
Coastal Lake Tributaries	July 1 - September 15 *(CO,STW,CT*)*

Rogue Watershed District

Gold Beach Office - (541) 247-7605

Pacific	
Sixes/Coastal Tributaries	
Estuaries (Floras Cr., Sixes R., below 101 bridge)	October 1 - May 31 *(JUV CHF*)*

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WATERWAY	PREFERRED WORK PERIOD[1]
Floras Creek	July 15 - September 30 *(CHF,CO,STW,CT*)*
Sixes River	July 15 - September 30 *(CHF,CO,STW,CT*)*
Elk	
Elk River Estuary (below 101 bridge)	October 1 - May 31 *(JUV CHF*)*
Elk River	July 15 - September 30 *(CHF,CO,STW,CT*)*
Euchre/Coastal Tributaries	
Euchre Creek Estuary	October 1 - May 31 *(JUV CHF*)*
Euchre Creek	July 15 - September 30 *(CHF,CO,STW,CT*)*
Hubbard Cr., Brush Cr., Mussel Cr.	July 15 - October 31 *(STW,CT*)*
Rogue River	
Rogue River Estuary	October 1 - May 31 *(JUV CHF*)*
Rogue River (below Marial)	May 1 - September 30 *(CHF*)*
Rogue River Tributaries (below Marial)	July 15 - September 30 *(CHF,STW,CT*)*
Hunter	
Hunter Creek Estuary	October 1 - May 31 *(JUV CHF*)*
Hunter Creek	July 15 - September 30 *(CHF,STW,CT*)*
Pistol/Coastal Tributaries	
Pistol River Estuary	October 1 - May 31 *(JUV CHF*)*
Pistol River	July 15 - September 30 *(CHF,STW,CT*)*
Chetco/Coastal Tributaries	
Chetco River Estuary	October 1 - May 31 *(JUV CHF*)*
Chetco River	July 15 - September 30*(CHF,STW,CT*)*
Meyers Cr., Thomas Cr., & Whalehead Cr.	July 15 - October 31 *(STW,CT*)*
Winchuck	
Winchuck River Estuary	October 1 - May 31 *(JUV CHF*)*
Winchuck River	July 15 - September 30 *(CHF,STW,CT*)*
Other Coastal Tributaries	July 15 - October 31 *(CT*)*
Central Point Office (541) 826-8774	
Rogue	
Rogue River (above Marial)	June 15 - August 31 *(CHS,STW*)*
Illinois River	June 15 - September 15 *(CHF,STW*)*
Applegate River	July 1 - September 15 *(CHF,STW*)*
Other Rogue River Tributaries (above Marial).	June 15 - September 15 *(CHS,STW*)*
Rogue River (above Lost Cr.)	June 15 - September 15 *(BT,CT*)*

High Desert Region

Deschutes Watershed District

The Dalles Office - (541) 296-4628

Columbia	
Columbia River (Within District Bonneville to John Day Dam)	November 15 - March 15 *(CHF,CHS,SS,CO,STW,STS*)*
Columbia River Tributaries	July 1 - September 30 *(STW,CO,RB*)*
Fifteenmile Creek	July 1 - October 31 *(STW,RB*)*
Hood River	

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WATERWAY	PREFERRED WORK PERIOD[1]
Hood River	July 15 - August 31 *(CHF,CHS,CO,STS,STW*)*
East Fork Hood River & Tribs.	July 15 – August 31 *(CHF,CO,STS,STW*)*
Middle Fork Hood River & Tribs.	July 15 – August 15 *(STW,CHS,BUT*)*
West Fork Hood River & Tribs.	July 15 – August 15 *(CHS,STS,STW*)*
Deschutes	
Deschutes River (below Pelton Dam)	February 1 - March 15 *(CHF,STS,RB*)*
White River	July 1 - October 31 *(RB*)*
Buckhollow Cr.	July 1 - October 31 *(STS,RB*)*
Bakeoven Cr.	July 1 - October 31 *(STS,RB*)*
Trout Cr. July 1 - October 31 (*STS,RB*)*	
Bend Office - (541) 388-6363	
Deschutes	
Metolius	
Metolius River	by specific arrangement *(K,RB,BR,BUT*)*
Spring Creek	July 1 - September 30 *(K,RB*)*
Lake Creek	July 1 - September 30 *(K,RB,BR*)*
Deschutes River (Pelton Dam through Lake Billy Chinook)	July 1 - September 30 *(RB,BR*)*
Crooked River	
Crooked River (below Prineville Dam)	July 1 - October 31 *(RT*)*
Prineville Reservoir	July 1 - October 31 *(RT*)*
Crooked River (above Prineville Dam)	July 1 - October 31 *(RT*)*
N.Fk. Crooked River (above Big Summit Prairie)	July 1 - September 30 *(RT*)*
Deschutes River (Lake Billy Chinook to Bend)	July 1 - September 30 *(RB,BR,BUT,K*)*
Squaw Creek	July 1 - October 15 *(RB,BR,BUT*)*
Tumalo	July 1 - October 15 *(RB,BR*)*
Deschutes River (Bend-North Canal Dam to Benham Falls)	July 1 - October 15 *(RB,BR*)*
Deschutes River (Benham Falls to Wickiup Dam)	July 1 - October 15 *(RB,BR*)*
Little Deschutes River	July 1 - October 15 *(RB,BR*)*
Fall River July 1 - October 15 *(RB,BR*)*	
Deschutes River (Wickiup Reservoir to Crane Prairie Dam)	July 1 - August 31 *(RB,BR,K *)*
Deschutes River (Crane Prairie Reservoir to Little Lava Lake)	July 1 - August 31 *(RB,BT,K*)*
Klamath Watershed District	
Klamath Falls Office - (541) 883-5732	
Klamath	
Klamath River (below Keno)	July 1 - March 31 *(RB*)*
Cottonwood Creek	June 15 – September 15 (*STW**)
Jenny Creek	July 1 – January 31 (*SCRT,JCS**)
Klamath River (above Keno)	July 1 – February 1 *(SNS,BCHUB,RB*)*
Lost River above Bonanza	July 1 – February 1 (*RT,SNS*)
Lost River below Bonanza	July 1 - March 31 *(RT*)*
Williamson River	August 1 - September 30 *(RB,BT,BR,RT,SNS,LRS,KLS*)*

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WATERWAY	PREFERRED WORK PERIOD [1]
Sprague River	August 1 - September 30 *(BUT,LRS,SNS,RB,BT,BR *)*
Sycan River	August 1 - September 30 *(RB,BT,BR,BUT,LRS,SNS*)*
Wood River	August 1 - September 30 *(RB,BR,BUT,SNS*)*
Sevenmile Creek	August 1 - September 30 *(RB,BR*)*
Klamath Lake and Agency Lake	July 1 - January 31 *(RB,LRS,SNS,BCHUB*)*
Silver Lake tributaries	July 1 - September 15 *(RT,BT*)*
Summer Lake	July 1 - September 15 *(*)*
Chewaucan River	July 1 - September 15 *(RT*)*
Goose Lake tributaries	July 1 - September 15 *(GRT,GLAM,GSUC,GCB,PRCH,PSCL *)*
Warner Valley tributaries	July 1 - September 15 *(WSUC,FD*)*

Malheur Watershed District

Hines Office - (541) 573-6582

Columbia	
Snake	
Snake River (Malhuer County)	Open
Malheur	
Malheur River (below Namorf Dam)	Open
Willow Cr. (below Brogan Cyn.)	Open
Willow Cr. (above Brogan Cyn)	October 1 - March 31 *(RB,RT*)*
Cottonwood, Cr., Squaw Cr.	October 1 - March 31 *(RB,RT*)*
Other Tributaries	October 1 - March 31 *(RB,RT*)*
Malheur River (Namorf Dam to Dreswsey Valley)	November 1 - March 31 *(RT*)*
North Fork Malheur (mouth to Beulah Res.)	November 1 - March 31 *(RT,RB*)*
North Fork Malheur (above Beulah Res.)	July 1 - August 31 *(BUT,RT,BT*)*
South Fork Malheur	October 1 - March 31 *(RT*)*
Malheur River (above Drewsey Valley)	July 1 - August 31 *(BUT,RT,BT*)*
Owyhee River	
Owyhee River (below dam)	November 1 - March 31 *(RB,BT*)*
Owyhee River (above dam)	October 1 - March 31 *(RB,RT*)*
Succor Creek	October 1 - March 31 *(RT*)*
Silvies River (above 5mi dam)	October 1 - March 31 *(RT,*)*
Silver Creek (above Hwy 45)	October 1 - March 31 *(RT*)*
Donner Blitzen River (Steen Mtns)	October 1 - March 31 *(RT*)*
Alvord Basin	October 1 - March 31 *(LCT,AC*)*
Catlow Valley tributaries	October 1 - March 31 *(LCT,CTC,RT*)*
Trout Creek Mountains streams	October 1 - March 31 *(LCT,AC,RB,CT*)*
Quinn River	October 1 - March 31 *(LCT,RB,CT*)*

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WATERWAY	PREFERRED WORK PERIOD[1]
Northeast Region	
John Day Watershed District	
John Day Office - (541) 575-1167	
Columbia River	
Lower John Day	
John Day River (below John Day)	July 15 - August 31 *(STS,RT*)*
Rock Creek	
Rock Creek (Gilliam Co.)	July 15 - September 30 *(STS,RT*)*
North Fork John Day	
North Fork John Day River (below U.S. 395)	July 15 - August 31 *(STS,RT*)*
Middle Fork John Day	
Middle Fork John Day River (below US 395)	July 15 - August 31 *(STS,RT*)*
Middle Fork John Day River (above US 395)	July 15 - August 15 *(CHS,STS,RT,BUT*)*
North Fork John Day River (above U.S. 395)	July 15 - August 15 *(CHS,STS,BUT*)*
Upper John Day	
South Fork John Day River	
South Fork John Day River	July 15 - August 31 *(STS,RT*)*
John Day River (above John Day)	July 15 - August 15 *(CHS,STS,BUT,RT,CT*)*
Canyon Creek	July 15 - August 31 *(STS,RB,CT*)*
Pendleton Office - (541) 276-2344	
Columbia	
Columbia River (John Day Dam upstream)	December 1 - March 31 *(CHF,CHS,SS,CO,STS*)*
Willow Creek	July 1 - December 31 *(RT*)*
Umatilla	
Umatilla River (below Pendleton)	July 15 - October 15 *(CHF,CHS,CO,STS*)*
Butter Creek	July 1 - December 31 *(RT*)*
Umatilla River (above Pendleton)	July 1 - August 15 *(CHS,CHF,STS,RT*)*
Birch Creek	July 1 - October 31 *(STS,RT*)*
McKay Creek	
McKay Creek (below reservoir)	November 1 - March 31 *(CHF,CHS,CO,STS*)*
McKay Creek (above reservoir)	July 1 - December 31 *(RT*)*
Wildhorse Creek	July 1 - October 31 *(CHF,CHS,CO,STS,RT*)*
Meacham Creek	July 1 - August 15 *(CHS,STS,RT,BUT*)*
Walla Walla	
Walla Walla River (below Harris Park)	July 1 - October 31 *(STS,RT,BUT*)*
Mill Creek	July 1 - October 31 *(STS,RT,BUT*)*
Walla Walla River (above Harris Park)	July 1 - August 15 *(STS,RT,BUT*)*
Grande Ronde Watershed District	
Enterprise Office - (541) 426-3279	
Columbia	

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WATERWAY	PREFERRED WORK PERIOD [1]
Snake River (state line to Hells Canyon Dam)	July 1 - October 15 *(CHF,CHS,SS,STS*)*
Grande Ronde	
Grande Ronde River (below Wallowa River)	July 1 - September 15 *(CHF,STS*)*
Wenaha River	July 1 - August 15 *(CHS,STS,BUT*)*
Joseph Creek	July 1 - March 31 *(STS*)*
Wallowa River	July 15 - August 15 *(CHS,STS,RB,BT,BUT *)*
Imnaha River (above Big Sheep Creek)	July 15 - August 15 *(CHS,STS,BUT*)*
Imnaha River (below Big Sheep Creek)	July 1 – October 15 *(CHF,STS*)*

La Grande Office - (541) 963-2138
Columbia
Snake

Grande Ronde	
Grande Ronde River (Wallowa River to Highway 244 Bridge)	July 1 - October 15 *(CHS,STS,RB,BUT*)*
Minam River	July 1 – August 15 (*CHS,STS,RB,BUT**)
Lookingglass Creek	July 1 - August 15 *(CHS,STS,RB,BUT*)*
Catherine Creek	
Catherine Creek (to, and including Little Creek)	July 1 - October 15 *(CHS,STS,RB,BUT*)*
Catherine Creek (above Little Creek)	July 1 – August 15 *(CHS,STS,RB,BUT*)*
Grande Ronde River (above highway 244 bridge)	July 1 - July 31 *(CHS,STS,RB,BUT*)*
Snake River Reservoir	July 1 - November 30 *(WW*)*
Snake River Reservoir Tributaries	July 1 - October 31 *(RB*)*
Burnt River	July 1 - October 31 *(RB,BT*)*
Pine Creek	July 1 – August 31 *(RB,BUT *)*
Powder River (mouth to Phillips Reservoir)	July 1 - October 31 *(RB*)*
Anthony Creek	July 1 – August 31 (*RB,BUT**)
North Powder R. (above Dutch Flat Cr.)	July 1 – August 31 (*RB,BUT**)
Wolf Creek (above Wolf Creek Res.)	July 1 – August 31 (*RB,BUT**)
Big Muddy Creek (above Foothill Rd.)	July 1 – August 31 (*RB,BUT**)
Pine Creek (above North Fork Pine Cr.)	July 1 – August 31 (*RB,BUT**)
Salmon Creek (above Pocahontas Road)	July 1 – August 31 (*RB,BUT**)
Powder River (above Phillips Reservoir)	July 1 – August 31 (*RB,BUT**)
Deer Creek (above Phillips Reservoir)	July 1 – August 31 (*RB,BUT**)

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* Coded fish species defined below provide the primary basis for timing guidelines. The species list should be considered general information and is not necessarily comprehensive nor accurate.

AC - Alford chub
BCHUB – blue chub
BR - brown trout
BT - brook trout
BUT - bull trout
CR - Crappie
CHF - chinook salmon, fall
CHR - chinook salmon, summer
CHS - chinook salmon, spring
CO - coho salmon
CS - chum salmon
CT - cutthroat trout (includes sea run)
CTC - Catlow tui chub
GCB - goose lake chub
GLAM - goose lake lamprey
GSUC - goose lake sucker
JCRT – Jenny Creek red band trout
JCS – Jenny Creek sucker
JUV - juvenile salmonids
K - kokanee
KLS – Klamath largescale sucker
LCT - Lahontan cutthroat trout
LRS – Lost River sucker
MAR - various marine species of fish
MD – Millicoma Dace
MMS - Malheur mottled sculpin
PRCH - pit roach
PSCL - pit sculpin
RB - rainbow trout
RT - red band trout
SHL - various marine shell fish
SNS shortnose sucker
SS - sockeye salmon
STS - steelhead summer
STW - steelhead winter
WW - various warm water game fish

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APPENDIX N
Inventory and Monitoring Framework

APPENDIX N: Inventory and Monitoring Framework

Taken from Appendix M in the Invasive Plant FEIS (USDA Forest Service, 2005a), modified by Invasive Plant ROD (USDA Forest Service, 2005b)

It is assumed every Forest in Region Six has an invasive plants coordinator and is maintaining an up-to-date invasive plant inventory using NRIS/Terra, the nationally accepted protocol. The inventory will be the primary means to plan and prioritize treatments. The inventory will be used as the main vehicle for tracking treatment effectiveness both regionally and on a site-specific basis.

In addition to the monitoring that is already required under various Forest Plans, this inventory and monitoring plan framework is part of all action alternatives in this Environmental Impact Statement (EIS). The framework would guide the development of detailed monitoring plans at the site-specific project scale. Invasive plant treatment and restoration actions 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 likely that a site will be treated multiple times over the years. Tracking these efforts and subsequent progress will be crucial to determining success.

A good monitoring program will be well thought out and have a high probability of detecting change in the resource being monitored (NPS, 2002). The Field Guide to Invasive Plant Inventory, Monitoring and Mapping (USDA FS, 2002) has been developed to guide monitoring efforts in conjunction with NRIS/Terra. It suggests a monitoring regime may start with 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 until the seed source has been exhausted (i.e. no new germination taking place).

Monitoring regimes may vary in time and space depending on the species; for example, those that reproduce vegetatively may require a longer span of annual monitoring. The monitoring categories described in this framework (implementation/compliance, and effectiveness (of treatments in meeting project objectives, and effectiveness of protection measures) can be used to implement a long-term adaptive management strategy. By implementing an adaptive management approach, managers will identify and respond to changing conditions and new information on an ongoing basis, and assess the need to make changes to treatment and restoration strategies.

Implementation/Compliance Monitoring

Implementation/compliance monitoring answers the question, “Did we do what we said we would do?” This question needs to be answered on a Regional scale, because adaptive management strategies require determination that actions are taking place as described in the Invasive Plants EIS.

If an action alternative is selected, each Forest Supervisor will be directed to assess compliance with the Invasive Plant Program EIS Record of Decision as a part of Forest Plan Implementation monitoring. Regional Office staff will periodically aggregate this information as a part of program oversight.

An implementation/compliance checklist database, such as the Pacfish/Infish Biological Opinion Implementation Monitoring module database for the eastside, could be used as a template to input and analyze implementation/compliance monitoring data. The use of a consistent reporting format will allow for aggregation of information at various scales. Such as system will be used to determine patterns of compliance.

Listed Species — An implementation/compliance monitoring database would track invasive plant treatment projects that are the subject of Section 7 consultations under the Endangered Species Act (ESA), generate annual reporting of compliance for use by the Services (NOAA Fisheries, U.S. Fish and Wildlife) and Forest Service (FS), and allow for common reporting of data on individual projects. As a minimum, on each project requiring consultation, reporting will be required on compliance with Standards 16, 18, 19, and 20 in the Invasive Plant EIS. Additional standards could be included, as appropriate, for the individual ecoregions, Forests, or projects. For example, Northwest Forest Plan (NWFP) riparian standards relevant to herbicide use or invasive plant control projects could be included in the database for those Forests in the NWFP-covered areas.

Effectiveness Monitoring

Effectiveness monitoring, relative to project objectives, answers the question, “Were treatment and restoration projects effective?” This question could be answered on either a regional or a project-level scale. Invasive plant infestations require pre-project inventories to determine how, when, and where treatments are to be applied, and post-treatment monitoring to assess the effectiveness (treatment) in meeting project objectives (e.g. restoring structure and composition of native vegetation).

A goal of the Effectiveness Monitoring component in the Regional Invasive Plant Program is to answer the following questions:

- Have the number of new invasive plant infestations increased or decreased in the Region or at the project level?
- What changes in distribution, amount and proportion of invasive plant infestations have resulted due to treatment activities in the region or at the project level?
- Has the infestation size for a targeted invasive plant species been reduced regionally or at the project level?
- Which treatment methods, separate or in combination, are most successful for specific invasive species?
- Which treatment methods have not been successful for specific invasive species?

The nation-wide NRIS/Terra database, and the upcoming FACTS database, provide common reporting formats to input information and provide a mechanism for addressing the above questions. In addition, current long-term ecological monitoring networks will assist the FS in determining trends of invasive plant infestations at the Regional level.

The NRIS/Terra database could be sorted to answer the above questions because it tracks size and species of infestations as well as treatment methods. The Forest Inventory and Analysis Network (FIA) or the Forest Health Monitoring plots associated with the FIA network could be used to follow invasion trends. Such networks could be used to track trends in the spread or reduction in spread of the more dominant invasive plants in the region. Monitoring programs developed at the Forest level would answer more project specific questions.

Listed Species - Monitoring that addresses the effectiveness of various measures designed to reduce potential adverse effects from the project, including standards in the EIS, “project design criteria”, “design features”, and “protection measures” may also need to be conducted. This type of monitoring will only be required for **a representative sample of** invasive plant treatment projects that pose a “high risk” to federally listed species. “High risk” projects are defined as projects with the potential to affect listed species, in the following situations:

- Any project involving aerial application of herbicide.
- Projects involving the use of heavy equipment or broadcast application of herbicide (e.g. boom spray or backpack spraying that is not limited to spot sprays) that occur in 1) riparian areas (as defined in NWFP, Pacfish, or Infish, as applicable), ditches or water corridors connected to habitat for listed fish; or, 2) proximity to federally listed plants or butterfly habitat.

For the purposes of determining the need for protection measure effectiveness monitoring, invasive plant treatment methods that are **not** considered “high risk” can include, but are not limited to, the following:

- Broadcast application of herbicide and use of heavy equipment that occurs **outside** of, 1) riparian areas, ditches or water corridors connected to water bodies, or, 2) areas in proximity to federally listed plants or butterfly habitat.
- Manual methods including hand-pulling, grubbing, stabbing, pruning, cutting, etc.
- Mechanical methods using small equipment like chainsaws, or equipment rarely used and not often in proximity to listed fish habitat, like flamers, foamers, hot steam, etc.
- Prescribed fire used expressly for invasive plant control and which occurs outside of riparian areas or habitat for federally listed plants or butterflies.

- Herbicide applications using spot spray (used with a shield near listed plant locations) with a backpack sprayer, cut stump, injection, wicking wiping, basal bark applications, or other highly selective methods.

- Minor uses of fertilizer to encourage native plant competition or growth.

- Biological controls used in habitat areas for terrestrial wildlife or fish. Use in proximity to listed plants or butterflies should be evaluated on a case-by-case basis.

- Broadcast applications (except aerial) using clopyralid, imazapic, and metsulfuron methyl in proximity to habitat for listed fish or listed terrestrial wildlife.

A collection of several of these low risk projects in close proximity to each other and in proximity to habitat for listed species may constitute a "high risk" project, but this should be evaluated on a case-by-case basis.

Monitoring for "high risk" invasive plant treatments that may affect ESA-listed species or designated critical habitat should determine if standards and/or protection measures were effective at reducing potential effect pathways (e.g. disturbance, sedimentation, exposure to herbicides) and results should be applicable elsewhere. Unique, individual monitoring efforts and protocols have not provided information that is applicable to other areas or projects. Therefore, a Regional approach is outlined in this framework that will help address the needs for protection measure effectiveness at a broader scale. The regional approach will be developed in consultation with other agencies, including but not limited to National Marine Fisheries Service and U. S. Fish and Wildlife Service.

For example, Japanese knotweed is a serious invader of riparian areas and has the potential to alter ecosystems upon which listed salmon depend. The Region may have several Japanese knotweed treatment projects over the next several years and each one may have the potential to adversely affect listed salmon or designated critical habitat if adequate measures are not part of the treatment plan or are not complied with during implementation. Designing consistent monitoring protocol will allow a more efficient and effective evaluation of the project protection measures.

To meet the objective of being able to evaluate standards and measures applied at the Regional, sub-Regional, and project level for protection of ESA-listed species and/or designated critical habitat in "high risk" projects, an interagency monitoring protocol ***and reporting schedule*** will be developed by 2007. The expectation being that this protocol would be applied to high risk projects to determine the effectiveness of Regional EIS standards, and additional standards or protection measures applied at finer scales, in reducing potential effect pathways (e.g. disturbance, sedimentation, exposure to herbicides, etc.) for listed species.

In the interim, information obtained from implementation/compliance monitoring reports for "high risk" projects will be reviewed in 2005 and 2006 to inform the development of a consistent monitoring protocol for ensuring that standards and protection measures were effective. This 2-3 year lag time, before protocol is developed and effectiveness monitoring is implemented, does not apply to aerial application of herbicides. All projects with aerial applied herbicide will include a monitoring plan to assess the effectiveness of measures in protecting ESA-listed species and/or designated critical habitat.

Until a Regional, interagency effectiveness monitoring protocol for ESA-listed species and/or designated critical habitat is developed (2007), the need for effectiveness monitoring on "high risk" projects will be evaluated by Level 1 or other interagency technical teams during Section 7 consultation.

Recommendations for additional effectiveness monitoring beyond that described in this framework will require that Level 2 or other appropriate interagency management team agree to the recommendations of the technical or Level 1 team for the project. This process will help lead the Region toward efficient and reliable data collection and allow statistical analysis of the data gathered.

References

USFS (U.S. Forest Service). 2001. Invasive Plant Management Decisions and Environmental Analysis. USDA Forest Service

USFS (U.S. Forest Service). 2002. Field Guide – Invasive Plant Inventory, Monitoring and Mapping Protocol. USDA Forest Service.

NPS (National Park Service). 2002. Invasive Plants Inventory and Monitoring Guidelines, National Park Service.

APPENDIX O
Existing Conditions Characteristics

APPENDIX O: Existing Conditions Characteristics

Summary of existing conditions at each treatment area, including habitat, elevation, slope, soil information, precipitation, water characteristics, fauna, flora, recreation uses, and special uses. Table continued with more characteristics on page O-19. Information compiled from existing GIS layers, maintained in the Mt. Hood National Forest and Columbia River Gorge National Scenic Area, Geographic Information System data library (http://www.fs.fed.us/r6/data-library/gis/).

Key for table:

SRI	Soil Resource Inventory
NWFP	Northwest Forest Plan
TES	Threatened, Endangered, or Sensitive Species

Treatment ID #	Habitat (excluding harvest)	Average Elevation (ft)	% Slope (Min – Max)	% Slope (Average)	Main SRI Code [1]	Soil Type	Precipitation (inch/year)	Min. Dist To Water (ft.)	Category of Water
22-01	Hardwood riparian forest & wetlands	24.6	0-22	2		Lahar Sauvie silt loam; Flat (0% slope)	40	50	Columbia and Sandy Rivers, Wetlands
22-05	Open fields	379.3	1-52	22		Wyeth gravelly loam (0-10% slope)	80	350	Columbia River
22-07	Hardwood riparian forest	79.2	0-8	4		Sandy Xerofluvents; Flat (0% slope)	35	50	Columbia River
22-08	Restored rock quarry	495.3	0-60	21		Rock; No organic except small area (0-90% slope)	30	50	Pond
22-11	Open fields / Oak forest	657.9	0-59	12		Bodell cobbly loam (2-20% slope)	20	50	Rowena Creek Ponds

[1] GIS data on SRI Code is not available for the Scenic Area.

Treatment ID #	Habitat (excluding harvest)	Average Elevation (ft)	% Slope (Min – Max)	% Slope (Average)	Main SRI Code [1]	Soil Type	Precipitation (inch/year)	Min. Dist To Water (ft.)	Category of Water
22-12	Open fields / Oak forest	760.5	0-34	13		Bodell cobbly loam (5-45% slope); Skyline complex (0-20 % slope)	15	100	Pond
22-17	Active hay fields	612.3	1-60	11		Loam, silt loam (0-20% slope)	50	1000	Class IV stream
61-002	Coniferous forest	3360.0	1-44	13	161	Fine sandy loams & loams	45	0	Cross ephemeral & perennial streams
61-003	Coniferous forest	2720.0	1-63	24	154	Fine sandy loams & loams	35	0	Crosses ephemeral stream; Adjacent to perennial stream
61-005	Coniferous forest	3280.0	2-40	16	161	Fine sandy loams & loams	35	327	Perennial stream
61-006	Coniferous forest	3360.0	0-34	11	161	Fine sandy loams & loams	35	0	Crosses perennial stream
61-007	Rocky with minimum vegetation potential	3600.0	3-33	19	161	Fine sandy loams & loams	40	0	Pond in quarry
61-009	Coniferous forest	3040.0	2-53	18	156	Loams & silt loams	25	0	Crosses perennial stream
61-017	Coniferous forest	3520.0	1-52	17	156	Loams & silt loams	30	0	Crosses perennial stream; Adjacent to ephemeral stream

Treatment ID #	Habitat (excluding harvest)	Average Elevation (ft)	% Slope (Min – Max)	% Slope (Average)	Main SRI Code [1]	Soil Type	Precipitation (inch/year)	Min. Dist To Water (ft.)	Category of Water
61-018	Coniferous forest	3280.0	1-45	20	154	Fine sandy loams & loams	25	75	Intermittent stream
61-019	Administrative or agricultural	2640.0	0-78	17	156	Loams & silt loams	20	0	Crosses multiple perennial streams
61-020	Non-vegetated (<10% vegetation)	3040.0	15-16	15	156	Loams & silt loams	20	340	Intermittent stream
61-021	Coniferous forest	3120.0	3-38	15	352	Silt loams & heavy silt loams	25	0	Crosses perennial stream
61-022	Coniferous forest	3880.0	8-20	13	351	Silt loams & heavy silt loams	30	0	
61-023	Non-vegetated (<10% vegetation)	2760.0	7-39	21	350	Silt loams & heavy silt loams	20	20	Perennial stream
61-024	Coniferous forest	2640.0	2-31	17	157	Loams & silt loams	20	150	Perennial stream
61-025	Coniferous forest	3200.0	3-30	12	352	Silt loams & heavy silt loams	40	0	Crosses perennial & ephemeral streams
61-026	Coniferous forest	2960.0	4-34	13	156	Loams & silt loams	25	0	Crosses perennial stream
61-027	Coniferous forest	2360.0	1-8	3	153-8	Fine sandy loams & loams to dry meadows	20	300	Perennial stream
61-028	Coniferous forest	2480.0	0-25	11	156	Loams & silt loams	20	0	Crosses ephemeral stream
61-029	Coniferous forest	2880.0	1-43	13	352	Silt loams & heavy silt loams	30	0	Crosses ephemeral stream

Treatment ID #	Habitat (excluding harvest)	Average Elevation (ft)	% Slope (Min – Max)	% Slope (Average)	Main SRI Code [1]	Soil Type	Precipitation (inch/year)	Min. Dist To Water (ft.)	Category of Water
61-030	Coniferous forest	3460.0	9-12	11	350	Silt loams & heavy silt loams	30	215	Intermittent stream
61-034	Coniferous forest	2400.0	1-26	7	152	Find sandy loams & silt loams	20	93	Perennial stream
61-036	Coniferous forest	2440.0	4-14	8	156	Loams & silt loams	20	180	Perennial stream
61-039	Coniferous forest	3360.0	6-27	15	352	Silt loams & heavy silt loams	30	0	Crosses ephemeral stream
61-040	Coniferous forest	3440.0	6-19	11	352	Silt loams & heavy silt loams	30	0	Crosses ephemeral stream
61-041	Coniferous forest	3280.0	1-30	15	352	Silt loams & heavy silt loams	30	0	Spring seep; crosses ephemeral & intermittent streams
61-042	Coniferous forest	3120.0	3-27	11	352	Silt loams & heavy silt loams	30	0	Crosses several ephemeral streams
61-043	Coniferous forest	3280.0	2-18	7	352	Silt loams & heavy silt loams	35	0	Perennial stream
61-044	Coniferous forest	3160.0	3-13	6	352	Silt loams & heavy silt loams	25	40	Ditch on uphill
61-045	Shrubland	3200.0	3-14	6	352	Silt loams & heavy silt loams	25	164	Perennial stream
61-046	Coniferous forest	3160.0	7-16	11	352	Silt loams & heavy silt loams	25	9	Perennial stream
61-047	Wet forblands; Forb meadow	3160.0	4-8	5	8	Dry meadows	25	10	Wet meadow
61-048	Coniferous forest	3240.0	2-24	9	352	Silt loams & heavy silt loams	25	100	Ditch

Treatment ID #	Habitat (excluding harvest)	Average Elevation (ft)	% Slope (Min – Max)	% Slope (Average)	Main SRI Code [1]	Soil Type	Precipitation (inch/year)	Min. Dist To Water (ft.)	Category of Water
61-049	Coniferous forest	3080.0	4-20	12	351	Silt loams & heavy silt loams	25	10	Perennial stream
61-050	Coniferous forest	3280.0	2-27	12	352	Silt loams & heavy silt loams	25	200	Perennial stream
61-051	Coniferous forest	2920.0	7-7	7	352	Silt loams & heavy silt loams	25	585	Perennial stream
61-053	Coniferous forest	3240.0	7-12	9	352	Silt loams & heavy silt loams	25	0	Ditch on downhill
61-055	Bunchgrass vegetation	3240.0	2-17	9	352	Silt loams & heavy silt loams	25	115	Intermittent stream
61-057	Coniferous forest	3400.0	2-3	2	352	Silt loams & heavy silt loams	25	240	Intermittent stream
61-058	Coniferous forest	3200.0	3-7	4	352	Silt loams & heavy silt loams	25	300	Intermittent stream
61-059	Coniferous forest	3160.0	2-23	10	352	Silt loams & heavy silt loams	25	0	Perennial stream
61-062	Coniferous forest	3040.0	1-20	11	352	Silt loams & heavy silt loams	25	0	Ephemeral stream
61-064	Coniferous forest	3000.0	16-16	16	352	Silt loams & heavy silt loams	25	0	Crosses ephemeral stream
61-065	Coniferous forest	3040.0	2-24	18	352	Silt loams & heavy silt loams	25	0	Perennial stream
61-066	Coniferous forest	3160.0	2-15	7	352	Silt loams & heavy silt loams	25	230	Intermittent stream
61-071	Coniferous forest	3280.0	4-32	19	350	Silt loams & heavy silt loams	30	0	Intermittent stream

Treatment ID #	Habitat (excluding harvest)	Average Elevation (ft)	% Slope (Min – Max)	% Slope (Average)	Main SRI Code [1]	Soil Type	Precipitation (inch/year)	Min. Dist To Water (ft.)	Category of Water
61-073	Coniferous forest	3000.0	0-21	12	350	Silt loams & heavy silt loams	25	0	Perennial stream
61-074	Coniferous forest	3400.0	4-29	12	352	Silt loams & heavy silt loams	25	100	Ditch
61-075	Coniferous forest	3000.0	1-17	7	352	Silt loams & heavy silt loams	25	0	Crosses ephemeral stream
61-076	Coniferous forest	3040.0	3-13	8	352	Silt loams & heavy silt loams	25	0	Crosses ephemeral stream
61-077	Coniferous forest	2960.0	2-29	9	352	Silt loams & heavy silt loams	25	396	Perennial stream
61-078	Coniferous forest	3240.0	1-20	9	352	Silt loams & heavy silt loams	25	11	Intermittent stream
61-079	Coniferous forest	3240.0	0-15	6	352	Silt loams & heavy silt loams	25	0	Below ditch
61-080	Coniferous forest	3160.0	1-24	9	352	Silt loams & heavy silt loams	25	385	Intermittent stream
61-081	Coniferous forest	3280.0	4-10	7	352	Silt loams & heavy silt loams	25	578	Perennial stream
61-082	Coniferous forest	2880.0	18-19	18	350	Silt loams & heavy silt loams	25	0	Perennial stream; Crosses ephemeral stream
61-083	Coniferous forest	3088.0	1-26	14	352	Silt loams & heavy silt loams	25	0	Crosses several ephemeral streams

Treatment ID #	Habitat (excluding harvest)	Average Elevation (ft)	% Slope (Min – Max)	% Slope (Average)	Main SRI Code [1]	Soil Type	Precipitation (inch/year)	Min. Dist To Water (ft.)	Category of Water
61-084	Coniferous forest	3360.0	5-59	37	354-7	Gravelly loamy fine sands & loamy fine sands with igneous rock outcrop	40	0	Spring at bottom
61-085	Coniferous forest	3000.0	3-48	18	156	Loams & silt loams	25	0	Intermittent stream
61-086	Coniferous forest	3000.0	0-23	8	352	Silt loams & heavy silt loams	25	0	Crosses perennial & ephemeral streams
61-087	Coniferous forest	3240.0	0-20	9	352	Silt loams & heavy silt loams	25	0	Crosses several ephemeral streams
61-088	Coniferous forest	3360.0	1-29	14	161	Fine sandy loams & loams	35	100	
61-089	Coniferous forest	3280.0	0-57	14	156	Loams & silt loams	25	220	Perennial stream
61-090	Coniferous forest	3520.0	3-4	4	352	Silt loams & heavy silt loams	45	0	Crosses ephemeral stream
61-091	Administrative or agricultural	3320.0	9-20	14	352	Silt loams & heavy silt loams	40	100	Perennial stream
61-092	Coniferous forest	3520.0	7-15	11	352	Silt loams & heavy silt loams	25	61	Perennial stream
61-093	Coniferous forest	3440.0	2-24	8	352	Silt loams & heavy silt loams	25	200	Intermittent stream
61-095	Coniferous forest	3814.2	1-36	11	156	Loams & silt loams	80		
65-001	Coniferous forest	1950.0	1-26	11	304	Gravelly & cobbly loams	60	20	Stream

Treatment ID #	Habitat (excluding harvest)	Average Elevation (ft)	% Slope (Min – Max)	% Slope (Average)	Main SRI Code [1]	Soil Type	Precipitation (inch/year)	Min. Dist To Water (ft.)	Category of Water
65-002	Coniferous forest	1982.8	4-100	38	201-7	Cobbly & gravelly loams with igneous rock outcrop	90	0	Streams
65-003	Coniferous forest	3600.0	2-56	28	323	Gravelly silt loams	60	0	Stream
65-005	Coniferous forest		0-0		100	Heavy loam to silty clay loam	60	150	Stream
65-006	Coniferous forest	1450.0	6-6	6	100	Heavy loam to silty clay loam	60	50	Pond
65-007	Coniferous forest	2600.0	8-26	18	317	Cobbly loams	90	500	Stream
65-008	Administrative or agricultural	1450.0	14-14	14	100	Heavy loam to silty clay loam	60	5	Pond
65-009	Coniferous forest	1800.0	17-43	32	102P		60	225	Stream
65-010	Coniferous forest	2800.0	1-23	11	304	Gravelly & cobbly loams	60	175	Stream
65-011	Administrative or agricultural	1500.0	15-31	23	100G		60	200	Stream
65-012	Coniferous forest	3100.0	7-61	33	325-6	Gravelly silt loams with unvegetated talus & rubbleland	120	0	Stream
65-013	Coniferous forest	3200.0	6-70	33	322	Gravelly loams & gravelly silt loams	90	0	Stream
65-014	Coniferous forest	3800.0	10-41	22	305D		70	750	Stream
65-015	Administrative or agricultural	2000.0	2-20	7	3	Wet meadows	60	0	Wetland; Stream
65-016	Coniferous forest	3800.0	19-29	22	305D		70	800	Stream

Treatment ID #	Habitat (excluding harvest)	Average Elevation (ft)	% Slope (Min – Max)	% Slope (Average)	Main SRI Code [1]	Soil Type	Precipitation (inch/year)	Min. Dist To Water (ft.)	Category of Water
65-017	Coniferous forest	1600.0	22-88	52	7-13	Igneous rock outcrop with felsenmeer slopes	60	125	River
65-018	Administrative or agricultural	1500.0	5-7	6	100G		60	200	Stream
65-019	Running water	800.0	0-79	16	11	Alluvial bottomlands	70	20	River
65-020	Coniferous forest	907.9	0-147	34	11	Alluvial bottomlands	80	0	Streams
65-021	Coniferous forest	1450.0	8-19	12	100	Heavy loam to silty clay loam	60	0	Stream
65-022	Coniferous forest	1500.0	12-41	22	100	Heavy loam to silty clay loam	10	200	Stream
65-023	Coniferous forest	2453.8	1-68	17	306	Loams	80	0	Streams
65-024	Coniferous forest	1450.0	1-17	5	100G		60	30	Wetland
65-025	Administrative or agricultural	1450.0	1-12	5	100G		10	0	Pond
65-026	Coniferous forest	2101.0	3-14	6	100	Heavy loam to silty clay loam	60	0	Seasonal wetland
65-027	Coniferous forest	2159.6	1-14	7	100	Heavy loam to silty clay loam	60	0	Seasonal wetland
65-028	Coniferous forest	1728.8	19-29	23	2	Unstable sideslopes adjacent to major drainageways	60	100	River
65-029	Coniferous forest	1800.0	3-36	17	2	Unstable sideslopes adjacent to major drainageways	70	40	River

Treatment ID #	Habitat (excluding harvest)	Average Elevation (ft)	% Slope (Min – Max)	% Slope (Average)	Main SRI Code [1]	Soil Type	Precipitation (inch/year)	Min. Dist To Water (ft.)	Category of Water
65-030	Coniferous forest	1977.5	10-45	27	102	Heavy loam to silty clay loam	70	100	Stream
65-031	Coniferous forest	2000.0	1-10	7	100	Heavy loam to silty clay loam	70	0	Stream
65-032	Coniferous forest	3400.0	17-37	27	327	Loams & gravelly silt loams	70	350	Stream
65-033	Coniferous forest	3000.0	6-41	16	327	Loams & gravelly silt loams	70	100	Stream
65-034	Coniferous forest	3227.1	5-31	17	304	Gravelly & cobbly loams	60	230	Stream
65-035	Coniferous forest	3800.0	8-15	11	304	Gravelly & cobbly loams	60	200	Stream
65-036	Coniferous forest	3200.0	23-38	29	317	Cobbly loams	120	0	Stream
65-037	Coniferous forest	3197.0	12-12	12	330	Stony loams	60	50	Streams
65-038	Coniferous forest	2308.2	28-52	39	6-13	Unvegetated talus & rubbleland with felsenmeer slopes	60	150	Stream
65-039	Coniferous forest	3200.0	13-13	13	323	Gravelly silt loams	60	50	Stream
65-040	Coniferous forest	4100.0	5-6	6	304X		70	150	Stream
65-041	Coniferous forest	1800.0	10-76	31	2	Unstable sideslopes adjacent to major drainageways	70	25	Stream
65-042	Coniferous forest	2400.0	9-30	19	306	Loams	60	200	Stream
65-043	Coniferous forest	3200.0	7-31	17	302	Cobbly sandy loams	70	0	Stream

Treatment ID #	Habitat (excluding harvest)	Average Elevation (ft)	% Slope (Min – Max)	% Slope (Average)	Main SRI Code [1]	Soil Type	Precipitation (inch/year)	Min. Dist To Water (ft.)	Category of Water
65-044	Coniferous forest	3200.0	7-37	16	302	Cobbly sandy loams	80	0	Stream
65-045	Coniferous forest	2200.0	2-2	2	500	Very gravelly loams & very stony silt loams	60	780	Stream
65-046	Coniferous forest	3560.0	5-18	11	302	Cobbly sandy loams	80	0	Crosses intermittent stream
66-001	Coniferous forest	5000.0	3-33	24	335	Sandy loams & silt loams	70	300	Intermittent stream
66-003	Coniferous forest	3700.0	3-64	24	380	Gravelly loams	100	150	Intermittent stream
66-004	Coniferous forest	3600.0	31-93	52	13-12	Felsenmeer slopes with wet talus	100	0	Crosses intermittent stream
66-005	Coniferous forest	4240.0	1-60	29	345	Very gravelly loams	100	0	Crosses intermittent stream
66-006	Coniferous forest	2800.0	1-74	31	374	Gravelly & cobbly loams	90	0	Crosses intermittent & perennial streams
66-007	Coniferous forest	2200.0	0-74	22	378	Stony loams & cobbly loams	90	0	Crosses intermittent & perennial streams
66-008	Administrative or agricultural	4000.0	1-99	18	361	Gravelly sandy loams	90	0	Crosses perennial stream
66-009	Coniferous forest	4000.0	9-38	24	333	Sandy loams & silt loams	120	0	Crosses intermittent stream
66-010	Recreation sites	5400.0	2-11	6	379	Cobbly loams & cobbly sandy loams	120	0	Perennial stream
66-011	Administrative or agricultural	4400.0	6-9	7	361	Gravelly sandy loams	90	670	Perennial stream

Treatment ID #	Habitat (excluding harvest)	Average Elevation (ft)	% Slope (Min – Max)	% Slope (Average)	Main SRI Code [1]	Soil Type	Precipitation (inch/year)	Min. Dist To Water (ft.)	Category of Water
66-012	Coniferous forest	4000.0	17-25	20	335	Sandy loams & silt loams	120	250	Ephemeral stream
66-013	Buildings, structures, or roads	3920.0	12-33	19	380	Gravelly loams	90	80	Perennial stream
66-016	Coniferous forest	3000.0	4-50	27	377	Loams & gravelly loams	90	0	Crosses intermittent & perennial streams
66-017	Coniferous forest	3360.0	2-61	30	377	Loams & gravelly loams	90	0	Crosses perennial stream
66-018	Coniferous forest	3840.0	2-61	31	359	Cobbly & gravelly loams	80	0	Perennial stream
66-020	Coniferous forest	3600.0	0-35	9	352	Silt loams & heavy silt loams	70	0	Intermittent stream
66-023	Coniferous forest	3000.0	3-75	29	374	Gravelly & cobbly loams	90	0	Crosses perennial stream
66-025	Rocky with minimum vegetation potential	3120.0	31-50	41	335	Sandy loams & silt loams	90	85	Perennial stream
66-026	Coniferous forest	3280.0	0-0		333	Sandy loams & silt loams	120	0	Intermittent stream
66-027	Administrative or agricultural	2800.0	6-31	23	361	Gravelly sandy loams	80	0	Perennial stream
66-028	Coniferous forest	3200.0	4-10	6	333	Sandy loams & silt loams	80	250	Intermittent stream
66-029	Coniferous forest	2080.0	48-71	57	334-7	Sandy loams & silt loams with igneous rock outcrop	80	288	Perennial stream
66-030	Coniferous forest	3000.0	21-41	31	380	Gravelly loams	100	300	Perennial stream
66-033	Coniferous forest	3600.0	2-39	20	158	Fine sandy loams & loams	35	900	Ephemeral stream

Treatment ID #	Habitat (excluding harvest)	Average Elevation (ft)	% Slope (Min – Max)	% Slope (Average)	Main SRI Code [1]	Soil Type	Precipitation (inch/year)	Min. Dist To Water (ft.)	Category of Water
66-035	Coniferous forest	3440.0	2-43	27	7	Igneous rock outcrop	60	1000	Ephemeral stream
66-037	Tule meadow (standing water)	3520.0	0-23	5	352	Silt loams & heavy silt loams	60	400	Draw down zone; Lake; Intermittent stream
66-038	Coniferous forest	3440.0	3-60	19	347	Gravelly loams	60	0	Perennial & intermittent sreams
66-039	Rocky with minimum vegetation potential	3680.0	12-32	20	330	Stony loams	70	0	Perennial stream
66-040	Shrubland	2320.0	22-33	27	377-6	Loams & gravelly loams with unvegetated talus & rubbleland	90	1500	Perennial stream
66-041	Coniferous forest	3700.0	5-12	8	168	Gravelly & cobbly fine sandy loams	80	600	Perennial stream
66-042	Rocky with minimum vegetation potential	4160.0	22-37	30	7-6	Igneous rock outcrop with unvegetated talus & rubbleland	60	1000	Intermittent stream
66-043	Talus with mimimum vegetation potential	3680.0	12-30	18	335	Sandy loams & silt loams	80	1000	Intermittent stream
66-044	Coniferous forest	3680.0	26-26	26	347	Gravelly loams	70	2000	Perennial stream
66-046	Coniferous forest	3400.0	10-16	13	347	Gravelly loams	60	600	Perennial stream
66-047	Man-caused minimum vegetation	4200.0	15-23	20	333	Sandy loams & silt loams	100	350	Perennial stream

Treatment ID #	Habitat (excluding harvest)	Average Elevation (ft)	% Slope (Min – Max)	% Slope (Average)	Main SRI Code [1]	Soil Type	Precipitation (inch/year)	Min. Dist To Water (ft.)	Category of Water
66-048	Rocky with minimum vegetation potential	3600.0	23-66	37	335	Sandy loams & silt loams	100	300	Perennial stream
66-049	Man-caused minimum vegetation	3840.0	18-33	27	333	Sandy loams & silt loams	80	1000	None
66-051	Rocky with minimum vegetation potential	3600.0	6-33	18	355	Gravelly loamy fine sands & loamy fine sand	40	200	Intermittent stream
66-052	Buildings, structures, or roads	4480.0	5-44	21	1	Fresh sands & gravels	90	200	Perennial stream
66-053	Administrative or agricultural	3700.0	5-115	62	359	Cobbly & gravelly loams	80	13	River
66-055	Coniferous forest	3800.0	0-27	11	347	Gravelly loams	80	0	Crosses perennial
66-057	Coniferous forest	3700.0	2-28	10	352	Silt loams & heavy silt loams	70	0	Ephemeral stream
66-058	Coniferous forest	3900.0	1-19	10	334	Sandy loams & silt loams	70	300	Perennial stream
66-059	Coniferous forest	4300.0	11-53	32	335	Sandy loams & silt loams	70	0	Crosses intermittent stream
66-060	Coniferous forest	2400.0	1-57	22	378	Stony loams & cobbly loams	90	0	Perennial stream
66-062	Coniferous forest	3000.0	2-68	26	333	Sandy loams & silt loams	90	0	Crosses perennial & intermittent streams
66-063	Coniferous forest	3600.0	0-69	24	333	Sandy loams & silt loams	90	0	Perennial stream
66-067	Coniferous forest	3600.0	0-55	18	333	Sandy loams & silt loams	90	0	Crosses perennial stream

Treatment ID #	Habitat (excluding harvest)	Average Elevation (ft)	% Slope (Min – Max)	% Slope (Average)	Main SRI Code [1]	Soil Type	Precipitation (inch/year)	Min. Dist To Water (ft.)	Category of Water
66-069	Coniferous forest	3800.0	1-10	5	352	Silt loams & heavy silt loams	60	0	Intermittent stream
66-071	Coniferous forest	3500.0	2-60	24	334	Sandy loams & silt loams	120	0	Crosses perennial stream
66-074	Coniferous forest	4000.0	1-40	16	347	Gravelly loams	80	0	Crosses perennial stream
66-081	Coniferous forest	3800.0	1-30	18	347	Gravelly loams	70	90	Perennial stream
66-082	Coniferous forest	4000.0	3-65	27	380	Gravelly loams	90	0	Crosses perennial stream
66-083	Coniferous forest	3600.0	29-51	41	335	Sandy loams & silt loams	90	300	Perennial stream
66-084	Coniferous forest	3400.0	2-39	16	361	Gravelly sandy loams	80	0	Crosses perennial stream
66-085	Coniferous forest	4320.0	0-35	14	352	Silt loams & heavy silt loams	70	0	Crosses perennial stream
66-086	Coniferous forest	3200.0	0-46	13	304	Gravelly & cobbly loams	70	0	Crosses perennial & intermittent streams
66-087	Coniferous forest	3500.0	1-23	9	304	Gravelly & cobbly loams	60	0	Crosses perennial & intermittent streams
66-089	Coniferous forest	3400.0	0-49	13	352	Silt loams & heavy silt loams	60	0	Crosses perennial & intermittent streams
66-091	Coniferous forest	3600.0	3-63	28	354	Gravelly loamy fine sands & loamy fine sands	90	0	Crosses perennial & intermittent streams

Treatment ID #	Habitat (excluding harvest)	Average Elevation (ft)	% Slope (Min – Max)	% Slope (Average)	Main SRI Code [1]	Soil Type	Precipitation (inch/year)	Min. Dist To Water (ft.)	Category of Water
69-001	Coniferous forest	2350.0	1-37	22	333	Sandy loams & silt loams	70	750	Stream
69-002	Coniferous forest		0-0		111	Very gravelly loams & gravelly silt loams	80	0	Streams
69-003	Coniferous forest	2550.0	4-44	21	338	Stony silt loams	90	0	Streams
69-004	Coniferous forest	3878.8	1-27	10	333	Sandy loams & silt loams	60	1	Stream
69-005	Coniferous forest	3800.0	11-41	20	343	Gravelly loams & cobbly gravelly loams	90	500	Stream
69-006	Coniferous forest	1500.0	0-0		333	Sandy loams & silt loams	60	200	Stream
69-007	Shrubland	3800.0	12-12	12	338	Stony silt loams	90	500	Stream
69-008	Coniferous forest	1800.0	0-94	25	346	Very cobbly loamy coarse sand, single grain	90	0	Stream
69-010	Coniferous forest	2450.0	0-0		346	Very cobbly loamy coarse sand, single grain	80	0	Streams
69-011	Coniferous forest	1800.0	0-0		111	Very gravelly loams & gravelly silt loams	80	50	Stream
69-012	Coniferous forest	1600.0	0-0		346	Very cobbly loamy coarse sand, single grain	80	0	Drainage ditch (only seasonally wet)
69-013	Coniferous forest	1800.0	0-0		15	Steep to very steep, unstable dranageways	80	150	Stream

Treatment ID #	Habitat (excluding harvest)	Average Elevation (ft)	% Slope (Min – Max)	% Slope (Average)	Main SRI Code [1]	Soil Type	Precipitation (inch/year)	Min. Dist To Water (ft.)	Category of Water
69-014	Coniferous forest	1450.0	25-25	25	111	Very gravelly loams & gravelly silt loams	80	0	Stream
69-015	Hardwood forest	1950.0	0-0		346	Very cobbly loamy coarse sand, single grain	80	75	Stream
69-016	Coniferous forest	2874.6	0-97	15	346	Very cobbly loamy coarse sand, single grain	80	0	Streams
69-017	Coniferous forest	1600.0	15-18	16	346	Very cobbly loamy coarse sand, single grain	80	75	Stream
69-018	Coniferous forest	1600.0	13-20	17	346	Very cobbly loamy coarse sand, single grain	80	50	Stream
69-019	Coniferous forest	1800.0	2-4	3	346	Very cobbly loamy coarse sand, single grain	80	50	Stream
69-020	Coniferous forest	1450.0	7-7	7	346	Very cobbly loamy coarse sand, single grain	80	0	Stream
69-021	Coniferous forest	1600.0	2-6	3	346	Very cobbly loamy coarse sand, single grain	80	10	Stream
69-022	Coniferous forest	1639.8	2-6	4	346	Very cobbly loamy coarse sand, single grain	80	25	Stream

Treatment ID #	Habitat (excluding harvest)	Average Elevation (ft)	% Slope (Min – Max)	% Slope (Average)	Main SRI Code [1]	Soil Type	Precipitation (inch/year)	Min. Dist To Water (ft.)	Category of Water
69-023	Coniferous forest	1600.0	10-11	10	346	Very cobbly loamy coarse sand, single grain	80	30	Stream
69-024	Hardwood forest	1450.0	19-19	19	11	Alluvial bottomlands	80	150	Stream
69-025	Buildings, structures, or roads	2491.1	5-11	8	346	Very cobbly loamy coarse sand, single grain	80	0	Streams
69-026	Coniferous forest	1800.0	6-8	7	352	Silt loams & heavy silt loams	50	200	Stream
69-027	Coniferous forest	1085.6	0-113	34	11	Alluvial bottomlands	80	0	Crosses intermittent & perennial streams
69-028	Coniferous forest	3920.0	9-18	13	6	Unvegetated talus & rubbleland	90	40	Perennial stream
69-029	Buildings, structures, or roads	1440.0	1-1	1	346	Very cobbly loamy coarse sand, single grain	80	0	Crosses perennial stream
69-030	Coniferous forest	1560.0	3-5	4	346	Very cobbly loamy coarse sand, single grain	80	315	Intermittent stream

Continuation . . . Additional existing condition characteristics by treatment area.

Treatment ID #	Miles of Stream	Miles of Fish Bearing Stream	Road / Stream Crossings Count [2]	NWFP Key Watershed Acres	Miles of Road	Landslide Risk	Fauna TES Species Present	Flora TES Species Present	Recreation Use	Special Uses
22-01	0.96	0.96		0.00	0.00	Low	Fish	None	Non-System Trails	None
22-05	0.14	0.14		0.00	0.00	Low	None	None	Camp-ground	None
22-07	0.00	0.00		0.00	0.00	Low	Fish; Bald eagle	None	None	None
22-08	0.00	0.00		0.00	0.00	Low	Bald Eagle Peregrine falcon	None	Trail	None
22-11	0.10	0.10		0.00	0.00	Low	Lewis' woodpecker; Peregrine Falcon	None	Non-System Trails	None
22-12	0.44	0.44		0.00	0.00	Low	None	None	Non-System Trails	None
22-17	0.17	0.17		0.00	0.00	Low	None	None	None	Haying
61-002	0.16	0.07	7	119.37	9.02	High	Fish; Northern spotted owl	None	Trail	None
61-003	0.25	0.18	4	55.02	4.09	High	Fish; Northern spotted owl	None	None	None
61-005	0.00	0.00	0	72.23	4.39	High	Northern spotted owl	None	None	None
61-006	0.18	0.02	2	92.13	6.89	High	Fish; Northern spotted owl	None	Trail	None
61-007	0.00	0.00	0	5.44	0.08	High	None	None	Camp-ground	None
61-009	0.08	0.00	3	43.22	3.22	High	Northern spotted owl	None	None	None
61-017	0.36	0.03	7	96.07	7.22	High	Fish; Northern spotted owl	None	None	None
61-018	0.00	0.00	0	48.17	3.68	High	Northern spotted owl	None	None	None

[2] GIS data on Road/ Stream Crossings Count is not available for the Scenic Area.

Treatment ID #	Miles of Stream	Miles of Fish Bearing Stream	Road / Stream Crossings Count [2]	NWFP Key Watershed Acres	Miles of Road	Landslide Risk	Fauna TES Species Present	Flora TES Species Present	Recreation Use	Special Uses
61-019	0.65	0.12	23	257.56	19.75	High	Fish; Northern spotted owl	None	Trail	None
61-020	0.00	0.00	0	0.49	0.00	Low	None	None	None	None
61-021	0.00	0.00	0	46.26	3.46	Medium	Northern spotted owl	None	None	None
61-022	0.00	0.00	0	11.27	0.85	Medium	Northern spotted owl	None	None	None
61-023	0.10	0.10	2	10.93	0.06	Medium	Fish; Northern spotted owl	None	None	None
61-024	0.00	0.00	0	30.12	2.26	Medium	None	None	None	None
61-025	0.37	0.00	9	54.12	4.15	Low	Fish; Northern spotted owl	None	None	None
61-026	0.05	0.02	2	34.72	2.59	Low	Fish	None	None	None
61-027	0.00	0.00	0	26.81	2.00	Medium	None	None	None	None
61-028	0.17	0.00	7	51.60	3.86	Low	Northern spotted owl	None	None	None
61-029	0.02	0.00	1	40.20	3.03	Low	Northern spotted owl	None	None	None
61-030	0.00	0.00	0	5.98	0.24	Low	Northern spotted owl	None	None	None
61-034	0.00	0.00	0	58.46	4.43	Low	Northern spotted owl	None	None	None
61-036	0.00	0.00	0	25.80	1.95	Low	Northern spotted owl	None	None	None
61-039	0.51	0.00	3	75.93	0.82	Medium	Northern spotted owl	None	None	None
61-040	0.02	0.00	1	10.40	0.82	Low	Northern spotted owl	None	None	None
61-041	0.14	0.02	5	54.98	4.48	Medium	Fish; Northern spotted owl	None	Trail/ Camp-ground	None
61-042	0.16	0.00	5	52.14	3.84	Medium	Northern spotted owl	None	Trail	None
61-043	0.57	0.57	0	15.74	0.00	Low	Fish; Northern spotted owl	None	None	None
61-044	0.00	0.00	0	20.16	1.56	Low	Northern spotted owl	None	None	None

Treatment ID #	Miles of Stream	Miles of Fish Bearing Stream	Road / Stream Crossings Count [2]	NWFP Key Watershed Acres	Miles of Road	Landslide Risk	Fauna TES Species Present	Flora TES Species Present	Recreation Use	Special Uses
61-045	0.00	0.00	0	33.17	0.18	Low	None	None	None	None
61-046	0.00	0.00	0	2.89	0.10	Low	Northern spotted owl	None	Trail	None
61-047	0.00	0.00	0	1.47	0.00	Low	None	None	None	None
61-048	0.00	0.00	0	19.02	2.90	Low	Northern spotted owl	None	None	None
61-049	0.00	0.00	0	19.55	0.11	Low	Northern spotted owl	None	Trail	None
61-050	0.00	0.00	0	17.81	0.00	Low	Northern spotted owl	None	None	None
61-051	0.00	0.00	0	0.36	0.00	Low	None	None	None	None
61-053	0.04	0.04	0	3.74	0.00	Low	Northern spotted owl	None	None	None
61-055	0.00	0.00	0	0.00	0.00	Low	None	None	None	None
61-057	0.00	0.00	0	0.00	0.00	Low	None	None	None	Telephone Line
61-058	0.00	0.00	0	0.00	0.00	Low	Northern spotted owl	None	None	None
61-059	0.00	0.00	0	0.00	0.10	Low	None	None	None	None
61-062	0.00	0.00	0	0.00	0.00	Low	None	None	None	None
61-064	0.02	0.00	0	0.00	0.00	Low	None	None	None	None
61-065	0.27	0.15	0	0.00	0.00	Low	Fish; Northern spotted owl	None	None	None
61-066	0.00	0.00	0	0.00	0.46	Low	Northern spotted owl	None	None	None
61-071	0.13	0.00	0	40.82	0.23	Medium	Northern spotted owl	None	None	None
61-073	0.22	0.01	3	0.00	0.85	Medium	Fish; Northern spotted owl	None	Camp-ground	None
61-074	0.00	0.00	0	45.73	0.18	Low	None	None	None	None
61-075	0.09	0.00	0	12.53	0.97	Low	Northern spotted owl	None	None	None

Treatment ID #	Miles of Stream	Miles of Fish Bearing Stream	Road / Stream Crossings Count [2]	NWFP Key Watershed Acres	Miles of Road	Landslide Risk	Fauna TES Species Present	Flora TES Species Present	Recreation Use	Special Uses
61-076	0.06	0.00	2	15.39	1.15	Low	None	None	None	None
61-077	0.00	0.00	0	44.66	3.33	Medium	Northern spotted owl	None	None	None
61-078	0.01	0.00	0	22.43	1.66	Low	Northern spotted owl	None	None	None
61-079	0.27	0.27	0	15.63	2.80	Low	Northern spotted owl	None	None	None
61-080	0.00	0.00	0	0.00	1.33	Low	Northern spotted owl	None	None	None
61-081	0.00	0.00	0	0.00	0.26	Low	None	None	None	None
61-082	0.00	0.00	1	0.00	0.16	Medium	Northern spotted owl	None	None	None
61-083	0.28	0.06	6	0.00	1.42	Low	Fish; Northern spotted owl	None	None	None
61-084	0.00	0.00	0	32.39	2.42	Medium	Northern spotted owl	None	None	None
61-085	0.00	0.00	0	5.79	1.17	Medium	None	None	None	None
61-086	0.08	0.00	3	39.88	4.91	Low	Fish; Northern spotted owl	None	None	None
61-087	0.07	0.00	3	0.20	2.31	Low	Northern spotted owl	None	None	None
61-088	0.00	0.00	0	59.71	4.39	High	Northern spotted owl	None	None	None
61-089	0.07	0.02	2	88.62	6.60	High	Northern spotted owl	None	Trail	None
61-090	0.02	0.00	0	0.51	0.00	Low	None	None	None	None
61-091	0.05	0.00	0	3.65	0.03	Medium	Northern spotted owl	None	None	None
61-092	0.00	0.00	0	5.99	0.00	Low	Northern spotted owl	None	None	None
61-093	0.00	0.00	0	5.40	0.06	Low	Northern spotted owl	None	None	Power-line
61-095	0.05	0.03	2	103.96	7.84	High	Fish; Northern spotted owl	None	Trail	None
65-001	0.09	0.02	4	0.00	2.45	Low	Northern spotted owl	None	Trail	None

Treatment ID #	Miles of Stream	Miles of Fish Bearing Stream	Road / Stream Crossings Count [2]	NWFP Key Watershed Acres	Miles of Road	Landslide Risk	Fauna TES Species Present	Flora TES Species Present	Recreation Use	Special Uses
65-002	0.05	0.03	2	12.81	4.61	High	Fish; Northern spotted owl	None	None	None
65-003	0.09	0.00	4	11.72	3.06	Low	Northern spotted owl	None	None	None
65-005	0.00	0.00	0	0.06	0.00	High	Northern spotted owl	None	None	None
65-006	0.01	0.01	0	0.00	0.00	High	Northern spotted owl	None	None	None
65-007	0.00	0.00	0	0.00	0.25		None	None	None	None
65-008	0.00	0.00	0	0.00	0.02	High	None	None	None	None
65-009	0.03	0.00	1	1.03	0.02	Medium	None	None	None	None
65-010	0.00	0.00	0	0.38	0.97	Low	Northern spotted owl	None	None	None
65-011	0.00	0.00	0	1.07	0.03	Medium	None	None	None	None
65-012	0.09	0.02	4	0.00	0.99	High	Northern spotted owl	None	None	None
65-013	0.13	0.02	5	0.00	3.49	High	Northern spotted owl	None	None	None
65-014	0.00	0.00	0	0.00	0.17	Low	Northern spotted owl	None	None	None
65-015	0.09	0.07	0	0.00	0.11	Medium	Northern spotted owl	None	None	None
65-016	0.00	0.00	0	0.00	0.14	Medium	Northern spotted owl	None	None	None
65-017	0.03	0.03	0	4.05	0.20	High	Fish; Northern spotted owl	None	None	None
65-018	0.00	0.00	0	0.76	0.09	Medium	None	None	None	None
65-019	0.08	0.08	0	4.95	0.08	High	Fish; Northern spotted owl	None	None	None
65-020	2.96	0.69	55	414.37	15.56	High	Fish; Northern spotted owl	None	Trail	Outfitter guide
65-021	0.01	0.00	0	1.52	0.15	High	Northern spotted owl	None	None	None

Treatment ID #	Miles of Stream	Miles of Fish Bearing Stream	Road / Stream Crossings Count [2]	NWFP Key Watershed Acres	Miles of Road	Landslide Risk	Fauna TES Species Present	Flora TES Species Present	Recreation Use	Special Uses
65-022	0.00	0.00	0	1.86	0.20	High	Northern spotted owl; Bald eagle	None	None	None
65-023	2.13	0.88	76	342.71	24.64	High	Fish; Northern spotted owl	Coldwater corydalis	None	None
65-024	0.00	0.00	0	4.58	0.13	Medium	Northern spotted owl	None	None	None
65-025	0.00	0.00	0	0.00	0.00	High	None	None	None	None
65-026	0.00	0.00	0	4.72	0.09	High	None	Pale blue-eyed grass	None	None
65-027	0.00	0.00	0	0.73	0.00	High	None	Adder's tongue	None	None
65-028	0.00	0.00	0	0.77	0.01	High	Northern spotted owl	None	None	None
65-029	0.11	0.05	2	11.63	0.52	High	Fish; Northern spotted owl	None	None	None
65-030	0.03	0.00	1	11.39	0.60	High	Northern spotted owl	None	None	None
65-031	0.09	0.07	3	14.27	0.02	High	Northern spotted owl	None	None	None
65-032	0.00	0.00	0	2.74	0.23	High	Northern spotted owl	None	None	None
65-033	0.06	0.06	2	9.64	0.38	High	Northern spotted owl	None	None	None
65-034	0.00	0.00	0	5.20	0.30	Medium	Northern spotted owl	None	None	None
65-035	0.00	0.00	0	0.00	0.20	Low	Northern spotted owl	None	None	None
65-036	0.08	0.01	0	0.00	0.06	High	Northern spotted owl	None	None	None
65-037	0.02	0.00	1	0.00	0.06	Low	Northern spotted owl	None	None	None
65-038	0.01	0.00	0	0.00	0.06	Medium	None	None	None	None
65-039	0.02	0.02	0	0.00	0.00	Low	Northern spotted owl	None	None	None
65-040	0.00	0.00	0	0.00	0.04	Low	Northern spotted owl	None	None	None
65-041	0.00	0.00	0	4.18	0.17	High	Northern spotted owl	None	None	None

Treatment ID #	Miles of Stream	Miles of Fish Bearing Stream	Road / Stream Crossings Count [2]	NWFP Key Watershed Acres	Miles of Road	Landslide Risk	Fauna TES Species Present	Flora TES Species Present	Recreation Use	Special Uses
65-042	0.09	0.00	2	6.90	0.37	High	Northern spotted owl	None	None	None
65-043	0.03	0.00	0	0.00	0.39	Medium	Northern spotted owl	None	None	None
65-044	0.11	0.00	2	0.00	0.55	Medium	Northern spotted owl	None	None	None
65-045	0.00	0.00	0	0.11	0.02	Low	Northern spotted owl	None	None	None
65-046	0.05	0.00	2	0.00	0.63	Low	Northern spotted owl	None	None	None
66-001	0.00	0.00	0	20.75	0.05	High	Northern spotted owl	None	None	None
66-003	0.00	0.00	0	34.57	0.18	Medium	Northern spotted owl	None	Trail	None
66-004	0.10	0.00	0	18.88	0.00	High	None	None	Trail	None
66-005	0.15	0.00	0	25.02	0.00	Medium	Northern spotted owl	None	Trail	None
66-006	0.39	0.03	1	58.62	0.16	High	Northern spotted owl	None	Trail	None
66-007	3.64	1.49	9	448.73	4.87	High	Fish; Northern spotted owl	None	Trail	Right-of-way, BPA
66-008	3.49	2.72	48	178.20	20.37	High	Fish; Northern spotted owl	None	Trail	Ski Area
66-009	0.02	0.00	1	0.00	0.00	Low	None	None	None	None
66-010	0.12	0.00	0	0.00	0.00	Low	None	None	None	Ski Area
66-011	0.00	0.00	0	0.00	0.00	Low	None	None	None	Ski Area
66-012	0.00	0.00	0	0.67	0.07	Low	Northern spotted owl	None	Trail	None
66-013	0.00	0.00	0	0.00	0.22	Medium	Northern spotted owl	None	Trail	Ski Area
66-016	0.51	0.04	23	78.79	5.07	High	Fish; Northern spotted owl	None	Trail	None
66-017	0.16	0.00	4	66.57	4.37	Medium	Northern spotted owl	None	Trail	None
66-018	0.12	0.07	5	0.00	3.83	High	Northern spotted owl	None	Trail	None

Treatment ID #	Miles of Stream	Miles of Fish Bearing Stream	Road / Stream Crossings Count [2]	NWFP Key Watershed Acres	Miles of Road	Landslide Risk	Fauna TES Species Present	Flora TES Species Present	Recreation Use	Special Uses
66-020	4.00	0.13	14	1014.29	5.65	Medium	Northern spotted owl	None	None	None
66-023	1.86	0.14	77	350.83	26.10	High	Fish; Northern spotted owl	None	Trail	None
66-025	0.00	0.00	0	0.00	0.00	Low	Northern spotted owl	None	Trail / Camp-ground	None
66-026	0.01	0.00	0	0.07	0.00	Low	None	None	None	None
66-027	0.02	0.02	0	0.00	0.00	Low	Fish	None	None	Hydro-electric
66-028	0.00	0.00	0	0.00	0.00	Low	None	None	None	None
66-029	0.00	0.00	0	0.00	0.05	High	None	None	None	None
66-030	0.00	0.00	0	0.00	0.04	Medium	Northern spotted owl	None	None	None
66-033	0.00	0.00	0	17.30	0.54	Medium	Northern spotted owl	Elegant rockcress	None	None
66-035	0.00	0.00	0	0.00	0.04	Medium	None	Watson's desert-parsley	Trail	Right-of-way, Road
66-037	0.11	0.09	1	9.63	0.05	Low	Fish; Northern spotted owl	None	Campground/Picnic Area	None
66-038	0.97	0.30	1	0.00	1.41	High	Northern spotted owl	Elegant rockcress; Watson's desert-parsley	Trail	Right-of-way, BPA
66-039	0.01	0.01	0	3.52	0.08	Medium	Northern spotted owl	None	None	None
66-040	0.00	0.00	0	1.08	0.00	Medium	None	None	None	None
66-041	0.00	0.00	0	0.00	0.13	Low	Northern spotted owl	None	None	None
66-042	0.00	0.00	0	2.74	0.00	High	None	Elegant rockcress	None	None
66-043	0.00	0.00	0	0.00	0.00	Low	Northern spotted owl; Bald eagle	None	None	None

Treatment ID #	Miles of Stream	Miles of Fish Bearing Stream	Road / Stream Crossings Count [2]	NWFP Key Watershed Acres	Miles of Road	Landslide Risk	Fauna TES Species Present	Flora TES Species Present	Recreation Use	Special Uses
66-044	0.00	0.00	0	0.00	0.00		Northern spotted owl	None	None	None
66-046	0.00	0.00	0	0.00	0.14		Northern spotted owl	None	None	None
66-047	0.00	0.00	0	0.00	0.03	Low	None	None	None	None
66-048	0.00	0.00	0	3.59	0.00	Medium	Northern spotted owl	None	None	None
66-049	0.00	0.00	0	0.00	0.00	Low	Northern spotted owl	None	None	None
66-051	0.00	0.00	0	5.67	0.06	Low	None	None	None	None
66-052	0.02	0.02	0	8.78	0.07	Medium	None	None	None	None
66-053	0.00	0.00	0	0.00	0.02	Medium	Fish; Northern spotted owl	None	Trail	None
66-055	0.03	0.02	1	36.70	3.08	Low	Northern spotted owl	None	None	None
66-057	0.55	0.25	4	80.31	2.02	Medium	Northern spotted owl	None	None	None
66-058	0.00	0.00	0	14.94	0.78	Medium	Northern spotted owl	None	None	None
66-059	0.05	0.00	1	39.70	1.50	High	Northern spotted owl	None	None	None
66-060	0.57	0.20	20	105.24	7.85	Medium	Fish; Northern spotted owl	None	Trail	None
66-062	0.61	0.50	15	0.00	10.87	Medium	Fish; Northern spotted owl	None	Trail	None
66-063	1.40	0.54	47	217.98	47.45	High	Fish; Northern spotted owl	None	Trail	None
66-067	0.27	0.00	12	0.00	9.56	Medium	Northern spotted owl	None	Trail	None
66-069	0.19	0.00	1	50.45	0.66	Low	Northern spotted owl	None	None	None
66-071	0.46	0.06	20	0.00	3.64	Medium	Northern spotted owl	None	None	None
66-074	0.23	0.21	3	53.18	8.25	Medium	Northern spotted owl	Elegant rockcress	Trail	None
66-081	0.00	0.00	0	22.23	1.66	Low	Northern spotted owl	None	None	None

Treatment ID #	Miles of Stream	Miles of Fish Bearing Stream	Road / Stream Crossings Count [2]	NWFP Key Watershed Acres	Miles of Road	Landslide Risk	Fauna TES Species Present	Flora TES Species Present	Recreation Use	Special Uses
66-082	0.45	0.11	21	0.00	6.96	High	Fish; Northern spotted owl	None	Trail	None
66-083	0.00	0.00	0	27.70	0.00	Medium	None	None	None	None
66-084	0.24	0.20	11	0.00	5.49	High	Fish; Northern spotted owl	None	Trail	None
66-085	0.53	0.04	21	148.06	11.17	High	Northern spotted owl	None	Trail	None
66-086	1.42	0.02	49	296.42	22.09	High	Northern spotted owl; Bald eagle	None	Trail	None
66-087	0.70	0.04	16	67.97	5.16	Low	Fish; Northern spotted owl; Bald eagle	None	None	None
66-089	0.77	0.11	27	154.45	11.68	High	Fish; Northern spotted owl	None	Trail	None
66-091	0.52	0.11	23	120.19	8.31	High	Fish; Northern spotted owl	None	Trail	None
69-001	0.05	0.05	1	7.50	0.28	Medium	Northern spotted owl	None	None	Right-of-way, Road
69-002	0.00	0.00	0	0.00	0.00	Medium	Northern spotted owl	None	None	None
69-003	0.25	0.12	11	0.00	3.27		Northern spotted owl	None	None	None
69-004	0.00	0.00	0	24.14	1.84	Low	Northern spotted owl	None	None	None
69-005	0.30	0.08	12	0.00	3.17		Northern spotted owl	None	None	None
69-006	0.00	0.00	0	0.09	0.01	Low	Northern spotted owl	None	None	None
69-007	0.00	0.00	0	0.00	0.00		Northern spotted owl	None	None	None
69-008	8.18	1.27	172	2.37	53.01	High	Fish; Northern spotted owl	None	Trail/ Camp-ground	Recreational Residence
69-010	0.01	0.01	0	0.00	0.00	Low	Fish	None	None	None
69-011	0.00	0.00	0	0.00	0.00	Medium	Northern spotted owl	None	None	Recreational Residence
69-012	0.00	0.00	0	0.00	0.00	Low	Fish	None	None	None

Treatment ID #	Miles of Stream	Miles of Fish Bearing Stream	Road / Stream Crossings Count [2]	NWFP Key Watershed Acres	Miles of Road	Landslide Risk	Fauna TES Species Present	Flora TES Species Present	Recreation Use	Special Uses
69-013	0.00	0.00	0	0.00	0.01	Low	None	None	None	Recreational Residence
69-014	0.00	0.00	0	0.00	0.00	Low	None	None	None	None
69-015	0.00	0.00	0	0.00	0.00	Low	Fish	None	None	None
69-016	3.27	2.36	30	72.25	16.91	High	Fish; Northern spotted owl	None	Trail	Ski Area
69-017	0.00	0.00	0	0.00	0.00	Low	Northern spotted owl	None	None	Recreational Residence
69-018	0.05	0.01	0	0.00	0.00	Low	Fish; Northern spotted owl	None	None	Recreational Residence
69-019	0.00	0.00	0	0.00	0.00	Low	Fish; Northern spotted owl	None	None	Recreational Residence
69-020	0.00	0.00	0	0.00	0.00	Low	Fish; Northern spotted owl	None	None	Recreational Residence
69-021	0.01	0.01	0	0.00	0.01	Low	Fish; Northern spotted owl	None	None	Recreational Residence
69-022	0.00	0.00	0	0.00	0.00	Low	Fish; Northern spotted owl	None	None	Recreational Residence
69-023	0.00	0.00	0	0.00	0.00	Low	Fish; Northern spotted owl	None	None	Recreational Residence
69-024	0.01	0.00	0	0.19	0.00	Low	Northern spotted owl	None	None	None
69-025	0.00	0.00	0	0.00	0.14	Low	None	None	None	Right-of-way, Road
69-026	0.00	0.00	0	1.12	0.00	Low	Northern spotted owl	None	None	None
69-027	2.06	1.06	4	188.12	2.43	High	Fish; Northern spotted owl	None	Trail	Hydro-electric
69-028	0.00	0.00	0	0.00	0.00	Low	None	None	Trail	None
69-029	0.02	0.02	0	0.00	0.00	Low	Fish	None	None	None
69-030	0.00	0.00	0	0.00	0.06	Low	Northern spotted owl	None	None	Recreational Residence

APPENDIX P
Ownership Patterns by Fifth Field Watershed

APPENDIX P: Ownership Patterns by Fifth Field Watershed, within the Forest and Scenic Area

Information compiled from existing GIS layers, maintained in the Mt. Hood National Forest and Columbia River Gorge National Scenic Area, Geographic Information System data library (http://www.fs.fed.us/r6/data-library/gis/).

5th Field Watersheds		Acres by Ownership Class								
Watershed #	Watershed Name	USDA Forest Service	USDI BLM	Other Federal Govern't	Tribal Lands	State	Local Govern't	Private	Un-known	Total
1707030605	Beaver Creek	1312.2			70547.8			34882.1		**105429.8**
1708000105	Bull Run River	78650.7	1055.0				4791.3	4488.0		**10334.3**
1709001101	Collawash River	96559.4	861.7							**861.7**
1708000107	Columbia Gorge Tributaries	44712.1	1.9	2021.5		17285.9	242.5	35840.8	3821.3	**59213.9**
1707010506	East Fork Hood River	68419.2	209.6			663.9	7102.2	24558.4		**32534.1**
1707010502	Fifteenmile Creek	17579.6	58.9	33.1	251.9	10.8		139301.0	2.2	**139658.0**
1707010503	Fivemile Creek	18557.0	544.4					59089.1		**59633.5**
1709001106	Lower Clackamas River	1622.6	4935.3			1427.3	401.4	109274.1		**116038.1**
1707010508	Lower Hood River	3273.8	157.4		222.4	318.4	9033.4	38278.0	5.9	**48015.5**
1708000108	Lower Sandy River	3833.4	3614.4			760.8	497.6	37661.8	787.1	**43321.8**
1709001104	Middle Clackamas River	124902.8	4848.7			86.6	19.7	8648.9		**13603.8**
1707010513	Middle Columbia/Eagle Creek	46380.7	62.3	116.4	4.5	16865.0	445.2	19172.2	1448.8	**38114.5**
1707010512	Middle Columbia/Grays Creek	28936.4		211.1	603.7	7857.9	644.3	50089.0	4380.5	**63786.4**
1707010504	Middle Columbia/Mill Creek	16825.4	2097.4	1074.1	2611.3	5064.1	388.4	99480.7	3156.2	**113872.2**

5th Field Watersheds		Acres by Ownership Class								
Watershed #	Watershed Name	USDA Forest Service	USDI BLM	Other Federal Govern't	Tribal Lands	State	Local Govern't	Private	Un-known	Total
1707030607	Middle Deschutes River	2874.4	20736.7		56919.0	1392.1		113462.5		**192510.2**
1708000104	Middle Sandy River	6571.6	7811.7			237.5	800.1	25535.8		**34385.1**
1709001103	Oak Grove Fork Clackamas River	79256.1			11285.9					**11285.9**
1708000101	Salmon River	67920.2	1463.6			74.2	915.0	3343.1		**5795.9**
1707030609	Tygh Creek	41636.6	255.7			14595.4	39.6	25031.0		**39921.8**
1709001102	Upper Clackamas River	94781.2			5578.3			137.2		**5715.5**
1708000103	Upper Sandy River	30721.6	301.8					3177.5		**3479.3**
1707010507	West Fork Hood River	42862.8					3873.5	18730.1		**22603.5**
1707030610	White River	105184.6	3249.8		2915.8	10718.8		54203.2		**71087.7**
1708000102	Zigzag River	36502.3						1261.4		**1261.4**
	Total	**1059876.6**	**52266.3**	**3456.2**	**150940.6**	**77358.7**	**29194.3**	**905646.0**	**13601.9**	**1232463.9**
	Percentage of Total	**46.2%**	**2.3%**	**0.2%**	**6.6%**	**3.4%**	**1.3%**	**39.5%**	**0.6%**	**53.8%**

APPENDIX Q
Herbicide Information Summary and Project Design Criteria Crosswalk

APPENDIX Q: Herbicide Information Summary and Project Design Criteria Crosswalk

Prepared by Shawna L. Bautista, Pacific Northwest Region, Portland, OR
and Stephen P. Bulkin, Pacific Northwest Region, Portland, OR
March 16, 2006

Mt. Hood National Forest and Columbia River Gorge National Scenic Area
PDC Information incorporated by Jennie O'Connor, Mt. Hood National Forest, Sandy OR
April 30, 2006

The following information is designed to aid in the understanding of herbicides used for invasive plant treatment. Any attempt to summarize the complex information about herbicides is prone to over simplification and errors. The information in these tables should be used as an introduction to the herbicides, but should not be the sole source of information used for analysis purposes. It is important to refer to the respective risk assessments prepared by Syracuse Environmental Research Associates, Inc. (SERA) and peer-reviewed literature for effects analysis information.

These tables have five columns labeled herbicide characteristics, basic hazard identification, risk characterization, label restrictions and information, and project design criteria (PDC). Herbicide characteristics are general pieces of information about the herbicide and its use, often taken from the *Herbicide Handbook* (Weed Science Society of America, 2002) or the respective risk assessments (SERA, 2001b, 2003a, 2003b, 2003c, 2004a, 2004b, 2004c, 2004d, 2004e, 2004f). Qualitative statements (e.g., highly water soluble) are based on information in charts on water solubility and soil mobility found at the end of the document. These categories are not absolute, but have been gleaned from a variety of sources. These charts (water solubility and soil mobility) need to be completed and updated, as they are a work in progress.

To better understand each herbicide, it is important to recognize the difference between the inherent risks from the chemical (i.e., hazard identification) from those risks associated with the intended use, which take into account application and exposure amounts (i.e., risk characterization). The hazard identification and risk characterization information is mostly taken from the respective risk assessments for each herbicide, prepared by SERA, Inc., as well as analysis results from the Invasive Plant FEIS (USDA Forest Service, 2005a). The Invasive Plant FEIS already has conducted the analysis of effects from the hazard identification and risk characterization information. It need not be repeated. Standards added to Mt. Hood Land and Resource Management Plan and Columbia River Gorge National Scenic Area Management Plan from the Invasive Plant ROD (USDA Forest Service, 2005b) further reduce the potential risks listed in the risk characterization column. PDC (Section 2.2 of this EIS) focus on reducing risks remaining after the application and exposure amounts are taken into consideration (i.e., risk characterization), along with compliance with label directions and new Forest Plan standards.

We have also included brief summaries of some label restrictions or information. Please note: the label restrictions column in these tables is not a comprehensive listing of all label requirements. The information is largely brief excerpts of *some* requirements from *some* formulations. Labels are also updated and revised periodically, so it is important to obtain and read the full label for complete information. Labels may be downloaded from the following website: www.cmds.net/manuf/default.asp.

This version of the table contains, for each herbicide, the priority target species for the Mt. Hood National Forest and Columbia River Gorge National Scenic Area in Oregon. The herbicide became a first priority for the identified invasive plants based on efficacy of the herbicide on that species, as per recommendations from the local State and County weed specialists. Environmental and seasonal variables, as well as infestations that contain several species, may require using a different herbicide in a given treatment area.

Herbicide grazing restrictions are summarized in the table on pages 35-36.

Acronyms used in the table include:

- LOC= Level of Concern. The concentration in media or some other estimate of exposure above which there may be effects.
- RfD = Reference dose. 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.

The use of product names is for illustrative purposes only and is not intended as a recommendation for use or an endorsement of these products by the USDA Forest Service.

Active Ingredient: **Chlorsulfuron** Trade Name(s): **Telar, Glean, Corsair**

Mode of Action: Acetolactate synthesis inhibitor Chemical Family: Sulfonylurea

Forest-Scenic Area target species: Known infestations – thistles, houndstongue

Invasive plants in close proximity – perennial pepperweed, whitetop, puncture vine

Project Design Criteria (PDC) A.1. and A.2. applicable to all herbicide characteristics and risks. A.1. states: "Herbicides would be used in accordance with label instructions, except where more restricted measures are required as described . . ." And A.2. states: "Herbicide use would comply with standards in the *Pacific Northwest Regional Invasive Plant Program – Prevention and Managing Invasive Plants* FEIS (2005a), including standards on herbicide selection, broadcast use of some herbicides, tank mixing, licensed applications, and use of adjuvants, surfactants and other additives."

Chlorsulfuron

Herbicide Characteristics	Basic Hazard Identification	Risk Characterization (SERA Risk Assess.)	Label Restrictions & Information	Project Design Criteria
SELECTIVE: controls broadleaf weeds some and grasses			Supplemental label for mix with clopyralid for control of yellow starthistle in Oregon	
Very high water solubility at pH 7; decreases to medium solubility at pH 5	Leaching, runoff	Rainfall post treatment: Off target movement and non-target effects.	Do not contaminate water	C.3. – Precipitation
Moderate affinity for organic material, but adsorption to clay is low	High mobility in soils		Treatment of powdery, dry soil and light sandy soils when there is little likelihood of rainfall soon after treating may result in off target movement and possible damage to susceptible crops when soil particles are moved by wind or water.	G.2. – Chlorsulfuron use on soils
In H20, degraded by sunlight	Half-live in water is 1 month	Very low application rates; therefore, little potential to enter ground water		A.8. – Application rates C.2. – Drift F.1. – Aquatic buffers

Chlorsulfuron				
Herbicide Characteristics	**Basic Hazard Identification**	**Risk Characterization (SERA Risk Assess.)**	**Label Restrictions & Information**	**Project Design Criteria**
Degradation by soil microbes is slow	Half-life in field avg 40 days (range 4-6 wks); shorter at lower pH			
	Low toxicity to soil microorganisms	Exposure far below level of concern		
In field, degraded primarily by hydrolysis, but rates are slow	Persistent		Residues may injure susceptible plants up to 4yrs after application in high pH soils	E.1. – Botanical buffers
Absorbed thru roots and foliage; active in soil as a pre-emergent			Do not apply thru irrigation system	
Resistant Biotypes may develop			Application should be based on IPM principles	
Maintains native perennial grasses				
Potent herbicide. Requires small amounts of AI to be effective.	May damage non-target plants and trees; Wind erosion concern	Adverse effects on some nontarget plants are plausible		A.8. – Application rates E.1. – Botanical buffers
	Can cause body weight loss in mammals	Worker and public exposures below level of concern (LOC) except workers using ground broadcast applications, which is slightly above LOC at high application rate (0.14 lb/acre)	Do not apply in a way that will contact workers or other persons, either directly or through drift.	A.8. – Application rates D.1. – Personal protective equipment
	Mild eye and skin irritant	Mild irritation to skin and eyes from exposures to high levels from mishandling	Only protected handlers may be in the area during application.	A.8. – Application rates D.1. – Personal protective equipment
	May alter insulin production, cholesterol levels, and triglycerides at high doses	Exposures far below levels of concern		A.8. – Application rates

Chlorsulfuron				
Herbicide Characteristics	**Basic Hazard Identification**	**Risk Characterization (SERA Risk Assess.)**	**Label Restrictions & Information**	**Project Design Criteria**
Does not bioaccumulate or bioconcentrate	No evidence of reproductive risk, malformations, cancer, or mutagenicity			A.8. – Application rates
	Can cause mild body weight loss in mammals and birds	Exposures well below levels of concern		
		No plausible risk to insectivorous species		
	Very low toxicity to fish, no effects to egg & fry	Exposures far below levels of concern	Do not contaminate water	A.8 – Application rates F.1. – Aquatic buffers
	Very low toxicity to aquatic invertebrates	Exposures far below levels of concern	Do not contaminate water	A.8 – Application rates F.1. – Aquatic buffers
	No data on effects to amphibians, fish used as a surrogate	Exposures far below levels of concern	Do not contaminate water	A.8 – Application rates F.1. – Aquatic buffers H.2. – Salamanders and mollusks
	Aquatic plants are susceptible to chlorsulfuron, algae is less susceptible	Peak exposures could damage aquatic plants at typical and high application rates; algae may be damaged at high rates	Do not contaminate water	A.8 – Application rates F.1. – Aquatic buffers
	Low toxicity to bees or beetles	Exposure below level of concern		

Active Ingredient: **Clopyralid** Trade Name(s): **Transline**

Mode of Action: Plant growth regulator Chemical Family: Not known

Forest-Scenic Area target species: Known infestations – hawkweeds, knapweeds (not Russian), thistles, tansy ragwort, scotch broom, rush skeleton

Invasive plants in close proximity – Mediterranean sage

Project Design Criteria (PDC) A.1. and A.2. applicable to all herbicide characteristics and risks. A.1. states: "Herbicides would be used in accordance with label instructions, except where more restricted measures are required as described . . ." And A.2. states: "Herbicide use would comply with standards in the *Pacific Northwest Regional Invasive Plant Program – Prevention and Managing Invasive Plants* FEIS (2005a), including standards on herbicide selection, broadcast use of some herbicides, tank mixing, licensed applications, and use of adjuvants, surfactants and other additives."

Clopyralid				
Herbicide Characteristics	**Basic Hazard Identification**	**Risk Characterization (SERA Risk Assess.)**	**Label Restrictions & Information**	**Project Design Criteria**
Extremely SELECTIVE for broadleaves. Post emergent herbicide		Selectivity reduces threat to non-target plants	Avoid non-target contact with spray in treated areas	E.1. – Botanical buffers
Targets: knapweeds and families Asteraceae, Fabaceae, Solanaceae. Canada thistle; Does NOT effect conifers, grasses are tolerant			Supplemental label for control on tree plantations and forest sites	
High water solubility	0.01 % of that applied may reach stream after first significant rainfall	Contamination threat to water resources and non-target species	Do not contaminate water. Do not apply directly to water or to areas where surface water is present. Do not contaminate irrigation ditches.	C.3. – Precipitation D.7. – Water intake F.1. – Aquatic buffer
Photo degradation and hydrolysis do not occur	8-40 day ½ life in water			A.8 – Application rate C.2. – Drift F.1. – Aquatic buffers

Clopyralid				
Herbicide Characteristics	**Basic Hazard Identification**	**Risk Characterization (SERA Risk Assess.)**	**Label Restrictions & Information**	**Project Design Criteria**
Weakly adsorbed to soil	Very high mobility in soil		Users are advised not to apply where soils have a rapid to very rapid permeability throughout the profile (such as loamy sand to sand) and the water table is shallow.	F.1 – Aquatic buffers G.1 – Low risk herbicides
Degraded by soil microbes	Half-life in field avg 40 days (range 12-70 days)	Relatively rapid breakdown reduces potential for run-off or leaching		
	Low toxicity to soil organisms	Exposures far below level of concern		A.8. – Application rate
Non-microbial degradation does not occur			Do not use hay or straw from treated areas for composting or mulching on susceptible plants	
Contaminated with hexachlorobenzene (HCB) (less than that in picloram)	HCB is a persistent carcinogen and it bioaccumulates	Exposure levels far below level of concern. Clopyralid does not present any substantial cancer risk.		A.8. – Application rate
Does not bioaccumulate or bioconcentrate	No evidence of reproductive risk, malformations, cancer, or mutagenicity	Exposures far below levels of concern		A.8. – Application rate
	High acute doses cause depression of central nervous system in mammals	Exposures far below levels of concern		A.8. – Application rate
	Chronic doses cause weight loss, thicken stomach lining in mammals	Exposures far below levels of concern		A.8. – Application rate
	Low toxicity to birds	Exposures far below levels of concern		A.8. – Application rate
		Chronic risk to insect-eating birds or mammals unknown		A.8. – Application rates

Clopyralid				
Herbicide Characteristics	**Basic Hazard Identification**	**Risk Characterization (SERA Risk Assess.)**	**Label Restrictions & Information**	**Project Design Criteria**
	Slight skin and eye irritation		Avoid contact with skin and eyes or clothing. Avoid breathing spray mist. Applicators and handlers must wear long-sleeved shirt and long pants, waterproof gloves, shoes plus socks	A.8. – Application rates D.1 – Personal protective equipment
Potent herbicide. Requires small amounts of AI to be effective.	May damage susceptible non-target terrestrial plants	Adverse effects on some non-target plant species due to drift are likely under certain conditions		C.2. – Drift E.1. – Botanical buffers
	Low toxicity to birds and mammals	Exposures below levels of concern	No grazing restriction	A.8. – Application rates
	low toxicity to fish or aquatic invertebrates	Exposures very far below levels of concern		A.8. – Applications rates F.1. – Aquatic buffers
	No chronic tests to fish, or eggs and fry studies available; use surrogate	Exposures very far below levels of concern		A.8. – Applications rates F.1. – Aquatic buffers
	No data on effects to amphibians, fish used as a surrogate	Exposures far below levels of concern		A.8. – Applications rates F.1. – Aquatic buffers H.2. – Salamanders and mollusks
	Aquatic plants and algae are not susceptible	Exposures far below levels of concern		A.8. – Applications rates F.1. – Aquatic buffers
	Low toxicity to bees and earthworms	Exposures far below level of concern		A.8. – Applications rates

Active Ingredient **Glyphosate** Trade Name(s): **RoundUp, Rodeo, Accord, many others**

Aquatic formulations: **Rodeo; Aquamaster**

Mode of Action: Inhibits 3 amino acids and protein synthesis Chemical Family: None generally accepted

Forest-Scenic Area target species: Known infestations – hawkweeds, knotweeds, butter n' eggs, houndstongue, blackberries, tansy ragwort, thistles, reed canarygrass, knapweeds, St. Johnswort, scotch broom, rush skeletonweed

Invasive plants in close proximity – shining geranium, false broom, garlic mustard, leafy spurge, purple loosestrife, water hemlock, whitetop, Dalmatian toadflax, perennial peavine, perennial pepperweed, medusahead rye, Mediterranean sage

Project Design Criteria (PDC) A.1. and A.2. applicable to all herbicide characteristics and risks. A.1. states: "Herbicides would be used in accordance with label instructions, except where more restricted measures are required as described . . ." And A.2. states: "Herbicide use would comply with standards in the *Pacific Northwest Regional Invasive Plant Program – Prevention and Managing Invasive Plants* FEIS (2005a), including standards on herbicide selection, broadcast use of some herbicides, tank mixing, licensed applications, and use of adjuvants, surfactants and other additives."

Glyphosate				
Herbicide Characteristics	**Basic Hazard Identification**	**Risk Characterization (SERA Risk Assess.)**	**Label Restrictions & Information**	**Project Design Criteria**
Broad spectrum, NON selective	Will kill contacted desirable plants,	boom-spray drift may adversely affect non-target species	Keep people and pets off treated areas until spray solution has dried to prevent transfer of this product onto desirable vegetation.	C.2. – Drift D.2., D.3., D.4., D.5., D.6., D.7. – Public notification E.1. – Botanical buffers
Quickly absorbed by leaves and rapidly moves thru plant; no root absorption		No risk to non-target plants from runoff		E.1. – Botanical buffers
Aquatic Use formulations exist				G.1. – Soils & Aquatic labeled herbicides F.3. – Wetlands
Very high water solubility	Runoff, leaching potential		Rainfall within 6 hours may reduce effectiveness;	C.3. – Precipitation

Glyphosate				
Herbicide Characteristics	**Basic Hazard Identification**	**Risk Characterization (SERA Risk Assess.)**	**Label Restrictions & Information**	**Project Design Criteria**
Strongly adsorbed to soil particles, especially clay	Low mobility in soil	Low likelihood of runoff due to strong adsorption to soil; soil-bound glyphosate not available to plants		
No photo degradation or hydrolysis				
Degraded by soil microbes	Avg half-life 25-47 days (range 3-130 days)			
	May cause transient population decrease or increase in some bacteria & fungi			
Does not bioaccumulate or bioconcentrate	No evidence of dose-related reproductive risk, malformations, cancer, or mutagenicity	All exposures for workers and public far below level of concern		A.8. – Application rates D.1 – Personal protective equipment
	May damage mucosal tissue, weight loss in mammals; mild liver toxicity	All exposures for workers and public far below level of concern	Applicators and other handlers must wear long-sleeved shirt and long pants, shoes plus socks, and protective eyewear.	A.8. – Application rates D.1 – Personal protective equipment
	Mild to moderate irritant to skin and eyes.		Do not get in eyes or on clothing; Avoid breathing vapor or spray mist;	A.8. – Application rates D.1 – Personal protective equipment
	Can cause diarrhea, weight loss in mammals; weight loss in birds at very high doses; some mortality to pregnant rabbits observed	Mortality to some large vegetation-eating mammals plausible at highest application rates only; some risk to insect-eating birds & mammals at high rate		A.8. – Application rates
		Chronic risk to insect-eating birds at typical rate unknown; at highest rate, chronic risk to insect-eating birds and mammals unknown		A.8. – Application rates

Glyphosate				
Herbicide Characteristics	**Basic Hazard Identification**	**Risk Characterization (SERA Risk Assess.)**	**Label Restrictions & Information**	**Project Design Criteria**
Surfactants (tallow amine or POEA) in non-aquatic use formulations very toxic to aquatic organisms	Low toxicity to fish; surfactant in some formulations much more toxic than glyphosate	Even aquatic formulation exceeds level of concern for **endangered fish**, with max risk assumptions; surfactant formulations may cause mortality at high application rate only	Follow label – no POEA to reach water	A.8. – Application rates A.9. – NPE application rate F.1. – Aquatic buffers
	Low toxicity to aquatic invertebrates	Exposures below level of concern		A.8. – Application rates F.1. – Aquatic buffers
	No malformations in amphibians; toxicity to amphibians is comparable to that of fish	At typical rate, all exposures below level of concern		A.8. – Application rates A.9. – NPE application rate F.1. – Aquatic buffers H.2. – Salamanders and mollusks
	Surfactants may be highly toxic to aquatic organisms		Do not apply (surfactant formulations) directly to water, to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment.	A.8. – Application rates A.9. – NPE application rate B.7. – Rinse equipment F.1. – Aquatic buffers F.2. – NPE surfactant
	Aquatic plants and algae are susceptible to glyphosate; but it does not control submerged plants	Exposures below levels of concern; some algae growth stimulated at low concentrations	No restriction on the use of treated water for irrigation, recreation, or domestic purposes. If emerged weeds cover entire water body, treatment of aquatic weeds may result in oxygen depletion.	A.8. – Application rates D.7. – Water intake F.1. – Aquatic buffers

Glyphosate				
Herbicide Characteristics	**Basic Hazard Identification**	**Risk Characterization (SERA Risk Assess.)**	**Label Restrictions & Information**	**Project Design Criteria**
	Low or no toxicity to bees, beetles, spider mites, wasps, isopods, earthworms, or snails.	Highest application rate may pose risk to some individual bees, but not likely to populations		A.8. – Application rates F.1. – Aquatic buffers

Active Ingredient: **Imazapic** Trade Name(s): **Plateau**

Mode of Action: acetolactate synthesis inhibitor Chemical Family: Imidazolinone

Forest-Scenic Area target species: Known infestations – butter n' eggs, houndstongue

Invasive plants in close proximity – medusahead rye, Dyer's toad, puncture vine

Project Design Criteria (PDC) A.1. and A.2. applicable to all herbicide characteristics and risks. A.1. states: "Herbicides would be used in accordance with label instructions, except where more restricted measures are required as described . . ." And A.2. states: "Herbicide use would comply with standards in the *Pacific Northwest Regional Invasive Plant Program – Prevention and Managing Invasive Plants* FEIS (2005a), including standards on herbicide selection, broadcast use of some herbicides, tank mixing, licensed applications, and use of adjuvants, surfactants and other additives."

Imazapic				
Herbicide Characteristics	**Basic Hazard Identification**	**Risk Characterization (SERA Risk Assess.)**	**Label Restrictions & Information**	**Project Design Features**
Selective against some broadleaves & some grasses				E.1. – Botanical buffers
Uptake by roots & leaves; active in soil as pre-emergent	May damage non-target plants and trees	Drift or runoff may cause some damage to susceptible species	Do not treat inside of irrigation ditches; conduct small test areas to determine risk to desirable trees and plants	C.2. – Drift E.1. – Botanical buffer E.4 – Botanical buffer adaptive management
Very high water solubility	Leaching, runoff		Do not contaminate water	D.7. – Water Intake F.1. – Aquatic Buffers
Adsorbs to OM in soil	Moderately mobile in soils, leachable in coarse soils			

Imazapic				
Herbicide Characteristics	**Basic Hazard Identification**	**Risk Characterization (SERA Risk Assess.)**	**Label Restrictions & Information**	**Project Design Features**
Degraded by soil microbes	Half-life avg. 120d		Treatment of areas that were previously treated with chlorsulfuron, metsulfuron methyl, sulfometuron or imazapyr may cause compound injury or death to desirable plants	E.1. – Botanical buffer E.4. – Botanical buffer adaptive management
No info on toxicity to soil microbes				
In H20, degraded by sunlight				
	Not irritating to skin, minimal irritation to eye	Mild eye irritation from mishandling; no exposure scenario exceeded RfD for workers or public except spill		D.1. – Personal protective equipment
Does not bioaccumulate or bioconcentrate	No adverse effects to mammal reproduction or development, not carcinogenic or mutagenic			
	Muscle, liver, & blood damage in dogs at high chronic doses	Exposures far below levels of concern		A.8. – Application rates
	Low toxicity to birds	Exposures far below levels of concern		A.8. – Application rates
		No plausible risk to insectivorous species		A.8. – Application rates
	Low toxicity to fish, no effects to egg & fry	Exposures far below levels of concern		A.8. – Application rates F.1. – Aquatic buffers
	No data on effects to amphibians, fish used as a surrogate	Exposures far below levels of concern		A.8. – Application rates F.1. – Aquatic buffers H.2. – Salamanders and mollusks

Imazapic				
Herbicide Characteristics	**Basic Hazard Identification**	**Risk Characterization (SERA Risk Assess.)**	**Label Restrictions & Information**	**Project Design Features**
	Aquatic plants sensitive, algae is not	Potential risk to aquatic plants at highest application rate only, no risk to algae		A.8. – Application rates F.1. – Aquatic buffers
	Low toxicity to bees	Exposure far below level of concern		A.8. – Application rates

Active Ingredient: **Imazapyr** Trade Name(s): **Arsenal, Chopper, Stalker**

Aquatic Formulation: **Habitat**

Mode of Action: acetolactate synthesis inhibitor Chemical Family: Imidazolinone

Forest-Scenic Area target species: Known infestations – knotweeds

Project Design Criteria (PDC) A.1. and A.2. applicable to all herbicide characteristics and risks. A.1. states: "Herbicides would be used in accordance with label instructions, except where more restricted measures are required as described . . ." And A.2. states: "Herbicide use would comply with standards in the *Pacific Northwest Regional Invasive Plant Program – Prevention and Managing Invasive Plants* FEIS (2005a), including standards on herbicide selection, broadcast use of some herbicides, tank mixing, licensed applications, and use of adjuvants, surfactants and other additives."

Imazapyr				
Herbicide Characteristics	**Basic Hazard Identification**	**Risk Characterization (SERA Risk Assess.)**	**Label Restrictions & Information**	**Project Design Features**
Non-selective				
Uptake by roots & leaves; active in soil as pre-emergent	May damage non-target plants; may be exuded into soil from roots of treated plants	Drift or runoff may cause some damage to susceptible species	Do not apply to irrigation ditches; prevent drift to desirable plants	C.2. – Drift D.7. – Water intake E.1. – Botanical buffer
Very high water solubility			Do not contaminate water	F.1. – Aquatic buffer
Weakly bound to soil, but OM and lower pH increase adsorption to moderate levels	Moderately mobile in soils			
Photodegrades in H2O	Half-life in water 1-2 d		May be used in intermittent drainages, flood plains, and bogs when no water is present	F.1. – Aquatic buffer F.3. – Wetlands
Degrades by soil microbes	Half-life in soil 25-142 d; weed control for 3 mo-2yrs			
	Slight effect on soil microbes at high doses	Peak concentrations in soil well below level of concern		A.8. – Application rates

Imazapyr				
Herbicide Characteristics	**Basic Hazard Identification**	**Risk Characterization (SERA Risk Assess.)**	**Label Restrictions & Information**	**Project Design Features**
	Mildly irritating to eyes and skin	Mild eye irritation from mishandling; no exposure scenario exceeded RfD for workers or public except spill		D.1. – Personal protective equipment
Does not bioaccumulate or bioconcentrate	No adverse effects to mammal reproduction or development, not carcinogenic or mutagenic			
	No effects to birds or mammals even at high doses	Exposures all below level of concern		A.8. – Application rates
		No plausible risk to insectivorous species		A.8. – Application rates
	Low toxicity to North American fish	Exposures very far below levels of concern		A.8. – Application rates F.1. – Aquatic buffers
	No data on effects to amphibians, fish used as a surrogate	Exposures far below levels of concern		A.8. – Application rates F.1. – Aquatic buffers H.2. – Salamanders and mollusks
	Some aquatic plant species sensitive to imazapyr	Potential risk to aquatic plants at typical application rate, no risk to algae		A.8. – Application rates F.1. – Aquatic buffers
	Low or no toxicity to bees	Exposure well below level of concern		A.8. – Application rates

Active Ingredient: **Metsulfuron methyl** Trade Name(s): **Escort**

Mode of Action acetolactate synthesis inhibitor Chemical Family: Sulfonylurea

Forest-Scenic Area target species: Known infestations – butter n' eggs, houndstongue, thistles, St. Johnswort, tansy ragwort

Invasive plants in close proximity – Dalmatian toadflax, Dyer's toad, perennial pepperwood, whitetop

Project Design Criteria (PDC) A.1. and A.2. applicable to all herbicide characteristics and risks. A.1. states: "Herbicides would be used in accordance with label instructions, except where more restricted measures are required as described . . ." And A.2. states: "Herbicide use would comply with standards in the *Pacific Northwest Regional Invasive Plant Program – Prevention and Managing Invasive Plants* FEIS (2005a), including standards on herbicide selection, broadcast use of some herbicides, tank mixing, licensed applications, and use of adjuvants, surfactants and other additives."

Metsulfuron methyl				
Herbicide Characteristics	**Basic Hazard Identification**	**Risk Characterization (SERA Risk Assess.)**	**Label Restrictions & Information**	**Project Design Features**
Selective for some broad-leaf and woody species; can damage conifers				E.1 – Botanical buffers
Resistant biotypes may develop			Manage herbicide resistance, use IPM	
Potent herbicide; uptake by roots & leaves	May damage non-target plants and trees; highly potent herbicide at low rates	Drift, runoff or wind erosion, may cause damage to susceptible species	This herbicide is injurious to plants at extremely low concentrations. Non-target plants may be adversely affected from drift and run-off. Do not use on irrigation ditches.	C.2. – Drift D.7. – Water intake E.1. – Botanical buffers F.1. – Aquatic buffers
High water solubility	Runoff, leaching potential		Do not contaminate water; do not apply or rinse equipment near desirable plants;	B.7. – Rinse equipment E.1. – Botanical buffers F.1. – Aquatic buffers

Metsulfuron methyl				
Herbicide Characteristics	**Basic Hazard Identification**	**Risk Characterization (SERA Risk Assess.)**	**Label Restrictions & Information**	**Project Design Features**
Low adsorption to clay, OM increases adsorption; active in soil as pre-emergent	Very high mobility in soils		Treatment of powdery, dry soil or light sandy soil when there is little likelihood of rainfall soon after treating may result in off target movement and possible damage to susceptible crops when soil particles are moved by wind or water.	C.1. – Wind C.3. – Precipitation
No photo degradation				
Slow microbial degradation at high pH, fast at low pH	Typical half-life 30 d (range 1-6 wks)			
	Short-term toxicity to soil microbes			F.3. – Wetlands
Degrades by hydrolysis			May be used in intermittent drainages, flood plains, marshes, and bogs when no water is present	F.1. – Aquatic buffers A.8. – Application rates
	May alter insulin production, cholesterol levels, and triglycerides at high doses	Exposures well below levels of concern even at highest application rates		A.8. – Application rates D.1. – Personal protective equipment
	Irritates skin and eyes	Mild eye irritation from mishandling; all exposures below levels of concern for workers and public	Applicator and other handlers must wear long-sleeved shirt, long pants, shoes plus socks	
Does not bioaccumulate or bioconcentrate	No adverse effects to mammal reproduction or development, not carcinogenic or mutagenic			
	Can cause body weight loss in mammals & birds	Exposures well below levels of concern even at highest application rates		A.8. – Application rates
		No plausible risk to insectivorous species		A.8. – Application rates

Metsulfuron methyl				
Herbicide Characteristics	**Basic Hazard Identification**	**Risk Characterization (SERA Risk Assess.)**	**Label Restrictions & Information**	**Project Design Features**
	Low toxicity to fish, no effects to egg & fry	Exposures very far below levels of concern		A.8. – Application rates F.1. – Aquatic buffers
	No data on effects to amphibians, fish used as a surrogate	Exposures very far below levels of concern		A.8. – Application rates F.1. – Aquatic buffers H.2. – Salamanders and mollusks
	Can damage aquatic plants in acute exposures	Potential risk to aquatic plants at typical application rate, no risk to algae		A.8. – Application rates F.1. – Aquatic buffers
	Low or no toxicity to bees	Exposure well below level of concern		A.8. – Application rates F.1. – Aquatic buffers

Active Ingredient: **Picloram** Trade Name(s): **Tordon 22K**

Mode of Action: Plant growth regulator Chemical Family: Pyridcarboxylic acid or picolinic acid

Forest-Scenic Area target species: Known infestations – thistles, houndstongue, hawkweeds, Scotch broom, knapweeds, St. Johnswort, tansy ragwort

Invasive plants in close proximity – whitetop, leafy spurge, Mediterranean sage, puncture vine, rush skeletonweed, water hemlock

Project Design Criteria (PDC) A.1. and A.2. applicable to all herbicide characteristics and risks. A.1. states: "Herbicides would be used in accordance with label instructions, except where more restricted measures are required as described . . ." And A.2. states: "Herbicide use would comply with standards in the *Pacific Northwest Regional Invasive Plant Program – Prevention and Managing Invasive Plants* FEIS (2005a), including standards on herbicide selection, broadcast use of some herbicides, tank mixing, licensed applications, and use of adjuvants, surfactants and other additives."

Picloram				
Herbicide Characteristics	**Basic Hazard Identification**	**Risk Characterization (SERA Risk Assess.)**	**Label Restrictions & Information**	**Project Design Criteria**
Selective: rate and season dependant; pre-emergent and soil active		Off-site drift of picloram may cause damage to susceptible plant species	Minimize drift and runoff	C.2. – Drift G.3. – Soils (picloram and sulfometuron methyl) G.4. – One application per year
Target: composite, legume, buckwheat, and parsley families. Less affected families: mustard, lily, figwort.				E.1. – Botanical buffer

Picloram				
Herbicide Characteristics	**Basic Hazard Identification**	**Risk Characterization (SERA Risk Assess.)**	**Label Restrictions & Information**	**Project Design Criteria**
High water solubility	Run-off, leaching potential;		Under some conditions, picloram may also have a high potential for runoff into surface water… Do not apply directly to water, to areas where surface water is present. Do no allow run-off or spray to contaminate wells, irrigation ditches or any body of water used for irrigation or domestic purposes.	D.7. – Water intake F.1. – Aquatic buffers G.3. – Soils (picloram and sulfometuron methyl) G.4. – One application per year
Photodegradation	Half-life in H20 is 2.6 days			
Weakly adsorbed to soils	Very high mobility in soils; leaching potential greatest in sandy soils with low OM	1-6% of application mobilized and reached drainage channels (monitoring results)	Picloram is known to leach through soil into ground water under certain conditions as a result of agricultural use. Use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in ground water contamination.	A.8. – Application rates G.3. – Soils (picloram and sulfometuron methyl) G.4. – One application per year
Degraded slowly in soil by microbes	Half-life avg. 90 days (range 20-300 d)		NTE 2 qts/ac/growing season as a broadcast application	G.3. – Soils (picloram and sulfometuron methyl) G.4. – One application per year
	Can inhibit microbial activity	Microbial activity inhibition likely at rates used by FS		G.3. – Soils (picloram and sulfometuron methyl) G.4. – One application per year
Contaminated with hexachlorobenzene HCB (more than clopyralid)	HCB is a persistent carcinogen and it bioaccumulates	Exposure levels below level of concern. Picloram does not present any substantial cancer risk.		A.8. – Application rates

Picloram				
Herbicide Characteristics	**Basic Hazard Identification**	**Risk Characterization (SERA Risk Assess.)**	**Label Restrictions & Information**	**Project Design Criteria**
Does not bioaccumulate or bioconcentrate	No adverse effects to mammal reproduction or development, not carcinogenic or mutagenic			
	Weight loss and increased liver weight in mammals following long term exposure to high concentrations	No exposures for workers or public exceeded levels of concern except spill		A.8. – Application rates D.1. – Personal protective equipment
	Moderate eye irritant, can cause skin sensitization	Eye irritation and skin sensitization can occur with mishandling	Applicator and other handlers must wear long-sleeved shirt, long pants, shoes plus socks	A.8. – Application rates D.1. – Personal protective equipment
	Low in toxicity to mammals	Exposure to insect-eating mammals exceed acute levels of concern only at highest application rates		A.8. – Application rates
	Almost nontoxic to birds	Exposures below levels of concern		A.8. – Application rates
		Chronic risk to insect-eating birds or mammals unknown at typical and highest rates		A.8. – Application rates
	Toxic to fish	Exposures exceed level of concern for listed fish at typical and highest application rate		A.8. – Application rates F.1. – Aquatic buffers
	No data on effects to amphibians, fish used as a surrogate	Potential adverse effects to amphibians at typical and highest application rates		A.8. – Application rates F.1. – Aquatic buffers H.2. – Salamanders and mollusks
	Relatively nontoxic to bees	Exposures below level of concern even at highest application rates		A.8. – Application rates

Active Ingredient: **Sethoxydim** Trade Name(s): **POAST**

Mode of Action: Inhibits acetyl co-enzyme (ACE) Chemical Family: Cyclohexanedione or cyclohexenone

Forest-Scenic Area target species: Known infestations – reed canarygrass

Project Design Criteria (PDC) A.1. and A.2. applicable to all herbicide characteristics and risks. A.1. states: "Herbicides would be used in accordance with label instructions, except where more restricted measures are required as described . . ." And A.2. states: "Herbicide use would comply with standards in the *Pacific Northwest Regional Invasive Plant Program – Prevention and Managing Invasive Plants* FEIS (2005a), including standards on herbicide selection, broadcast use of some herbicides, tank mixing, licensed applications, and use of adjuvants, surfactants and other additives."

Sethoxydim

Herbicide Characteristics	Basic Hazard Identification	Risk Characterization (SERA Risk Assess.)	Label Restrictions & Information	Project Design Criteria
Selective for annual and perennial grasses			Low likelihood of impacting non-target plants from drift	E.1. – Botanical buffers C.2. – Drift
Soil activity prevents germination of grasses				
Absorbed rapidly by foliage and roots. Systemic				
Broadleaf and sedges are tolerant			Some herbicide resistance can develop	
Very high water solubility	Leaching, run-off potential		Do not contaminate water.	F.1. – Aquatic buffers
Medium mobility in soil				
Photodegrades	Phytolysis in <4 hours in soil; <1 hr in water	Low soil persistence		
Degraded by soil microbes	5-25 day ½ life (avg is 5 days)	Rapidly degraded		
	Causes skin and eye irritation	Skin or eye irritation from mishandling.	Applicators and other handlers must wear coveralls over short-sleeved shirt and short pants; chemical resistant gloves and footwear, plus socks; protective eyewear; etc.	D.1 – Personal protective equipment

Sethoxydim				
Herbicide Characteristics	**Basic Hazard Identification**	**Risk Characterization (SERA Risk Assess.)**	**Label Restrictions & Information**	**Project Design Criteria**
Does not bioaccumulate or bioconcentrate	Not mutagenic or carcinogenic			A.8. – Application rates
	Can cause liver and blood toxicity in chronic doses	All chronic exposures well below level of concern for workers and public		A.8. – Application rates
	Decreased reproduction and maternal toxicity in high doses	All acute exposures below level of concern except for drinking water contaminated by accidental spill		A.8. – Application rates
	Reproductive and neurological effects to small mammals at high doses	Exposures below levels of concern for mammals		A.8. – Application rates
	Low toxicity to birds but reduced hatching for chronic exposures	Exposures below levels of concern except chronic dose for grass-eating bird at highest application rate		A.8. – Application rates
		Chronic risk to insect-eating birds or mammals unknown at typical and highest rates		
	Highly toxic to fish due to petroleum inert	Exposure exceeds level of concern for federally listed fish at typical rate, and max exposure assumptions	This product is toxic to aquatic organisms. Do not apply directly to water or to areas where surface water is present.	A.8. – Application rates C.3. – Precipitation F.1. – Aquatic buffers
	No data on effects to amphibians, fish used as a surrogate	Plausible risk to amphibians		A.8. – Application rates F.1. – Aquatic buffers H.2 – Salamander and mollusk
	Nontoxic to bees	Exposure below level of concern		A.8. – Application rates

Active Ingredient: **Sulfometuron methyl** Trade Name(s): **Oust XP**

Mode of Action: acetolactate synthesis inhibitor Chemical Family: Sulfonylurea

Forest-Scenic Area target species: Known infestations – reed canarygrass

Invasive plants in close proximity – whitetop

Project Design Criteria (PDC) A.1. and A.2. applicable to all herbicide characteristics and risks. A.1. states: “Herbicides would be used in accordance with label instructions, except where more restricted measures are required as described . . .” And A.2. states: “Herbicide use would comply with standards in the *Pacific Northwest Regional Invasive Plant Program – Prevention and Managing Invasive Plants* FEIS (2005a), including standards on herbicide selection, broadcast use of some herbicides, tank mixing, licensed applications, and use of adjuvants, surfactants and other additives.”

Sulfometuron methyl				
Herbicide Characteristics	**Basic Hazard Identification**	**Risk Characterization (SERA Risk Assess.)**	**Label Restrictions & Information**	**Project Design Criteria**
Non-selective Pre-emergent and post emergent.			If a surfactant is used, contact with tree foliage may injure or kill trees.	A.8. – Application rates A.9. – NPE application rate E.1. – Botanical buffers
Target: annual and perennial broadleaf weeds, some grasses and some woody tree species			Do not apply more than 8 oz/ac/yr	A.8. – Application rates
Potent herbicide; uptake by roots & leaves	May damage non-target plants and trees; highly potent herbicide at low rates	Drift, runoff or wind erosion, may cause damage to susceptible species	Potential for drift is an issue. Use weather and droplet size criteria	C.1. – Wind C.2. – Drift C.3. – Precipitation E.1. – Botanical buffers

Sulfometuron methyl				
Herbicide Characteristics	**Basic Hazard Identification**	**Risk Characterization (SERA Risk Assess.)**	**Label Restrictions & Information**	**Project Design Criteria**
Only medium solubility in water; difficult to create high concentrations	May leach or runoff into water	Low application rates and microbe degradation pose little risk for water contamination	Do not treat dry or frozen soils, unless rainfall is anticipated	A.8. – Application rates G.3. – Soils (picloram and sulfometuron methyl) G.4. – One application per year
High mobility in soil			Treatment of powdery, dry soil and light sandy soils when there is little likelihood of rainfall soon after treating may result in off target movement and possible damage to susceptible crops when soil particles are moved by wind or water.	C.3. – Precipitation G.3. – Soils (picloram and sulfometuron methyl) G.4. – One application per year
Degraded by microbes, light and hydrolysis	30 day ½ life in silt loam soils			
	Some growth inhibition to soil microbes in lab, but not demonstrated while in soil	Percolation could inhibit growth of microbes if lab results are relevant in the field		G.3. – Soils (picloram and sulfometuron methyl) G.4. – One application per year
Does not bioaccumulate or bioconcentrate	Not mutagenic, carcinogenic			A.8. – Application rates
	Reproductive and immune system effects to mammals at higher doses; very high doses cause neurotoxic effects	Exposures far below levels of concern		A.8. – Application rates
	Irritating to skin and eyes at high doses	Mild irritation to skin and eyes from exposures to high levels from mishandling	Only protected handlers may be in the area during treatment	A.8. – Application rates D.1. – Personal protective equipment

Sulfometuron methyl				
Herbicide Characteristics	**Basic Hazard Identification**	**Risk Characterization (SERA Risk Assess.)**	**Label Restrictions & Information**	**Project Design Criteria**
	Causes hemolytic anemia and weight loss in mammals	Exposures far below levels of concern		A.8. – Application rates
	Slightly toxic to fish. Highly toxic to embryo hatch	Exposures very far below level of concern	Do not apply directly to water or where surface water is present	A.8. – Application rates F.1. – Aquatic buffers
	Can cause malformations in amphibians	Exposures very far below level of concern		A.8. – Application rates F.1. – Aquatic buffers H.2. – Salamanders and mollusks
	Low toxicity to bee	Exposures well below level of concern		A.8. – Application rates

Active Ingredient: **Triclopyr** Trade Name(s): **Garlon 4, Remedy, PathFinder, Redeem**

Aquatic formulation: **Garlon 3A**

Mode of Action: Plant growth regulator Chemical Family: Pyridinecarboxylic acid

Forest-Scenic Area target species: Known infestations – knotweeds, thistles, English ivy, blackberries, scotch broom

Invasive plants in close proximity – garlic mustard, policeman's helmet

Project Design Criteria (PDC) A.1. and A.2. applicable to all herbicide characteristics and risks. A.1. states: "Herbicides would be used in accordance with label instructions, except where more restricted measures are required as described . . ." And A.2. states: "Herbicide use would comply with standards in the *Pacific Northwest Regional Invasive Plant Program – Prevention and Managing Invasive Plants* FEIS (2005a), including standards on herbicide selection, broadcast use of some herbicides, tank mixing, licensed applications, and use of adjuvants, surfactants and other additives."

Triclopyr

Herbicide Characteristics	Basic Hazard Identification	Risk Characterization* (SERA Risk Assess.)	Label Restrictions & Information	Project Design Criteria
Selective for broadleaf and woody plants				
Target: Woody and herbaceous plants, especially root- or stem-sprouting species				
Absorbed thru roots, foliage and green bark.	Non-target plant effects possible; some bryophytes and lichens sensitive to triclopyr		Do not apply through any type of irrigation system.	
Two forms: salt (acid) (Garlon 3A) and ester (Garlon 4)	Ester form more toxic and volatile		Apply at cool temps with no wind. Combustible.	C.1. – Wind
Salt formulation is highly soluble in water	Runoff, leaching		Do not contaminate water when cleaning equipment.	A.3. – Equipment B.7. – Rinse equipment D.7. – Water intake
Ester formulation has medium water solubility.	Less mobile			

Triclopyr				
Herbicide Characteristics	**Basic Hazard Identification**	**Risk Characterization* (SERA Risk Assess.)**	**Label Restrictions & Information**	**Project Design Criteria**
Low adsorption to soils, varies with clay and OM content	Very high mobility in soils		The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination.	A.1. Regional standard – Application method G.1. – Low risk herbicides
Degraded by photolysis in soil and water	½ life 2-6 hours in water			
Degraded by microbes in soil	½ life avg 30days in soils; range 10-46 days			
	Inhibits growth of soil fungi and bacteria	Transient inhibition in the growth of some bacteria or fungi might be expected		A.1. Regional standard – Application method
	Can cause severe eye damage		Applicators and other handlers must wear long-sleeved shirt and long pants; shoes plus socks; protective eyewear; chemical resistant gloves.	D.1. – Personal protective equipment
Does not bioaccumulate or bioconcentrate	Ester has much higher lipophilic tendancy (K_{ow} = 10, 233) than salt (K_{ow} = 0.35)			
	Adverse effects to mammal reproduction or development only at doses that are maternally toxic		Except for lactating dairy animals, there are no grazing restrictions	A.8. – Application rates
	Evidence for carcinogenicity is marginal (not convincing, but not entirely negative)			A.8. – Application rates

Triclopyr				
Herbicide Characteristics	**Basic Hazard Identification**	**Risk Characterization* (SERA Risk Assess.)**	**Label Restrictions & Information**	**Project Design Criteria**
	Effects to kidney are basis of risk to for acute and chronic exposures humans	At high application rates, chronic exposures to workers exceed level of concern; acute exposures do not exceed level of concern for workers. At high application rates, some acute and chronic exposures exceed level of concern for public. No exposures exceed level of concern at typical application rate.	Do not apply this product in a way that will contact workers or other persons, either directly or through drift.	A.8. – Application rates C.2. – Drift D.1. – Personal protective equipment
	For wildlife, acute lethality only at very high doses, but effects to kidney and liver at lower doses	Acute exposures below level of concern at typical application rate, but exceed level of concern for grass and insect eating mammals		A.1. Regional standard – Application method A.8. – Application rates
	Primary effect from chronic doses is to the kidney	Using protective assumptions, chronic exposures exceed level of concern for grass-eating mammals. Risk from chronic exposure to contaminated insects unknown.		A.1. Regional standard – Application method A.8. – Application rates D.1. – Personal protective equipment
	Formulations contain inerts that are neurotoxic (Garlon 3A = ethanol) (Garlon 4 = kerosene)	Exposures very far below level of concern; less toxic than triclopyr		A.8. – Application rates D.1. – Personal protective equipment
	Ester more toxic to birds that salt form	Several scenarios exceed level of concern at typical and highest application rates for acute and chronic exposures		A.1. Regional standard – Application method A.8. – Application rates

Triclopyr				
Herbicide Characteristics	**Basic Hazard Identification**	**Risk Characterization* (SERA Risk Assess.)**	**Label Restrictions & Information**	**Project Design Criteria**
	Salt/acid formulation low toxicity to fish; has aquatic use label	Exposures exceed level of concern for federally listed fish at typical rate, but not other fish even at highest application rate	(Garlon 3A) Permissible to treat flood plains, marshes, swamps, bogs etc. Permissible to treat non-irrigation ditch banks. When making application to banks or shorelines of moving water sites, minimize overspray to open water.	A.1. Regional standard – Application method A.8. – Application rates F.1. – Aquatic buffers
	Ester formulation toxic to fish and aquatic invertebrates	Exposures exceed level of concern for federally listed fish at typical rate, but not other fish even at highest application rate	(Garlon 4) This pesticide is toxic to fish. Do not apply directly to water, to areas where surface water is present… Do not contaminate water when disposing of equipment wash waters.	A.1. Regional standard – Application method A.8. – Application rates B.7. – Rinse equipment F.1. – Aquatic buffers
	Metabolite TCP much more toxic to fish than the salt form, about the same toxicity as ester	At typical application rate, no TCP exposures exceed level of concern. At highest application rate, chronic exposure exceeds level of concern		A.8. – Application rates F.1. – Aquatic buffers
	Ester form much more toxic to aquatic plants and algae than salt form	Only salt form exceeds level of concern for aquatic plants; algae not at risk from either form		A.1. Regional standard – Application method A.8. – Application rates F.1. – Aquatic buffers
	Ester formulation much more toxic to amphibians than salt formulation	At typical application rate, risk to amphibians from either form is low. At highest rate, exposure to run-off of either form could adversely affect responsiveness of tadpoles.		A.8. – Application rates F.1. – Aquatic buffers H.2. – Salamanders and mollusks

Triclopyr				
Herbicide Characteristics	**Basic Hazard Identification**	**Risk Characterization* (SERA Risk Assess.)**	**Label Restrictions & Information**	**Project Design Criteria**
	Practically non-toxic to bees	Exposure exceeds level of concern only for highest application rates		A.8. – Application rates F.1. – Aquatic buffers

*Results of these risk characterizations are from scenarios where triclopyr is broadcast sprayed over a large area. A standard in each Forest Plan that was added by the Invasive Plant Program ROD (USDA Forest Service, 2005b) prohibits this type of application. Triclopyr is restricted to selective application methods only. Therefore, in practice, it is not plausible to create the exposures causing concern during use of triclopyr for invasive plant treatment in the USDA Forest Service, Pacific Northwest Region.

Water Solubility Chart

Solubility Class	Water Solubility (ppm=mg/L)	Examples
Very High	3,000 – 1,000,000	chlorsulfuron, glyphosate, imazapic, imazapyr, picloram, sethoxydim,
High	300-3,000	clopyralid, metsulfuron methyl, 2,4-D
Medium	30-300	sulfometuron, triclopyr
Low	2-30	
Slight	0.5-2	
Immobile	<0.5	DDT (0.0012)

From Jay Davis, US Fish and Wildlife Service

Mobility in Soil (Koc)

Mobility Class	Koc in Soil	Examples
Very High	0-35	clopyralid, picloram, metsulfuron methyl, triclopyr
High	36-100	sulfomet.,chlrosufluron,
Medium	100-1,000	imazapic, imazapyr, sethoxydim, atrazine
Low	1,000-3,000	glyphosate
Slight	3,000-10,000	Trifluralin
Immobile	>10,000	chlorpyrifos, DDT

Adapted from Jay Davis, US Fish and Wildlife Service
Mobility class categories by S.Bautista and are general breakdowns, not a definitive classification

Grazing Restriction Table (Sources are Trade Name Labels for Specific Herbicides)

Livestock Use Restrictions by Herbicide*			
Herbicide	**Brand Name**	**Restriction**	**Remarks**
Chlorsulfuron	Telar, Glean, Corsair, Landmark (oust + telar)	None	
Clopyralid	Transline, Redeem (Clopyralid + Triclopyr)	Redeem: Do not graze treated areas until poisonous plants are dry and no longer palatable to livestock. Withdraw livestock from grazing treated grass at least 3 days prior to slaughter.	See label for cropland grazing restrictions post treatment in pastures. Redeem: Herbicide application may increase palatability of certain poisonous plants.
Glyphosate	RoundUp, Rodeo, etc.	None	RoundUp: ingestion of this product or large amounts of freshly sprayed vegetation may cause temporary gastrointestinal irritation.
Imazapic	Plateau	Plateau: None. Plateau DG: Do not use on areas to be grazed.	
Imazapyr	Arsenal, Chopper, Stalker	Arsenal: none. Chopper: none. Stalker: none.	
Metsulfuron methyl	(Escort)/Sulfon ylurea	None.	

This table is not meant to be an inclusive or up-to-date list; please refer to product labels for the most accurate and inclusive information.

Grazing Restriction Table (Sources are Trade Name Labels for Specific Herbicides)

Livestock Use Restrictions by Herbicide*(continued)			
Herbicide	**Brand Name**	**Restriction**	**Remarks**
Picloram	Tordon	Tordon 101/22K/K: allow one week of grazing/feeding in non-exposure area before moving livestock onto broadleaf cropland. Tordon 22K: herbicide application may increase palatability of certain poisonous plants. Do not graze treated areas until poisonous plants are dry and no longer palatable to livestock. Meat grazing animals up to two weeks after treatment should be removed from treated areas 3 days prior to slaughter.	
Sethoxydim	Poast	None	
Sulfometuron methyl	(Oust)/Sulfonyl urea, & Landmark (oust + telar)	None	
Triclopyr	(Garlon, Pathfinder, Remedy)/Synthetic auxin, Redeem (Clopyralid + Triclopyr)	Forestry Garlon 4, Garlon 4, & Remedy: 2 quarts per acre or less, no restriction. If less than 25% of the grazing area is treated, there is no restriction. Slaughter: remove animals from treated area 3 days prior to slaughter. Garlon 3A: none. Remove animals from treated area 3 days prior to slaughter. Pathfinder II & Remedy RTU: 2.5 gallons per acre or less, no restriction. If less than 25% of the grazing area is treated, there is no restriction. Slaughter: remove animals from treated area 3 days prior to slaughter. Redeem: Do not graze treated areas until poisonous plants are dry and no longer palatable to livestock. Withdraw livestock from grazing treated grass at least 3 days prior to slaughter.	

This table is not meant to be an inclusive or up-to-date list; please refer to product labels for the most accurate and inclusive information.

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APPENDIX R
Adjuvants and Surfactants Addressed by Bakke (2003A)

APPENDIX R: Adjuvants and Surfactants Addressed by Bakke (2003A)

The following surfactants have been reviewed in risk assessments and may be used to help herbicides adhere to target plants (Bakke, 2003a). The effects of using these ingredients, along with other inerts and metabolites, have been disclosed in the Invasive Plant FEIS (2005a). Most surfactants do not have adverse effects of concern. At certain rates, NPE (Nonylphenol Polyethoxylate) surfactants have been shown to have adverse effects on human health and aquatic ecosystem elements so some limitations on their use have been included in the PDC.

- **Surfactants**

  There are several different basic chemistries of surfactants. Examples of each[1]:

  Ethoxylated fatty amines (Cationic)

  Entry™ II (Monsanto Company)

  POEA - Roundup® has 15 percent POEA

  Alkylphenol ethoxylate-based surfactants (non-ionic)

  R-11® Spreader Activator (Wilbur-Ellis Company)

  Activator 90 (Loveland Industries)

  X-77® (Loveland Industries)

  Latron AG-98™ (N) (Dow AgroSciences LLC)

  Latron AG-98™ (Dow AgroSciences LLC)

  Cide-kick®, Cide-kick® II™ (Brewer International)

  These surfactants usually include an alcohol as a solvent (isopropanol (X-77®, AG-98™)), butanol (R-11®, AG-98™ (N)), glycol (AG-98™ (N), Activator 90), a silicone defoamer (polydimethylsiloxane), and water.

[1] The use of product names is for illustrative purposes only and is not intended as a recommendation for use or an endorsement of these products by the USDA Forest Service.

Alcohol ethoxylate-based surfactants (non-ionic)

Activator N.F. (Loveland Industries)

Silicone-Based Surfactants

Also known as organosilicones, these are increasing in popularity because of their superior spreading ability. This class contains a polysiloxane chain. Some of these are a blend of non-ionic surfactants (NIS) and silicone while others are entirely silicone. The combination of NIS and a silicone surfactant can increase absorption into a plant so that the time between application and rainfall can be shortened. Examples:

Sylgard® 309 (Wilbur-Ellis Company) –silicones

Freeway® (Loveland Industries) –silicone blend

Dyne-Amic® (Helena Chemical Company) - silicone blend

Silwet L-77® (Loveland and Helena) - silicones

Blends normally include an alcohol ethoxylate, a defoamer, and propylene glycol.

Oils

Adjuvants that are primarily oil-based have been gaining in popularity especially for the control of grassy weeds. Oil additives function to increase herbicide absorption through plant tissues and increase spray retention. They are especially useful in applications of herbicides to woody brush or tree stems to allow for penetration through the bark. Oil adjuvants are made up of either petroleum, vegetable, or methylated vegetable or seed oils plus an emulsifier for dispersion in water.

Vegetable Oils: The methylated seed oils are formed from common seed oils, such as canola, soybean, or cotton. They act to increase penetration of the herbicide. These are comparable in performance to crop oil concentrates. In addition, silicone-seed oil blends are also available that take advantage of the spreading ability of the silicones and the penetrating characteristics of the seed oils.

The U.S. Food and Drug Administration (FDA) considers methyl and ethyl esters of fatty acids produced from edible fats and oils to be food grade additives (CFR 172.225). Because of the lack of exact ingredient statements on these surfactants, it is not always clear whether the oils that are used in them meet the U.S. FDA standard.

APPENDIX S
Economic Assumptions

MSO® Concentrate Methylated Seed Oil (Loveland Industries)

Hasten® (Wilbur-Ellis Company)

The surfactant in Pathfinder™ II (a triclopyr formulation)

Improved JLB Oil Plus (Brewer International)

Cide-Kick and Cide-Kick II (Brewer International)

Blends of vegetable oils and silicone-based surfactants

Syl-tac™ (Wilbur-Ellis Company)

Phase™ (Loveland Industries)

Crop Oils and Crop Oil Concentrates: These are normally derivatives of paraffin-based petroleum oil. Crop oils are generally 95 to 98 percent oil with 1 to 2 percent surfactant/emulsifier. Crop oils also promote the penetration of a pesticide spray. Traditional crop oils are more commonly used in insect and disease control than with herbicides. Crop oil concentrates are a blend of crop oils (80 to 85 percent) and a nonionic surfactant (15 to 20 percent). The purpose of the nonionic surfactant in this mixture is to emulsify the oil in the spray solution and lower the surface tension of the overall spray solution.

kerosene (found in the triclopyr formulation Garlon 4),

Agri-dex® (Helena Chemical Co. or Setre Chemical Co.)

Red-Top Mor-Act® (Wilbur-Ellis Company)

- **Special Purpose or Utility Adjuvants**

The special purpose or utility adjuvants are used to offset or correct certain conditions associated with mixing and application such as impurities in the spray solution, extreme pH levels, and drift. These adjuvants include acidifiers, buffering agents, water conditioners, anti-foaming agents, compatibility agents, and drift control agents.

The pH of most solutions is not high or low enough for important herbicide breakdown in the spray tank. pH reducing adjuvants (example LI-700®) are sometimes recommended for use with herbicides because of greater absorption of weak acid type herbicides when the spray solution is acidic.

LI-700® Surfactant Penetrant Acidifier – (Loveland Industries)

APPENDIX S: Economic Assumptions

Assumptions used in the calculation of present value of costs for invasive plant treatments on the Forest and Scenic Area. Assumptions prepared by Malcolm Hamilton, Forest Recreation Program Manager, December 2005.

No Action Alternative

No Action treatment acres are based on actual treatments in fiscal year 2003:

- 450 acres of herbicide treatments (Forest); 150 acres of herbicide treatment (Scenic Area)
- 100 acres of manual treatments (Forest); 25 acres of manual treatment (Scenic Area)
- 10 acres of mechanical treatment (Forest); 500 acres of mechanical treatment (Scenic Area).

With two exceptions, all areas are treated once per year for one year. The exceptions are the Sandy River Delta and the utility corridor under the Big Eddy-Ostrander powerline. About 130 acres of the Sandy River Delta are treated each year. Treatment consists of three separate applications of herbicide. The powerline corridor site is sprayed with herbicide two times each year.

To provide an equal timeframe for comparison to the two action alternatives, the No Action Alternative treatments were analyzed over a five year time horizon.

Proposed Action and Reduced Herbicide Alternatives

- Priority 1 and 2 sites with site objectives of eradicate and contain would receive the most intense treatments. Except as noted below, herbicide treatments would be applied three times per year for the first three years.
- Picloram and Clopyralid would only be used one time per year at any site regardless of the prescription, priority or treatment strategies.
- Triclopyr would be limited to hand/selective application techniques only (spot or backpack spray, wiping, basal bark, cut stump, injection).
- Where broadcast herbicides applications methods (e.g., boom spraying) is the preferred treatment method, it would be done only one time and only during the first year of treatment. Subsequent herbicide treatments would employ some method of hand/selective application. The cost of backpack spraying was used for subsequent herbicide treatments.
- All priority 1 and 2 sites would have active restoration, regardless of the treatment strategy.
- Priority 3, 4, and 5 sites would be treated only once per year with herbicides.

- Active restoration would begin when all herbicide treatments are complete.

- Some inventoried sites have multiple invasive plant species. The Proposed Action and the Restricted Herbicide Use Alternative both prescribe a suite of herbicides because of differential effects on the various plant species. Only one herbicide per site is analyzed, however. For upland treatment sites, the first herbicides listed in the inventory database for the site was used. For aquatic influence areas, the cost of aqueous glyphosate (Rodeo) is used.

- The present value of costs for each of the alternatives includes proposed treatment areas only. The cost of the early detection / rapid response strategy (EDRR) is not included.

- None of the treatments would be expected to be 100 percent effective in the early stages. For the purpose of cost analysis only, it is assumed that each year's regime of vegetative treatments would be 80 percent effective in the Proposed Action and 60 percent effective in the Restricted Use Herbicide Alternative.

- Restoration would occur on 50 percent of upland treatment areas, and 95 percent of aquatic influence areas corresponding to Forest Plan standards for vegetative ground cover.

- Analysis for the Proposed Action (rows of data and statistics in Table 3-10) assumes five years of integrated treatments for every acre of inventoried invasive plants as described above. Treatment acres in years 2 through 5 are reduced by 80 percent per year, as shown in the table below, to simulate the effectiveness of treatment. Treatment of any given acre is assumed to be accomplished at the end of year 5. Because each area is treated for five years, the number of "new" acres treated in years 2 through N is reduced by 80 percent in order to maintain a fixed budget for each treatment regime. The table below demonstrates these assumptions for a hypothetical treatment regime of 1000 acres treated each year. In order to maintain a steady budget of 1000 acres of annual treatment, only 800 new, previously untreated acres are treated in years 2 through N.

Treatment Year											
1	**2**	**3**	**4**	**5**	**6**	**7**	**N**	**N+1**	**N+2**	**N+3**	**N+4**
1000	200	40	8	1.6							
	800	160	32	6.4	1.6						
		800	160	32	6.4	1.6					
			800	160	32	6.4	1.6				
				800	160	32	6.4	1.6			
					800	160	32	6.4	1.6		
						800	160	32	6.4	1.6	
							800	160	32	6.4	1.6
1000	1000	1000	1000	1000	1000	1000	1000	200	40	8	1.6

- Analysis for the Restricted Herbicide Use alternative (rows of data and statistics in Table 3-11) assumes five years of integrated treatments for every acre of inventoried invasive plants as described above. Treatment acres in years 2 through 5 are reduced by 60 percent per year, as shown in the table below, to simulate the effectiveness of treatment. Treatment of any given acre is assumed to be accomplished at the end of year 5. Because each area is treated for five years, the number of "new" acres treated in years 2 through N is reduced by 60 percent in order to maintain a fixed budget for each treatment regime. The table below demonstrates these assumptions for a hypothetical treatment regime of 1000 acres treated each year. In order to maintain a steady budget of 1000 acres of annual treatment, only 600 new, previously untreated acres are treated in years 2 through N.

Treatment Year											
1	**2**	**3**	**4**	**5**	**6**	**7**	**N**	**N+1**	**N+2**	**N+3**	**N+4**
1000	400	160	64	26							
	600	240	96	38	26						
		600	240	96	38	26					
			600	240	96	38	26				
				600	240	96	38	26			
					600	240	96	38	26		
						600	240	96	38	26	
							600	240	96	38	26
1000	1000	1000	1000	1000	1000	1000	1000	400	160	64	26

APPENDIX T
Labor Cost, Wage Income and Potential Job Estimates

APPENDIX T: Labor Cost, Wage Income and Potential Job Estimates

Assumptions and data used for jobs created analysis for invasive plant treatments on the Forest and Scenic Area. Assumptions prepared by Elisabeth Grinspoon, Social Scientist, January 2006.

Treatment Type	Acres	Labor ($)	Equipment ($)	Herbicide ($)	Total ($)	Labor Cost ($)	Wage Income	Jobs @ $20,000/year
Alternative 1 - No Action Alternative								
Herbicide Treatment	4500				$175.00	$630,000.00		
Manual Treatment	625				$340.00	$212,500.00		
Mechanical Treatment	510				$100.00	$20,400.00		
Monitoring	6175				$2.00	$12,350.00		
Planning	1915				$2.00	$3,830.00		
					Sub-total	**$879,080.00**	**$703,264.00**	**$35.16**
Alternative 2 - Proposed Action								
Herbicide Treatment with Clopyralid, Backpack Spray	3374	$184.00	$20.00	$38.00	$242.00	$620,750.86		
Herbicide Treatment with Clopyralid, Truck Mounted Boom	10084	$9.00	$8.00	$38.00	$55.00	$90,757.80		
Herbicide Treatment with AQ Glyphosate, Backpack Spray	2225	$184.00	$20.00	$21.00	$225.00	$409,362.54		
Herbicide Treatment with AQ Glyphosate, Stem Injection	1214	$184.00	$0.00	$21.00	$205.00	$223,290.62		
Herbicide Treatment with Glyphosate, Stem Injection	10	$184.00	$0.00	$29.00	$213.00	$1,848.10		

Treatment Type	Acres	Labor ($)	Equipment ($)	Herbicide ($)	Total ($)	Labor Cost ($)	Wage Income	Jobs @ $20,000/year
Herbicide Treatment with Imazapic, Backpack Spray	166	$184.00	$20.00	$16.00	$220.00	$30,527.44		
Herbicide Treatment with Imazapic, Truck Mounted Boom	232	$9.00	$8.00	$16.00	$33.00	$2,088.00		
Herbicide Treatment with Sulfometuron methyl, Backpack Spray	4	$184.00	$20.00	$12.00	$216.00	$812.40		
Herbicide Treatment with Sulfometuron methyl, Truck Mounted Boom	17	$9.00	$8.00	$12.00	$29.00	$156.60		
Herbicide Treatment withTriclopyr, Backpack Spray	170	$184.00	$20.00	$116.00	$320.00	$31,235.10		
Manual Treatment	24				$340.00	$8,251.66		
Mechanical Treatment	183				$100.00	$7,302.88		
Monitoring	65406				$2.00	$130,812.00		
Project Implementation Planning	13081				$2.00	$26,162.40		
Active Restoration	1923				$1,000.00	$769,213.60		
					Sub-total	**$2,352,572.00**	**$1,882,057.60**	**$94.10**
Alternative 3 - Restricted Herbicide Use Alternative								
Herbicide Treatment with Clopyralid, Backpack Spray	3610	$184.00	$20.00	$38.00	$242.00	$664,221.60		
Herbicide Treatment with Clopyralid, Truck Mounted Boom	562	$9.00	$8.00	$38.00	$55.00	$5,058.00		

Treatment Type	Acres	Labor ($)	Equipment ($)	Herbicide ($)	Total ($)	Labor Cost ($)	Wage Income	Jobs @ $20,000/year
Herbicide Treatment with AQ Glyphosate, Backpack Spray	2792	$184.00	$20.00	$21.00	$225.00	$513,769.95		
Herbicide Treatment with AQ Glyphosate, Stem Injection	20	$184.00	$0.00	$21.00	$205.00	$3,749.18		
Herbicide Treatment with Glyphosate, Stem Injection	36	$184.00	$0.00	$29.00	$213.00	$6,630.62		
Herbicide Treatment with Imazapic, Backpack Spray	977	$184.00	$20.00	$16.00	$220.00	$179,716.48		
Manual Treatment	1431				$340.00	$486,635.20		
Mechanical Treatment	22882				$100.00	$915,271.60		
Monitoring	65406				$2.00	$130,812.00		
Project Implementation Planning	13081				$2.00	$26,162.40		
Active Restoration	2626				$1,000.00	$1,050,442.00		
					Sub-total	**$3,982,469.04**	**$3,185,975.23**	**$159.30**

Notes:

- Labor costs for manual treatments include costs for project implementation planning and monitoring, which are assumed to be 100% of total cost.
- Labor costs for mechanical treatments are assumed to be 40% of total cost.
- Labor costs of herbicide treatment under the No Action Alternative (Alternative 1) are calculated as 80% of total cost. This is similar to calculations for labor cost in herbicide treatments in both Proposed Action and Restricted Herbicide Use alternatives.
- Wage income is calculated as 80% of labor cost given a 20% cost in taxes and benefits.
- Total ($) in is the sum of Labor ($), Equipment ($), and Herbicide ($).

APPENDIX U
Effects on Soil Properties: Review of Proposed Herbicides

APPENDIX U: Effects on Soil Properties: Review of Proposed Herbicides

General characteristics for the proposed herbicides are displayed in Table 3-17 in Section 3.8 – Soil Productivity. Appendix prepared by John Dodd, Forest Soil Scientist, November 2005.

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.

- Relatively little information is available on the toxicity of chlorsulfuron to soil invertebrates.
- No effects of chlorsulfuron were found for soil biota at recommended application rates, with the exception of transient decreases in soil nitrification (SERA, 2003a).
- 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 relatively arid environments as well as sandy or loam 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 (SERA, 2003a; Herbicide Handbook, 2002).

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 (SERA, 1999a).

- 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 –eight after 42 to 87 days, and so on.

- Increased soil moisture decreases degradation time.

- Clopyralid is weakly adsorbed and has moderate leaching potential.

- Modeling results indicate clopyralid **runoff is highest in clay soils** with peaks after rainfall events.

- Clopyralid ***percolation*** **is highest in sandy loam soils** (SERA, 1999a; Herbicide Handbook, 2002).

Glyphosate

Numerous soil bacteria, fungi, invertebrates, and other microorganisms have been studied for effects of glyphosate application.

- There is nothing to suggest glyphosate would adversely affect soil organisms.

- Glyphosate is readily metabolized by soil microorganisms and some species can use glyphosate as a sole source of carbon (SERA, 2003b).

- 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 weeds 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 weeds.

- Glyphosate degrades in soil, with an estimated half-life of 30 days.

- Glyphosate is highly soluble, but adsorbs rapidly and 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 (SERA, 2003b; Herbicide Handbook, 2002).

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 (SERA, 2001a).

- 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** (SERA, 2001a; Herbicide Handbook, 2002).

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 (SERA, 1999b).

- 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.
- Imazapyr is weakly bound to soil, but **adsorption increases with lower pH and increasing clay and organic matter content.**
- Adsorption increases with time as soil dries and is reversible.
- Field studies indicate that imazapic remains in the top 20 inches of soil and do not indicate any potential for imazapic 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** (SERA, 1999b; Herbicide Handbook, 2002).

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 (SERA, 2003c).
- 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** (SERA, 2003c; Herbicide Handbook, 2002).

Picloram

The persistence of picloram increases with soil concentration, thus increasing the likelihood that it becomes toxic to soil microorganisms in the short-term.

- 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 (SERA, 2003d).
- Picloram applied at a typical application rate is likely to change microbial metabolism, though detectable effects to soil productivity are not expected.

- Field studies (Brooks et. al., 1995; Nolte and Fulbright, 1997) have not noted substantial adverse effects associated with the normal application of picloram that might be expected if soil microbial activity were substantially damaged. (SERA, 2003d)
- Substantial effects to soil productivity from the use of picloram over the last 40 years have not been noted (SERA, 2003d).

- 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 (KSU, 2001; SERA, 2003d).

- Picloram ***percolation* is highest in loam and sandy soils** (SERA, 2003d; Herbicide Handbook, 2002). 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 (SERA, 2001c).

- Sethoxydim is degraded by soil microbes, with an estimated half-life of 1 to 60 days. Adsorption of sethoxydim varies with organic material content.

- Modeling results indicate sethoxydim **runoff is highest in clay and loam soils** with peaks after the first rainfall (SERA, 2001c; Herbicide Handbook, 2002).

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 (SERA, 2003e).

- 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 (SERA, 2003e; Herbicide Handbook, 2002).

- 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 (SERA, 2003e). Arthur and Wang (1999) found that a formulation of sulfometuron methyl had a negative impact on the abundance of microorganisms and decreased soil nitrogen content on a Christmas tree farm.

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 (SERA, 2003f).

- 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 (SERA, 2003f; Herbicide Handbook, 2002).

Impurities

“Virtually no herbicide synthesis yields a totally pure product. Technical grade herbicides undoubtedly contain some impurities” (SERA, All risk assessments). Herbicide-specific risk assessments include the identity of impurities, if it is available. In some instances, toxicity and mobility of impurities is studied in conjunction with the technical grade of the herbicide. In other instances, risks of the impurities are assessed separately from the herbicide. Some impurities are more toxic than the associated herbicide, but the risks are minimized due to low concentrations of the impurity in the herbicide.

Hexachlorobenzene, classified as a human carcinogen, is an impurity in both clopyralid and picloram (SERA, 1999a and 2003d). Hexaclorobenzene is ubiquitous and persistent in the environment and volatizes from the soil surface. Because hexachlorobenzene binds tightly to soil, it is **not likely to percolate** through soil to contaminate groundwater.

Metabolites

Metabolites are substances created by the metabolism of herbicides. Most herbicides considered are not readily metabolized by aquatic animal species, and are passed through their bodies unchanged. Most herbicides are metabolized microbially. Herbicide-specific risk assessments include the identity of known metabolites. Some metabolites are more toxic or persistent than the associated herbicide, but the risks can be minimized by choosing herbicides appropriate to environmental factors such as soil type and climate.

Soil microbes are able to use **NPE surfactants** and breakdown products. Concern has been expressed about the potential for surfactant increasing the movement of other harmful materials, such as pesticides, into soils. A study shows that this is not a concern at soil concentrations resulting from typical USDA Forest Service application rates. In the presence of oxygen, NPE is biodegradable in soil or water, with a half-life of a few up to 90 days. Breakdown products biodegrade more slowly, but are ultimately biodegradable (Bakke, 2003a).

APPENDIX V
Drinking Water Protection Areas

APPENDIX V: Drinking Water Protection Areas

Treatment areas within drinking water protection areas, including drinking water source number and treatment acres. All treatment areas are located on the Mt. Hood National Forest.

Treatment ID #	Drinking Water Source		City	Treatment Acres
	Name	Number		
61-095	Dog River	500030	The Dalles	0.10
65-001	Frog Lake	101635	Sandy	33.30
65-002	Clackamas River (Estacada)	100426	Estacada	61.03
65-002	Clackamas River (Estacada)	100426	Estacada	0.56
65-003	Frog Lake	101635	Sandy	64.81
65-005	Clackamas River (Estacada)	100426	Estacada	0.06
65-006	Clackamas River (Estacada)	100426	Estacada	0.24
65-007	Clackamas River (Clackamas)	100284	Clackamas	3.38
65-008	Clackamas River (Estacada)	100426	Estacada	0.20
65-009	Clackamas River (Estacada)	100426	Estacada	1.03
65-010	Frog Lake	101635	Sandy	12.99
65-011	Clackamas River (Estacada)	100426	Estacada	1.07
65-012	Clackamas River (Estacada)	100426	Estacada	12.38
65-013	Clackamas River (Estacada)	100426	Estacada	46.77
65-014	Clackamas River (Estacada)	100426	Estacada	4.54
65-015	Clackamas River (Estacada)	100426	Estacada	17.01
65-015	Clackamas River (Estacada)	100426	Estacada	1.67
65-016	Clackamas River (Estacada)	100426	Estacada	4.01
65-017	Clackamas River (Estacada)	100426	Estacada	4.05
65-018	Clackamas River (Estacada)	100426	Estacada	1.09
65-019	Clackamas River (Estacada)	100426	Estacada	3.58
65-019	Clackamas River (Estacada)	100426	Estacada	1.37
65-020	Clackamas River (Estacada)	100426	Estacada	347.07
65-020	Clackamas River (Estacada)	100426	Estacada	3.58
65-020	Clackamas River (Estacada)	100426	Estacada	62.36
65-020	Clackamas River (Estacada)	100426	Estacada	1.37
65-021	Clackamas River (Estacada)	100426	Estacada	3.22
65-022	Clackamas River (Estacada)	100426	Estacada	5.18
65-023	Clackamas River (Estacada)	100426	Estacada	416.39
65-024	Clackamas River (Estacada)	100426	Estacada	4.58
65-025	Clackamas River (Estacada)	100426	Estacada	2.80
65-026	Clackamas River (Estacada)	100426	Estacada	4.72
65-027	Clackamas River (Estacada)	100426	Estacada	0.73

Treatment ID #	Drinking Water Source		City	Treatment Acres
	Name	Number		
65-028	Clackamas River (Estacada)	100426	Estacada	0.77
65-029	Clackamas River (Estacada)	100426	Estacada	11.63
65-030	Clackamas River (Estacada)	100426	Estacada	11.39
65-031	Clackamas River (Estacada)	100426	Estacada	14.27
65-032	Clackamas River (Estacada)	100426	Estacada	2.74
65-033	Clackamas River (Estacada)	100426	Estacada	9.64
65-034	Frog Lake	101635	Sandy	5.20
65-035	Frog Lake	101635	Sandy	5.30
65-036	Clackamas River (Estacada)	100426	Estacada	3.62
65-037	Frog Lake	101635	Sandy	0.39
65-038	Clackamas River (Estacada)	100426	Estacada	1.08
65-039	Frog Lake	101635	Sandy	0.28
65-040	Clackamas River (Estacada)	100426	Estacada	1.67
65-041	Clackamas River (Estacada)	100426	Estacada	4.18
65-042	Clackamas River (Estacada)	100426	Estacada	9.65
65-043	Clackamas River (Estacada)	100426	Estacada	18.51
65-044	Clackamas River (Estacada)	100426	Estacada	23.02
65-045	Clackamas River (Estacada)	100426	Estacada	0.11
65-046	Clackamas River (Estacada)	100426	Estacada	8.31
66-033	South Fork Mill Creek	101342	The Dalles	0.63
66-042	South Fork Mill Creek	101342	The Dalles	2.78
66-074	South Fork Mill Creek	101342	The Dalles	21.49
66-081	South Fork Mill Creek	101342	The Dalles	0.01
66-086	Frog Lake	101635	Sandy	0.06
69-003	North Fork Gordon Creek	100530	Corbett	28.69
69-005	North Fork Gordon Creek	100530	Corbett	19.57
69-005	South Fork Gordon Creek	106541	Corbett	12.14
69-007	South Fork Gordon Creek	106541	Corbett	0.48
69-008	Bull Run	101008	Portland	1.37
69-027	Clackamas River (Estacada)	100426	Estacada	150.73
69-027	Clackamas River (Estacada)	100426	Estacada	0.56
69-027	Clackamas River (Estacada)	100426	Estacada	1.67
69-027	Clackamas River (Estacada)	100426	Estacada	62.36
69-027	Clackamas River (Estacada)	100426	Estacada	1.37
			Grand Total	**1562.92**

APPENDIX W
Summary Tables of Site-Specific Herbicide Effects for Various Aquatic Species

APPENDIX W: Summary Tables of Site-Specific Herbicide Effects for Various Aquatic Species

Tables prepared by Gary Asbridge, Fish Biologist, February 2006; updated, August 2006.

Table W-1. Toxicity indices for fish used in the effects analysis for the EIS. For each herbicide if more than one study or data set for a given fish species or life stage was available, the smallest dose was used to ensure that potential effects to all species and life stages would be addressed. Thus, for some species and life stages the dose is conservative. Likewise, if the chronic value was less than the acute value it was used in the effects analysis.

Herbicide	Duration	Endpoint	Dose	Species
Chlorsulfuron	Acute	NOEC	2 mg/l*	Brown trout
Clopyralid	Acute	NOEC	5 mg/l*	Rainbow trout
AQ Glyphosate	Acute	NOEC	0.5 mg/l*	Rainbow trout
Glyphosate	Acute	NOEC	0.065 mg/l*	Rainbow trout
Imazapic	Acute	NOEC	100 mg/l	All fish
Imazapyr	Acute	NOEC	5 mg/l*	Trout, catfish, bluegill
Metsulfuron methyl	Chronic	NOEC	4.5 mg/l	Rainbow trout
Picloram	Acute	NOEC	0.04 mg/l*	Cutthroat trout
Sethoxydim	Acute	NOEC	0.06 mg/l*	Rainbow trout
Sulfometuron methyl	Chronic	NOEC	1.17 mg/l	Fathead minnow
AQ Triclopyr (TEA)	Acute	NOEC	0.26 mg/l*	Chum salmon
Triclopyr (BEE)	Acute	NOEC	0.012 mg/l	Bluegill, sunfish

* 1/20th of the LC_{50}

Table W-2. Toxicity concentrations for aquatic macroinvertebrates, aquatic macrophytes and algae that were used in the effects analysis for this EIS. Toxicity values are the same as those used by the USDA Forest Service in the Invasive Plant FEIS (2005a). Toxicity values were not available (NA) for some herbicides and/or organisms.

Herbicide	Toxicity Concentration (mg/l)		
	Aquatic Macroinvertebrates	Aquatic Macrophytes	Algae
Chlorsulfuron	10.00	0.000047	0.01
Clopyralid	21.40	NA	0.69
AQ Glyphosate	78.00	NA	NA
Glyphosate	1.10	3.00	0.89
Imazapic	100.00	0.00127	0.05
Imazapyr	100.00	0.013	0.02
Metsulfuron methyl	17.00	0.00016	0.01
Picloram	2.68	0.10	0.23
Sethoxydim	0.26	0.25	0.25
Sulfometuron methyl	6.10	0.00021	0.0025
AQ Triclopyr (TEA)	13.90	0.42	0.42
Triclopyr (BEE)	0.855	0.007	0.007

Table W-3. Proposed herbicide treatment sites within the Mt. Hood National Forest located outside riparian reserves. There are no sites wholly outside riparian reserves proposed in the Columbia River Gorge National Scenic Area. Proposed invasive plant treatments at these sites would have no effect on any aquatic species.

Treatment Site ID	Ranger District	6th Field HUC	6th Field Watershed Name	Acres
61-020	Barlow	170703060902	Jordan Creek	0.5
61-022	Barlow	170703061007	Threemile Creek	11.3
61-027	Barlow	170703061005	Rock Creek	26.8
61-030	Barlow	170703061004	Gate Creek	6.0
61-036	Barlow	170703061004	Gate Creek	9.4
		170703061005	Rock Creek	16.4
61-045	Barlow	170703061001	Clear Creek	27.1
		170703061006	Middle White River	6.1
61-050	Barlow	170703060706	Wapinitia Creek	94.0
		170703061006	Middle White River	17.8
61-051	Barlow	170703061006	Middle White River	0.4
61-055	Barlow	170703060503	Middle Beaver Creek	6.9
61-057	Barlow	170703060503	Middle Beaver Creek	0.6
61-058	Barlow	170703060706	Wapinitia Creek	9.9
61-059	Barlow	170703060706	Wapinitia Creek	22.8
61-066	Barlow	170703060706	Wapinitia Creek	8.3
61-074	Barlow	170703061001	Clear Creek	43.7
		170703061006	Middle White River	2.0
61-077	Barlow	170703061006	Middle White River	44.7
61-081	Barlow	170703060706	Wapinitia Creek	3.5
61-084	Barlow	170703061003	Upper White River	32.4
61-085	Barlow	170703060706	Wapinitia Creek	15.9
61-092	Barlow			6.0
61-093	Barlow	170703060503	Middle Beaver Creek	13.7
		170703061001	Clear Creek	5.4
65-007	Clackamas River	170900110601	Upper Clear Creek	3.4
65-011	Clackamas River	170900110306	Cot Creek	1.1
65-014	Clackamas River	170900110204	Last Creek	4.5
65-016	Clackamas River	170900110204	Last Creek	4.0
65-018	Clackamas River	170900110306	Cot Creek	1.1
65-022	Clackamas River	170900110401	Three Lynx Creek	5.2
65-026	Clackamas River	170900110107	Lower Collawash River Tributaries	4.7
65-035	Clackamas River	170900110303	Stone Creek	5.3
65-045	Clackamas River			0.1
66-001	Hood River	170703061001	Clear Creek	18.8
		170703061003	Upper White River	1.9
66-011	Hood River	170701050601	Upper East Fork Hood River	3.0
66-012	Hood River	170701050702	Divers Creek	0.7
66-030	Hood River	170701050604	Pinnacle Creek	0.3
66-033	Hood River	170701050401	North Fork Mill Creek	17.3

Treatment Site ID	Ranger District	6th Field HUC	6th Field Watershed Name	Acres
66-035	Hood River	170701050606	Lower East Fork Hood River	5.5
		170701050801	Neal Creek	1.4
66-040	Hood River	170701050701	Camp Creek	1.1
66-041	Hood River	170701050602	Middle East Fork Hood River	1.0
66-042	Hood River	170701050401	North Fork Mill Creek	2.7
		170701050603	Dog River	0.1
66-043	Hood River	170701050602	Middle East Fork Hood River	1.4
66-046	Hood River	170701050801	Neal Creek	1.8
66-047	Hood River	170701050605	Middle Fork Hood River	7.1
66-048	Hood River	170701050701	Camp Creek	3.6
66-049	Hood River	170701050703	Dead Point Creek	3.7
66-083	Hood River	170701050701	Camp Creek	27.7
69-002	Zigzag			0.01
69-004	Zigzag			24.1
69-006	Zigzag			0.1
69-007	Zigzag	170800010801	Gordon Creek	0.5
69-011	Zigzag			0.01
69-025	Zigzag			3.3
69-026	Zigzag	170703061001	Clear Creek	1.1
69-030	Zigzag	170800010202	Zigzag Canyon	3.1
TOTAL ACRES OUTSIDE RIPARIAN RESERVES				**592.1**

Table W-4. Treatment sites with portions located within riparian reserves, but not close or adjacent to fish bearing streams, lakes, or ponds. Treatment sites are sorted by aquatic influence zone acres. Site ID numbers in **bold** are proposed for treatment in both Alternatives 2 and 3.

Treatment Site ID	Ranger District	Site Acres	Riparian Reserve Acres	Percent of Site in Riparian Reserve	Aquatic Influence Zone Acres	Percent of Site in Aquatic Influence Zone
61-005	Barlow	72.2	0.9	1.2%	0.0	0.0%
61-034	Barlow	58.5	0.3	0.5%	0.0	0.0%
61-062	Barlow	3.8	0.1	2.6%	0.0	0.0%
61-080	Barlow	18.0	0.3	1.7%	0.0	0.0%
65-010	Clackamas River	13.0	0.8	6.2%	0.0	0.0%
65-024	Clackamas River	4.6	0.6	13.0%	0.0	0.0%
65-032	Clackamas River	2.7	0.1	3.7%	0.0	0.0%
65-034	Clackamas River	5.2	0.5	9.6%	0.0	0.0%
66-003	Hood River	42.8	0.3	0.7%	0.0	0.0%
66-028	Hood River	0.8	0.0	1.3%	0.0	0.0%
66-029	Hood River	0.7	0.7	100.0%	0.0	0.0%
66-044	Hood River	0.4	0.2	50.0%	0.0	0.0%
66-058	Hood River	14.9	0.2	1.3%	0.0	0.0%
	SUB-TOTAL	**237.6**	**5.0**	**2.1%**	**0.0**	**0.0%**
22-05	Scenic Area	89.6	16.0	17.9%	6.4	7.1%
22-08	Scenic Area	23.5	1.1	4.7%	0.4	1.7%
22-11	Scenic Area	109.9	18.9	17.2%	8.8	8.0%
22-12	Scenic Area	81.9	28.6	34.9%	14.0	17.1%
22-17	Scenic Area	139.1	9.8	7.0%	4.6	3.3%
61-009	Barlow	43.2	6.2	14.4%	4.4	10.2%
61-018	Barlow	48.2	0.1	0.2%	0.0	0.0%
61-025	Barlow	54.1	9.8	18.1%	6.9	12.8%
61-028	Barlow	51.6	5.9	11.4%	4.5	8.7%
61-029	Barlow	40.2	0.7	1.7%	0.5	1.2%
61-039	Barlow	75.9	15.2	20.0%	12.2	16.1%
61-040	Barlow	10.4	0.7	6.7%	0.6	5.8%
61-042	Barlow	52.1	5.8	11.1%	4.3	8.3%
61-044	Barlow	20.2	3.6	17.8%	1.1	5.4%
61-048	Barlow	38.8	0.7	1.8%	0.0	0.0%
61-053	Barlow	3.7	3.1	83.8%	2.1	56.8%
61-064	Barlow	0.4	0.4	100.0%	0.3	75.0%
61-065	Barlow	18.9	11.3	59.8%	5.2	27.5%
61-071	Barlow	40.8	5.5	13.5%	3.4	8.3%
61-075	Barlow	12.5	2.6	20.8%	2.1	16.5%
61-076	Barlow	15.4	1.5	9.9%	2.3	14.7%
61-078	Barlow	22.4	0.6	2.8%	0.5	2.1%
61-079	Barlow	37.2	9.3	24.9%	7.0	18.8%
61-083	Barlow	18.9	8.2	43.6%	5.6	29.7%
61-087	Barlow	30.2	2.3	7.5%	1.7	5.6%
61-088	Barlow	59.7	0.7	1.2%	0.2	0.4%
61-090	Barlow	0.5	0.5	102.0%	0.3	64.0%

Treatment Site ID	Ranger District	Site Acres	Riparian Reserve Acres	Percent of Site in Riparian Reserve	Aquatic Influence Zone Acres	Percent of Site in Aquatic Influence Zone
61-091	Barlow	3.7	2.6	70.7%	1.3	34.2%
65-002	Clackamas River	61.6	10.1	16.4%	1.6	2.6%
65-003	Clackamas River	64.8	4.6	7.0%	2.7	4.1%
65-005	Clackamas River	0.1	0.1	60.0%	0.0	10.0%
65-009	Clackamas River	1.0	1.0	103.0%	0.6	58.0%
65-021	Clackamas River	3.2	2.0	62.2%	0.6	19.4%
65-027	Clackamas River	0.7	0.7	100.0%	0.7	94.5%
65-030	Clackamas River	11.4	3.0	26.1%	1.8	15.9%
65-037	Clackamas River	0.4	0.4	97.5%	0.3	80.0%
65-038	Clackamas River	1.1	1.0	89.1%	0.6	50.0%
65-039	Clackamas River	0.3	0.3	93.3%	0.3	93.3%
65-040	Clackamas River	1.7	1.4	81.8%	0.0	0.6%
65-042	Clackamas River	9.6	3.7	38.8%	2.0	21.3%
65-043	Clackamas River	18.5	3.2	17.2%	1.0	5.6%
65-044	Clackamas River	23.0	4.7	20.4%	2.2	9.5%
65-046	Clackamas River	8.3	1.1	13.4%	0.7	8.7%
66-004	Hood River	18.9	5.5	29.3%	4.2	22.2%
66-005	Hood River	43.7	4.0	9.1%	3.9	8.9%
66-009	Hood River	9.3	0.7	7.6%	0.6	6.0%
66-010	Hood River	10.0	4.9	48.8%	4.0	39.6%
66-013	Hood River	10.8	1.0	9.5%	0.1	1.1%
66-017	Hood River	66.6	10.7	16.0%	4.7	7.1%
66-026	Hood River	0.1	0.1	70.0%	0.1	70.0%
66-051	Hood River	5.7	0.9	15.1%	0.1	0.9%
66-059	Hood River	39.7	2.0	5.1%	1.2	3.0%
66-067	Hood River	133.5	13.5	10.1%	7.9	5.9%
66-069	Hood River	50.5	9.2	18.3%	5.2	10.2%
69-013	Zigzag	0.1	0.1	70.0%	0.1	50.0%
69-014	Zigzag	0.0	0.0	100.0%	0.0	100.0%
	SUB-TOTAL	**1737.6**	**261.4**	**15.0%**	**147.6**	**8.5%**
	GRAND TOTAL	**1975.2**	**266.5**	**13.5%**	**147.6**	**7.5%**

Table W-5. Treatment sites located wholly or partially within riparian reserves adjacent to fish bearing streams, lakes, or ponds. Treatment sites are grouped by the listing status (threatened, endangered, or USDA Forest Service, Pacific Northwest Region sensitive – TES) of one or more fish species residing in the water body nearest the treatment site. Site ID numbers in bold are proposed for treatment in both Alternatives 2 and 3. The zero acres associated with some sites are due to rounding to the first decimal place, many sites are quite small. *Note:* A table key is located at the end.

Treatment Site ID	Ranger District	Site Acres	Riparian Reserve Acres	Percent of Site in Riparian Reserve	Aquatic Influence Zone Treatment Acres	Percent of Site in Aquatic Influence Zone	Special Status Species	Fish Species Present
THREATENED, ENDANGERED OR R6 SENSITIVE SPECIES PRESENT								
22-01	Scenic Area	1573.1	1402.4	89.1%	425.8	27.1%	T&E	ONMY1, ONMY4, ONTS, ONKI, SACO, ONNE1 (E), ONTS2 (E), ONMY5 (E), ONTS3, ONMY6, ONKE
22-07	Scenic Area	21.2	21.2	100.0%	21.2	100.0%	T&E	ONMY1, ONMY4, ONTS, ONKI, SACO, ONNE1 (E), ONTS2 (E), ONMY5 (E), ONTS3, ONMY6, ONKE
61-003	Barlow	55.0	27.6	50.1%	12.9	23.5%	T	ONMY3, ONMY4, ONCL1
61-017	Barlow	96.1	11.8	12.3%	8.3	8.6%	T	ONMY3, ONMY4
65-017	Clackamas River	4.1	4.1	100.0%	2.3	56.6%	T	ONTS, ONKI, ONMY1, ONMY2, ONCL1
65-019	Clackamas River	5.0	5.0	100.0%	4.7	93.6%	T	ONTS, ONKI, ONMY1, ONMY2, ONCL1
65-020	Clackamas River	414.4	400.0	96.5%	214.0	51.6%	T	ONTS, ONKI, ONMY1, ONMY2, ONCL1
65-023	Clackamas River	416.4	232.4	55.8%	100.5	24.1%	T	ONTS, ONKI, ONMY1, ONMY2, ONCL1
65-028	Clackamas River	0.8	0.8	100.0%	0.0	0.0%	T	ONTS, ONMY1, ONMY2, ONCL1
65-029	Clackamas River	11.6	11.1	95.7%	2.6	22.1%	T	ONTS, ONMY1, ONMY2, ONCL1
65-041	Clackamas River	4.2	4.2	100.0%	0.1	2.4%	T	ONTS, ONMY1, ONMY2, ONCL1
66-007	Hood River	448.8	206.7	46.1%	127.5	28.4%	T	ONTS, ONMY1, ONMY2

Treatment Site ID	Ranger District	Site Acres	Riparian Reserve Acres	Percent of Site in Riparian Reserve	Aquatic Influence Zone Treatment Acres	Percent of Site in Aquatic Influence Zone	Special Status Species	Fish Species Present
66-008	Hood River	509.3	216.6	42.5%	103.1	20.2%	T	ONKI, ONMY1, ONMY2, ONMY3, ONCL1
66-016	Hood River	78.8	25.0	31.7%	13.3	16.9%	T	ONTS, ONMY1, ONMY2
66-023	Hood River	350.9	129.6	36.9%	49.0	14.0%	T	ONMY1, ONMY2
66-025	Hood River	1.6	1.6	100.0%	0.1	6.3%	T	SACO, ONCL1, ONMY2
66-027	Hood River	4.0	4.0	100.0%	0.6	15.0%	T	SACO, ONCL1, ONMY1, ONMY2
66-053	Hood River	4.2	2.7	64.3%	0.6	13.1%	T	ONMY1 (suspected), ONMY2, ONCL1
66-060	Hood River	105.2	51.1	48.6%	19.3	18.4%	T	ONTS, ONMY1, ONMY2
66-062	Hood River	145.8	58.7	40.3%	19.7	13.5%	T	SACO, ONMY1, ONMY2, ONCL1
66-063	Hood River	630.9	115.5	18.3%	40.3	6.4%	T	SACO, ONMY1, ONMY2, ONCL1
66-082	Hood River	93.1	31.4	33.7%	12.3	13.2%	T	ONMY1 (suspected), ONMY2, ONCL1
66-084	Hood River	73.2	19.6	26.8%	7.7	10.5%	T	ONMY1 (suspected), ONMY2, ONCL1
69-008	Zigzag	1056.2	506.4	47.9%	210.4	19.9%	T	ONKI, ONMY1, ONMY2, ONCL1
69-010	Zigzag	0.0	0.0	100.0%	0.0	100.0%	T	ONTS, ONKI, ONMY1, ONMY2, ONCL1
69-012	Zigzag	0.2	0.2	100.0%	0.2	100.0%	T	ONTS, ONKI, ONMY1, ONMY2, ONCL1
69-015	Zigzag	0.0	0.0	100.0%	0.0	100.0%	T	ONKI, ONMY1, ONMY2, ONCL1
69-016	Zigzag	444.6	209.5	47.1%	96.8	21.8%	T	ONTS, ONKI, ONMY1, ONMY2, ONCL1
69-017	Zigzag	0.9	0.9	100.0%	0.0	0.0%	T	ONTS, ONKI, ONMY1, ONMY2, ONCL1
69-018	Zigzag	1.1	1.1	100.0%	1.0	86.4%	T	ONTS, ONKI, ONMY1, ONMY2, ONCL1

Treatment Site ID	Ranger District	Site Acres	Riparian Reserve Acres	Percent of Site in Riparian Reserve	Aquatic Influence Zone Treatment Acres	Percent of Site in Aquatic Influence Zone	Special Status Species	Fish Species Present
69-019	Zigzag	0.7	0.7	100.0%	0.4	57.1%	T	ONTS, ONKI, ONMY1, ONMY2, ONCL1
69-020	Zigzag	0.4	0.4	100.0%	0.2	50.0%	T	ONTS, ONKI, ONMY1, ONMY2, ONCL1
69-021	Zigzag	1.4	1.4	100.0%	0.5	35.7%	T	ONTS, ONKI, ONMY1, ONMY2, ONCL1
69-022	Zigzag	0.8	0.8	100.0%	0.3	37.5%	T	ONTS, ONKI, ONMY1, ONMY2, ONCL1
69-023	Zigzag	0.6	0.6	100.0%	0.3	50.0%	T	ONTS, ONKI, ONMY1, ONMY2, ONCL1
69-024	Zigzag	0.2	0.2	100.0%	0.1	50.0%	T	ONTS, ONKI, ONMY1, ONMY2, ONCL1
69-027	Zigzag	216.7	177.8	82.0%	78.5	36.2%	T	ONTS, ONKI, ONMY1, ONMY2, ONCL1
69-029	Zigzag	0.4	0.4	100.0%	0.4	87.5%	T	ONTS, ONKI, ONMY1, ONMY2, ONCL1
	SUB-TOTAL	**6772.0**	**3883.5**	**57.3%**	**1574.9**	**23.3%**		

Treatment Site ID	Ranger District	Site Acres	Riparian Reserve Acres	Percent of Site in Riparian Reserve	Aquatic Influence Zone Treatment Acres	Percent of Site in Aquatic Influence Zone	Special Status Species	Fish Species Present
R6 SENSITIVE SPECIES PRESENT								
61-002	Barlow	119.4	13.8	11.6%	3.9	3.3%	S	ONMY3, ONCL1
61-006	Barlow	92.2	10.3	11.2%	6.4	6.9%	S	ONMY3
61-019	Barlow	264.5	56.8	21.5%	23.0	8.7%	S	ONMY3
61-021	Barlow	46.3	0.1	0.3%	0.0	0.0%	S	ONMY3
61-023	Barlow	10.9	6.8	62.4%	2.5	22.5%	S	ONMY3
61-024	Barlow	30.1	1.2	4.0%	0.1	0.3%	S	ONMY3
61-026	Barlow	34.7	3.0	8.6%	1.2	3.5%	S	ONMY3
61-041	Barlow	59.2	11.2	19.0%	4.2	7.1%	S	ONMY3
61-043	Barlow	15.7	15.7	100.0%	12.5	79.6%	S	ONMY3
61-046	Barlow	2.9	2.8	96.6%	0.7	23.8%	S	ONMY3
61-047	Barlow	1.5	0.7	46.7%	1.3	86.7%	S	ONMY3
61-049	Barlow	19.6	9.2	46.9%	1.8	9.2%	S	ONMY3
61-073	Barlow	31.1	22.5	72.3%	8.9	28.6%	S	ONMY3
61-082	Barlow	0.3	0.3	100.0%	0.2	66.7%	S	ONMY3
61-086	Barlow	64.2	4.9	7.6%	2.8	4.4%	S	ONMY3
61-089	Barlow	88.6	5.8	6.5%	1.7	1.9%	S	ONMY3
61-095	Barlow	104.0	6.2	6.0%	2.1	2.0%	S	ONMY3
66-037	Hood River	9.6	9.6	100.0%	8.6	89.1%	S	ONMY3
66-039	Hood River	3.5	2.8	80.0%	0.5	14.3%	S	ONMY3
66-052	Hood River	8.8	6.6	74.8%	1.1	12.5%	S	ONMY3 (suspected)
66-057	Hood River	80.3	30.2	37.6%	12.6	15.7%	S	ONMY3, SAFO (suspected)
66-085	Hood River	148.1	30.6	20.7%	13.7	9.3%	S	ONMY3
66-086	Hood River	296.4	104.9	35.4%	51.0	17.2%	S	ONMY3
66-087	Hood River	68.0	23.9	35.1%	15.2	22.4%	S	ONMY3
66-091	Hood River	120.2	26.2	21.8%	12.7	10.6%	S	ONMY3
SUB-TOTAL		**1720.1**	**406.2**	**23.6%**	**188.6**	**11.0%**		
NON-SPECIAL STATUS SPECIES PRESENT								
61-007	Barlow	5.4	0.0	0.4%	0.0	0.0%		ONCL1

Treatment Site ID	Ranger District	Site Acres	Riparian Reserve Acres	Percent of Site in Riparian Reserve	Aquatic Influence Zone Treatment Acres	Percent of Site in Aquatic Influence Zone	Special Status Species	Fish Species Present
65-001	Clackamas River	33.3	15.7	47.1%	6.7	20.1%		ONNE, ONMY2, ONCL1
65-006	Clackamas River	0.2	0.2	100.0%	0.2	100.0%		ONMY2, ONCL1 (suspected)
65-008	Clackamas River	0.2	0.2	100.0%	0.2	100.0%		ONMY2, ONCL1
65-012	Clackamas River	12.4	9.1	73.4%	2.6	21.0%		ONCL1
65-013	Clackamas River	46.8	10.5	22.4%	3.4	7.3%		ONCL1
65-015	Clackamas River	18.7	12.9	69.0%	3.3	17.6%		ONMY2, ONCL1
65-025	Clackamas River	2.8	2.4	85.7%	0.0	0.0%		ONCL1
65-031	Clackamas River	14.3	7.1	49.7%	1.6	11.2%		ONCL1
65-033	Clackamas River	9.6	7.1	74.2%	1.5	15.6%		COTTU
65-036	Clackamas River	3.6	1.0	27.8%	1.6	44.4%		ONMY2, ONCL1
66-006	Hood River	58.6	17.7	30.2%	17.0	29.0%		ONMY2
66-018	Hood River	51.2	10.0	19.5%	3.6	7.0%		ONCL1
66-020	Hood River	1014.3	197.0	19.4%	101.0	10.0%		SAFO
66-038	Hood River	261.5	41.4	15.8%	23.5	9.0%		ONCL1
66-055	Hood River	41.2	13.8	33.4%	1.5	3.6%		ONCL1
66-071	Hood River	64.7	28.0	43.2%	12.1	18.7%		ONMY2
66-074	Hood River	109.1	32.3	29.6%	10.7	9.8%		ONCL1
66-081	Hood River	22.2	2.1	9.5%	0.1	0.5%		ONCL1
66-089	Hood River	154.4	56.0	36.3%	17.5	11.3%		SAFO
69-001	Zigzag	7.5	4.0	53.3%	1.2	16.0%		ONMY2, ONCL1 (suspected)
69-003	Zigzag	43.6	25.6	58.7%	7.0	16.0%		ONCL1 (suspected)
69-005	Zigzag	42.7	17.7	41.5%	7.8	18.3%		ONCL1 (suspected)
69-028	Zigzag	3.7	1.6	43.2%	0.8	21.6%		ONCL1
	SUB-TOTAL	**2022.0**	**513.4**	**25.4%**	**224.8**	**11.1%**		
	GRAND TOTAL	**10514.1**	**4803.0**	**45.7%**	**1988.3**	**18.9%**		

Table Key:

Special Status Species	Forest Fish Species Present
T - Fish listed as threatened are present or nearby	ONMY1 – Lower Columbia River steelhead trout *Oncorhynchus mykiss.* Listed as threatened.
E - Fish listed as endangered are present or nearby	ONMY2 – Resident coastal rainbow trout *O. mykiss*.
S – USDA Forest Service USDA Forest Service, Pacific Northwest Region sensitive fish species present or nearby	ONMY3 – Resident inland rainbow trout *O. mykiss*. USDA Forest Service, Pacific Northwest sensitive species.
Blank - Fish present or nearby but not PETS	ONMY4 – Middle Columbia River steelhead trout *O. mykiss*. Listed as threatened.
	ONCL1 – Resident coastal cutthroat trout *O. clarki*.
	ONTS – Chinook salmon *O. tshawytcha* (all races and ESUs). *Note*: Spring Chinook in the Hood River Basin are not listed as threatened, unlike other populations within the Forest.
	ONKI – Lower Columbia River coho salmon *O. kisutch*. Listed as threatened
	ONNE – Resident kokanee salmon *O. nerka*.
	SACO – Columbia River bull trout *Salvelinus confluentus*. Listed as threatened.
	SAFO – Resident (non-native) brook trout *S. fontinalis*.
	COTTU – Sculpin (various species) *Cottus spp*.
	Scenic Area Fish Species Present
	ONNE1 – Snake River sockeye salmon *O. nerka* (E).
	ONTS2 – Upper Columbia River spring Chinook salmon (E).
	ONMY5 – Upper Columbia River steelhead trout (T).
	ONTS3 – Snake River spring, summer, and fall Chinook salmon (T).
	ONMY6 – Snake River steelhead trout (T).
	ONKE – Columbia River chum salmon *O. keta* (T).

Tables W-6 – W-9 display predicted hazard quotient values for algae, aquatic plants, aquatic invertebrates, and fish. Hazard quotients (HQ) were calculated for all sites wholly or partially within riparian reserves for the first three organism groups. For fish, hazard quotients were only calculated for those sites within riparian reserves adjacent to fish bearing streams (regardless of species present). Herbicide toxicity concentrations used to calculate the following HQ values were those displayed in Tables W-1 and W-2, above, which were taken directly from the Invasive Plant FEIS (2005a). Some concentrations were not available for algae and aquatic plants.

It is extremely important to note that the predicted HQ values are based solely on the GLEAMS model and they do not reflect site condition differences or the application of PDC as proposed in this EIS. These values were used as part of a screening process to identify sites with the greatest risk to contribute enough herbicide to a water body where biological effects could be relevant. The HQ value trigger for **potential** biological relevance was one. HQ values less than one indicate a concentration less than the “No Observable Effect Concentration” for the organism group and thus the effect of the herbicide would be discountable. There would be no mortality of any aquatic organism.

The values are displayed below primarily to illustrate the fact that the toxicity of most herbicides at most sites is extremely low even before PDC and site specific conditions were applied.

Table W-6. Predicted hazard quotient (HQ) values for algae at sites proposed for treatment with herbicides located within riparian reserves. These values reflect GLEAMS model predictions **before** application of PDC. Not all herbicides are proposed for use at all sites. A “P” following the treatment site ID indicates a pond. Toxicity concentrations for AQ Glyphosate were not available.

Treatment Site ID	Chlorsulfuron	Clopyralid	Glyphosate	Imazapic	Imazapyr	AQ Imazapyr	Metsulfuron methyl	Picloram	Sethoxydim	Sulfometuron methyl	AQ Triclopyr
22-01	0.0147	0.0107	0.1741	0.0000			0.0004			0.0008	0.4016
22-05		0.0132	0.2972				0.0004			0.0008	0.5289
22-07		0.0091	0.1273								0.1304
22-08 P		0.0168	0.0338	0.0001				0.0488			0.0784
22-11	0.0024	0.0036	0.0631	0.0000	0.0001	0.0001	0.0002	0.0176		0.0000	
22-12 P		0.0006		0.0000				0.0021			
22-17		0.0107	0.1741						0.3672		0.4016
61-002		0.0107						0.0250			
61-003		0.0036						0.0176			
61-005		0.0036						0.0176			
61-006		0.0036						0.0176			
61-007 P											
61-009		0.0036						0.0176			
61-017		0.0036						0.0176			

Treatment Site ID	Chlorsulfuron	Clopyralid	Glyphosate	Imazapic	Imazapyr	AQ Imazapyr	Metsulfuron methyl	Picloram	Sethoxydim	Sulfometuron methyl	AQ Triclopyr
61-018		0.0036						0.0176			
61-019		0.0036						0.0176			
61-021		0.0036						0.0176			
61-023		0.0091						0.0734			
61-024		0.0036						0.0176			
61-025		0.0107						0.0250			
61-026		0.0036						0.0176			
61-028		0.0036						0.0176			
61-029		0.0036						0.0176			
61-034		0.0036						0.0176			
61-039		0.0036		0.0000			0.0002	0.0176			0.2238
61-040				0.0000			0.0002				
61-041		0.0036		0.0000			0.0002	0.0176			0.2238
61-042		0.0036		0.0000			0.0002	0.0176			
61-043		0.0036					0.0002	0.0176			
61-044		0.0036		0.0000			0.0002	0.0176			
61-046		0.0036		0.0000			0.0002	0.0176			
61-047		0.0054		0.0000			0.0036	0.0543			
61-048		0.0036		0.0000			0.0002	0.0176			
61-049		0.0036		0.0000			0.0002	0.0176			
61-053		0.0036		0.0000			0.0002	0.0176			
61-062		0.0036		0.0000			0.0002	0.0176			
61-064		0.0036		0.0000			0.0002	0.0176			
61-065		0.0036		0.0000			0.0002	0.0176			
61-071		0.0036		0.0000			0.0002	0.0176			0.2238
61-073		0.0036		0.0000			0.0002	0.0176			
61-075		0.0036		0.0000			0.0002	0.0176			
61-076		0.0036		0.0000			0.0002	0.0176			
61-078		0.0036		0.0000			0.0002	0.0176			
61-079		0.0036		0.0000			0.0002	0.0176			
61-080		0.0036		0.0000			0.0002	0.0176			
61-082		0.0036		0.0000			0.0002	0.0176			
61-083		0.0036		0.0000			0.0002	0.0176			
61-086		0.0036		0.0000			0.0002	0.0176			
61-087		0.0036		0.0000			0.0002	0.0176			
61-088		0.0036						0.0176			
61-089		0.0036						0.0176			
61-090		0.0107					0.0004	0.0250			
61-091		0.0226		0.0000			0.0015	0.1034			
61-092		0.0036		0.0000			0.0002	0.0176			
61-095		0.0132					0.0004	0.0272			
65-001		0.0226						0.1034			

Treatment Site ID	Chlorsulfuron	Clopyralid	Glyphosate	Imazapic	Imazapyr	AQ Imazapyr	Metsulfuron methyl	Picloram	Sethoxydim	Sulfometuron methyl	AQ Triclopyr
65-002		0.0315						0.1109			
65-003		0.0107						0.0250			
65-005			0.1186								0.2985
65-006 P						0.0323					0.5812
65-008 P			0.0072			0.0323					0.5812
65-009			0.1186			0.0451					0.5812
65-010		0.0226						0.1034			
65-012		0.0139						0.0268			
65-013		0.0141						0.0268			
65-015										0.0295	
65-017		0.0226						0.1034			
65-019			0.5103			0.0135					0.2727
65-020		0.0296						0.1134			0.2727
65-021			0.1186			0.0451					0.5812
65-023		0.0132									
65-024		0.0053						0.2800			0.5812
65-025		0.0035						0.0339			0.0771
65-027		0.0053									
65-028		0.0053						0.2800			
65-029		0.0051						0.2848			
65-030		0.0051						0.2848			
65-031		0.0051						0.2848			
65-032		0.0132						0.0272			
65-033		0.0132						0.0272			
65-034		0.0226						0.1034			
65-036		0.0139						0.0268			
65-037		0.0107						0.0250			
65-038		0.0226						0.1034			
65-039		0.0107						0.0250			
65-040		0.0296						0.1134			
65-041		0.0051						0.2848			
65-042		0.0107						0.0250			
65-043		0.0296						0.1134			
65-044		0.0296						0.1134			
65-045		0.0226						0.1034			
65-046		0.0296						0.1134			
66-003		0.0141						0.0268			
66-004		0.0315						0.1109			
66-005		0.0315						0.1109			
66-006		0.0141						0.0268			
66-007		0.0141						0.0268			
66-008		0.0315					0.0019	0.1109			0.2727

Treatment Site ID	Chlorsulfuron	Clopyralid	Glyphosate	Imazapic	Imazapyr	AQ Imazapyr	Metsulfuron methyl	Picloram	Sethoxydim	Sulfometuron methyl	AQ Triclopyr
66-009		0.0139						0.0268			
66-010		0.0342						0.1150			
66-013		0.0141						0.0268			
66-016		0.0141					0.0004	0.0268			
66-017		0.0141					0.0004	0.0268			
66-018		0.0132					0.0004	0.0272			
66-020		0.0132					0.0004	0.0272			
66-023		0.0141					0.0004	0.0268			
66-025		0.0315						0.1109			
66-026		0.0342						0.1150			
66-027		0.0296						0.1134			
66-028		0.0296						0.1134			
66-029		0.0132						0.0272			
66-037		0.0107						0.0250			
66-038		0.0107						0.0250			
66-039		0.0296					0.0018	0.1134			
66-044		0.0296						0.1134			
66-051		0.0226						0.1034			
66-052		0.0315						0.1109			
66-053		0.0296		0.0117			0.0018	0.1134			
66-055		0.0132		0.0000			0.0004	0.0272			
66-057		0.0132					0.0004	0.0272			
66-058		0.0132					0.0004	0.0272			
66-059		0.0132		0.0000			0.0004	0.0272			
66-060		0.0141					0.0004	0.0268			
66-062		0.0141					0.0004	0.0268			
66-063		0.0141					0.0004	0.0268			
66-067		0.0141					0.0004	0.0268			0.6385
66-069		0.0107					0.0004	0.0250			
66-071		0.0139					0.0004	0.0268			0.7350
66-074		0.0132					0.0004	0.0272			
66-081				0.0000			0.0004				
66-082				0.0000			0.0004				
66-084				0.0117			0.0018				
66-085		0.0132					0.0004	0.0272			
66-086		0.0296					0.0018	0.1134			
66-087		0.0226					0.0015	0.1034			
66-089		0.0107					0.0004	0.0250			
66-091		0.0315					0.0019	0.1109			
69-001		0.0132						0.0272			
69-002			0.5103								0.2727
69-003		0.0141						0.0268			

Treatment Site ID	Chlorsulfuron	Clopyralid	Glyphosate	Imazapic	Imazapyr	AQ Imazapyr	Metsulfuron methyl	Picloram	Sethoxydim	Sulfometuron methyl	AQ Triclopyr
69-004		0.0107						0.0250			
69-005		0.0141						0.0268			
69-006		0.0107						0.0250			
69-008		0.0315						0.1109			0.2727
69-010						0.0135					0.2727
69-011			0.5103								0.2727
69-012			0.5103			0.0135					0.2727
69-013			0.5103								0.2727
69-014						0.0135					0.2727
69-015						0.0135					0.2727
69-016		0.0296						0.1134			0.2727
69-017											0.2727
69-018											0.2727
69-019											0.2727
69-020											0.2727
69-021											0.2727
69-022											0.2727
69-023											0.2727
69-024											0.2727
69-025		0.0296						0.1134			
69-027		0.0296						0.1134			0.2727
69-028		0.0315						0.1109			
69-029			0.5103			0.0135					0.2727

Table W-7. Predicted hazard quotient (HQ) values for aquatic plants at sites proposed for treatment with herbicides located within riparian reserves. These values reflect GLEAMS model predictions **before** application of PDC. Not all herbicides are proposed for use at all sites. A “P” following the treatment site ID indicates a pond. The “NTV” stands for no toxicity value as toxic Clopyralid and AQ Glyphosate concentrations were not available for aquatic plants.

Treatment Site ID	Chlorsulfuron	Clopyralid	Glyphosate	AQ Glyphosate	Imazapic	Imazapyr	AQ Imazapyr	Metsulfuron methyl	Picloram	Sethoxydim	Sulfometuron methyl	AQ Triclopyr
22-01	3.1183	NTV	0.0516	NTV	0.0072			0.0220			0.0093	0.4016
22-05		NTV	0.0882	NTV				0.0264			0.0100	0.5289
22-07		NTV	0.0378	NTV								0.1304
22-08 P		NTV	0.0100	NTV	0.0219				0.1121			0.0784
22-11	0.5125	NTV	0.0187	NTV	0.0005	0.0002	0.0002	0.0102	0.0405		0.0002	
22-12 P		NTV		NTV	0.0000				0.0049			
22-17		NTV	0.0516	NTV						0.3672		0.4016
61-002		NTV		NTV					0.0576			
61-003		NTV		NTV					0.0405			
61-005		NTV							0.0405			
61-006		NTV		NTV					0.0405			
61-007 P												
61-009		NTV		NTV					0.0405			
61-017		NTV		NTV					0.0405			
61-018		NTV							0.0405			
61-019		NTV		NTV					0.0405			
61-021		NTV							0.0405			
61-023		NTV		NTV					0.1688			
61-024		NTV							0.0405			
61-025		NTV		NTV					0.0576			
61-026		NTV		NTV					0.0405			
61-028		NTV		NTV					0.0405			
61-029		NTV		NTV					0.0405			
61-034		NTV							0.0405			
61-039		NTV		NTV	0.0005			0.0102	0.0405			0.2238
61-040				NTV	0.0005			0.0102				
61-041		NTV		NTV	0.0005			0.0102	0.0405			0.2238
61-042		NTV		NTV	0.0005			0.0102	0.0405			
61-043		NTV		NTV				0.0102	0.0405			
61-044		NTV		NTV	0.0005			0.0102	0.0405			
61-046		NTV		NTV	0.0005			0.0102	0.0405			
61-047		NTV		NTV	0.0125			0.2243	0.1248			
61-048		NTV			0.0005			0.0102	0.0405			
61-049		NTV		NTV	0.0005			0.0102	0.0405			

Treatment Site ID	Chlorsulfuron	Clopyralid	Glyphosate	AQ Glyphosate	Imazapic	Imazapyr	AQ Imazapyr	Metsulfuron methyl	Picloram	Sethoxydim	Sulfometuron methyl	AQ Triclopyr
61-053		NTV		NTV	0.0005			0.0102	0.0405			
61-062		NTV			0.0005			0.0102	0.0405			
61-064		NTV		NTV	0.0005			0.0102	0.0405			
61-065		NTV		NTV	0.0005			0.0102	0.0405			
61-071		NTV		NTV	0.0005			0.0102	0.0405			0.2238
61-073		NTV		NTV	0.0005			0.0102	0.0405			
61-075		NTV		NTV	0.0005			0.0102	0.0405			
61-076		NTV		NTV	0.0005			0.0102	0.0405			
61-078		NTV		NTV	0.0005			0.0102	0.0405			
61-079		NTV		NTV	0.0005			0.0102	0.0405			
61-080		NTV			0.0005			0.0102	0.0405			
61-082		NTV		NTV	0.0005			0.0102	0.0405			
61-083		NTV		NTV	0.0005			0.0102	0.0405			
61-086		NTV		NTV	0.0005			0.0102	0.0405			
61-087		NTV		NTV	0.0005			0.0102	0.0405			
61-088		NTV							0.0405			
61-089		NTV		NTV					0.0405			
61-090		NTV		NTV				0.0220	0.0576			
61-091		NTV		NTV	0.0072			0.0961	0.2379			
61-092		NTV			0.0005			0.0102	0.0405			
61-095		NTV		NTV				0.0264	0.0625			
65-001		NTV		NTV					0.2379			
65-002		NTV		NTV					0.2550			
65-003		NTV		NTV					0.0576			
65-005			0.0352									0.2985
65-006 P				NTV			0.0323					0.5812
65-008 P			0.0021	NTV			0.0323					0.5812
65-009			0.0352	NTV			0.0451					0.5812
65-010		NTV							0.2379			
65-012		NTV		NTV					0.0617			
65-013		NTV		NTV					0.0617			
65-015				NTV							0.3506	
65-017		NTV		NTV					0.2379			
65-019			0.1514	NTV			0.0135					0.2727
65-020		NTV		NTV					0.2609			0.2727
65-021			0.0352	NTV			0.0451					0.5812
65-023		NTV		NTV								
65-024		NTV							0.6441			0.5812
65-025		NTV							0.0780			0.0771
65-027		NTV		NTV								
65-028		NTV							0.6441			
65-029		NTV		NTV					0.6550			

Treatment Site ID	Chlorsulfuron	Clopyralid	Glyphosate	AQ Glyphosate	Imazapic	Imazapyr	AQ Imazapyr	Metsulfuron methyl	Picloram	Sethoxydim	Sulfometuron methyl	AQ Triclopyr
65-030		NTV		NTV					0.6550			
65-031		NTV		NTV					0.6550			
65-032		NTV							0.0625			
65-033		NTV		NTV					0.0625			
65-034		NTV							0.2379			
65-036		NTV		NTV					0.0617			
65-037		NTV		NTV					0.0576			
65-038		NTV		NTV					0.2379			
65-039		NTV		NTV					0.0576			
65-040		NTV							0.2609			
65-041		NTV		NTV					0.6550			
65-042		NTV		NTV					0.0576			
65-043		NTV		NTV					0.2609			
65-044		NTV		NTV					0.2609			
65-045		NTV							0.2379			
65-046		NTV		NTV					0.2609			
66-003		NTV							0.0617			
66-004		NTV		NTV					0.2550			
66-005		NTV		NTV					0.2550			
66-006		NTV		NTV					0.0617			
66-007		NTV		NTV					0.0617			
66-008		NTV		NTV				0.1186	0.2550			0.2727
66-009		NTV		NTV					0.0617			
66-010		NTV		NTV					0.2645			
66-013		NTV							0.0617			
66-016		NTV		NTV				0.0277	0.0617			
66-017		NTV		NTV				0.0277	0.0617			
66-018		NTV		NTV				0.0264	0.0625			
66-020		NTV		NTV				0.0264	0.0625			
66-023		NTV		NTV				0.0277	0.0617			
66-025		NTV							0.2550			
66-026		NTV		NTV					0.2645			
66-027		NTV		NTV					0.2609			
66-028		NTV							0.2609			
66-029		NTV							0.0625			
66-037		NTV		NTV					0.0576			
66-038		NTV		NTV					0.0576			
66-039		NTV		NTV				0.1129	0.2609			
66-044		NTV							0.2609			
66-051		NTV							0.2379			
66-052		NTV		NTV					0.2550			
66-053		NTV		NTV	4.5983			0.1129	0.2609			

Treatment Site ID	Chlorsulfuron	Clopyralid	Glyphosate	AQ Glyphosate	Imazapic	Imazapyr	AQ Imazapyr	Metsulfuron methyl	Picloram	Sethoxydim	Sulfometuron methyl	AQ Triclopyr
66-055		NTV		NTV	0.0097			0.0264	0.0625			
66-057		NTV		NTV				0.0264	0.0625			
66-058		NTV						0.0264	0.0625			
66-059		NTV		NTV	0.0097			0.0264	0.0625			
66-060		NTV		NTV				0.0277	0.0617			
66-062		NTV		NTV				0.0277	0.0617			
66-063		NTV		NTV				0.0277	0.0617			
66-067		NTV		NTV				0.0277	0.0617			0.6385
66-069		NTV		NTV				0.0220	0.0576			
66-071		NTV		NTV				0.0274	0.0617			0.7350
66-074		NTV		NTV				0.0264	0.0625			
66-081				NTV	0.0097			0.0264				
66-082				NTV	0.0099			0.0277				
66-084				NTV	4.5983			0.1129				
66-085		NTV		NTV				0.0264	0.0625			
66-086		NTV		NTV				0.1129	0.2609			
66-087		NTV		NTV				0.0961	0.2379			
66-089		NTV		NTV				0.0220	0.0576			
66-091		NTV		NTV				0.1186	0.2550			
69-001		NTV		NTV					0.0625			
69-002		NTV	0.1514									0.2727
69-003		NTV		NTV					0.0617			
69-004		NTV							0.0576			
69-005		NTV		NTV					0.0617			
69-006		NTV							0.0576			
69-008		NTV		NTV					0.2550			0.2727
69-010				NTV			0.0135					0.2727
69-011			0.1514									0.2727
69-012			0.1514	NTV			0.0135					0.2727
69-013			0.1514									0.2727
69-014				NTV			0.0135					0.2727
69-015				NTV			0.0135					0.2727
69-016		NTV		NTV					0.2609			0.2727
69-017												0.2727
69-018				NTV								0.2727
69-019				NTV								0.2727
69-020				NTV								0.2727
69-021				NTV								0.2727
69-022				NTV								0.2727
69-023				NTV								0.2727
69-024				NTV								0.2727
69-025		NTV							0.2609			

Treatment Site ID	Chlorsulfuron	Clopyralid	Glyphosate	AQ Glyphosate	Imazapic	Imazapyr	AQ Imazapyr	Metsulfuron methyl	Picloram	Sethoxydim	Sulfometuron methyl	AQ Triclopyr
69-027		NTV		NTV					0.2609			0.2727
69-028		NTV		NTV					0.2550			
69-029			0.1514	NTV			0.0135					0.2727

Table W-8. Predicted hazard quotient (HQ) values for aquatic invertebrates at sites proposed for treatment with herbicides located within riparian reserves. These values reflect GLEAMS model predictions **before** application of PDC. Not all herbicides are proposed for use at all sites. A "P" following the treatment site ID indicates a pond.

Treatment Site ID	Chlorsulfuron	Clopyralid	Glyphosate	AQ Glyphosate	Imazapic	Imazapyr	AQ Imazapyr	Metsulfuron methyl	Picloram	Sethoxydim	Sulfometuron methyl	AQ Triclopyr
22-01	0.0542	0.0003	0.1409	0.0020	0.0000			0.0000			0.0000	0.0121
22-05		0.0004	0.2405	0.0034				0.0000			0.0000	0.0160
22-07		0.0003	0.1030	0.0015								0.0039
22-08 P		0.0005	0.0274	0.0004	0.0000				0.0042			0.0024
22-11	0.0277	0.0001	0.0510	0.0007	0.0000	0.0000	0.0000	0.0000	0.0015		0.0000	
22-12 P		0.0000		0.0002	0.0000				0.0002			
22-17		0.0003	0.1409	0.0020						0.3531		0.0121
61-002		0.0003		0.0020					0.0021			
61-003		0.0001		0.0007					0.0015			
61-005		0.0001							0.0015			
61-006		0.0001		0.0007					0.0015			
61-007 P												
61-009		0.0001		0.0007					0.0015			
61-017		0.0001		0.0007					0.0015			
61-018		0.0001							0.0015			
61-019		0.0001		0.0007					0.0015			
61-021		0.0001							0.0015			
61-023		0.0003		0.0015					0.0063			
61-024		0.0001							0.0015			
61-025		0.0003		0.0020					0.0021			
61-026		0.0001		0.0007					0.0015			
61-028		0.0001		0.0007					0.0015			
61-029		0.0001		0.0007					0.0015			
61-034		0.0001							0.0015			
61-039		0.0001		0.0007	0.0000			0.0000	0.0015			0.0068

Treatment Site ID	Chlorsulfuron	Clopyralid	Glyphosate	AQ Glyphosate	Imazapic	Imazapyr	AQ Imazapyr	Metsulfuron methyl	Picloram	Sethoxydim	Sulfometuron methyl	AQ Triclopyr
61-040				0.0007	0.0000			0.0000				
61-041		0.0001		0.0007	0.0000			0.0000	0.0015			0.0068
61-042		0.0001		0.0007	0.0000			0.0000	0.0015			
61-043		0.0001		0.0007				0.0000	0.0015			
61-044		0.0001		0.0007	0.0000			0.0000	0.0015			
61-046		0.0001		0.0007	0.0000			0.0000	0.0015			
61-047		0.0002		0.0005	0.0000			0.0000	0.0047			
61-048		0.0001			0.0000			0.0000	0.0015			
61-049		0.0001		0.0007	0.0000			0.0000	0.0015			
61-053		0.0001		0.0007	0.0000			0.0000	0.0015			
61-062		0.0001			0.0000			0.0000	0.0015			
61-064		0.0001		0.0007	0.0000			0.0000	0.0015			
61-065		0.0001		0.0007	0.0000			0.0000	0.0015			
61-071		0.0001		0.0007	0.0000			0.0000	0.0015			0.0068
61-073		0.0001		0.0007	0.0000			0.0000	0.0015			
61-075		0.0001		0.0007	0.0000			0.0000	0.0015			
61-076		0.0001		0.0007	0.0000			0.0000	0.0015			
61-078		0.0001		0.0007	0.0000			0.0000	0.0015			
61-079		0.0001		0.0007	0.0000			0.0000	0.0015			
61-080		0.0001			0.0000			0.0000	0.0015			
61-082		0.0001		0.0007	0.0000			0.0000	0.0015			
61-083		0.0001		0.0007	0.0000			0.0000	0.0015			
61-086		0.0001		0.0007	0.0000			0.0000	0.0015			
61-087		0.0001		0.0007	0.0000			0.0000	0.0015			
61-088		0.0001							0.0015			
61-089		0.0001		0.0007					0.0015			
61-090		0.0003		0.0020				0.0000	0.0021			
61-091		0.0007		0.0036	0.0000			0.0000	0.0089			
61-092		0.0001			0.0000			0.0000	0.0015			
61-095		0.0004		0.0034				0.0000	0.0023			
65-001		0.0007		0.0036					0.0089			
65-002		0.0010		0.0081					0.0095			
65-003		0.0003		0.0020					0.0021			
65-005			0.0960									0.0090
65-006 P				0.0001			0.0000					0.0176
65-008 P			0.0058	0.0001			0.0000					0.0176
65-009			0.0960	0.0014			0.0000					0.0176
65-010		0.0007							0.0089			
65-012		0.0004		0.0064					0.0023			
65-013		0.0005		0.0049					0.0023			
65-015				0.0014							0.0000	
65-017		0.0007		0.0036					0.0089			

Treatment Site ID	Chlorsulfuron	Clopyralid	Glyphosate	AQ Glyphosate	Imazapic	Imazapyr	AQ Imazapyr	Metsulfuron methyl	Picloram	Sethoxydim	Sulfometuron methyl	AQ Triclopyr
65-019			0.4129	0.0058			0.0000					0.0082
65-020		0.0010		0.0058					0.0097			0.0082
65-021			0.0960	0.0014			0.0000					0.0176
65-023		0.0004		0.0034								
65-024		0.0002							0.0240			0.0176
65-025		0.0001							0.0029			0.0023
65-027		0.0002		0.0014								
65-028		0.0002							0.0240			
65-029		0.0002		0.0024					0.0244			
65-030		0.0002		0.0024					0.0244			
65-031		0.0002		0.0024					0.0244			
65-032		0.0004							0.0023			
65-033		0.0004		0.0034					0.0023			
65-034		0.0007							0.0089			
65-036		0.0004		0.0064					0.0023			
65-037		0.0003		0.0020					0.0021			
65-038		0.0007		0.0036					0.0089			
65-039		0.0003		0.0020					0.0021			
65-040		0.0010							0.0097			
65-041		0.0002		0.0024					0.0244			
65-042		0.0003		0.0020					0.0021			
65-043		0.0010		0.0058					0.0097			
65-044		0.0010		0.0058					0.0097			
65-045		0.0007							0.0089			
65-046		0.0010		0.0058					0.0097			
66-003		0.0005							0.0023			
66-004		0.0010		0.0081					0.0095			
66-005		0.0010		0.0081					0.0095			
66-006		0.0005		0.0049					0.0023			
66-007		0.0005		0.0049					0.0023			
66-008		0.0010		0.0081				0.0000	0.0095			0.0082
66-009		0.0004		0.0064					0.0023			
66-010		0.0011		0.0103					0.0099			
66-013		0.0005							0.0023			
66-016		0.0005		0.0049				0.0000	0.0023			
66-017		0.0005		0.0049				0.0000	0.0023			
66-018		0.0004		0.0034				0.0000	0.0023			
66-020		0.0004		0.0034				0.0000	0.0023			
66-023		0.0005		0.0049				0.0000	0.0023			
66-025		0.0010							0.0095			
66-026		0.0011		0.0103					0.0099			
66-027		0.0010		0.0058					0.0097			

Treatment Site ID	Chlorsulfuron	Clopyralid	Glyphosate	AQ Glyphosate	Imazapic	Imazapyr	AQ Imazapyr	Metsulfuron methyl	Picloram	Sethoxydim	Sulfometuron methyl	AQ Triclopyr
66-028		0.0010							0.0097			
66-029		0.0004							0.0023			
66-037		0.0003		0.0020					0.0021			
66-038		0.0003		0.0020					0.0021			
66-039		0.0010		0.0058				0.0000	0.0097			
66-044		0.0010							0.0097			
66-051		0.0007							0.0089			
66-052		0.0010		0.0081					0.0095			
66-053		0.0010		0.0058	0.0001			0.0000	0.0097			
66-055		0.0004		0.0034	0.0000			0.0000	0.0023			
66-057		0.0004		0.0034				0.0000	0.0023			
66-058		0.0004						0.0000	0.0023			
66-059		0.0004		0.0034	0.0000			0.0000	0.0023			
66-060		0.0005		0.0049				0.0000	0.0023			
66-062		0.0005		0.0049				0.0000	0.0023			
66-063		0.0005		0.0049				0.0000	0.0023			
66-067		0.0005		0.0049				0.0000	0.0023			0.0193
66-069		0.0003		0.0020				0.0000	0.0021			
66-071		0.0004		0.0064				0.0000	0.0023			0.0222
66-074		0.0004		0.0034				0.0000	0.0023			
66-081				0.0034	0.0000			0.0000				
66-082				0.0049	0.0000			0.0000				
66-084				0.0058	0.0001			0.0000				
66-085		0.0004		0.0034				0.0000	0.0023			
66-086		0.0010		0.0058				0.0000	0.0097			
66-087		0.0007		0.0036				0.0000	0.0089			
66-089		0.0003		0.0020				0.0000	0.0021			
66-091		0.0010		0.0081				0.0000	0.0095			
69-001		0.0004		0.0034					0.0023			
69-002			0.4129									0.0082
69-003		0.0005		0.0049					0.0023			
69-004		0.0003							0.0021			
69-005		0.0005		0.0049					0.0023			
69-006		0.0003							0.0021			
69-008		0.0010		0.0081					0.0095			0.0082
69-010				0.0058			0.0000					0.0082
69-011			0.4129									0.0082
69-012			0.4129	0.0058			0.0000					0.0082
69-013			0.4129									0.0082
69-014				0.0058			0.0000					0.0082
69-015				0.0058			0.0000					0.0082
69-016		0.0010		0.0058					0.0097			0.0082

Treatment Site ID	Chlorsulfuron	Clopyralid	Glyphosate	AQ Glyphosate	Imazapic	Imazapyr	AQ Imazapyr	Metsulfuron methyl	Picloram	Sethoxydim	Sulfometuron methyl	AQ Triclopyr
69-017												0.0082
69-018				0.0058								0.0082
69-019				0.0058								0.0082
69-020				0.0058								0.0082
69-021				0.0058								0.0082
69-022				0.0058								0.0082
69-023				0.0058								0.0082
69-024				0.0058								0.0082
69-025		0.0010							0.0097			
69-027		0.0010		0.0058					0.0097			0.0082
69-028		0.0010		0.0081					0.0095			
69-029			0.4129	0.0058			0.0000					0.0082

Table W-9. Predicted hazard quotient (HQ) values for fish at sites proposed for treatment with herbicides located within riparian reserves adjacent to fish bearing streams. These values reflect GLEAMS model predictions **before** application of PDC. Not all herbicides are proposed for use at all sites. A "P" following the treatment site ID indicates a pond.

Treatment Site ID	Chlorsulfuron	Clopyralid	Glyphosate	AQ Glyphosate	Imazapic	AQ Imazapyr	Metsulfuron methyl	Picloram	Sethoxydim	Sulfometuron methyl	AQ Triclopyr
22-01	0.0001	0.0015	2.3838	0.3099	0.0000		0.0000			0.0000	0.6488
22-07		0.0013	1.7427	0.2266							0.2106
61-002		0.0015		0.3099				0.1439			
61-003		0.0005		0.1122				0.1012			
61-006		0.0005		0.1122				0.1012			
61-007 P											
61-017		0.0005		0.1122				0.1012			
61-019		0.0005		0.1122				0.1012			
61-021		0.0005						0.1012			
61-023		0.0013		0.2266				0.4221			
61-024		0.0005						0.1012			
61-026		0.0005		0.1122				0.1012			
61-041		0.0005		0.1122	0.0000		0.0000	0.1012			0.3615
61-043		0.0005		0.1122			0.0000	0.1012			
61-046		0.0005		0.1122	0.0000		0.0000	0.1012			
61-047		0.0007		0.0723	0.0000		0.0000	0.3120			

Treatment Site ID	Chlorsulfuron	Clopyralid	Glyphosate	AQ Glyphosate	Imazapic	AQ Imazapyr	Metsulfuron methyl	Picloram	Sethoxydim	Sulfometuron methyl	AQ Triclopyr
61-049		0.0005		0.1122	0.0000		0.0000	0.1012			
61-073		0.0005		0.1122	0.0000		0.0000	0.1012			
61-082		0.0005		0.1122	0.0000		0.0000	0.1012			
61-086		0.0005		0.1122	0.0000		0.0000	0.1012			
61-089		0.0005		0.1122				0.1012			
61-091		0.0031		0.5618	0.0000		0.0000	0.5948			
61-095		0.0018		0.5291			0.0000	0.1563			
65-001		0.0031		0.5618				0.5948			
65-006 P				0.0128		0.0001					0.9389
65-008 P			0.0987	0.0128		0.0001					0.9389
65-012		0.0019		1.0006				0.1544			
65-013		0.0019		0.7604				0.1544			
65-015				0.2111						0.0001	
65-017		0.0031		0.5618				0.5948			
65-019			6.9868	0.9083		0.0001					0.4405
65-020		0.0041		0.9083				0.6521			0.4405
65-023		0.0018		0.5291							
65-025		0.0005						0.1950			0.1246
65-028		0.0007						1.6102			
65-029		0.0007		0.3698				1.6374			
65-031		0.0007		0.3698				1.6374			
65-033		0.0018		0.5291				0.1563			
65-036		0.0019		1.0006				0.1544			
65-041		0.0007		0.3698				1.6375			
66-006		0.0019		0.7604				0.1544			
66-007		0.0019		0.7604				0.1544			
66-008		0.0043		1.2588			0.0000	0.6376			0.4405
66-016		0.0019		0.7604			0.0000	0.1544			
66-018		0.0018		0.5291			0.0000	0.1563			
66-020		0.0018		0.5291			0.0000	0.1563			
66-023		0.0019		0.7604			0.0000	0.1544			
66-025		0.0043						0.6376			
66-027		0.0041		0.9083				0.6521			
66-037		0.0015		0.3099				0.1439			
66-038		0.0015		0.3099				0.1439			
66-039		0.0041		0.9083			0.0000	0.6521			
66-052		0.0043		1.2588				0.6376			
66-053		0.0041		0.9083	0.0001		0.0000	0.6521			
66-055		0.0018		0.5291	0.0000		0.0000	0.1563			
66-057		0.0018		0.5291			0.0000	0.1563			
66-060		0.0019		0.7604			0.0000	0.1544			
66-062		0.0019		0.7604			0.0000	0.1544			

Treatment Site ID	Chlorsulfuron	Clopyralid	Glyphosate	AQ Glyphosate	Imazapic	AQ Imazapyr	Metsulfuron methyl	Picloram	Sethoxydim	Sulfometuron methyl	AQ Triclopyr
66-063		0.0019		0.7604			0.0000	0.1544			
66-071		0.0019		1.0006			0.0000	0.1544			1.1873
66-074		0.0018		0.5291			0.0000	0.1563			
66-081				0.5291	0.0000		0.0000				
66-082				0.7604	0.0000		0.0000				
66-084				0.9083	0.0001		0.0000				
66-085		0.0018		0.5291			0.0000	0.1563			
66-086		0.0041		0.9083			0.0000	0.6521			
66-087		0.0031		0.5618			0.0000	0.5948			
66-089		0.0015		0.3099			0.0000	0.1439			
66-091		0.0043		1.2588			0.0000	0.6376			
69-001		0.0018		0.5291				0.1563			
69-003		0.0019		0.7604				0.1544			
69-005		0.0019		0.7604				0.1544			
69-008		0.0043		1.2588				0.6376			0.4405
69-010				0.9083		0.0001					0.4405
69-012			6.9868	0.9083		0.0001					0.4405
69-015				0.9083		0.0001					0.4405
69-016		0.0041		0.9083				0.6521			0.4405
69-017											0.4405
69-018				0.9083							0.4405
69-019				0.9083							0.4405
69-020				0.9083							0.4405
69-021				0.9083							0.4405
69-022				0.9083							0.4405
69-023				0.9083							0.4405
69-024				0.9083							0.4405
69-027		0.0041		0.9083				0.6521			0.4405
69-028		0.0043		1.2588				0.6376			
69-029			6.9868	0.9083		0.0001					0.4405

APPENDIX X
Effects of Herbicides on Wildlife Species

APPENDIX X: Effects of Herbicides on Wildlife Species

Appendix prepared by Alan Dyck, Forest Wildlife Biologist, December 2006.

All invasive plant treatment methods have the potential to temporarily disturb, displace, or directly harm various wildlife species. All methods are considered as part of the biological evaluation for the species in the project area. The primary focus of this analysis, however, is the effects from herbicides on wildlife. During scoping comment periods for the Invasive Plant FEIS (2005a), the public expressed specific concern about herbicides and their effects on wildlife species. Little concern was expressed about the effects of other kinds of treatment (manual, mechanical and cultural). The effects or disturbance to threatened and endangered wildlife is analyzed, and included in the discussion of alternatives.

The wildlife analysis considers the effects of herbicide treatment on Special Status Species, including threatened, endangered, and sensitive species and survey and manages species, as well as those animals considered Management Indicator Species (MIS) in the Forest Plan. Some discussion on the effects to landbird is included with emphasis on Partners in Flight watch list species. For most species, the size and distribution of actual treatment areas, the dispersed populations of terrestrial wildlife, and the foraging area and behavior of individual animals eliminate the potential for direct effects at the population level. Herbicide effects analysis relies on information in the SERA Risk Assessments (2001b, 2003a, 2003b, 2003c, 2004a, 2004b, 2004c, 2004d, 2004e, 2004f) unless otherwise noted. The risk assessments used peer-reviewed articles from public scientific literature, current U.S. Environmental Protection Agency (EPA) documents available to the public, and Confidential Business Information[1] to evaluate toxicity and risk from the herbicides analyzed. Detailed information on the herbicide analysis conducted for this EIS, including the potential for endocrine disruption and synergistic effects, is documented in the Invasive Plant FEIS (2005a), Appendix P, Summary of Herbicide Effects to Wildlife.

The Invasive Plant FEIS (2005a) quantitative estimates of worst-case doses of herbicide have been calculated using information such as body size, diet, and water concentrations to calculate the potential dose a certain type of animal might receive. The estimated dose was compared to the toxicity index (i.e., threshold dose). An estimated dose less than the toxicity index resulted in no plausible adverse effect. An estimated dose greater than the toxicity index was called a potential adverse effect. If an estimated dose exceeded the toxicity index, it was further evaluated to determine if the dose exceeded a known LOAEL (Lowest-Observed-Adverse-Effect Level). The LOAEL is 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.

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[1] Confidential Business Information (CBI) is defined as information that contains trade secrets, commercial or financial information, or other information that has been claimed as confidential by the submitter (EPA/OPP, 2004). Individuals must apply for and be granted access to CBI.

Generally, this analysis was conducted for both acute and chronic exposures. (Note that this discussion is on exposure, which differs from acute or chronic effects. The acute and chronic effects imply toxic or non-effects to wildlife.) An acute exposure is a single exposure or multiple brief exposures occurring within a short time (e.g., 24 hours or less in humans). A chronic exposure are exposures that extend over the average lifetime or for a significant fraction of thee lifetime of the species (for a rat, chronic exposures is typically about two years) (Invasive Plant FEIS, 2005a). When data were insufficient to develop an estimate of chronic dose, acute doses were evaluated against the chronic toxicity index. When the acute dose is less than the chronic toxicity index, there is no plausible risk to the animal, because actual chronic exposures would be less than acute exposures. When the acute dose is greater than the chronic toxicity index, no estimate of risk could be made and potential effects remain uncertain because existing data do not provide sufficient information. The general results of the herbicide analysis have been applied to the specific focal species that were analyzed by the Forest Wildlife Biologist is summarized in Table X-3. The analyzed effects are predicted if none of the standards and guidelines presented in the Invasive Plant ROD (2005b) would be used and no Project Design Criteria (PDC) (Section 2.2) implemented. This analysis was conducted to look at what herbicides could harm wildlife species in order to determine the potential effects and help determine PDC that need to be implemented to reduce risk. Assumptions were made regarding whether the species would be exposed to acute or chronic levels of exposure and are described for the table. Habitat use and foraging strategies used by the species which could lead to different exposure scenarios were based on species knowledge and the professional judgment of the Forest Wildlife Biologist. Species information referenced, especially for mollusk, is based on Mt. Hood National Forest Wildlife Surveys conducted in 1997, 1998, 1999, 2000, 2001, and 2002. The Land Mammals of Oregon (Verts and Carraway, 1998) was consulted on mammal habitat and life history.

Data on toxicity of herbicides to amphibians are more limited than data for mammals and birds. "Little information exists about effects of herbicides, especially operational treatments, on some taxa such as amphibians and reptiles. However, the data available suggest that because of application timing (late summer-early autumn), habitat preference (wet areas, generally not harvested or treated), and the secretive nature of amphibians, they are unlikely to be exposed, and therefore, affected either directly or indirectly by herbicide treatments in northern forested ecosystems" (Lautenschlager and Sullivan, 2004). Consequently, quantitative estimates of dose from exposure scenarios for all herbicides have not been created for amphibians in the SERA Risk Assessments (2001b, 2003a, 2003b, 2003c, 2004a, 2004b, 2004c, 2004d, 2004e, 2004f).[2] Quantitative exposure scenarios were conducted for amphibians when sufficient data existed to support the scenario (e.g., sulfometuron methyl). Toxicity data and exposure scenarios for fish provide a reasonable surrogate for effects on amphibians because 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; Perkins et al., 2000). Comparison of toxicity values for fish and amphibians for the herbicides analyzed indicate similar sensitivities See SERA Risk Assessments (2001b, 2003a, 2003b, 2003c, 2004a, 2004b, 2004c, 2004d, 2004e, 2004f) for more information.

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[2] Amphibian exposure scenarios are available for sulfometuron methyl.

With a few exceptions, the toxicity index used in this analysis for each herbicide represents a sub-lethal effect. Tables X-1 and X-2 list the toxicity indices used in the analysis and the potential effects to wildlife at the LOAEL. All toxicity indices represent the lowest dose (e.g. most sensitive endpoint) from the species most sensitive to herbicide effects, for which adequate data are available.

The same methodology was used to quantitatively estimate risk from the use of surfactants added to herbicides prior to their use. Most surfactants used are based on a component known as nonylphenol polyethoxylate (NPE). The use of NPE-based surfactants in any of the 10 herbicides considered in this EIS could result in toxic effects to mammals and birds that eat contaminated vegetation or insects at typical and high application rates. Use of NPE is not likely to adversely affect amphibians found in the Pacific Northwest for normal operations. Overspray or accidental spills, however, could produce concentrations of NPE that could adversely affect amphibians, particularly in small stagnant ponds.

Table X-1: Toxicity indices used and LOAELs reported for Mammals. Table from Invasive Plant FEIS (2005a), page 4-47. Classified by herbicides analyzed in this EIS (SERA 2001b, 2003a, 2003b, 2003c, 2004a, 2004b, 2004c, 2004d, 2004e, 2004f) and NPE surfactants (Bakke, 2003b).

Herbicide	Duration[1]	Endpoint	Dose	Species	Effect Noted at LOAEL
Chlorsulfuron	Acute	NOAEL	75 mg/kg	Rabbit	Decreased weight gain at 200 mg/kg
	Chronic	NOAEL	5 mg/kg/day	Rat	Weight changes at 25 mg/kg/day
Clopyralid	Acute	NOAEL	75 mg/kg	Rat	Decreased weight gain at 250 mg/kg
	Chronic	NOAEL	15 mg/kg/day	Rat	Thickening of gastric epithelium at 150 mg/kg/day
Glyphosate	Acute	NOAEL	175 mg/kg	Rabbit	Diarrhea at 350 mg/kg
	Chronic	NOAEL	175 mg/kg/day	Rabbit	Diarrhea at 350 mg/kg
Imazapic	Acute	NOAEL	350 mg/kg	Rabbit	Decreased body weight at 500 mg/kg
	Chronic	NOAEL[2]	45 mg/kg	Dog	Microscopic muscle effects at 137 mg/kg
Imazapyr	Acute	NOAEL	250 mg/kg	Dog	No effects at highest doses tested
	Chronic	NOAEL	250 mg/kg/day	Dog	No effects at highest doses tested
Metsulfuron methyl	Acute	NOAEL[3]	25 mg/kg	Rat	Decreased weight gain at 500 mg/kg
	Chronic	NOAEL	25 mg/kg/day	Rat	Decreased weight gain at 125 mg/kg
Picloram	Acute	NOAEL	34 mg/kg	Rabbit	Decreased weight gain at 172 mg/kg
	Chronic	NOAEL	7 mg/kg	Dog	Increased liver weight at 35 mg/kg[4]
Sethoxydim	Acute	NOAEL	160 mg/kg[5]	Rabbit	Reduced number of viable fetuses, some dam mortality at 480 mg/kg
	Chronic	NOAEL	9 mg/kg/day	Dog	Mild anemia at 18 mg/kg/day
Sulfometuron methyl	Acute	NOAEL	87 mg/kg	Rat	Decreased body weight at 433 mg/kg

Herbicide	Duration[1]	Endpoint	Dose	Species	Effect Noted at LOAEL
	Chronic	NOAEL	2 mg/kg/day	Rat	Effects on blood and bile ducts at 20 mg/kg/day
Triclopyr[6]	Acute	NOAEL	100 mg/kg	Rat	Malformed fetuses at 300 mg/kg
	Chronic[7]	NOAEL	0.5 mg/kg/day	Dog	Effect on kidney at 2.5 mg/kg/day
	Chronic	NOAEL	1 mg/kg/day	Rat & Dog	Effects on kidney, blood, and liver at 5 mg/kg/day
NPE Surfactants	Acute	NOAEL	10 mg/kg	Rat	Slight reduction of polysaccharides in liver at 50 mg/kg/day
	Chronic	NOAEL	10 mg/kg/day	Rat	Increased weights of liver, kidneys, ovaries, and decreased live pups at 50 mg/kg/day

1. An acute dose is one that occurs over a short time. A chronic dose is a smaller amount given repeatedly over time.
2. Imazapic – NOAEL calculated from a LOAEL of 137 mg/kg/day and application of a safety factor of 3 to extrapolate from a LOAEL to a NOAEL.
3. The acute NOAEL of 24 mg/kg is very close to the chronic NOAEL, so chronic value is used for acute exposures as well.
4. USEPA/OPP 1998.
5. Source of the value used by EPA (180 mg/kg) is not well documented, so the lower value of 160 mg/kg from a rabbit study is used as the toxicity index for this analysis.
6. Triclopyr BEE and TEA have equal toxicities to mammals (SERA, 2003c).
7. Value taken from Quast et al. 1976 as cited in SERA, 2003c. This represents an extremely conservative approach, explained in more detail in the write up on triclopyr later in this document.

SERA (2001b, 2003a, 2003b, 2003c, 2004a, 2004b, 2004c, 2004d, 2004e, 2004f) and Bakke (2003b)

Table X-2: Toxicity indices used and LOAELs reported for Bird. Table from Invasive Plant FEIS (2005a), page 4-47. Classified by herbicides analyzed in this EIS (SERA 2001b, 2003a, 2003b, 2003c, 2004a, 2004b, 2004c, 2004d, 2004e, 2004f) and NPE surfactants (Bakke, 2003b).

Herbicide	Duration[1]	Endpoint	Dose	Species	Effects Noted at LOAEL
Chlorsulfuron	Acute	NOAEL	1686 mg/kg	Quail	No significant effects at highest dose
	Chronic	NOAEL	140 mg/kg/day	Quail	No significant effects at highest dose
Clopyralid	Acute	NOAEL	670 mg/kg	Mallard & Quail	No signs of toxicity reported, LOAEL not determined
	Chronic[2]	NOAEL	15 mg/kg/day	Rat	Thickening of gastric epithelium at 150 mg/kg/day
Glyphosate	Acute	NOAEL	562 mg/kg	Mallard & Quail	No effects at highest dose
	Chronic	NOAEL	100 mg/kg	Mallard & Quail	No effects on reproduction at highest dose
Imazapic	Acute	NOAEL	1100 mg/kg	Quail	No effects at highest dose
	Chronic	NOAEL	113 mg/kg/day	Quail	Decreased weight gain in chicks at 170 mg/kg/day
Imazapyr	Acute	NOAEL	674 mg/kg	Quail	No effects at highest dose
	Chronic	NOAEL	200 mg/kg/day	Mallard & Quail	No effects at highest dose
Metsulfuron methyl	Acute	NOAEL	1043 mg/kg	Quail	No significant effects at highest dose
	Chronic	NOAEL	120 mg/kg/day	Mallard & Quail	No significant effects at highest dose
Picloram	Acute	NOAEL	1500 mg/kg	Chicken & pheasant	No effect to reproduction. LOAEL not reported
	Chronic[3]	NOAEL	7 mg/kg/day	Dog	Increased liver weight at 35 mg/kg/day
Sethoxydim	Acute	LOAEL	>500 mg/kg	Mallard & Quail	No or low mortality at highest doses tested. LOAEL not available.
	Chronic	LOAEL[4]	10 mg/kg/day	Mallard	Decreased number of normal hatchlings at 10 mg/kg/day
Sulfometuron methyl	Acute	LOAEL	312 mg/kg	Mallard	Decreased weight gain at 625 mg/kg/day
	Chronic[5]	LOAEL	2 mg/kg/day	Rat	Effects on blood and bile ducts at 20 mg/kg/day
Triclopyr BEE[6]	Acute	LD_{50}	388 mg/kg	Quail	50 percent mortality at 388 mg/kg
	Chronic	NOAEL	10 mg/kg/day	Mallard & quail	Decreased survival of offspring, reduced eggshell thickness at 20 mg/kg/day
Triclopyr TEA	Acute	LD_{50}	535 mg/kg	Quail	50 percent mortality at 535 mg/kg
	Chronic	NOAEL	10 mg/kg/day	Mallard & Quail	Decreased survival of offspring, reduced eggshell thickness at 20 mg/kg/day
NPE Surfactants[7]	Acute	LOAEL	10 mg/kg	Rat	Slight reduction of polysaccharides in liver at 50 mg/kg/day

Herbicide	Duration[1]	Endpoint	Dose	Species	Effects Noted at LOAEL
	Chronic	LOAEL	10 mg/kg/day	Rat	Increased weights of liver, kidneys, ovaries, and decreased live pups at 50 mg/kg/day

1. An acute dose is one that occurs over a short time. A chronic dose is a smaller amount given repeatedly over time.
2. Chronic toxicity studies in birds are not available, so the value from mammal studies is used.
3. Chronic toxicity studies in birds are not available, so the value from mammal studies is used.
4. Based on one study in which a NOAEL was not determined, so the LOAEL is used.
5. Birds may be somewhat less sensitive than mammals, but data are limited, so the lower value from mammal studies is used.
6. Unlike in mammals, the toxicities of triclopyr BEE and triclopyr TEA are different for birds, so the indices of the two forms of triclopyr are presented separately
7. Data on birds is not available in published literature, so values from mammals are used.

Source: SERA (2001b, 2003a, 2003b, 2003c, 2004a, 2004b, 2004c, 2004d, 2004e, 2004f) and Bakke (2003b)

Summary of Effects to Species Exposed to Herbicides

Table X-3 summarizes effects of herbicides in individuals of target species. Basic assumptions for Table X-3 are:

1. Aquatic organisms such as aquatic salamanders would have the same sensitivity to herbicides as fish.

2. Small insectivorous birds that defend territories may feed in the same area and are subject to chronic exposures. Exposures to herbicides by the three Partners in Flight watch listed insectivorous migratory birds, however, is probably 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.

3. Grouse may return to the same areas to feed on a regular basis, especially if the food supply is close to a breeding display area. As a result, chronic exposures may occur.

4. Bats feed over a large enough area to not be subjected to chronic exposures.

5. Mustelids travel widely and would not be in the same area long enough to be subjected to chronic exposures.

6. Northern Spotted Owls and peregrine falcons forage over a large territory and would not be subjected to chronic exposures.

7. 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.

8. Woodpeckers and hummingbirds would not be exposed to herbicide because of their feeding methods. Their food sources are protected. Since the beetles and ants that the woodpeckers feed on are buried inside of decaying wood, and since the nectar of flowers is inside the "throat" of the flower which is formed by the elongated petals, the food source of these two groups of birds is not likely to be contaminated by spraying herbicides.

9. Deer and Elk would occasionally feed in the same area for multiple days leading to chronic exposures.

10. The impacts to mollusk may be greater than depicted in the table based their skin may absorb herbicides more than the invertebrates that were used in the analysis. The likelihood of the sensitive mollusk being in the areas targeted for spraying, however, is extremely low based on habitat types. Since the potential is there, they are included in the table.

Table X-3: Summary of Effects Analysis to Individuals of Target Species prior to implementation of Invasive Plant ROD (2005b) and Project Design Criteria. For species: T=Threatened; E=Endangered; S=Sensitive; P=Proposed. Symbology for effects analysis: ↓↓ Doses are anticipated to be below the toxicity index; ▲ Doses are anticipated to be above the toxicity index; **Unk**. Effects are unknown and there are no surrogate species.

Species	HERBICIDE										
	Clopyra-lid	Chlor-sulfuron	Glyphosate	Imazapic	Imazapyr	Metsulfuron methyl	Picloram	Sethoxydim	Sulfo-meturon methyl	Triclopyr	NPE
Threatened, Endangered and Sensitive Species											
Northern Spotted Owl (T)	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓
Northern Bald Eagle (T)	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓
Oregon Slender Salamander (S)	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk
Larch Mountain Salamander (S)	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk
Oregon Spotted Frog (S)	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk
Cope's Giant Salamander (S)	↓↓	↓↓	▲	↓↓	↓↓	↓↓	▲	↓↓	↓↓	▲	↓↓
Cascade Torrent Salamander (S)	↓↓	↓↓	▲	↓↓	↓↓	↓↓	▲	↓↓	↓↓	▲	↓↓
Painted Turtle (S)	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk
Northwestern Pond Turtle (S)	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk
Horned Grebe (S)	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓
Bufflehead (S)	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓
Harlequin Duck (S)	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓
American Peregrine Falcon (S)	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓
Grey Flycatcher (S)	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓
Black Swift (S)	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓
Baird's Shrew (S)*	▲	↓↓	↓↓	↓↓	↓↓	↓↓	▲	↓↓	▲	▲	▲

Species	HERBICIDE									
	Clopyra-lid	Chlor-sulfuron	Glyphosate	Imazapic	Imazapyr	Metsulfuron methyl	Picloram	Sethoxydim	Sulfo-meturon methyl	Triclopyr	NPE
Pacific Fringe-tailed Bat (S)	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	▲
Pacific pallid bat (S)	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	▲
California Wolverine (S)	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓
Pacific Fisher (S)	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓
Crater Lake Tightcoil (S)	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓
Dalles Sideband *(S)*	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓
Puget Oregonian (S)	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓
Columbia Oregonian (S)	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓
Management Indicator Species											
Pileated Woodpecker	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓
American Marten	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓
Deer and Elk	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	▲	↓↓
Gray Squirrel	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓
Migratory Birds and Partners in Flight Watch list species (management)											
Hermit Warbler	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓
Blue Grouse	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	▲	▲
Rufous Hummingbird	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓
Willow Flycatcher	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓
Band-tailed Pigeon	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	▲	▲
Olive-sided Flycatcher	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓	↓↓

Life History and Occurrence of Wildlife Species Used For Evaluation of Alternatives

Northern Spotted Owl (*Strix occidentalis caurina*): Threatened

A. Habitat

Old growth coniferous forest is the preferred nesting, roosting and foraging habitat of spotted Northern Spotted Owls in Oregon. Old growth habitat components that are typical for Northern Spotted Owls are: Multilayered canopies, closed canopies, large diameter trees, abundance of dead or defective standing trees, and abundance of dead and down woody material. The following describes Northern Spotted Owl habitat as defined in the *Programmatic Biological Assessment for Projects with the Potential to Modify the Habitats of Northern Spotted Owls and/or Bald Eagles or Modify Critical Habitat of the Northern Spotted Owl*, Willamette Province, FY 2005-2006 (Reference).

<u>Suitable habitat</u> for the Northern Spotted Owls consists of habitat used by owls for nesting, roosting *and* foraging (NRF). Generally this habitat is 80 years of age or older, multi-storied and has sufficient snags and down wood to provide opportunities for nesting, roosting and foraging. The canopy closure generally exceeds 60 percent. A wildlife biologist makes site-specific determinations and delineations of suitable habitat.

<u>Dispersal habitat</u> for the Northern Spotted Owls generally consists of mid-seral stage stands between 40 and 80 years of age with canopy closures of 40 percent or greater and an average dbh of 11 inches. Northern Spotted Owls use dispersal habitat to move between blocks of suitable habitat; juveniles use it to disperse from natal territories. Dispersal habitat may have roosting and foraging components, enabling Northern Spotted Owls to survive, but the habitat lacks structure suitable for nesting. A wildlife biologist makes site-specific determinations and delineations of dispersal habitat.

<u>Critical Habitat Units (CHUs)</u>: Designation of critical habitat serves to identify lands that are considered essential for the conservation and recovery of listed species. The functional value of critical habitat is to preserve options for the species eventual recovery. The Service's primary objective in designating critical habitat was to identify existing Northern Spotted Owl habitat and highlight specific areas where management considerations or protections should be given highest priority. CHUs were distributed in a manner that would facilitate demographic interchange.

Since the designation of Northern Spotted Owl critical habitat in 1992, the Northwest Forest Plan (USDA & USDI 1994a) developed as a conservation strategy for all late-successional forest species, including the Northern Spotted Owl. Like critical habitat, the Northwest Forest Plan (USDA Forest Service and USDI BLM, 1994) was based on the work of the Interagency Science Committee. In addition, the Northwest Forest Plan incorporated recommendations from the Northern Spotted Owl recovery team and addressed the needs of other late-successional forest-associated species.

Primary Constituent Elements

Primary constituent elements are environmental factors the FWS determines are essential to a species' conservation. For the Northern Spotted Owl the primary constituent elements of critical habitat have been identified as the physical and biological features that support nesting, roosting, foraging, and dispersal (USDI, 1992a).

Current Information

In 2004, the FWS initiated a 5-year review of the Northern Spotted Owl, *Scientific evaluation of the status of the Northern Spotted Owl* (Courtney et al., 2004). The review collates and analyzes the recent body of knowledge related to the Northern Spotted Owl since it was listed as a threatened species in 1990. The review includes a summary of current threats to the Northern Spotted Owl, including the barred owl, West Nile virus, habitat modification, and forest management challenges associated within the existing legal framework. Also included in the 5-year review is a report entitled, *Status and Trends in Demography of Northern Spotted Owls, 1985-2003* (Anthony et al., 2004).

The information in Coutney et al. (2004) and Anthony et al. (2004) was reviewed by Alan Dyck, Forest Wildlife Biologist for the Forest. The results of the 5-year review do not alter how the Forest Wildlife Biologist determines the effects to the Northern Spotted Owl or its habitat. This project was also reviewed for consistency with the Northwest Forest Plan (USDA Forest Service and USDI BLM, 1994). As a result of the review, the effects to the habitat and the owl has not changed and the information in Courtney et al. (2004) does not alter the effects determination made for the treatment of invasive plants.

B. Re-Field Review

Habitat Available Within the Project Area

Yes. The Proposed Action (Alternative 2) has approximately 2373 acres of the treatment areas that are either adjacent to or bisect suitable Northern Spotted Owl habitat. Also, there are approximately 2976 treatment acres of dispersal habitat. Of these acres, 2175 acres that would receive broadcast boom spray treatments in/or adjacent to suitable habitat (Table X-4). Approximately 2582 treatment acres are in or adjacent to Northern Spotted Owl critical habitat and 2068 acres are in Late Successional Reserve (LSR). LSRs are a Northwest Forest Plan land allocation: this land allocation is managed to protect and enhance conditions of forest ecosystems, which serve as habitat for late-successional and old-growth related species, including the Northern Spotted Owl.

Disturbance Noise Levels from Invasive Plant Treatments

To determine if sound level disturbance would impact Northern Spotted Owls, a sound level reading was made on the truck and spray pump used by Hood River County. Two distances were measured for sound levels on a dirt parking area on a cold clear morning at 10 yards and 35 yards. At 10 yards, the decibel reading was 72 decibels and at 35 yards it was 64 decibels. In a white paper for the FWS, Kent Livesey analyzed the research on Northern Spotted Owl disturbance factors (BA 2003). In the document Livesey states, "...we estimated these sound-only levels to be: 40 dB for the ambient sound level; 44 dB for the detect threshold; 57 dB for the alert threshold; 70 dB for the disturbance threshold; and 92 for the injury threshold." The Willamette Province Level One Team has interpreted this information and assigned a threshold for disturbance effects calls. When the sound levels reach the disturbance threshold 70 decibels, the effect determination is *May Affect, Not Likely to Adversely Affect* Northern Spotted Owls when the sound level reaches 92 decibels and above, the effect determination is *May Affect, Likely to Adversely Affect* Northern Spotted Owls. If sound levels are below 70 decibels, there is no effect anticipated. These effect determinations are reflected in the distance charts that are located in the Programmatic Biological Assessment (Reference).

C. Field Reconnaissance

A Level A survey was conducted for the project area in addition to examining some habitat during field reconnaissance. There is a high potential for species presence in some locations based on current field reconnaissance, GIS (Geographic Information System) analysis, and on historic data.

D. Analysis of Direct and Indirect Effects

Alternative 1 – No Action

Effects to the owl would be limited to the existing planned invasive plant treatments. The habitat would continue to function as Northern Spotted Owl suitable or dispersal habitat. The effects analysis indicates that there would be no toxic effects to Northern Spotted Owls from the use of herbicides on the 450 acres of treatment on the Forest and 150 acres on the Scenic Area. The possible indirect effect of noise from the use of pumps and equipment used for broadcast boom spraying and mechanical treatment methods have been analyzed and the sound levels compared to the sound standards described by Livesey of the FWS Lacey Office and found to be below the disruption threshold and is therefore negligible. The majority of the invasive plant treatments that would create noise occur along roads and openings. The Fish and Wildlife Service has indicated in the Biological Opinion for the FY06-07 LAA Disturbance activities, Willamette Planning Province Owls that Northern Spotted Owls rarely nest at or immediately adjacent to road or edges (Kerns et al. 1992, Perkins 2000). These effects are analyzed in the Biological Opinion for Effects to Northern Spotted Owls (Strix occidentalis caurina) from the Willamette Planning Province Fiscal Year 2006 – 2007 activities that have the potential to adversely affect, due to disturbance, on U.S. Department of the Interior; Bureau of Land Management, Eugene District and Salem District, and the U.S. Department of Agriculture; Mt. Hood National Forest, Willamette National Forest and the Columbia River Gorge National Scenic Area (FWS Reference Number 1-7-05-F-0663)

Alternative 2 – Proposed Action

The Proposed Action would bisect or be adjacent to Northern Spotted Owl suitable, dispersal, critical habitat and LSRs. The treatment areas are in habitats (mostly roads or openings) that cross or are within a GIS polygon designated as one of the categories of Northern Spotted Owl habitat. The breakdown of treatment acres in or adjacent to Northern Spotted Owl habitat is as follows: 2373 acres Northern Spotted Owl suitable habitat, 2976 acres dispersal habitat, 2582 critical habitat, and 2068 acres are in or adjacent to LSR. Approximately 18 percent of the proposed treatment areas would be in or adjacent to suitable Northern Spotted Owl habitat. The Proposed Action is to treat 2175 acres of areas in or adjacent to suitable habitat by broadcast boom spraying with a broadcast boom spray truck. There would be no impact to any of the primary constituent elements of Northern Spotted Owl habitat. The benefit to the habitat would be eliminating invasive plants that would otherwise out compete native vegetation which principle prey species use for foraging. The indirect effect of noise and disturbance would be negligible due to the very small area of suitable habitat and low noise created by mechanical and sprayers in the project area. The majority of the invasive plant treatments that would create noise occur along roads and openings. The Fish and Wildlife Service has indicated in the Biological Opinion for the FY06-07 LAA Disturbance activities, Willamette Planning Province Owls that Northern Spotted Owls rarely nest at or immediately adjacent to road or edges (Kerns et al. 1992, Perkins 2000). Sound level readings of the truck mounted boom sprayer were 64 decibels at 35 yards and were below the disturbance threshold, so the determination is No Effect from disturbance. Implementation of this project would have no impact to habitat connectivity cells. There are no negative effects to habitat.

Table X–4: Treatment Acre by Alternative and Northern Spotted Owl Habitat Type

Habitat Type or Treatment	Treatment Acres Bisecting or Adjacent		
	Alternative 1	Alternative 2	Alternative 3
Suitable habitat	<1235	2373	2373
Broadcast Boom spraying in suitable habitat	<415	2175	507
Dispersal habitat	<1235	2976	2976
Critical Habitat	<1235	2582	2582
Broadcast Boom spraying in Critical Habitat	<415	2222	548
Manual and/or mechanical treatment only	635	82.5	10417

Alternative 3 – Restricted Herbicide Use Alternative

Distribution of habitat types adjacent to the treatment areas is the same as Alternative 2. From the table above it is clear that the difference in the alternatives is the amount of area that would be sprayed with a broadcast boom sprayer. There would only be 507 treatment acres adjacent to suitable habitat sprayed by broadcast boom sprayer in this alternative. The toxic effect analysis indicates no effect to Northern Spotted Owls from herbicide. Exposure to herbicides would negligible since herbicides would rarely if ever be sprayed in suitable habitat and the chances of Northern Spotted Owls or their prey coming into contact with the chemicals is below any threshold for concern. The analysis for disturbance shows a negligible effect of the treatment on Northern Spotted Owl survival or recruitment and no effect to their habitat. **Effects to NRF and Dispersal Habitat on a Local and Watershed Scale**: There are no effects to the primary constituent elements of NRF (suitable) or dispersal habitat. There would be no changes in the age or structure, understory layer, down logs, or snag habitat. There may be improvements in forage for prey species in some situations. The removal of invasive plant species may improve prey habitat and contribute to improved prey conditions.

<u>Effects to Critical Habitat</u>: This project occurs adjacent to and in 2582 acres of critical Northern Spotted Owl habitat. No components in the Proposed Action or Restricted Herbicide Use Alternatives including herbicide, manual, mechanical, and cultural treatments would affect the ability of critical habitat to aide the recovery of the Northern Spotted Owl. There are no changes to the primary constituent elements of the habitat by any of the treatment methods.

<u>Effects to Northern Spotted Owl on a province scale (Willamette Province)</u>: The FWS issued an opinion on the effects noise disturbance of the herbicide treatments in the programmatic biological assessment titled, Programmatic Biological Assessment for Activities with the Potential to Disturb Northern Spotted Owls and/or Bald Eagles in the Willamette Province FY2006-2007.” The conclusion reached is the following: “After reviewing the current status of the bald eagle and Northern Spotted Owl, including critical habitat, the environmental baseline for both species, the effects of the Proposed Action, and the cumulative effects, it is the Service’s biological opinion that the FY 2005-2006 Habitat Modification Projects in the Willamette Province are not likely to jeopardize the continued existence of the bald eagle or Northern Spotted Owl and is not likely to destroy or adversely modify designated critical habitat for the Northern Spotted Owl” (USDI, 2005). The acres contained in the programmatic biological assessment were for the effects of the projects in treatment areas covered in Alternative 1. After taking noise level readings of herbicide spray equipment that would be used to treat invasive plants in the project area, it is clear that sound levels are below the disturbance threshold established by the Level One Team; therefore, there is no need for further consultation for disturbance to this species for invasive plant treatment from herbicide spraying. The sound levels generated by other manual and mechanical treatments also are considered below the disturbance threshold.

<u>Effects to Northern Spotted Owl on the entire range of the species (Washington, Oregon, and California)</u>: The Record of Decision for Amendments to USDA Forest Service and USDI Bureau of Land Management Project Documents within the Range of the Northern Spotted Owl established a system of land allocations and a set of standards and guidelines that is considered to be consistent with maintaining viability for the Northern Spotted Owl across its range (USDA Forest Service and USDI BLM 1994). This EIS meets all the Standards and Guidelines set forth within this decision document.

Early Detection / Rapid Response Strategy

This provision creates the possibility of invasive plant treatment outside of the original mapped treatment areas. Expanding the area of treatment would have no effect on habitat, exposure to herbicide, or disturbance of Northern Spotted Owls. The actions created by the treatments pose no risk to Northern Spotted Owl survival or reproduction.

Cumulative Effects

Currently, the only foreseeable future actions on USDA Forest Service lands within the watersheds that might be considered cumulative herbicide use and invasive plant treatments to the Proposed Action are those projects already approved and listed in the No Action Alternative and the EDRR. There would continue to be management activity within these watersheds that have the potential to adversely impact Northern Spotted Owl individuals due to disturbance. These types of projects would continue to be consulted on with the FWS. There are no actions outside of USDA Forest Service lands that become a cumulative effect for Northern Spotted Owls because there is no impact to Northern Spotted Owl habitat, the effect of noise is local and would not be considered cumulative and the herbicides used do not bioaccumulate. The possibility that there could be 13,000 acres of treatment per year with EDRR does not alter the determination of effects to the habitat or herbicide effects on the owl. The analysis of spray equipment noise levels and the type of equipment being used for cultural, manual and mechanical treatment has eliminated the concern for disturbance to Northern Spotted Owl nesting, foraging, or reproductive success.

E. Mitigation Measures

Mitigation measures or seasonal restrictions are proposed for the treatment of invasive plants in suitable habitat in the LSR and Congressionally Withdrawn land allocations. These restrictions would only be applied to areas of suitable habitat in these land allocations. There are 48 treatment sites in LSR totaling approximately 2068 acres for the Proposed Action. Of these sites there are 1058 acres that are suitable Northern Spotted Owl habitat. Treatment of invasive plants must occur during the critical breeding season for Northern Spotted Owls, but the noise levels produced by the treatment methods would not reach the level of harm. As a result, there is no need for further mitigation.

F. Communication with U.S. Fish & Wildlife Service

The Northern Spotted Owl was listed as threatened throughout its range under the ESA (55 CFR 26114) on June 22, 1990. Any action that would result in a beneficial effect or could result in an adverse impact to the Northern Spotted Owl would result in a may effect determination and would require consultation with the FWS.

Consultation with the FWS was initiated on for the treatment of invasive species in three separate consultation avenues. Disturbance effects of invasive plant treatments were analyzed and consulted on in the Programmatic Biological Assessment for Activities with the Potential to Disturb Northern Spotted Owls and/or Bald Eagles in the Willamette Province FY2006-2007 (Reference) and the Willamette Province Level One Team was given a presentation on the effects analysis and subsequent determination made on the effects to the Northern Spotted Owl and its habitat from the treatment of these invasive plants. The Level One Team was informed that the Forest and Scenic Area had determined that the effect from the use of herbicide, manual, mechanical, and cultural treatment of invasive plants was no effect to the Northern Spotted Owl or its habitat. The team was reminded that the disturbance effects had been analyzed in the Programmatic Biological Assessment. There was only one comment from the Level One Team on the use of herbicides: the comment was related to the use of picloram and its effects to fish through impacts to their food source. The comment was forwarded to the fisheries biological on the interdisciplinary team. The Level One Team made no comments on the effects determination.

A letter was sent on July 25, 2006 to the U.S. Fish and Wildlife Service outlining the effects determinations based on project alternatives information. The effects determination based on the analysis is no effect to Northern Spotted Owls or their habitats. The effects determination from disturbance is no effect to Northern Spotted Owls.

3.10.5.1 Northern Bald Eagle (*Haliaeetus leucocephalus*): Threatened

A. Habitat

The bald eagle is a permanent resident in Oregon. Their nests are usually located in multi-storied stands with old-growth components, and are near water bodies that support an adequate food supply. Nests, which usually consist of a bulky platform of sticks, are usually located in the super-canopy of trees or on a cliff. Nest sites are usually within one-quarter mile of water in the Cascades.

Adequate forage sources are possibly the most critical component of bald eagle breeding and wintering habitat. Fish, waterfowl, rabbits, and various types of carrion comprise the most common food sources for eagles in the Pacific Recovery Plan area. Wintering bald eagles perch on a variety of substrates, proximity to a food source being the most important factor influencing perch selection. Eagles tend to use the highest perch sites available that provides a good view of the surrounding area. Communal roosts are invariably near a rich food source and in forest stands that are multi-storied and have at least a remnant old growth component.

B. Re-Field Review

Habitat available within the project area

Yes. There are five areas outlined on the Forest and Scenic Area that are designated as part of the Bald Eagle recovery area. Two of these areas have eagles nesting in them. Two of the other areas do have eagles utilizing them throughout the year and may have undocumented nesting. All of the areas do have some invasive treatments planned (Sites #). There are three areas designated as bald eagle habitat areas (A13) in the Forest Plan which have proposed treatments. The habitat could be utilized as nesting, roosting, or perching habitat for the bald eagle.

C. Field Reconnaissance

A Level A survey was conducted. There is some potential for this species to inhabit the project area. Birds are nesting in the Timothy Lake and Clear Lake Areas as well as Rock Creek Reservoir, just off the Doewar. No communal roost areas are known for the Forest. There has been consistent use by adults in two areas of the Forest and nesting occurs within a half mile of some of the roadside treatment areas.

D. Analysis of Direct and Indirect Effects

Effects Common to All Alternatives

No effect to the bald eagles would occur from ingesting or contacting herbicides. The effects analysis (Appendix X, Table X-3) showed no anticipated toxic effects to bald eagle. The concentrations of herbicides from invasive plant treatment would not be elevated to a point where there would be any observable effect to eagles.

Alternative 1 – No Action

This alternative includes some pre-existing invasive plant treatments, including herbicide, manual, and mechanical treatment methods. There are three roadside treatment areas (Sites #) that are within a half-mile, but over one-quarter mile of a previously occupied bald eagle nest near Rock Creek Reservoir. These areas are outside the disturbance distance of the bald eagle nest. The nest was not occupied in 2005 but was successful in fledging young the previous year (Thurman, 2005). Due to of the proximity to the treatment areas, it is possible that people working in the treatment area could potentially create nest site disturbance. It is unlikely, however, given the nest was established in the proximity to the roads being proposed for treatment. There is already a fair amount of recreation at the lake near the nest site and the invasive plant treatments could potentially add to this disturbance. It is more likely that the nest is hidden from the road well enough to not be impacted by the treatments.

Alternatives 2 & 3 – Proposed Action & Restricted Herbicide Use Alternatives

Effects to Habitat: Bald eagles usually nest within one-quarter mile of a water body in the Cascades. Eagles utilize large trees with platform nest. Diets vary with location and food availability. Eagles on the Forest primarily forage on fish although it is possible for them to eat carrion and dead or injured waterfowl on the lakes.

There are three proposed treatment sites (Sites #) that are in mapped bald eagle habitat that was identified as part of the Forest Plan. There are 369 acres of treatment area that are adjacent to or within these bald eagle habitat areas (A13) land allocations.

The primary constituent elements of bald eagle habitat include nest trees within a quarter mile of a water body and large trees for nesting and roosting. There are no treatments that would affect the availability of these habitat elements.

Effects to Individuals: There are two nest sites (thought to be alternates for the same pair) in the Clear Lake and Timothy Lake area (Sites #). These nest sites have produced young in the past (Isaacs, Frank B. and Robert G Anthony, March 2006). The distance from treatment areas to the nest sites is slightly over six tenths of mile for the nearest roadside treatment area. This distance is outside the disturbance distance for bald eagles.

Effects to Population: None expected since no effects to individuals and no effects to habitat occurring with project implementation.

Early Detection /Rapid Response Strategy

This provision creates the possibility of invasive plant treatment outside of the original mapped treatment areas. Expanding the area of treatment would have no effect on habitat or from exposure to herbicide. There is a possibility of treatment areas moving closer to a nest tree and within the disturbance zone of eagles. If the treatment area expands into the area within a quarter mile of a bald eagle or one half mile line of sight it would be necessary to adhere to a seasonal restriction outlined in the PDC H.1. (Section 2.2) or re-consult with the Fish and Wildlife Service.

Cumulative Effects

No cumulative effects for the treatment of invasive plants from herbicide, manual, mechanical or cultural treatments or the EDRR.

E. Mitigation Measures

None.

F. Communication with U.S. Fish & Wildlife Service

The northern bald eagle is listed as threatened throughout its range under the ESA (55 CFR 26114) on June 22, 1990. Any action that would result in a beneficial effect or could result in an adverse impact to the bald eagle would result in a may effect determination and would require consultation with the FWS.

Consultation with the U.S. Fish and Wildlife Service was initiated for invasive plant treatment in July of 2005 through the document titled "Programmatic Biological Assessment for Activities with the Potential to Disturb Northern Spotted Owls and/or Bald Eagles in the Willamette Province FY2006-2007." There were no effects to bald eagle from invasive plant treatment that were determined and therefore the Fish and Wildlife Service Biological Opinion did not list any terms or conditions March 2005.

3.10.5.2 Canada Lynx (*Lynx Canadensis*): Threatened

A. Habitat

In the Pacific Northwest, lynx are associated with high elevation, boreal forests that typify northern latitudes. They are found primarily above 4000 feet in Washington. Although scarce in Oregon, lynx range and habitat in Oregon and Washington is unclear. High quality lynx habitat is comprised of a mosaic of early successional forests with high prey densities (especially snowshoe hare) for foraging, and of late-successional forests with an accumulation of down logs used for denning, thermal and security cover. Intermediate successional stages are used mainly for travel and landscape connectivity but may also provide foraging opportunities.

B. Re-Field Review

Habitat available within the project area

No. In a letter dated August 2 of 2001 (USDA, 2001) and updated on December 3 of 2003 (USDA, 2003), the Forest has made a determination, based on the best available scientific and commercial data, that the Canada lynx and its habitat are currently not present on the Forest and Scenic Area. This letter is consistent with the January 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and Mitigation Measure Standards and Guidelines (USDA Forest Service and USDI BLM, 2001), and is consistent with the Lynx Conservation Assessment and Strategy (Ruediger, 2000) as specified in this Record of Decision.

The Lynx Nationwide Survey protocol was implemented and resulted in no lynx being located on the Forest and Scenic Area. Forest-wide winter tracking surveys have been conducted during the winters of 1994-1995, 1995-1996, 2000-2001, 2001-2002, 2002-2003, and 2003-2004. No lynx were detected during these surveys.

No further analysis needed due to lack of habitat.

Larch Mountain Salamander (*Plethodon larseli*): Sensitive

A. Habitat

Habitat is mainly restricted to the talus slopes of the Columbia River Gorge, although the species is now known to occur at several locations in the Cascade Mountains of Washington. The Larch Mountain salamander could be found near the surface under rocks during wet weather, but it retreats to considerable depths in the talus during cold and dry weather. Individuals could occur far from streams and seepages, and seem to be less common in perpetually wet talus, compared to than in talus that varies from wet to dry with seasonal rainfall. In most cases, Larch Mountain Salamanders remains under bark, rocks, leaves, and logs unless it is raining or extremely wet.

B. Re-Field Review

Habitat available within the project area

Yes. Some of the invasive plants treatment areas occur within the identified Larch Mountain salamander distribution range as defined in the Northwest Forest Plan. Some of the treatments do occur near or directly adjacent to talus slopes. Treatments in the Scenic Area and on the north side of the Forest have the greatest likelihood of being near Larch Mountain salamander populations.

C. Field Reconnaissance

Level A surveys were conducted. There is a low potential for this species to inhabit the project area due to the low distribution of this species. Some of the roads being treated, however, do have potential habitat for Larch Mountain salamanders.

Oregon Slender Salamander (*Batrachoseps wrighti*): Sensitive

A. Habitat

The only amphibian endemic to Oregon, this species is found predominantly on the western slopes of the Cascade Range from the Columbia River south to southern Lane County. Sites have been found in Lane, Linn, Clackamas, and Multnomah counties as well as a few sites on the eastern slopes of the Cascades in Hood River and Wasco counties. Sites are generally scarce, occurring in scattered and often widely separated colonies. Sites are sometimes locally common.

The Oregon Slender salamander is found in moist and dry woods consisting of Douglas-fir, maple, hemlock, and red cedar. It is most common in mature Douglas-fir forests and appears to be dependent on mature and old growth stands. Individuals are found under rocks, wood, or bark and wood chips at the base of stumps as well as under the bark and moss of logs. They are also found in rotting logs, in holes and crevices in the ground, and in termite burrows. Nests that have been located were found under bark and in rotten logs.

B. Re-Field Review

Habitat available within the project area

Yes. All the older stands have potential Oregon Slender salamander habitat.

C. Field Reconnaissance

Level A surveys were conducted. There is a low potential for this species to inhabit the treatment areas because most treatment occurs along roadsides and openings, and this species occurs where there is a forest canopy.

Cope’s Giant Salamander (*Dicamptodon copei*): Sensitive and

Cascade Torrent Salamander (*Rhyacotriton cascadae*): Sensitive)

A. Habitat

<u>Cope’s Giant Salamander</u>: Cope’s Giant salamander prefers streams and seepages in moist coniferous forests. They limit their occurrence to waters with temperatures in the 8 to 14 ^{o}C range. They would also inhabit cold clear mountain lakes and ponds. They occur in suitable areas from sea level up to approximately 4,430 feet elevation. The Cope's Giant salamander breed and rear its young within the cracks and crevices of the rocky substrates within the stream course. They sometimes leave streams on wet rainy nights but remain on wet rocks and vegetation near the stream. This salamander is most frequently found on pieces of wood in streams, under logs, bark, rocks or other objects near streams.

Cope's Giant salamander has the potential to be negatively affected by increased sedimentation, resulting from project activities adjacent to or intersecting streams and water sources. Sediment deposition within the substrate could impair preferred habitat characteristics. Also, sedimentation of streams could lead to asphyxiation of embryos and larvae as well as a degradation of over-wintering habitat that may result in local extinctions. There is no information on the impact of herbicides on these aquatic salamanders so the assumption is that they would have the same sensitivity to herbicides as fish (See Section 3-9 – Aquatic Organisms and Habitat).

Cascade Torrent Salamander: The range of this species is from the coastal mountains on the Olympic Peninsula in Washington south to Mendocino County in California. Also, there is a known population in the Cascade Mountains of southern Washington and northern Oregon, with a local disjunctive population in the southern Oregon Cascades.

The Cascade Torrent salamander is most abundant in rocks bathed in a constant flow of cold water, but also occurs in cool rocky streams, lakes, and seeps. Individuals from this species require microclimatic and microhabitat conditions generally found only in older forests.

The diet of this salamander consists of aquatic and semi-aquatic invertebrates, including amphipods, springtails, fly larvae, worms, snails, and spiders. They search for prey under rocks and other objects in streams. Adults occasionally are found under surface objects a few feet from water after heavy rains, but they are the most aquatic of our metamorphosed salamanders and should be expected only in saturated stream-side talus and in streams. Experiments have shown that this species are among the most sensitive of all terrestrial northwestern salamanders to loss of body water and would die quickly in a desiccating environment.

The Cascade Torrent salamander has the potential to be negatively affected by increased sedimentation resulting from project activities adjacent to or intersecting streams and water sources. Sediment deposition within the substrate could impair preferred habitat characteristics. Also, sedimentation of streams could lead to asphyxiation of embryos and larvae as well as a degradation of overwintering habitat that may result in local extinctions. There is no information on the impact of herbicides on these aquatic salamanders so the assumption is that they would have the same sensitivity to herbicides as fish (See Section 3-9 – Aquatic Organisms and Habitat).

B. Re-Field Review

Habitat available within the project area

Yes. There are sites within the invasive plant treatment project area that include perennial or intermittent streams, wet areas, or seeps.

Cope’s Giant Salamander: This species’ range is predominantly west of the Cascade Range. Potential habitat for this species does exist within the Forest and Scenic Area in the proposed treatment areas on the westside of Cascades.

Cascade Torrent Salamander: Potential habitat for this species does exist within the project area. Areas on the westside of the Cascades in the proposed treatment areas appear to have all the habitat characteristics essential to the species.

C. Field Reconnaissance

A Level A survey was conducted based on a low potential for species occurrence and Project Design Criteria H.2. (Section 2.2) that would reduce or eliminate risk to there species. Field surveys have not been accomplished.

American Peregrine Falcon (*Falco peregrinus anatum*): Sensitive

A. Habitat

The most critical habitat components for Peregrine Falcons are suitable nest sites, usually cliffs, overlooking fairly open areas with an ample food supply. They nest along seacoasts, near marshes, and even in cities, but they are not well suited to life in interior forests. They usually nest or roost near a marsh, lake, or coast where water birds are plentiful.

B. Re-Field Review

Habitat available within the project area

There are suitable cliffs within sight and adjacent to the treatment areas.

C. Field Reconnaissance

A Level A survey was conducted based on known sites for species occurrence and low risk from herbicide use as indicated by the herbicide effects analysis.

Northern Painted Turtle (*Chrysemys picta*): Sensitive and

Western Pond Turtle (*Clemmys marmorata marmorata*): Sensitive

A. Habitat

Northern Painted Turtle: An aquatic turtle that frequents ponds, marshes, small lakes, ditches and streams where the water is quiet or sluggish and the bottom is sandy or muddy, and there is considerable vegetation. Mudbanks, logs, partially submerged branches, and rocks are preferred for sunning.

<u>Western Pond Turtle</u>: The western pond turtle inhabits ponds, marshes, and the slow-moving portions of creeks and rivers that have rocky or muddy bottoms. Partially submerged logs, vegetation mats, mudbanks, rocks and tree branches provide areas for sunning. Western pond turtles have been found to occur from sea level up to around 2000 feet. During the winter months these turtles usually hibernate in bottom mud.

B. Re-Field Review

Habitat available within the project area

<u>Northern Pond Turtle:</u> Yes. Although not immediately adjacent to the ponds in the Scenic Area, the treatment sites are near the known sites for turtles on the eastern area of the Scenic Area. There are no known sightings of these species on the Forest. The USDA Forest Service, Pacific Northwest Regional Forester's Sensitive Species list only has this species as suspected to occur on the Forest.

<u>Painted Turtle</u>: No. The only known painted turtle sites on the administrative units are on the Washington side of the Scenic Area. Although potential habitat exists, there are no known locations. This species is easy to detect when present so it is not anticipated that any turtles are located in the project area or the EDRR area.

C. Field Reconnaissance

A Level A survey was conducted based on a low potential for species occurrence outside of the known areas. No observations have been made of any of the two species outside of the known locations in the Scenic Area. There is a potential for the turtles to live in areas previously unknown but these species are fairly conspicuous when they occur in a location. They are usually seen sunning on logs or exposed rocks and are easily observed.

Horned Grebe (*Podiceps auritus*): Sensitive and Bufflehead (*Bucephala albeola*): Sensitive

A. Habitat

<u>Horned Grebe:</u> The Horned Grebe breeds throughout most of Alaska and Canada and, locally, just south of the Canadian border. It also breeds in northern Eurasia. Its habitat consists of areas with much open water surrounded with emergent vegetation.

<u>Bufflehead</u>: The Bufflehead is a northern species that breeds from Alaska across Canada and south to Oregon, northern California, and Wisconsin. This species nests near mountain lakes surrounded by open woodlands containing snags. In many areas, the preferred nest trees are aspen, but they would also nest in ponderosa pine or Douglas-fir.

B. Re-Field Review

Habitat available within the project area

Horned Grebe: Yes. This species occurs both on the Forest and Scenic Area as a winter resident and as a migrant. No breeding has been observed or documented for this species on the Forest or Scenic Area.

Bufflehead: Yes. Buffleheads have been recently documented as breeding on the Forest at two locations monitored by the Wetland Wildlife Watch program. This species occurs both on the Forest and Scenic Area as a winter resident and as a migrant.

C. Field Reconnaissance

Annual surveys for wetland species (Wetland Wildlife Watch program) are performed by the Northwest Ecological Research Institute for the Forest. A comprehensive survey of amphibians and birds is performed in an attempt to locate breeding individuals and populations of wetland species. Although there are annual sightings of bufflehead and horned grebes this past year is the first year of any documented breeding of buffleheads and there has been no documented breeding of horned grebes. Habitat and individuals are recorded in the fall, winter, and early spring but these species move on before the annual invasive plant treatment would commence.

Harlequin Duck (*Histrionicus histrionicus*): Sensitive

A. Habitat

This species occurs from Iceland and Greenland west to eastern Canada. It is absent from the central part of North America, and the "western" population ranges from eastern Siberia east through Alaska, and south to the Sierra Nevada of California and the mountains of southwestern Colorado. In the Northwestern United States, the Harlequin duck breeds along relatively low-gradient, slower-flowing reaches of mountain streams in forested areas.

B. Re-Field Review

Habitat available within the project area

Yes. Level A surveys were conducted. Existing knowledge of the duck was incorporated. There is habitat for this species throughout the Forest and Scenic Area. There are several areas where this duck has been recorded throughout this area.

C. Field Reconnaissance

Harlequin ducks have received some attention from biologists on the Forest because of their sensitivity to human intrusion and their secretive and cryptic nature. Several locations on the Forest have been surveyed for this duck to establish use. A few of these areas have invasive plant treatments (Sites #).

Wolverine (*Gulo gulo*): Sensitive

A. Habitat

Populations in the Cascade Mountains are small and scattered. Wolverines are usually found in high temperate coniferous forests, from mid-elevation (around 4000 feet) to moderately high elevation (above timberline), depending on the season. Common tree species are sub-alpine fir and lodgepole pine. They prefer to feed along rivers and streams and in wet meadows. The den is usually in a rock crevice, cave, or beneath a talus slope. Territories may encompass 10 to 80 square miles. Wolverines have been recorded traveling as far as 500 miles. Wolverines are believed to prefer areas of minimal people presence and high levels of solitude and seclusion. They are usually associated with wilderness, primarily because they are so vulnerable to the activities of humans.

B. Re-Field Review

Habitat available within the project area

Yes. Wolverines have no real habitat preference, but instead appear to seek high elevations for denning and solitude. Wolverines are dependant on carrion for a large part of their diet and focus on big game populations rather than on specific habitats. Historic sightings of wolverines both verified and unverified are within a few miles of the treatment areas. Snow Bunny Snow Park had one verified track sighting in 1990 and one wolverine was found dead on interstate 84 in that same year. The best possible denning habitat for wolverines on the project area is on the north side of the Forest. The proposed treatment areas, however, occur in areas that lack solitude and seclusion qualities due to the open road densities, management activities, businesses, homes, and recreational opportunities in the area. It is unlikely, but possible, that a wolverine would be present in the treatment areas.

Recent intensive field surveys on the Forest have not been accomplished. The last time broad based surveys were conducted over the watershed was during the winter of 1993-1994 and 1994-1995. Some survey efforts have been ongoing to the east at the Badger Creek Wilderness and on the east and north sides of the Forest, but there have been no verifiable sightings of wolverine or signs of presence. The length of time with no verifiable sightings is 15 years. This fact calls into question if wolverines still exist on the Forest, Scenic Area, or even in the Oregon Cascades.

C. Field Reconnaissance

A Level A survey and strategic surveys were conducted based on a low potential for detecting species occurrence. No observations were made of wolverine or their tracks during field reconnaissance. The lack of sightings of this species is not a reliable indicator of species presence or absence. Since, the home range of wolverines is documented to be in the hundreds of miles, any wolverine that is present in the Cascades of Oregon may potentially travel or forage in the project area.

Baird's Shrew (*Sorex bairdii permiliensis*): Sensitive

A. Habitat

This species is endemic to Oregon. Its range is from northwestern Oregon from the Pacific coast east to the Cascades, and from the Columbia River south to Benton and Lane Counties.

Little published information exists that assigns with certainty habitat characteristics to the Baird's Shrew. In 1986, two specimens were collected in an open Douglas-fir forested area with numerous rotting logs in Polk County. The habitat of the Baird's shrew could be described as moist coniferous forests with a shrubby understory. Individuals of the species tend to forage near logs and rocks.

For the purpose of effects analysis on the Forest and Scenic Area, it is assumed that areas on the westside of the Cascades suitable for Northern Spotted Owls are also suitable for Baird's shrews. Since this hypothesis has not been tested it may or may not be valid.

B. Re-Field Review

Habitat available within the project area

Yes. As stated above, little is known about this species. The location and habitat characteristics of the forested areas of the invasive plant treatment areas does seem to fit with what little is known about the species. The affected area is probably similar to that of the Northern Spotted Owls on the westside of the Cascades.

C. Field Reconnaissance

A Level A survey was conducted. There is a moderate potential for this species to inhabit the areas adjacent to the treatment areas. In a few locations, such as those where English ivy would be manually or mechanically treated, the treatment areas may be occupied by Baird's shrews. The habitat in these areas appears to be similar to those described for the shrew.

Pacific Fringe-tailed Bat (*Myotis thysanodes vespertinus*): Sensitive

A. Habitat

Little to nothing is known about this subspecies of the Fringed Myotis (*Myotis thysanodes*); only one source of information for the Pacific Fringe-tailed bat appears to exist. The distribution of this species is in California, Oregon, and Washington. No habitat data could be found on the Pacific Fringe-tailed bat, so habitat information and the following analysis are based on what is known for the Fringed Myotis.

Although the Fringed Myotis is found in a wide variety of habitats throughout its range, it seems to prefer forested or riparian areas. Most Oregon records are west of the Cascade Mountains. Its nursery colonies and roost sites are established in caves, mines, and buildings. The species is thought to forage by picking up food items from shrubs or the ground. It consumes beetles, moths, harvestmen, crickets, craneflies, and spiders.

B. Re-Field Review

Habitat available within the project area

Yes. This species is considered suspected on the Forest. Until recently there were no verified records that had been documented for this species on the Forest. But recently in personal communication with Mark Perkins, a bat researcher that conducted bat surveys on the Mt. Hood National Forest in the 1990's, a documented occurrence was discovered. This species was documented on the Clackamas Ranger District during surveys conducted by Perkins (Perkins, 2006).

Bats often forage along roads and the Pacific Fringe-tailed bat may use roads for foraging and bridges for roosting. This species uses caves and may be found in caves, abandoned mines, or rock openings throughout the Forest and Scenic Area.

C. Field Reconnaissance

A Level A survey was conducted. There is a moderate potential for this species to inhabit the treatment areas.

Pacific Pallid Bat (*Antrozous pallidus pacificus*): Sensitive

A. Habitat

The Pacific Pallid Bat prefers dry climates and, therefore, is found in Eastern and Southern Oregon. This bat has colonies in buildings, caves, hollow trees, rock piles, mines and will roost under bridges with the proper structure. It is described as a semi-desert species; however, it also uses woodland edges and rocky areas. It has been documented in the drier areas of the Scenic Area.

The species forages by picking up food items from shrubs or the ground. It consumes beetles, moths, harvestmen, crickets, craneflies, and spiders.

B. Re-Field Review

Habitat available within the project area

Yes. This species is considered documented on the Scenic Area. No verified records have been documented for this species on the Forest. Bats often forage along roads and the Pacific Pallid Bat may use roads for foraging and bridges for roosting. This species uses caves and may be found in caves, abandoned mines, or rock openings throughout the eastern portion of the Scenic Area.

C. Field Reconnaissance

A Level A survey was conducted. There is a moderate potential for this species to inhabit the treatment areas.

Fisher (*Martes pennanti*): Sensitive

A. Habitat

In the northwest part of its range, the fisher occupies a wide variety of densely forested habitats at low to mid-elevations. The fisher is a moderate- to wide-ranging species and is considered rare in Oregon. West of the Cascade Range, all records for the species are for sites at elevations of 328 to 5906 feet, and are located in the Sub-alpine fire, western hemlock, and Sitka spruce zones. The species tends to frequent riparian corridors. They are known to occasionally use cut-over areas, but this is not their optimal habitat.

Research has shown that the habitat for fishers could be enhanced by minimizing forest fragmentation, both in the remaining old-growth and in second-growth forests; maintaining a high degree of forest-floor structural diversity in intensively managed plantations; preserving large snags and live trees with dead tops; maintaining continuous canopies in riparian zones; and protecting wetland habitat.

B. Re-Field Review

Habitat available within project area

Yes. The older forested stands have the structural characteristics of fisher habitat. Although these watersheds have been fragmented through past management, there remain enough unfragmented stands of old-growth and second-growth forests, including some of the stands proposed for treatment, that potential low quality habitat exists for the fisher. Fishers were reduced to extremely low numbers in Oregon as recently as 1950. There was a transplant of fishers into south central Oregon and those populations remain viable. No recent verifiable records exist for fishers on the Forest or Scenic Area. A few track sightings were recorded as potentially being fisher but these are unreliable due to the size overlap with American Marten (*Martes americana*). It is speculated that fishers have been extirpated from the Forest and Scenic Area.

C. Field Reconnaissance

A Level A survey was conducted. There is a low potential for this species to inhabit the project area. Since the early 1990's, an ongoing effort to establish any presence of fishers on the Forest and Scenic Area has been unsuccessful. Track surveys and remote cameras have been utilized to attempt to locate this species. Two track records from the 1990s made this species appear to be a potential species on this Forest. Further inspection of the recorded data sheets indicated that the tracking crew was not sure about the actual species and even indicated it could have been a raccoon. This combines with the fact that there is size overlap between marten and fisher makes the records very suspect and, therefore, not considered a verified record by the Forest. Despite continued efforts and even remote camera surveys, following the track discovery, no fisher evidence has been recorded.

It is the Forest Wildlife Biologist determination that fishers are not present on the Forest or Scenic Area.

Crater Lake Tightcoil (*Pristiloma arcticum crateris*): Sensitive

A. Habitat

Crater Lake Tightcoil habitat is found above 2000 feet elevation in moist conifer forests and among mosses and other vegetation near wetlands, springs, seeps, and riparian areas. This species may be found on logs, among sedges, attached to decaying leaf surfaces, in litter, or inside other shells (USDI BLM, 1999).

B. Re-Field Review

Habitat available within project area

Yes. Crater Lake Tightcoil has been found very rarely on the Forest and Scenic Area in the past. The habitat in the project area fits the habitat where this species has been found to occur. The project area does have mosses, wetlands, springs and seeps.

C. Field Reconnaissance

A Level A survey was done and it was determined that habitat for this species was present in the project area. In checking four years of protocol surveys from other projects in the vicinity of the proposed treatment areas, there are no records for this species. This is due in part to the fact that this species has not been found in most years when surveys have occurred.

Habitat for this species is present in the project area and, therefore, presence is assumed although it is anticipated that this species would not be within the treatment areas. In most cases, the species is not likely to be in the treatment areas because the microclimate requirements for the species would not be present. The species is not anticipated in the roadside treatment areas. The seeps and springs would have buffers that would protect the individuals occurring in the treatment areas (Project Design Criteria H.2.).

Dalles Sideband (*Monadenia fidelis minor*), Puget Oregonian (*Cryptomastix devia*), Columbia Oregonian (*Cryptomastix hendersoni*): Sensitive

A. Habitat

Dalles Sideband: This species is usually found in steppe or dry forest plant communities, on terraces or rocky slopes, within 61 feet of springs and seeps (USDI BLM, 1999). This habitat is associated with the eastside of the Forest and Scenic Area. Key components of the habitat are rock outcrops, talus, shrubs, and riparian vegetation.

Puget Oregonian: This species is found in moist conifer forest with hardwood component at low elevations through upper, western hemlock zone (USDI BLM, 1999). Key features of the habitat are large big-leaf maple trees (logs; sword ferns under canopy); other hardwood trees.

Columbia Oregonian: This species is found in steppe or open forest near springs and seeps at low to mid-elevations (USDI BLM, 1999). Key features of the habitat are talus, logs, shrubs and leaf litter.

B. Re-Field Review

Habitat available within the project area

Dalles Sideband: Yes. There is habitat for this species on the eastside of the Forest and Scenic Area. The majority of the time this species conserves moisture by living under rocks and logs, or in saturated wet areas, such as springs and seeps.

Puget Oregonian: Yes: There is habitat for this species in isolated pockets throughout the proposed treatment area. Big leaf maple and other hardwoods occur in saturated soils and primarily in riparian areas.

Columbia Oregonian: Yes. Spring and seeps occur in the proposed treatment areas.

C. Field Reconnaissance

A Level A survey was done and it was determined that habitat for these species was present in the project area.

Habitat for these species is present in the project area and, therefore, presence is assumed. It is anticipated, however, that this species would not be within the treatment areas, in most cases because the microclimate requirements for the species would not be present. The species are not anticipated in the roadside treatment areas. The seeps and springs would have buffers that would protect the individuals occurring in the project areas (Project Design Criteria H.2.).

Management Indicator Species (MIS)

Pileated woodpecker (*Dryocopus pileatus*)

The pileated woodpecker is a Forest MIS. 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, 2003). Pileated woodpeckers occur throughout the proposed treatment areas.

A. Habitat

Pileated woodpeckers are associated with older, mature forest stand because of their dependence on both large-diameter trees with decay and on snags for nesting, roosting, and foraging (Bull, 2003). Pileated woodpeckers have large home ranges. Telemetry studies in northeast Oregon have found that pileated woodpecker pairs had an average home range size of 543 acres. Home ranges averaging 1,181 acres and ranging from 660 to 2,609 acres have been reported for the Oregon Coast Range (Marshall et al., 1996).

The pileated woodpecker is most commonly found in mature to old-growth mixed conifer forests; although hardwood forests located in valley bottoms are also utilized. Necessary habitat components for this species include large diameter snags or living trees with some decay which are used for both nesting and roosting sites; both large diameter trees and logs which are used for foraging; and a dense canopy to provide cover which protects them from predators (Bull, 2003).

The pileated woodpeckers diet consists of carpenter ants, thatching ants, beetles, and occasionally wild fruits and nuts. The pileated woodpecker is a resident species that breeds throughout coniferous forests in western Oregon and Washington. Each pair excavates a new nest cavity each spring, usually in a dead tree at an average height of 50 feet above the ground. Courtship begins in February and March, nesting occurs from late March to early May, and nestlings are present from late May until early July. Adults are not migratory and do not exhibit seasonal movements outside of the nesting territory. Juveniles disperse from their natal area in the fall. In an Oregon study, an average juvenile dispersal distance of 2 miles was recorded, with a range 0 to 5.2 miles (Bull, 1987). Timber harvest has the most significant effect on habitat for this woodpecker. Forest fragmentation likely reduces population density and makes birds more vulnerable to predation as they fly between forest fragments (Bull, 2003).

B. Occurrence in Proposed Treatment Areas

Suitable habitat for the pileated woodpecker is present throughout the proposed treatment areas in mature forest with a relatively closed canopy.

American Marten (*Martes americana*)

The American marten is a Forest MIS. Concern for this species arises out of their association with mature and old-growth forest.

A. Habitat

Martens are associated with forested habitat and appear to prefer closed canopy mature forests. They have been observed using alpine areas and could use forest opening if there is sufficient down wood to provide cover (Csuti et al., 2001). The home range size of martens varies, with home ranges of approximately 6 square miles reported from Minnesota (Mech & Rogers, 1977 *in* Ruggerrio et al., 1994) and home ranges of approximately 0.32 square mile reported in Montana (Burnett, 1981 *in* Ruggerio et al., 1994). In Oregon, the home range of a male American marten is generally about 1 square mile in size and the home range of a female is generally about 0.25 square mile, with separation of home range territories within sexes and overlap between sexes being common (Maser, 1998). Martens are generally considered to be forest dependent species and have been observed to avoid large forest openings, although non-forested habitats are used by martens, particularly during summer above tree line. Martens have been observed crossing openings, particularly during winter (Ruggiero et al., 1994).

Martens are primarily carnivorous and feed on small mammals including shrews, voles, woodrats, rabbits, squirrels, and mountain beaver, although marten's prey items also include birds, insects, and fruits (Csuti et al., 2001).

B. Occurrence in Proposed Treatment Areas

In Oregon, martens are known to inhabit the Coast Ranges, the Cascades and the Blue Mountains. The higher elevation sites would be within the areas that martens exist on the Forest. Numerous remote camera and tracking surveys have documented this species occurring widely on the Forest and Scenic Area. With the large home ranges it is always possible that this species would travel through an area that has been treated.

Deer and Elk

The effects to deer and elk are almost identical, since their habitat requirements and forage are so similar.

<u>Deer</u>: There are two different subspecies of mule deer that occur in Oregon: the subspecies expected to occur within the treatment areas is the black-tailed deer (*Odocoileus hemionus).* The black tailed deer is a Forest MIS. Concern over this species arises from its status as an important game species.

Elk: Elk (*Cervus elaphus*) are Forest MIS. Two subspecies of elk occur on the Forest and Scenic Area. Roosevelt Elk (*Cervus elaphus roosevelti*) occur on the westside of the Cascades, and Rocky Mountain Elk (*Cervus canadensis nelsoni*) on the eastside of the Cascades. Concern over this species arises from its status as an important game species.

A. Habitat

Deer and elk are considered ecotone species, using edge habitats between open areas and forests. They are also known to utilize old-growth coniferous forest, and are often found far from forest edges in this habitat. Deer and elk breed from September to November. One or two young are born in May or June. Migration patterns vary considerably throughout the range of the subspecies. Populations inhabiting higher elevations in summer migrate down-slope to lower elevations when accumulations of snow make forage unavailable, while other populations move short distances to preferred food patches or do not migrate at all.

Dietary habits of deer and elk are relatively broad. Although traditionally considered a browser, deer are actually intermediate between browsers and grazers, with grasses and forbs making up a high proportion of the diet during some years and seasons. Browse consisting mainly of the tender new shoots of woody plants makes up approximately three-fourths of deer diets annually. In spring and summer, the new green growth of forbs and grasses could make up over half the food eaten. The fruits, nuts, buds, shoots and leaves of a wide variety of trees, shrubs, and vines as well as mushrooms, lichens, and other foods are regularly consumed.

Grasses and sedges make up the bulk of elk diets, with forbs and browse utilized to a lesser extent. Elk require a juxtaposition of forest for cover and open habitats for forage. Dispersal corridors between summer and winter ranges must provide these requirements, along with relative freedom from human disturbance. River corridors are often used as migration corridors.

Travel corridors between summer and winter range, freedom from human disturbance in fawning areas, and cover to escape harsh environmental conditions and predators are important components of high-quality deer and elk habitat. Within the Cascades elk typically begin migrating in June up-slope to summer range following new plant growth as it becomes available. Calving areas are defined as the upper reaches of winter range which offer open brush and grassy areas near water and nearby forested areas for cover. The elevation of calving varies with the depth of the snow pack and the availability of forage and cover. Young are born in early June and within a week or two, cow-calf herds are formed.

B. Occurrence in Proposed Treatment Areas

Suitable habitat for both deer and elk is present in the Study Area and individuals of this species have been observed within the treatment areas.

Analysis of State Listed Species for Scenic Area Analysis

Oregon State Endangered, Threatened, Sensitive and Candidate Species with historic or suspected range in the Scenic Area as defined by the1992 Management Plan for the Columbia River Gorge National Scenic Area that have not been addressed in the body of this EIS.

Table X-5: Summary table of effects for Oregon State Endangered (E), Threatened (T), Sensitive (S) and Candidate (C) Species. The sensitive species are broken down into Sensitive-Critical (SC), Sensitive-Vulnerable (SV), and Sensitive-Undetermined (SU).

Project Name: Site-Specific Invasive Plant Treatment EIS		State: Oregon			
SPECIES (population segment)	STATUS*	PREFIELD REVIEW Usual Habitat in OR/WA	Species Presence		Effect Determination
			Habitat Present?	Species Present?	
Columbia spotted frog *(Rana luteiventris)*	C, WA-C, OR-SU	Columbia basin (east of Cascades Range): In or near permanent slow ponds, streams, marshes with abundant vegetation (one known site at Conboy). No currents sites in Scenic Area.	Y	N	No Effect
Northern leopard frog *(Rana pipiens)*	WA-E, OR-SC	Lowland marsh/ponds with dense vegetation; presently found in Grant county only. Likely extirpated in Gorge.	Y	N	No Effect
Western toad *(Bufo boreas)*	WA-C, OR-SV	Widespread distribution in WA and OR: Most common near marshes and small lakes (breeding sites in mid-spring); can travel readily overland and be found along streams/seeps.	Y	Y	Effect Unknown
Tailed frog *(Ascaphus truei)*	OR-SV	Clear, cold, fast forest streams with little silt and (often) cobble substrate.	Y	Y	No Effect
Cascades frog *(Rana cascadae)*	OR-SV	High elevation streams (1500-6000') as well as mountain meadows and moist forests	Y	Y	No Effect
Northern red-legged Frog (**West Cascades**) *(Rana aurora)*	OR-SU	Moist forests and forested wetlands, breeding in cool ponds and slow streams.	Y	Y	Effect Unknown
California Mountain king snake *(Lampropeltis zonata)*	WA-C, OR-SV	Main population in CA and Klamath mountains, with disjunct pop. in Columbia River Gorge (Klickitat, Skamania county area): oak/pine woodland, rocky riparian within logs/rocky cover. No confirmed specimens on OR side of Scenic Area, although unconfirmed sightings have been reported at The Dalles and Maupin areas.	Y	N	No Effect
Sharptail snake *(Contia tenuis)*	WA-C, OR-SV	East slope of WA Cascades, Columbia R. Gorge, W OR: rocky slopes and open pine and oak woodland w/prey species of small slugs	Y	Y	Effect Unknown
Ferruginous hawk *(Buteo regalis)*	WA-T, OR-SC	Open prairie and shrub steppe in eastern WA and OR.	Y	N	No effect

Project Name: Site-Specific Invasive Plant Treatment EIS		**State: Oregon**			
SPECIES (population segment)	**STATUS***	**PREFIELD REVIEW Usual Habitat in OR/WA**	**Species Presence**		**Effect Determination**
			Habitat Present?	**Species Present?**	
Northern goshawk *(Accipiter gentilis)*	WA-C, OR-SC	Typically more common east of Cascades in a wide variety of forest ages, structural conditions, and successional stages. Uses stands of mature forest as nesting sites. Typically found between 1900 and 6100 feet in Oregon.	Y	Y	No effect
Flammulated owl *(Otus flammeolus)*	WA-C, OR-SC	E. Cascades: cavity nester in mature pine and mixed conifer, at mid-elevations. Winters S. of US border	Y	Y	No effect
Barrow's goldeneye (**breeding population**) *(Bucephala islandica)*	OR-SU	Cascade range: breeds along ponds, sloughs and lakes in mountainous areas, using tree cavities or nest boxes. Winters in large rivers or marine habitat.	Y	Not Breeding	No effect
American white pelican *(Pelecanus erythrorhynchos)*	WA-E, OR-SV	Gregarious birds that nest in large colonies on islands within shallow water and marshes free of human disturbance and mammalian predators. Post breeders sometimes seen in Col R. (such as Klickitat Delta). Winters in S US through Mexico.	Y	Y	No effect
Yellow-billed cuckoo *(Coccyzus americanus)*	WA-C, OR-SC	Historic range in WA and OR. No reported breeding occurrences since the 1950's, although individuals have been sighted east of Cascades sporadically. Riparian forests, with cottonwood/thick willow; Neotropical migrant. Considered extirpated from WA and OR.	Y	N	No effect
Lewis' woodpecker *(Melanerpes lewis)*	WA-C, OR-SC	Open pine/oak woodland, conifer forests, and riparian woodland; neotropical migrant. Commonly seen in east areas of Scenic Area in dry forest types of oak and pine.	Y	Y	No effect
White-headed woodpecker *(Picoides albolarvatus)*	WA-C, OR-SC	Central/E. WA/OR in mature and open coniferous forests, esp. ponderosa pines. Cavity nester. Unknown numbers in Scenic Area.	Y	Y	No effect
Three-toed woodpecker *(Picoides tridactylus)*	OR-SC	Range in Oregon cascades in forests with Pine or Spruce component with bark beetle availability (diseased/ dying/ burned trees). Very limited habitat in Scenic Area.	Y	Y	No effect
Black-backed woodpecker *(Picoides arcticus)*	WA-C, OR-SC	Uncommon Cascades resident usu. at higher elevations (>3000'). East Cascades in WA. Scattered distribution as populations are highly associated with post-fire habitats in mature forests (stand-replacement fires with snags), dependent on high density of dead and insect-ridden trees.	Y	Y	No effect

Project Name: Site-Specific Invasive Plant Treatment EIS			**State: Oregon**		
			Species Presence		
SPECIES (population segment)	**STATUS***	**PREFIELD REVIEW Usual Habitat in OR/WA**	**Habitat Present?**	**Species Present?**	**Effect Determination**
Williamson's sapsucker *(Sphyrapicus thyroideus)*	OR-SU	East slopes of Cascades: breeds in coniferous mountain forests at mid to high elevation. Prefers large snags for nesting. Majority of population migrate to Southwest U.S. for winter.	Y	Unk	No effect
Willow flycatcher **(East Cascades pop.)** *(Empidonax adastus)*	OR-SU	Associated with shrub habitat. Dependent on willow thickets in riparian zones for nesting and migration. Neotropical migrant.	Y	Y	No effect
Purple martin *(Progne subis)*	OR-SC, WA-C	Western WA/OR up through Gorge to Western Wasco County: Nests in artificial & natural snags/crevices, often over water. Forages over open water/fields/forest canopy. Winters in South America.	Y	Y	No effect
Bank swallow *(Riparia riparia)*	OR-SU	East of Cascades along waterways or roadcuts where vertical cliffs of soil are exposed adjacent to large open area. Neotropical migrant.	Y	Y	Minor effect
White-tailed jackrabbit *(Lepus townsendii)*	WA-C, OR-SU	East of Cascades: open areas with native bunchgrass, sagebrush plains, can also be found in coniferous forests and subalpine meadows. On periphery of habitat in Scenic Area at the Dalles/Dallesport.	Y	Y	No effect
Washington ground squirrel *(Spermophilus washingtoni)*	WA-C, OR-E	Presently found in Columbia basin of WA state in sagebrush/grassland w/ sandy soils; also Giliam, Morrow and Umatilla counties, OR. May have historically been within the eastern edge of Scenic Area.	Y	N	No effect
Western gray squirrel *(Sciurus griseus)*	OR-SU, WA-T	Oak & mixed oak woodland, typically within ½ mile of water source. Core range for WA in Klickitat county	Y	Y	No effect
Townsend's big-eared bat *(Corynorhinus townsendii)*	WA-C, OR-SC	Roosts and hibernaculum sites within caves, buildings, mines and bridge undersides, with exacting temp, humidity, and physical requirements. Very intolerant of human disturbance which results in loss of critical fat reserves during torpid period.	Y	Y	Minor effect
Silver-haired bat *(Lasionycteris noctivagans)*	OR-SU	Found throughout Oregon: among the most common bats in forested areas of America, most closely associated with coniferous or mixed coniferous and deciduous forest types, especially in areas of Old Growth. They form maternity colonies almost exclusively in tree cavities or small hollows	Y	Y	Minor effect
Western small-footed myotis *(Myotis ciliolabrum)*	OR-SU	West Cascades and eastward: Rears its young in cliff-face crevices, erosion cavities, and beneath rocks on the ground as well as hibernating in caves or mines. Relatively little is known about this species.	Y	Y	Minor effect

Project Name: Site-Specific Invasive Plant Treatment EIS		State: Oregon			
SPECIES (population segment)	**STATUS***	**PREFIELD REVIEW Usual Habitat in OR/WA**	**Species Presence**		**Effect Determination**
			Habitat Present?	**Species Present?**	
Long-eared myotis *(Myotis evotis)*	OR-SU	Statewide: found in coniferous roost in tree cavities and beneath exfoliating bark in both living trees and dead snags.	Y	Y	Minor effect
Long-legged- myotis *(Myotis volans)*	OR-SU	Statewide: especially dependent on wooded habitats of coniferous forests, usually at elevations of 4,000 to 9,000 feet. Nursery colonies found in large mature trees that provide crevices or exfoliating bark, along openings or along forest edges where they receive a large amount of daily sun. Also found in rock crevices, cliffs, and buildings. Long-legged myotis forage over ponds, streams, water tanks, and in forest clearings, often on moths.	Y	Y	Minor effect

APPENDIX Y
Programmatic Agreement Regarding Cultural Resources Management

PROGRAMMATIC AGREEMENT AMONG THE UNITED STATES DEPARTMENT OF AGRICULTURE FOREST SERVICE PACIFIC NORTHWEST REGION (REGION 6), THE ADVISORY COUNCIL ON HISTORIC PRESERVATION, AND THE OREGON STATE HISTORICAL PRESERVATION OFFICER REGARDING CULTURAL RESOURCES MANAGEMENT IN THE STATE OF OREGON BY THE USDA FOREST SERVICE

WHEREAS, the United States Department of Agriculture Forest Service (Forest Service) manages the resources on lands administered by the National Forests of the Pacific Northwest Region; and

WHEREAS, the Forest Service is directed by Congress to provide both financial and technical assistance on State and private lands; and

WHEREAS, the Forest Service has determined these activities often qualify as undertakings that may have an effect on properties included in or eligible for inclusion in the National Register of Historic Places (NRHP); and historic property(s) means any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic places (36 CFR 800.16(l)(1))

WHEREAS, the Forest Service recognizes the importance that properties with traditional religious or cultural values have to Federally recognized Indian Tribes (Tribes), and have invited affected Tribes to comment on this Programmatic Agreement (PA).

WHEREAS, this Agreement supersedes and replaces the Programmatic Agreement among the United States Department of Agriculture, Forest Service, the Advisory Council on Historic Preservation, and the Oregon State Historic Preservation Officer regarding Cultural Resources Management on National Forests in the State of Oregon, signed March 1995,

NOW, THEREFORE, the Forest Service, the Council, and the SHPO agree that the Forest Service shall administer its activities subject to sections 106 and 110 of the National Historic Preservation Act, in accordance with the following stipulations:

STIPULATIONS

I. To participate under this PA, a Forest shall meet the following stipulations:

A. Employ a professional in the protection of historic and archaeological resources, hereafter known as a Heritage Preservation Specialist (Specialist), who meets the qualifications referenced in 36 CFR 800.2(a)(1), and is employed at the Forest Supervisor's Headquarters. This Specialist shall meet the qualifications as defined in the Secretary of Interior's Professional Qualifications Standards (48 FR 44738-9). In cases where the Forest Service Historic Preservation Officer determines that a Forest Specialist does not possess the necessary qualifications to perform a specialized preservation function, the Forest will use available expertise from outside the immediate staff. The Forest shall:

1. Have completed and follow an inventory design for the discovery of historic properties that has been written or reviewed, and approved by the SHPO within the last five years. Tribes and interested parties will be provided an opportunity to review proposed and approved inventory designs as they relate to the identification properties of traditional religious or cultural importance.

2. Maintain and utilize a records system that is compatible with the SHPO record system for sharing information. The Forest Service and SHPO shall ensure that their record systems are compatible for all historic properties. The Forest Service and SHPO will be mutually responsible for accuracy of the records system.

3. The Forest Service Region 6 Historic Preservation Officer shall monitor and evaluate Forest program qualifications during the normal program administrative duties including evaluation of candidates for employment, functional assistance program reviews, and program reviews. The USFS shall provide immediate notification to the participating parties and tribes when a Forest does not meet these qualifications.

B. Any Forest that does not meet these qualifications must comply with 36 CFR 800 until such time as its program becomes re-qualified as determined by the Forest Service Regional Office based upon recommendations from the Regional Historic Preservation Officer and agreed to by the SHPO, and Council.

II. Tribal and Public Participation

A. Consultation with American Indian Tribes

1. Each Forest shall seek the views of appropriate Tribes (36 CRF 800.16(m)) with regard to the identification and evaluation of properties and the assessment of effects of undertakings on any historic property during the earliest feasible steps of project planning.

2. The Forest Service shall ensure access to decisions made pursuant to this Agreement and will consider comments or objections by appropriate Tribes in a timely manner consistent with the procedures established in this agreement.

3. To the extent possible, each Forest shall integrate Tribal consultation requirements following established protocols for Government-to-Government relations and the National Environmental Policy Act (NEPA) 36 CFR 800.8(a)(2).

4. Forests shall develop consultation procedures with appropriate Tribes that are sensitive to their modes of communication, cultural values, and systems of interaction, and the views of their traditional cultural authorities.

5. Each Forest will review established consultation procedures with the appropriate Tribes annually, and update them as necessary to ensure consultation is timely and effective.

B. Other Consulting Parties and General Public

1. Representatives of local governments, applicants for Federal assistance, permits, licenses, and other approvals, and certain individuals and organizations with a demonstrated interest in the undertaking may participate as consulting parties (36 CFR 800.2(c)(3)-(5)).

2. The Forest Service shall seek and consider the views of public in a manner that reflects the nature and complexity and its effects on historic properties.

3. The Forest Service will, except where appropriate to protect confidentiality, seek the participation of consulting parties and the public in the agency's effort to identify historic properties, evaluate their significance, and assess an undertaking's effects upon historic properties (36 CFR 800.2(d)).

III. Project Review

Each Forest will develop a formal process to ensure that the Forest specialist is informed of all projects, programs, and activities. Professional Heritage Specialists shall provide the responsible Line Officer appropriate recommendations for consideration in priority setting and decision-making.

In evaluating the proposal, the Specialist shall determine if the proposed action is an "undertaking" pursuant to the definition provided at section 301(7) of the NHPA. If the proposed action meets the definition of an undertaking, the "area of potential effect" (APE) shall be determined by the Specialist pursuant to the definition provided at 36 CFR 800.16(d). "Effect" means alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register (36 CFR 800.16 (i)). Comments received during Tribal and public participation shall be considered when determining the APE, identifying properties, determining eligibility, and assessing effects. The Specialist shall assess information needs to determine whether field inventory is required, shall ensure any required inventory follows the current Forest inventory design, and ensure that all properties within the APE are identified. The Specialist is responsible for the review of and determining the finding of effect for all undertakings subject to the following.

A. Programmatic Review:

Some undertakings have little or no potential to affect historical properties because their nature or size and, therefore, will be reviewed in accordance with Appendices A, B, and C. The streamlined procedures in Appendices A, B, and C are designed to reduce unnecessary identification, documentation, and review efforts by parties to this agreement, while still providing adequate protection of historic properties and qualities that could contribute to their eligibility.

If, at any time, a historic property that may be eligible for the NRHP, or could possibly be eligible for the NRHP, could possibly be affected by the undertaking, then the Specialist will assess the effects and seek ways to avoid, minimize, or mitigate any adverse effects of historic properties (36 CFR 800.1(a)). The Specialist shall make the determination as to whether an undertaking qualifies for review under the Appendices and document this decision or whether it merits standard review pursuant to Stipulation III.B below.

1. Appendix A contains a list of those undertakings which, by definition, would be considered undertakings, but typically have negligible potential to affect historic properties.

2. Appendix B contains a list of those undertakings, which, also by strict definition, would be considered undertakings, and may have some limited potential to affect historic properties. The Specialist shall determine the level of inspection, monitoring, or other identification, as necessary.

3. Appendix C contains a list of those activities that have no potential to cause effects to historic properties (36 CFR 800.3 (a)(1)).

4. Any party to this Programmatic Agreement may propose to modify, add to, or delete from the classes of undertakings in Appendices A, B, and C. The proponent will provide written notification to the other parties of the proposed change. Upon agreement by all parties, the changes will be implemented. Prior to the approval of modifications, the Forest Service shall elicit the views of federally recognized Tribes.

5. All Forests shall report applications of Appendices A and B annually, pursuant to Stipulation VIII.

B. Standard Case-by-Case Review

All other undertakings not meeting one of the conditions in Appendix A, B, or C, be subject to the stipulations below:

1. For undertakings where an appropriate inventory of the APE has been conducted in accordance with an approved inventory design, and no property(s) that could

possibly meet the criteria for the NRHP (36 CFR 60.4) are found within an undertaking's APE, the Specialist shall document the results of such inventory efforts as "No Historic Properties Affected," and the Forest may proceed with the undertaking after making the information available to the public.

2. Where a Forest causes an undertaking's APE to be inventoried in accordance with an approved inventory design, or an intensive inventory resulting in 100 percent coverage of the APE, and when such inventory results in the identification of properties that may qualify for the NRHP, the Specialist may find that the undertaking will have "Historic Properties Avoided." The Forest shall document this and proceed with undertaking in lieu of a consensus determination of eligibility pursuant to 36 CFR 800.4, provided that avoidance of all eligible properties is achieved in accordance with the following identification and avoidance procedures:

   a. The Forest shall consult with the appropriate Tribe(s) and interested persons to identify and determine the presence of traditional cultural properties within an undertaking's APE. Where consultation or an inventory of an APE has revealed the presence of a traditional cultural property, the Specialist shall consult pursuant to 36 CFR 800.4-6.

   b. A property discovered during identification activities will be documented following the Secretary of Interior's Standards and Guidelines for Identification (48 FR 44720-3), including a record of the precise location of the property with its surface and subsurface boundaries adequately identified, to ensure that the qualities that may make the property significant would be avoided. Documentation must also include sufficient information on the appearance, significance, and integrity of the property to make a determination of its significance. All site evaluation on State and private land requiring a permit will be completed in compliance with State law.

   c. The Specialist will determine, based on the attributes of each identified property and the nature of the undertaking, what avoidance procedures should be implemented. The Specialist will take into account potential visual, audible, and atmospheric intrusions and will decide if they are pertinent to the qualities that may make the property eligible. If the Specialist determines that they are, the Specialist will impose a buffer zone around the property that will ensure avoidance of those qualities.

   d. The Forest Service and SHPO may agree that certain classes of unevaluated properties are not eligible through one or more memoranda of agreement. These agreements will be attached to this programmatic agreement and provided to the Council. Prior to the approval of any proposed memorandum of agreement, the Forest Service shall elicit the views of the appropriate federally recognized Tribes.

9 If a previously unidentified property is discovered during project implementation, and no such plan is available the Forest shall fulfill its consultation requirement in accordance with 36 CFR 800.12(b).

10. Consultation and coordination among Forest Service, the SHPO, the Council, the appropriate Tribes and other interested parties, pursuant to this Agreement, shall be the responsibility of the Regional Forester or Forest Supervisors, as delegated.

IV. Existing Agreements

A. This Agreement incorporates signed agreements and signed management plans for the treatment of specific classes of historic properties among the Forest Service, ACHP, and SHPO. The application of these agreements ranges from Forest-specific to Region-wide in scope. Each agreement will continue to be implemented if deemed applicable by all parties. These agreements include the following:

1. Programmatic Memorandum of Agreement, signed January 1984 (Lithic Scatter Programmatic Memorandum of Agreement-Management Strategy for the Treatment of Lithic Scatter Sites, Studies in Cultural Resource Management No. 7, USDA Forest Service, Pacific Northwest Region, 1988).

2. Programmatic Memorandum of Agreement for Historic Water Transportation Ditches, Wallowa-Whitman, (Forest Service) published in the Federal Register October 22, 1985.

3. Programmatic Memorandum of Agreement for Historical Railroad Systems, United States Department of Agriculture, Forest Service, Wallowa-Whitman National Forest, signed September 1986.

4. Programmatic Memorandum of Agreement for Management of Depression-Era Administrative Structures on National Forest Lands in Washington and Oregon, signed December 1983 (Internal Management Guidelines, USDA Forest Service, Pacific Northwest Region, 1989).

V. Heritage Preservation Program

The Heritage Preservation Program of the Forest Service will meet the requirements of section 110 of the NHPA. The Forest Service will use the National Heritage Strategy as the guideline to accomplish this goal. As part of this program, the Forest Service shall continue to initiate, as appropriate, the following measures in partnership with SHPO:

A. Establish ongoing programs on all Forests to ensure that the terms of this PA are being upheld. Such programs should include, but not to be limited to, site visits during and after undertakings, and Regional Office reviews of Forest Programs to ensure that the resources provided to the Forests are being expended in the most effective manner. Site records will be updated as needed and provided to the SHPO.

B. Establish an ongoing monitoring program to evaluate the effectiveness of the avoidance procedures established at Stipulation III.B.2 of this agreement. The results of the evaluations will be reported in the Annual Monitoring Report (VIII.D). If needed, revisions will be addressed at the annual review meetings (IX).

C. Establish a program for ongoing determinations of eligibility of previously unevaluated properties on lands currently managed by the Forest Service (NHPA section 110). This may include the use of the Passport in Time program and other public participation programs (NHPA section 110 (a)(4)).

D. Utilize Geographic Information Systems and data base technologies to track and analyze site locations and develop models to guide future inventories and evaluations.

E. Develop context statements and historic property preservation plans for classes and types of properties managed by the Forest Service when applicable. The context statements and preservation plans will be provided to SHPO.

F. Conduct non-project related inventory in specially designated areas to improve the veracity of survey designs to locate historic properties and promote more informed management decisions.

G. Complete public participation projects such as Site Stewardship, Heritage Expeditions, Windows on the Past, and Passport in Time. These programs are the foundation of the Forest Service Heritage Preservation Program as outlined in National Strategy. They meet the paired goals of providing resource protection through public education and resource management through the labor of skilled volunteers. Section 106 compliance and NEPA review for these projects will be conducted when required.

H. The Forest Service will support cooperative historic preservation training programs when appropriate.

VI. Training

A. Agreement Training

The Forest Service, with the SHPO and Council's assistance, shall design and administer training to implement this Agreement. The training will include detailed explanation of the procedures in the Agreement and the roles of the consulting parties. Training will be aimed at Forest Service, Tribes, and SHPO management and staff with annual refresher courses.

B. Specialist Training

The Forest Service, in cooperation with SHPO, Tribal governments, other Federal agencies, and institutions of higher learning shall provide Historic Preservation training opportunities to Forest and District Specialists.

VII Dispute Resolution

A. Should the SHPO or Council object to the adequacy of any plans, specifications, or actions proposed pursuant to this Agreement, the Forest Service shall consult with the objecting party to resolve the objection. If the Forest Service or objecting party determines that the objection cannot be resolved, the Forest Service shall forward all relevant documentation of the dispute to the Council. Within 30 days after receipt of all pertinent documentation, the Council will either:

1. Provide the Forest Service with recommendations that the Forest Service will take into account in reaching a final decision regarding the dispute; or

2. Notify the Forest Service that it will comment pursuant to 36 CFR 800.6(b)(2), and proceed to comment. Any Council comment provided in response to such a request will be taken into account by the Forest Service with reference to the subject of the dispute. Any recommendation or comment provided by the Council will be understood to pertain only to the subject of the dispute; the Forest Service's responsibility to carry out all actions under this agreement that are not the subject of the dispute will remain unchanged.

B. At any time during the implementation of the measures stipulated in this agreement, should an objection to any such measure or its manner of implementation be raised by a Tribe or any member of the public, the Forest Service shall take the objection into account and consult as needed with the objecting party, the SHPO, or the Council to resolve the objection.

VIII. Annual Monitoring Report

The Forest Service shall prepare an annual monitoring report for the SHPO and the Council that describes Forest Service actions pursuant to this Agreement during the previous fiscal year. This report will be the baseline for discussions at the annual review stipulated in IX below. The reporting year shall be the Federal fiscal year and will be due to the SHPO on or before October 15 of each new fiscal year. The following information will be included in the annual monitoring report:

A. Total of all actions by Forest for each consultation stipulation, including undertakings that qualified for review by the Specialist under Appendices A and B.

B. Total number and type of undertakings for which an objection was issued or dispute arose and the manner by which each objection was resolved.

C. Evaluation of effectiveness of avoidance measures selected at Stipulation III.B.2.

D. Detailed account of activities accomplished pursuant to Stipulations V and VI.

E. Forest Service comments, findings, observations, or recommendations relevant to the implementation of this Agreement.

F. Other reasonable information requested by SHPO or Council relevant to implementation of this Agreement and identified to the Forest Service before the beginning of the Federal fiscal year to be reported.

IX. Review

The Forest Service and the SHPO may meet annually, as mutually agreed upon, for the purpose of reviewing the terms of this agreement. The Forest Service shall invite the ACHP to attend. Principal contacts are the Deputy State Preservation Officer for the State of Oregon, the Historic Preservation Officer for the Pacific Northwest Region, and the responsible staff for the Advisory Council on Historic Preservation Office.

X. Freedom of Information Act (FOIA).

Any information furnished to the Forest Service under this instrument is subject to the Freedom of Information Act (5 U.S.C. 552); except that information as specified by Exemption (3) (5 USC 552b) of FOIA, Archaeological Resource Protection Act of 1979, as amended, and NHPA.

XI. Participation in Similar Activities.

This instrument in no way restricts the Forest Service or the Cooperators from participating in similar activities with other public or private agencies, organizations, and individuals.

XII. Amendments

Any party to this Agreement may request that it be amended, whereupon, the parties will consult in accordance with 36 CFR 800.14 to consider the amendment.

XIII. Suspension for Cause

Upon determination by any party to this Agreement, of a documented pattern of failure to comply with this Agreement, the party may request in writing to the Forest Service that a Forest be excluded from the terms of this agreement. Upon receipt of such a request, the Forest Service shall consult with the parties to seek agreement or other actions that would avoid suspension. If a mutually acceptable solution to avoid suspension is not reached within 60 days of the objecting party's request to the Forest Service Regional Office, the suspension shall take effect. Suspension from this Agreement requires the pertinent Forest to comply with 36 CFR 800.3-7 with regard to all undertakings that otherwise would be reviewed under this Agreement. Suspension of a National Forest from the terms of this Agreement may be lifted with unanimous consent of the Forest Service, SHPO, and the Council.

XIV. Termination

Any party to this Agreement may terminate it by providing 60 days written notice to the other parties, provided that the parties will consult during the period prior to termination to seek agreement on amendments or other actions that would avoid termination. Termination of this Agreement or failure to abide by its terms shall require the Forest Service to comply with 36 CFR 800.3-7 with respect to undertakings that otherwise would be reviewed under this Agreement.

XV. Execution

Execution and implementation of this Programmatic Agreement satisfies the Forest Service Section 106 responsibilities for all individual undertakings on lands in the State of Oregon.

XVI. Implementation

This agreement becomes effective on the date of the last signature below and will be implemented immediately.

3/21/04
LINDA GOODMAN — Date
for Regional Forester
Pacific Northwest Region

5/17/04
JAMES M. HAMRICK — Date
Deputy State Historic Preservation Officer
Assistant Director for Heritage Conservation,
State of Oregon

6/4/04
JOHN M. FOWLER — Date
Office of the Executive Director
Advisory Council on Historic Preservation

APPENDIX A

TYPES OF UNDERTAKINGS EXCLUDED FROM CASE-BY-CASE REVIEW

Included below are Forest Service undertakings that will be excluded from case-by-case review because they have little or no potential to affect historic properties. The Specialist (Stipulation I.A.) will make the determination whether an undertaking meets the conditions of one or more of the following actions and can be excluded from case-by-case review.

The Specialist will document the decision that an undertaking is excluded from case-by-case review. The documentation will be kept on file at the Forest Supervisor's office. A summary of the number and types of undertakings excluded from case-by-case review will be included in the annual monitoring report prepared by the Forest Service for the SHPO and the Council.

The Specialist, at their discretion, may decide to follow standard review procedures under Stipulation III.B, or require an inspection or monitoring following procedures in Appendix B for any undertaking listed below.

ARCHAEOLOGICAL

1) Fence construction and maintenance that does not require blading of the fence line and that does not disturb rock cairns or channel animals in transportation corridors through archaeological sites.
2) Planting on streamside landslides or flood deposit "high-bars" near streams and rivers.
3) Planting or seeding in disturbed areas such as harvest units, skid trails, landings, hot-burned streamside areas, degraded meadows, and cable corridors.
4) Inter-planting appropriate conifer species among even-aged riparian hardwoods (such as alder and willow).
5) Pre-commercial thinning with under-story plantings.
6) Creation of snags.
7) Installation of routine signs or markers within or alongside existing roadways or trailways.
8) Encroachment thinning using hand methods to lop branches and cut small trees, and leaving debris on the ground.
9) Special-use permits that would add another user and related electronic equipment to an approved communication facility or structure, or not requiring substantial new installation of equipment that would be visible from a nearby NRHP-eligible site and not requiring the expansion of the facilities permit area where there is no new ground disturbance.
10) Seismic operations on maintained roads or trails, including the controlled placement or subsurface use of explosive charges, where no blading, or other land modifications are necessary.
11) Use of existing material source sites where no expansion of the source or the existing footprint will occur.
12) Issuance of special-use permits where the potential to cause ground disturbance or affect historic properties is negligible, including but not limited to:
    a. Along rivers, well-established trails, and other specified areas where use is similar to previous permits for which environmental documents have been prepared, and which

would not substantially increase the level of use or continue unsatisfactory environmental conditions.

b. Where uses are consistent with planning decisions or land allocations, as applicable, and where there will be no ground disturbance.

c. River use permits where campsite locations are restricted to areas along the river that have been previously surveyed and historic properties are not located.

13) Campground, recreation residence, organizational camp, and resort operation and maintenance when no new ground disturbance occurs (i.e., repair of existing buried utilities, tables, and fire rings) and no alterations to historic properties are involved.

14) Trail reconstruction within existing trail right-of-way.

15) Non-mechanized post and pole harvesting or pre-commercial thinning firewood cutting. Non-mechanized refers to the absence of conventional logging equipment. These projects, such as post and pole, pre-commercial thinning, and firewood cutting, could involve the use of a pick-up truck and a chainsaw.

16) Reforestation planting by hand, excluding site preparation that involves surface disturbance or ripping.

17) Special land use designations that do not authorize surface-disturbing projects (wilderness study areas, environmental education areas, Research Natural Areas, etc.).

18) Placement of monitoring stations where no ground disturbance is involved (e.g. stream gauges).

19) Routine or preventive operation and maintenance activities on Forest Service facilities that do not affect historic structures or previously undisturbed ground.

20) Instream structure placement that does not involve ground disturbance activities.

21) Flood damage repair to roads, bridges, and other facilities when the facility involved is not of historic significance and the rehabilitation is confined to the previously affected areas.

22) Meadow or power-line corridor mowing to prevent encroachment by brush species and establishment of noxious weeds.

23) Cattle guard installation and other such road facilities within the road prism.

24) New construction of aboveground water holding tanks and lines with no new ground disturbance.

25) Trail obliteration when there are minor route changes in places where there are no historic properties or features.

26) Landscape-scale low-intensity under-burning where fire sensitive historic properties are absent and existing fire lines or existing roads or natural barriers will be used as fire lines.

27) Removing and replacing non-historic culverts that are located entirely within the road prism.

28) Removal of non-historic structures or buildings where there will be no new ground disturbance.

29) Removal of modern dumps that are not associated with historic properties.

HISTORIC STRUCTURES and OTHER FEATURES

30) Mechanical systems when repair, replacement, and installation of the following systems does not affect the exterior or require installation of new ducts through the interior: electrical work, plumbing pipes and fixtures, heating, ventilation, and air conditioning system improvements, and installation of fire, smoke, or carbon monoxide detectors and security systems.
31) Installation of grab-bars and minor interior modifications for handicapped accessibility.
32) Installation of insulation, if installed from the interior, or blown in attic insulation, if venting does not change the roof design.
33) Repair of~~,~~ fencing, driveways, parking areas, exterior retaining walls, exterior steps or stairs, canals, and walkways when work is done in-kind to match existing materials in form and design.
34) Power-washing of exterior masonry if performed at no more than 600-psi with mild detergent, and otherwise meeting the Secretary of Interior's Standards.
35) Masonry repair including repointing and rebuilding chimneys if the joints are done by hand and the mortar is matched to original composition, color, texture, and application technique.
36) Repair and replacement of roofing, gutters, and roof drain systems with materials that match the existing material and form are allowed.
37) In-kind repair of foundations when work is done to match existing materials and form.
38) Installation of wheelchair ramps meeting building code as long as ramps can be easily removed
39) Repair of porches, cornices, doors, balustrades, stairs, or trim when the repair is done in-kind to match existing materials in form and design.
40) Caulking and weatherstripping with compatibly colored materials and are not permanently affixed to the structures.
41) Installation of handrails and guardrails to meet building code if not attached to significant detailing and designed in a compatible manner that does not detract from the historic character.
42) In-kind repair of deteriorated windows to match the existing material, size, configuration, muntin depth, muntin reveal, and muntin detail.
43) In-kind repair of deteriorated siding materials to match existing material in form and dimension.
44) In-kind interior wallpaper or painting when there is no change in color or form.
45) Repair of floors, including stone and concrete, when work is done in-kind to match existing materials in form and design.
46) In-kind repair of signs and awnings.

APPENDIX B

TYPES OF UNDERTAKINGS EXCLUDED FROM CASE-BY-CASE REVIEW BASED ON INSPECTION OR MONITORING

Included below are Forest Service undertakings that may be excluded from case-by-case review based on inspection or monitoring. A Specialist will make the determination whether an undertaking meets the conditions of one or more of the following actions listed below, will examine any previous inventories to determine whether they meet current inventory standards and are adequate for the current undertaking, and will determine whether pre-inspection and/or monitoring during the activities is appropriate for the undertaking.

The Specialist will document the decision that the undertaking is excluded form case-by-case review and whether any inspection or monitoring is required. Upon approval by the Forest Specialist, the District cultural resource specialist or a qualified cultural resource technician may perform inspection or concurrent monitoring. Following inspection and/or monitoring, a report will be submitted to the Specialist within 30 days of the last day of inspection and/or monitoring. The Specialist will review the report and certify the completion of the inspection and/or monitoring. The report will be kept on file with the decision document at the Supervisor's Office.

In event that properties are located, the project will be redesigned to ensure that the properties will be avoided as determined by the Specialist in accordance with the avoidance procedures at III.B.2. Documentation of all located properties will be sent to SHPO. If avoidance procedures are not possible, or if any question exists as to the effectiveness of avoidance, the project shall cease immediately, and the Forest shall consult with the SHPO and ACHP pursuant to 36 CFR Section 800.13(b) to consider the discovery.

A summary of the number and types of these inspected or monitored undertakings will be included in the annual monitoring report prepared by the Forest Service for the SHPO and the Council.

The Specialist may determine that special circumstances require a normally excluded undertaking to follow stipulation III.B.

1) Enclosures constructed for protective purposes and small study areas.
2) Construction of corrals and other fence structures that lead to the concentration of livestock in a confined area.
3) Relieving inboard ditchlines more frequently (to prevent critical amounts of drainage water discharge).
4) Rocking non-native road surfaces (to armor against road surface erosion and maintain design drainage configuration against traffic impacts, especially where roads must remain open during wet periods).
5) Road decommissioning including ripping, culvert removal, out sloping, water barring, stabilization (following analysis) potentially unstable fills, and seeding and planting native vegetation, and mulching, if needed.
6) Range improvements or/maintenance (i.e., pipelines and reservoirs).

7) Designated road or trail closures accomplished with gates, barricades, berms, and waterbars.
8) Seeding and planting, blading or the ripping of native or nonnative-surfaced roadways or trailways.
9) Installation of wildlife feeding, salting, and watering stations.
10) Approval of minor modifications to or minor variances from activities described in an approved mineral exploration plan that could not affect historic properties.
11) Approval of minor modifications to or minor variances from activities described in an approved mine operations plan that could not affect historic properties.
12) Campground, recreation residence, organizational camp, and resort operation and maintenance when there may be new ground disturbance but no alterations to historic properties.
13) Relocation of trail segments where historic properties are not affected.
14) Off-highway vehicle (OHV) trail designations that utilize existing roadways and trailways provided that no properties have been recorded within or adjacent to the roadways or trailways.
15) Issuance of recreation special use permits when the event is utilizing existing roads, recreation trails, or well-established livestock trails, and which would not increase the level of use or continue unsatisfactory environmental conditions.
16) Mechanized single-tree salvage, post and pole harvesting, pre-commercial thinning and superior tree clearing and maintenance where historic properties are not affected.
17) Prescribed burns where burning, line construction, or mop-up will not impact historic properties that consist of wooden structures or other fire sensitive features, or where special and proven protective measures are taken (e.g. wrapping, sprinklers) to preserve such features from fire effects.
18) Installation of buried utilities or power pole/tower replacement when placed in previously disturbed ground.
19) Proposed undertakings in areas that have been surveyed twice under an inventory strategy meeting current standards where no historic properties are affected.
20) Hazard tree removal using existing skid trails, roads, or other hardened surfaces where historic properties are not affected.
21) Placing riprap material on eroding lake, reservoir, or river shorelines where there may be new ground disturbance but no alterations to historic properties.

APPENDIX C

NO POTENTIAL TO CAUSE EFFECTS

The following includes a list of the undertakings that have *No potential to cause effects* (Section 800.3 a (1)): If the undertaking is a type of activity that does not have potential to cause effects on historic properties, the agency official has no further obligations under section 106. Included below are Forest Service undertakings that will be excluded from case-by-case review because they have little or no potential to affect historic properties. The Specialist (Stipulation I.A.) will make the determination whether an undertaking meets the conditions of one or more of the following actions that can be excluded from case-by case review.

The Specialist will document the decision that an undertaking is excluded form case-by-case review. The documentation will be kept at the Forest Supervisor's office.

1) Aerial or hand vegetation spraying/fertilization or grass seeding including undertakings issued by permit.
2) Invasive plant species eradication through the application of herbicides and hand removal (including hand tools such as shovels to dig up roots).
3) Replacement of non-historic watering troughs with no new ground disturbance.
4) Maintenance, snow removal, and resurfacing when confined to an existing road prism, parking lot, airstrip, or heliport where historic properties (roads, railroad grades, ect.) and native surface roads are not involved.
5) Recurrent brushing (hand, machine, chipping) activities to control vegetation within the existing clearing limits of roads, trails, parking lots, in power line corridors, airstrips, or heliports.
6) Modification of existing fences to provide wildlife ingress and egress.
7) Re-introduction of endemic or native faunal special into their historic habitats.
8) Establishment of long-term study plots for botanical research projects; botanical re-introduction studies which may involve driving stakes (i.e., rebar or angle iron) in the ground several feet, to serve as reference points.
9) Wildlife habitat improvement projects such as: hand planting of bitterbrush and other forage and browse; aerial seeding; and thinning from below (non-mechanized removal of down material).
10) Installation of nesting platforms and boxes.
11) Re-introduction of endemic or native floral species into their historical habitats, not previously surveyed.
12) Transfer of use authorization from one federal agency to another when an action such as a boundary adjustment necessitates changing a right-of-way from one Federal agency to another.
13) Issuance of special-use permits, easements, and other agreements where no surface disturbance is authorized and where no properties greater than 50 years old are involved (i.e., filming of movie and video productions, apiary permits, information collection).
14) Renewals, assignments and conversions of existing special-use permits, easements and other agreements where existing stipulations in the permit are sufficient to protect any historic properties that may be involved.

15) Upgrading or adding new lines (power or telephone) to existing poles, when there is no change in pole configuration.
16) Authorization for installation of devices to protect human or animal life (i.e., raptor electrocution prevention devices or grates across mines).
17) Dispersed noncommercial recreation activities such as Christmas tree cutting, hiking, hunting, fishing, camping, mountain biking, horseback riding, winter sports, photography, and mushroom gathering.
18) Issuance of recreation special-use permits for the following activities:
    a. For windsurfing events on lakes and reservoirs.
    b. Development of cross-country ski trails where ground disturbance is not involved.
    c. Development of snowmobile trails where ground disturbance is not involved and where noise or associated activities will not affect historic properties.
    d. Recreational activities conducted on snow-covered ground where there is no ground disturbance and where noise or associated activities will not affect historic properties.
19) Replacement of recreational, special designation, bulletin boards or information signs, barrier posts, and visitor registers within the existing footprint in both Forest Service developed sites and resort complexes.
20) Routine trail maintenance.
21) Pruning of clipping branches of trees by hand and leaving clippings where they fall, or removing (i.e., Christmas boughs) if no ground disturbance occurs.
22) Gathering of yew wood bark by de-barking standing trees or cutting of pole-sized trees that do not involve ground disturbance in felling or transportation.
23) Post harvest chipping operations in existing landings or skid trails in areas previously surveyed.
24) Construction of snow fences for safety purposes or to accumulate snow for small water facilities.
25) Removal of previously determined non-eligible objects and materials (including abandoned vehicles, dumps, and fences) and reclamation of the same previously surveyed site.
26) Inventory and data collection including land use and land cover, geologic, mineral and resource evaluation activities, cadastral surveys, geophysical surveys, and approval of permits for such activities, as long as no ground disturbing activities are involved.
27) Rendering formal classification of Federal lands in the United States as to their mineral character, waterpower, water storage values, plant association, ecological potential, and forage condition use.
28) Hazards abatement including elimination of toxic waste sites, drug labs, and marijuana plantations as long as historic properties are not involved.
29) Gopher control except those involving surface disturbing activities (i.e., ripping).
30) Removal of logjams and debris dams using hand labor or small mechanical devices.
31) Filling of non-historic abandoned mine shafts, adits, and stopes or other underground workings.
32) Landscape-scale special products harvesting when the ground-disturbance involved is point-specific and minimal.
33) Small placer-mining operations in streams, channels, and gravel bars below the high water mark.
34) Mulching and re-vegetating bare, erosion-prone surfaces such as cuts and fills.

APPENDIX Z
Response to Comments

APPENDIX Z: Response to Comments

The objective of this section is to display the public comments received by the USDA Forest Service regarding the three alternatives presented in the Draft EIS for the Site-Specific Invasive Plant Treatments, and to provide responses to these comments. The public comments were used to update and finalize the analysis in the Final EIS, and to help the Responsible Official select an alternative.

Z.1. Comment Period

The Draft EIS was released and distributed to the public on May 22, 2006. The Notice of Availability appeared in the Federal Register on May 26, 2006, initiating the formal 45-day comment period, which ended on July 13, 2006. Approximately 22 hardcopies of the documents, 191 CDs, and 977 summaries were either mailed or delivered to individuals, organizations, interested Tribes, and government agencies. All recreational residence permitees, approximately 550 people, received a summary or CD announcing the project. In addition, the document was made available on the Mt. Hood National Forest website (http://www.fs.fed.us/r6/mthood/projects/) and the project website (http://www.fs.fed.us/r6/invasiveplant-eis/site-specific/MTH/). Hard copies of the document were made available for public viewing at 6 USDA Forest Service offices.

Z.2. Responding to Comments Process

During the pubic comment period 25 responses were received (See Table Z-1). Consistent with the National Environmental Policy Act (NEPA), 40 CFR 1503.4(b), this volume addresses substantive comments on the DEIS. Substantive comments include those which challenge the information in the DEIS as being inaccurate or inadequate, or which offer specific information that may have a bearing on the decision. Non-substantive comments are those that express opinions without any accompanying factual basis or rationale to support the opinion; these comments are maintained in the project file in Mt. Hood National Forest Headquarters, Sandy, Oregon.

A process for responding to comments on a DEIS has been outlined in the USDA Forest Service Handbook (FSH) which states that the agency preparing the EIS must "review, analyze, and respond to substantive comments on the draft EIS" (FSH 24.1). Possible responses to substantive comments include:

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; and,
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.

All comments were assigned a unique identifying code and logged in. Each substantive comment was then assigned to a subject matter expert for a detailed response. All comments and response are part of the administrative record for this EIS, and have been considered during the decision-making process.

Table Z-1. List of Respondents to the DEIS.

Letter Number	Agency, Organization, Business, or Individual	Letter Number	Agency, Organization, Business, or Individual
1	LeRoy W. Layton, Individual	14	Larry Grant, Individual
2	B. Sachau, Individual	15	Jean Anderson, Individual
3	Kim Antieau, Individual	16	Carl Ray Clark, Individual
4	Linda Short, Individual	17	Jurgen Hess, Columbia Gorge Institute
5	Ron Garcia, Individual	18	Jordan Kim, Hood River Soil & Water Conservation District
6	B Strasburger, Individual	19	David Marshall, Individual
7	Emery Ingham, Individual	20	Don Mench & Christy Slovacek, Individuals
8	Jack Burkhalter, Individual	21	Preston Sleeger, U.S. Department of the Interior, Office of Environmental Policy & Compliance
9	Steven M. and Karen R. Schoenfeld, Individuals	22	Gloria Wiemann, Individual
10	Vern Holm, Northwest Weed Management Partnership	23	Joanna Wagner, Northwest Environmental Defense Center
11	Jennifer Vollmer Ph.D., Environmental Resources Specialist, BASF Corporation	24	Katy Coba, Oregon Department of Agriculture
12	Anne Saxby, Manager, Hood River Soil and Water Conservation District	25	Michael Carlson, Clackamas River Basin Council
13	Dave Anderson, Water Quality Manager, City of The Dalles	26	Christine B. Reichgott, Manager of NEPA Review Unit, U.S. Environmental Protection Agency

Z.3. Comments and Responses

The proceeding tables display the substantive comments and USDA Forest Service response by issue area. Full letters are not reproduced in this appendix, expect for comment letters received from governmental agencies (Federal, State and local) per FSH 24.1.1.(b). All comment letters are available in the project file in Mt. Hood National Forest Headquarters Office, Sandy, Oregon.

KEY ISSUES			
ISSUE: Treatment Effectiveness			
Invasive plant treatments can vary in effectiveness, depending on the invasive species to be treated, size of the population/infestation, method of treatment, and a host of other factors including timing, weather, soils, and moisture. The choice of treatment methods in combination with other factors needs to reflect a balance between optimum effectiveness and protection of the desirable botanical resources. The proposed alternatives and treatment methods vary in how well they provide the tools to effectively treat invasive species and protect natural resources, including water quality, fish, wildlife, soil productivity, and native plant communities. Further, the presence and spread of invasive plants within the Forest and Scenic Area may affect the presence and spread of invasive plants on neighboring ownerships. The effectiveness of treatments would influence if and to what degree invasive plants might spread to other ownerships.			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
2.2	Treatment methods	Use hand pulling or goats and stop poisoning every inch of earth in this country.	All alternatives utilize a range of invasive plant treatment methods; none propose to poison every inch of the earth. Emphasis would be placed on non-herbicide treatment unless they are ineffective. See Sections 1.3 and 2.1.3 for more details.

ISSUE: Treatment Effectiveness			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
6.5	Comment/ opinion/position statement [1]	In the long run herbicides don't really work, but they are fairly easy to administer and the herbicide makers are happy to receive the federal funds.	Comment noted.
11.3	Comment/ opinion/position statement	Addition of newer chemistry will aid in reducing the active ingredient to the environment while also increasing effectiveness of treatments. Therefore, I support the Proposed Action alternative.	Comment noted.
11.5	Early Detection/ Rapid Response strategy	All vehicle tracks (including road and utility right-of-ways (ROW)) and hiking trials, excluding wilderness, should be included in the EIS. These are all major possible routes of spread. Due to budgeting, work force and numerous other resources that will be most likely limiting factors to treatment, the opportunity for spread beyond the designated Invasive Plant Treatment Areas is highly likely. Rather than minimizing approved treatment areas and waiting for the invasive plant occurrence to spread, causing a need for amendments and delays, add all travel routes now to assure a cost effective, efficient overall program. These areas and situations maybe covered under the Proposed Action alternative, EDRR, last paragraph of page 2-33.	The Early Detection / Rapid Response strategy (EDRR) allows for treatment of uninventoried invasive plant sites that are unknown at this time and/or new infestations that become established in the future. The intent is to minimize the time between invasive plant detection and USDA Forest Service response (treatment). The EDRR is described in Sections 1.3, 2.1.3. and 2.1.4.

[1] The statement is: 1) a comment, opinion, or position statement with no specific concerns noted about adverse effects of the Proposed Action on a resource; 2) already decided by law, regulation, Forest Plan/Management Plan, or other higher-level decision; 3) outside the scope of the Proposed Action; 4) irrelevant to the decision to be made; or, 5) conjectural and not supported by scientific evidence.

ISSUE: Treatment Effectiveness			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
26.1	Toxicology	Because science cannot, in any practical sense, assure safety through any testing regime, pesticide use should be approached cautiously.	A conservative, cautious approach is taken throughout the Invasive Plant ROD standards (2005b) and PDC, which are above and beyond label restrictions and advisories. For example, PDC A.8. states: "Herbicide applications would not exceed the typical application rates specified in Table 2-7, except for imazapyr." Invasive Plant ROD Standard 15 (2005b) does require the use of licensed herbicide applicators, which are trained and tested in safety application techniques, as well as safe disposal techniques. The Invasive Plant ROD standards (2005b) are listed in Appendix A; the PDC are listed in Section 2.2; and layers of caution are discussed in Section 3.3.
26.2	Toxicology	Aside from the potential for toxic effects to people, overuse of pesticides may cause problems such as: a)killing beneficial organisms that would otherwise help control pests; b) promoting development of pesticide resistance in pests, which starts a vicious cycle in which more and more pesticides are needed: c) resurgence of pest populations, and d) contamination of the environment.	Compliance with Invasive Plant ROD, Standard 12 (2005b) would reduce the need for repeated herbicide treatments over time by requiring the development of a long-tem site strategy for restoring / revegetating invasive plant sites prior to treatment. By using effective treatment methods and minimizing the adverse effects to non-target species, this project would comply with Standards 19 and 20. The restoration strategies for this project as discussed in Section 2.1.3. Herbicide label advisories further disclose the potential for the development of herbicide resistance for specific herbicides. All label directions would be followed, as required in PDC A.1. Also, see response to Comment 2.2 (Issue: Treatment Effectiveness). Non-herbicide treatment methods would be used unless they are ineffective.

ISSUE: Economics and Social Resources			
Invasive plant treatments vary in cost, which affects the acreage that could be effectively treated each year given a set budget. The proposed treatments would be costly and fiscal resources are always limited. In addition to cost efficiency, the treatment methods vary in the amount of employment provided. Increasing the number of jobs could benefit local communities that are suffering from reduced employment levels.			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
6.6	Economics	Hand digging and pulling give people jobs and has a much less negative impact.	Section 3.7.3 of the EIS shows that more jobs would be created as the amount of manual and mechanical treatment increases. Hand pulling, however, does not have less impact necessarily and these manual treatments may actually exacerbate the invasive plant problem. As documented in Section 3.6.2, for example, “some authorities do not recommend manual or mechanical treatment of hawkweeds because disturbance to the plant could stimulate the growth of new plants from fragmented roots, stolons, and rhizomes and redistribute the plants, increasing their rate of spread (Montana State University Extension Service, 2006).” In Section 2.5.2, the analysis concluded that “many of the invasive plants proposed for treatment are most effectively controlled with herbicide methods, making non-herbicide methods ineffective and unsuccessful.”
17.7	Economics	While expensive, this more natural weed control method provides jobs for rural people and is effective. Of course, a caution is that goats tend to eat everything, including native plants.	Comment noted. As documented in Table 2-2, “grazing could either promote or reduce invasive plant abundance at a particular site. When grazing treatments are combined with other control techniques, such as herbicides, severe infestations could be reduced and small infestations may be eliminated.

ISSUE: Economics and Social Resources			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
17.10	Outside the scope	Funding must be addressed in this strategy. Show Congress what the complete costs are. Educate congressional staffers as to the issue and what the needs are – that's not lobbying.	See response to Comment 17.6 (Issue: Monitoring and Maintenance).
26.3	Economics	Integrated pest management, when viewed by traditional economics, often results in lower costs than conventional pest management. Additional costs beyond those considered in traditional analysis are likely to shift the balance even further towards IPM. Some of these additional costs are: potential long-term health effects, contamination of the environment, effects of pesticides on non-target animals and plants, the health effects to someone who may be particularly sensitive to a pesticide or pesticides, and any other effects that are not now understood, but will be uncovered over time.	The alternatives were analyzed using a combination of economic, quantitative, and qualitative measures to provide an assessment of effects beyond that considered in "traditional" economics. See Section 3.7 – Economics for more details. Integrated weed management (IWM) [a.k.a. IPM] techniques are incorporated into all alternatives. IWM is a process by which one selects and applies a combination of management techniques (manual, mechanical, and herbicide for example) that, together, would control a particular invasive plant species or infestation efficiently and effectively, with minimum adverse impacts to non-target organisms. It is species-specific, site-specific and designed to be practical with minimal risk.

ISSUE: Water Quality and Aquatic Organisms			
The application of herbicides in riparian areas has the potential to contaminate water and cause mortality to fish and other aquatic species. Herbicides that do not directly affect fish may affect their food chain through lethal effects to aquatic insects, plants, or algae. Sub-lethal effects, such as behavior changes, could result in increased vulnerability to predators. 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.			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
23.17	Water quality	Water quality and the well-being of aquatic organisms are threatened more by herbicidal control methods than by either invasive plants or non-chemical means of controlling invasive plants. The Forest Service must carefully analyze the effects of its proposed actions on dissolved oxygen, water temperature, stream turbidity, peak flows, low flows, water yield, and water chemistry. The area of most concern is that of water chemistry. We urge the Forest Service to consider a less herbicide-intensive method of invasive plant control.	A thorough analysis of effects to water quality and aquatic organisms is contained in Sections 3.9 and 3.10, and associated specialist reports. This analysis utilizes a blend of pertinent research, monitoring, modeling and literature review to display anticipated effects to water quality and aquatic organisms from implementing all of the proposed alternatives. Section 3.9 includes discussion on the direct, indirect and cumulative effects of water quality from soil, disturbance, turbidity and fine sediment; dissolved oxygen and nutrients; water temperature; peak flows/low flows/water yield; riparian structure; and water chemistry. This section was updated to clarify the analysis conducted and the results. Alternative 3 (Restricted Herbicide Use) considered a less herbicide-intensive method of invasive plant control. Only 4,047 acres were proposed for herbicide treatment.

ISSUE: Water Quality and Aquatic Organisms			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
23.18	Aquatics	We also urge the Forest Service to use caution when treating invasive plant populations near riparian areas. Aggressive treatment may not be necessary to protect riparian systems; it might damage them instead. While “trained field crews that are effectively supervised can achieve safe herbicide applications that do not result in biologically significant direct application or drift of herbicide into vegetated areas more than 25’ from the edge of the treated area,” (DEIS 3-139) perfect applications may not be the norm. Thus a plan of action that completely eliminates herbicide applications anywhere near the vicinity of these streams would be ideal. The Forest Service must remember that the effects of some herbicide ingredients – surfactants, adjuvants, and inert ingredients – have not been thoroughly studied, and aquatic species are more susceptible to their effects than terrestrial species.	Only trained and State or federally licensed applicators would apply herbicides at all treatments sites within the Forest and Scenic Area. In addition, PDC were carefully crafted to greatly reduce, if not eliminate, the chance that herbicides would drift or otherwise move off-target. As outlined in Sections 3.9 and 3.10, the effects to riparian dependent native fauna and flora as a result of invasive plant treatment are expected to be negligible. Riparian function and structure, in terms of native vegetation benefits, would improve as a result of proposed invasive plant treatment. If riparian areas were not treated, invasive plant populations would continue to spread, and have degrading impacts to riparian native vegetation composition and riparian structure. The best available information was used in the peer reviewed risk assessments, including information regarding surfactants, adjuvants, and inert ingredients. These results were incorporated in the aquatic-related analysis and in the formulation of PDC (Section 2.2). See also response to comments 3.2, 11.16, 23.10, and 23.16.
23.19	Aquatics	Of specific concern are the seventeen sites mentioned on DEIS 3-151, for which modeling showed that four herbicides (glyphosate, AQ glyphosate, AQ triclopyr, and picloram) could result in exposures that exceed the acute NOEC for fish. The Forest Service expects the amount of herbicide to reach the water to be less than modeled, due to “physical characteristics that would further minimize the risks posed by herbicides such as well vegetated buffer strips, larger streams than modeled, and few acres treated in the aquatic influence zone.” (DEIS 3-151). This would be unnecessarily risky behavior on the part of the	The analysis presented in Sections 3.9 and 3.10 outlines why the GLEAMS model used in the SERA risk assessments would overestimate amounts of herbicide reaching water at Forest and Scenic Area treatment sites. PDC would further reduce the actual amount reaching any water body. The four herbicides do not all exceed the acute NOEC at all seventeen sites – there are other herbicides proposed for use at each of the sites that could be used instead that did not exceed the acute NOEC. Viable populations of aquatic species would be maintained if invasive plant treatments are

ISSUE: Water Quality and Aquatic Organisms			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
		Forest Service, and contrary to the mandates of 36 C.F.R. 219.19, which states that "Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native species," and 36 C.F.R. 219.27(a)(1), which states that "All management prescriptions shall: Conserve soil and water resources and not allow significant or permanent impairment of the productivity of the land."	implemented as proposed. None of the herbicide or other treatment methods would result in death of any individuals, and any sub-lethal effects would be biologically irrelevant (i.e. they would not reduce fitness, survival, or some aspect of behavior).
23.20	Aquatics	The Forest Service admits that, "Alternative 3 relies more on manual and mechanical treatments. For example, over half of the riparian reserve acres (52 percent) in this alternative would be treated with non-herbicide methods only, compared to less than 1 percent in Alternative 2. Similarly, 57 percent of aquatic influence zone treatments would be non-herbicide treatments only, compared to 0.1 percent in Alternative 2." Under this plan, fish at only seven sites would face the possibility of mortality due to applications of glyphosate. Surely the Reduced Herbicide Use Alternative is a better plan of action for aquatic species. However, the Forest Service excuses itself from this action by claiming that control methods would be less successful and would require that sites be treated more frequently. The Forest Service has defeated its own logic, however; no additional damage to the environment would occur from more frequent treatments, because only minimal damage is expected to occur from manual, cultural, and mechanical means of control in riparian areas. It is the price of labor that is the issue.	Section 3.10.2.4 - There would be no mortality of any fish resulting from herbicide application under this alternative (Alternative 3). The EIS acknowledges there are seven sites in this alternative, compared to 17 in Alternative 2, where the ***predicted*** herbicide concentration ***could*** exceed the acute NOEC for fish. However, the actual amounts reaching water would be less than predicted due to site conditions and PDC (Section 2.2). Chapter 2 in the EIS describes the underlying assumptions regarding treatment efficiency. Manual and mechanical methods generally are not as efficient as herbicide treatment. For some invasive plant species, manual or mechanical treatment may actually exacerbate the infestation, leading to continued existence and spread (see Section 3.6).

ISSUE: Water Quality and Aquatic Organisms			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
24.6	Water quality	One of the pesticides on the proposed list, triclopyr, was detected in surface waters during the USGS National Ambient Water Quality Assessment (NAWQA) studies of the Willamette Basin. (pubs.usgs.gov/circ/circ1161/nawqa91.html). The number and frequency of detections of various herbicides found in the NAQWA study suggests that standard application practices may result in presence of herbicides in streams, sometimes above water quality standards. It should be noted that the occurrence in Oregon waters of some of these pesticides, such as chlorsulfuron, imazapic, imazapyr, metsulfuron methyl, sethoxydim, and sulfometuron methyl is unknown because of a lack of water quality data.	A thorough analysis of effects to water quality and aquatic organisms is contained in Sections 3.9 and 3.10, and associated specialist reports. This analysis utilizes a blend of pertinent research, monitoring, modeling and literature review to display anticipated effects to water quality and aquatic organisms from implementing all of the proposed alternatives. These sections were updated to clarify the analysis conducted and the results. In addition, PDC aimed at minimizing or eliminating detrimental effects to water quality were developed using the aforementioned sources. Some of the sources of the PDC include Best Management Practices (BMP) suggested by the Oregon State Department of Environmental Quality (DEQ) for pesticide and herbicide application along with BMPs recommended by the Environmental Protection Agency (EPA) Region 10 for source water protection. The majority of pesticides identified in the referenced USGS National Ambient Water Quality Assessment (NAWQA) studies of the Willamette Basin, were found in basins draining predominately agricultural or urban areas. The report states that “Only atrazine and deethylatrazine were detected in streams draining forested basins (greater than 90 percent forest, by area), and these compounds were present at extremely low concentrations (0.002 to 0.004 µg/L)” (Wentz et al, 1998). Neither of these herbicides is proposed for use with this project.
24.7	Aquatics	As a result of a lawsuit filed against the EPA by the Washington Toxics Coalition (2002), a federal judge ordered that “buffer zones” be placed around salmon bearing streams for the application of certain pesticides. Of the 26 pesticides still being investigated for their potential effects on threatened and endangered salmon species, diuron, 2,4-D, and triclopyr are the only three that are approved for use	Triclopyr is the only herbicide proposed for use in this project that is discussed in the Washington Toxics Coalition et. al. vs. EPA lawsuit. For triclopyr, the order from the lawsuit specifically excludes noxious weed programs and allows “the use of pesticides for control of state-designated noxious weeds as administered by public entities, when such control program implements the following safeguards that

ISSUE: Water Quality and Aquatic Organisms			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
		on national forests. DEQ asks that the USFS keep these restrictions in mind during the potential application of these pesticides. (www.epa.gov/espp/wtc/maps.htm)	NMFS (National Marine Fisheries Service) routinely requires for such programs . . ." (dated January 22, 2004). The safeguards are listed in Section 1.4 of this EIS. These safeguards are incorporated into the PDC and through consultation with regulatory agencies, including NMFS and U.S. Fish and Wildlife Service.
24.8	Water quality	The Source Water Assessments of the Safe Drinking Water Act Amendments provide a database of information about the watersheds and aquifers that supply public water systems in Oregon. USFS should consult with DEQ to ensure that the GIS shape files of the 5th-field watersheds and aquifer recharge areas are included in the USFS GIS data in this area. As the USFS project team selects alternatives to address areas within the municipal watersheds and groundwater recharge areas, the focus should be on decreasing the risks presented by the potential contaminant sources on national forests.	The most recent information on locations of the Drinking Water Protection Areas was secured from the DEQ and is included in Appendix V. This was confirmed in a July, 2006 phone conversation with Sheree Stewart of DEQ.
24.9	Water quality	Within the mission, budget, and legal authority, we request that the USFS consider local drinking water protection priorities when developing management plans for federal lands and facilities. This will preserve the use of public funds that would otherwise be spent to upgrade treatment facilities to remove the contaminants downstream.	Considerable effort went into reducing or eliminating potential detrimental effects to water quality from this project. Section 3.9 – Water Quality includes a full discussion of those potential effects. This section was updated to clarify the analysis and results.
24.10	Water quality	To prevent the potential increase in sedimentation from the removal of vegetation, we recommend the use of less intensive treatments in the areas adjacent to public water supply streams and the intakes. We do recognize that vegetation removal can occur from natural events, especially as a result of fire.	Invasive plant eradication has the potential to temporarily leave treatment areas with reduced ground cover which in turn has the potential for increased erosion and resulting sedimentation. In addition, equipment used in plant treatment has the potential to disturb or displace soil, making the soil more vulnerable to erosion. Short term erosion would be mitigated by creation of a restoration plan that would identify specific measures to ensure protection against erosion and resulting sedimentation. These

ISSUE: Water Quality and Aquatic Organisms			
Comment Number	Comment Summary/Topic	Comment Text	Response to Comment
			measures would be tailored to reduce erosion based on site specific conditions in the treatment areas. Typical measures such as application of mulch, hydroseeding with soil binding agents or erosion control blankets may be used to reduce the potential for soil detachment from raindrop impact and create a favorable environment for native vegetation to re-establish faster in the treatment area. See Sections 3.8 – Soil Productivity and 3.9 – Water Quality for more details. These sections were updated to clarify the analysis and results Also, see response to Comment 23.17 (Issue: Water Quality and Aquatic Organisms).
24.11	Water quality	Herbicides can negatively impact the water quality in streams and groundwater serving as public water supply sources. Most herbicides are not monitored at the intakes or wells for public water supplies as part of the routine requirements to meet federal drinking water standards. Most communities and public water providers do not have the resources to increase their monitoring capabilities when significant areas are sprayed adjacent to or upstream of their intake or well.	See response to Comment 24.6 (Issue: Water Quality and Aquatic Organisms). Also, Section 3.9 – Water Quality provides more information on the potential effects to water quality in streams and groundwater servicing as public water supply sources.
24.12	Water quality	We recommend that USFS establish direct communication with the public water system operator or community liaison downstream of the USFS land management areas. As with all of our state and federal partners, we request that USFS's management alternatives in the municipal watersheds/aquifers should be selected to support the overall goal of providing the highest quality water possible to downstream intakes and wells.	Contact was made to cities that have Drinking Water Protection Areas identified for treatment. The cities were provided an opportunity to comment on the project. Contact with these various entities would continue throughout the life of the treatment proposed with this project as this is a very important communication link to maintain.

RESOLVED ISSUES

ISSUE: Human Health and Safety

Invasive plant treatments within the Forest and Scenic Area may result in health risks to forestry workers and the public, including contamination of special forest products and drinking water. The health and safety of forestry workers and the public may be at risk from exposure to herbicides. The public expressed particular concern about human health effects related to the toxicity of chemicals and drinking water contamination. Public concern for drinking water contamination is high for the Forest, since it serves as a drinking water source for approximately a third of Oregonians. Implementing the PDC, as required by the alternatives, would mitigate any possible impacts to human health and safety.

Comment Number	Comment Summary/Topic	Comment Text	Response to Comment
2.1	Comment/ opinion/ position statement	I for one am sick and tired of toxic chemical pollutants covering our forests in the drive to get rid of invasive exotics.	Comment noted.
3.3	Toxicology & treatment methods	I have asthma and chemical sensitivities and could become seriously ill if I come in contact with pesticides. Unfortunately we have many people in the area with cancer and other immune problems who could also be harmed by these herbicides.	Risk assessments indicate these herbicides would not be detrimental to human health, given proposed application methods and rates. For instance, cancer risks are smaller than one in a million (SERA, 2001b; 2003a; 2003b; 2003c; 2004a; 2004b; 2004c; 2004d; 2004e; 2004f). Further discussion of the health risks are contained in Section 3.5 – Human Health and Safety.

ISSUE: Human Health and Safety			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
6.4	Toxicology	I have cancer and could become seriously ill if I come in contact with pesticides. Unfortunately we have many people in the area with other immune problems who could also be harmed by these herbicides.	See response to Comment 3.3 (Issues: Human Health and Safety).
15.2	Toxicology	One needs to be mindful of current and prior lawsuits and, at minimum, EPA phaseouts of acknowledged "dangerous pesticides"… In the late 1960s persons in the Coast Range observed that their lands were being sprayed by the FS under the guise of "eliminating weeds and scrub"…The described "harmless" agent in the Siuslaw NF areas was identified as being 2,4,5T -- "dioxin" the most toxic molecule known at that time. It became widely known as "Agent Orange", the air-deposited pesticide used first in the Viet Nam. Agent Orange's effects are now a definitive issue for the VA's treatment of affected military personnel -- and a costly error for all taxpayers in terms of financially supporting the gross neglect of the dangers of Agent Orange. Similarly, despite the on-going use domestically of other pesticides, many have been shown to be carcinogens (19 products), 13 have been hormone system.	Standard 16 of the Invasive Plant ROD (2005b) states: "Select from herbicide formulations containing one or more of the following 10 active ingredients: chlorsulfuron, clopyralid, glyphosate, imazapic, imazapyr, metsulfuron methyl, picloram, sethoxydim, sulfometuron methyl, and triclopyr." This site-specific EIS tiers to these standards. As such, only the ten active ingredients listed in this standard are proposed for use on the National Forest System lands. 2,4,5T (a.k.a. Agent Orange) and other "EPA phaseouts" are not approved for use. Information from laboratory and field studies of herbicide toxicity, exposure, and environmental fate was used to estimate the herbicide risks in the risk assessments. Formal risk assessments were done by Syracuse Environmental Research Associates, Inc. (SERA) using peer-reviewed articles from open scientific literature and current EPA documents, including Confidential Business Information. They considered worst-case scenarios including accidental exposures and application at maximum label rates. At the project scale, additional layers of caution would be integrated into herbicide use in both action alternatives:

ISSUE: Human Health and Safety			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
			• Treatment methods would be limited to those necessary to eradicate, control or contain invasive plants on the Forest and Scenic Area. No aerial treatment is proposed and broadcast application would be limited to certain areas. Treatment methods would be chosen based on the decision key presented in Figure 1-4. • PDC would ensure proposed herbicide exposures do not exceed conservative thresholds of concern for human health, water quality as well as botanical, wildlife and aquatic species of special concern. The analysis throughout Chapter 3 demonstrates that herbicide use is unlikely to result in exposures of concern. More information on the impacts of herbicide use on human health and safety can be found in Section 3.5 of this EIS.
23.10	Toxicology	Important questions about the dangerous effects of some herbicides remain unanswered. The chemicals deemed safest for application, strangely enough, appear to be those least thoroughly studied. The effects of Imazapic on soil organisms have not been studied at all. NEPA also mandates that the Forest Service evaluate the nonlethal effects of herbicides on plants. The DEIS omits important recent research in this area, which examines the mutagenic effects of 2,4-D at exposure levels below application rates, and the increase in disease susceptibility to plants exposed to glyphosate. Finally, it is crucial to further investigate how herbicidal chemicals combine together to become synergistically toxic, and how their inert ingredients, and surfactant and adjuvant additives, affect plants and soils.	Risk assessments considered active ingredients, additives, surfactants, metabolites and inerts. The risk assessments are discussed in Section 3.3 – Herbicides, Adjuvants, Surfactants and Inert Ingredients, and referenced throughout the document. Uncertainties have been considered and disclosed throughout Chapter 3. Uncertainties are addressed through PDC that limit the rate, type and method of herbicide application sufficiently to eliminate exposure scenarios that would cause concern. Imazapic is degraded by soil microbes (See Section 3.8 – Soil Productivity). Some studies have shown arthropod population increases over controls, as they can utilize the carbon on some of the herbicides as a food source. There are effects of herbicides on non-target plants, as discussed in Section 3.6 – Botany and Treatment Effectiveness.

ISSUE: Human Health and Safety			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
			2,4-D is not proposed for use in this project. Only the 10 herbicides analyzed in the Invasive Plant FEIS (2005a) can be used on the Forest and Scenic Area. These herbicides are listed in Invasive Plant ROD, Standard 16 (2005b). Further, there are no known synergistic effects with any of the proposed herbicide formulations, as analyzed in the Invasive Plant FEIS (2005a). The environmental effects documented from field research of these formulations have been reviewed and the risk assessments for all proposed herbicides have disclosed known effects.

ISSUE: Public Notification			
The application of herbicides raises many public concerns; informing the public of invasive plant treatments would help alleviate some concerns. Information regarding location, time, and treatment method/type should be provided before treatments begin. Public notification is a required component of the PDC.			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
15.3	Public involvement	I was unable to attend the "open house" on this subject . Notice of this event appeared on the same day as it was to occur, in the Oregonian via a very small announcement. Surely this was an ineffective way to announce such a vital issue to the public.	The USDA Forest Service hosted two open houses on June 8, 2006 in Hood River and June 19, 2006. Press releases announcing these meetings were distributed to local newspapers, including The Oregonian, on May 26, June 6 and June 14, 2006. Announcements of the meetings appeared in Sandy Post, Hood River News and The Oregonian. In addition, information regarding the open houses was posted to the Mt. Hood National Forest website as well as the project website (http://www.fs.fed.us/r6/invasiveplant-eis/site-specific/MTH/). Finally, a postcard announcing the meetings was distributed to the project mailing list. A copy of the list is available at the Mt. Hood National Forest Sandy Office.

TRACKING ISSUES			
ISSUE: Native Plant Communities			
Invasive plant treatments, especially herbicides may harm non-target plants, including culturally significant and special status species (USDA Forest Service Pacific Northwest sensitive plants, Survey and Manage plant species, federally listed plant species, and endemic plants). Different herbicides have varying degrees of potency and selectivity (e.g., some herbicides affect certain plant families more readily than others), and application methods vary in the potential for off-site drift. As invasive plants decrease, native plants are expected to benefit through increased habitat.			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
22.1	Toxicology	I am concerned by the use of herbicides like Imazapyr. It is not plant specific, so rare and endangered plants are also at risk. With a half-life of 17 months, and its high mobility, it can contaminate soil and water.	Imazapyr is a non-selective herbicide and as such does pose risks to non-target plants. These risks are managed through PDC that provide buffers around known sites of plants of concern. PDC E.1. details the botanical buffers incorporated into this project. Half life of Imazapyr in soil is 25 to142 days and the herbicide is decomposed by sunlight and soil microbes (See Appendix U). Potential exposures pose low risk to fish, birds, mammals, and bees. The effects to soil and water are minimized by following herbicide label requirements (PDC A.1.) and by properly implementing the PDC, especially PDC in Group F for Water Quality and Aquatic Organisms and Group G for soils. All PDC are listed in Section 2.2. More information on the properties of Imazapyr, and corresponding protection measures can be found in Appendix Q.

ISSUE: Native Plant Communities			
Comment Number	**Comment Summary/ Topic**	**Comment Text**	**Response to Comment**
23.9	Botany	The Forest Service fails to effectively consider the general impacts of its proposed actions. As a specific example, it fails to analyze the effects of herbicides on the population health of non-target plant species, saying that such information is unavailable, as studies have only been done on crop species. (DEIS 3-50). The Endangered Species Act (ESA) requires the Forest Service to use the best available scientific and commercial data in assessing the impacts to such species. The Forest Service has been using herbicides to eradicate invasive plant populations for years. Surely these treatments have produced some hard data about the effect of chemical control methods on non-target species. The law requires such data to have been collected. Additionally, the Management Plan for the Columbia Gorge National Scenic Area mandates specific sensitive plant protection standards. Revised Management Plan (RMP) at I-87-89. The Management Plan also includes a list of rare plant species in the Columbia Gorge. Management Plan, at I-134-35. Endemic species such as Howell's daisy (Erigeron howellii) and Oregon bolandra (Bolandra oregano) along with all listed rare plants must be protected by adequate buffer zones. The Forest Service must take special measures to prevent the further degradation of the habitat of sensitive plant species, eight of which are located in areas marked for invasive plant control measures. (DEIS 3-34). The Forest Service must also comply with the natural resource protection requirements for any actions that would occur in the National Scenic Area. Its willingness to gamble with the well-being of endangered	Negative impacts (adverse effects) on native plants from treatment of invasive plants are considered in the EIS. It is acknowledged that native plants, including special status plant species, may be harmed, weakened, or killed by treatment methods (manual, mechanical, cultural, or herbicide). Scientific research demonstrates that herbicide treatment is effective against invasive plants. Some herbicides are designed to kill only plants in certain genera or families in order to avoid killing non-target plants. Monitoring data indicates that these herbicides do not adversely impact non-target flora. This data generally are not in the scientific literature, rather the monitoring data is antidotal and professional judgment of USDA Forest Service botanists and their colleagues. The proposal outlines six steps to protect sensitive plant species (Project Design Criteria E.1 to E.6). These measures are analogous to those required by the Scenic Area Management Plan sensitive plant species protection guidelines. Buffer zones would be entered to treat invasive plants; a No Practicable Alternative Test and Mitigation Plan have been completed (See Appendix C). The project was also found to fulfill the General Management Area (GMA) Rare Plant guidelines. An Invasive Plant Treatment within Sensitive Buffer Zone “Practicable” Alternative Test and Mitigation Plan also were completed (see Appendix C). The EIS analyzed the sensitive plant species as defined by the Scenic Area Management Plan. Additional language has been added to Section 3.6. The analysis concluded that impacts to special status plants would be insignificant if the project is implemented with the appropriate PDC, which are designed to minimize or eliminate the negative impacts.

ISSUE: Native Plant Communities			
Comment Number	**Comment Summary/ Topic**	**Comment Text**	**Response to Comment**
		populations of plants is alarming.	The USDA Forest Service maintains monitoring data regarding herbicide and pesticide use and application on National Forest System lands. This information is available by contacting the Mt. Hood National Forest headquarters office of the Columbia River Gorge National Scenic Area office.

ISSUE: Wildlife Species			
The use of herbicides to treat invasive plants, if used in the certain habitats, could harm a variety of wildlife species. Late successional, wetland, talus, and aquatic habitats have special status species that may be affected by herbicides. 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. Wildlife, especially birds and mammals, may ingest vegetation or insects that have been sprayed with some herbicides and potentially experience these types of effects. Amphibians have semi-permeable skin that can absorb herbicides that affect them but herbicide effects to amphibians have not been thoroughly tested. Aquatic life stages of amphibians are susceptible to herbicides, but very little information has been documented on the effects of herbicides.			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
6.1	Toxicology	I am very concerned about pesticide use in the Mt. Hood National Forest and the Columbia River Gorge. These are heavily used recreational Areas and these areas contain many threatened and endangered species.	Risk assessments indicate these herbicides would not be detrimental to human health, given proposed application methods and rates. The PDC (Section 2.2) are designed to avoid or minimize potential effects on sensitive resources, including threatened and endangered species. These PDC ensure that there would be no effect to human health, including recreationalists, as discussed in Section 3.5 Aquatic: The aquatic organisms and habitat analysis indicates that the proposed herbicide application would not result in the direct mortality of any fish, including threatened and endangered species. The amount of herbicide entering streams harboring listed is expected to be biologically meaningless Effects, if any, from herbicide application to fish would be sub-lethal in nature. This analysis is discussed in Section 3.10.

ISSUE: Wildlife Species			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
			Wildlife: The wildlife analysis indicates that there would be no effect to either of the two threatened and endangered species (Northern Spotted Owl and Bald Eagle) that occur on the Forest and the Scenic Area. This is shown in Table 3-36, and the analysis for these species is in Section 3.11.
23.14	Correction	While the DEIS states that its goals will be reached by "manipulating vegetation to benefit fish and wildlife habitation. . ." (DEIS 1-3), there is no indication that this result would follow from the preferred action. The DEIS admits its own flaws in the Executive Summary, stating that the Proposed Actions "risks to non-target plants and animals, especially species of concern, have not been adequately evaluated." (DEIS 3-2). This clearly violates 36 C.F.R. 219.19, which states that "Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native species."	The two quotes in the comment cannot be found on the referenced pages or other sections of the DEIS. The purpose of this project is to eradicate, contain and control invasive plant infestations, to reverse the negative impacts caused by the invasive plants, and to restore healthy, native plant communities and function at the impacted sites in a cost-effective manner that meets current management direction. See Section 1.2 for more details on the purpose and goals.
23.21	Wildlife	The true effects of herbicide applications on individual wildlife species are unknown and it is unwise to gamble with the health of already threatened animal populations. The use of herbicides to manage invasive plants has the potential to harm free ranging wild animals and birds, especially those that eat grass and insects. Alternative 2 chemically treats the greatest amount of habitat that includes mature forest, thus increasing the potential for exposure of special status species wildlife. (DEIS 3-175). It increases the amount of herbicide sprayed by 500%! It makes little sense to choose an action alternative that increases the survival pressures on already	The EIS discloses that there is some uncertainty in the wildlife effects analysis. As a means to gain additional information across a wide range of species groups, surrogates have been used in testing taxonomic groups of animals and fish are used as a surrogate for aquatic amphibians (See Appendix X). The surrogates for testing are listed in Tables X-1 and X-2 in Appendix X. The Regional Invasive Plant FEIS (2005a) Appendix P is referenced. The wildlife analysis discloses that Alternative 2 bisects or traverses the greatest amount of mature forest. The wildlife analysis further points out that "by examining the life cycles of the special status species it becomes evident that the concern for exposure is minor because these species do not use the non-late seral habitats adjacent to their preferred late seral

ISSUE: Wildlife Species			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
		sensitive species. Conversely, there are no adverse effects to habitat from the use of manual, mechanical or cultural treatment to any of the species analyzed for any of the alternatives, with the exception of the possibility of disturbance of nesting birds. The Forest Service claims that, "[t]he biggest difference in the effect of [the Reduced Herbicide Use Alternative] compared to the Proposed Action is the effectiveness of the treatment. Manual, mechanical and cultural treatments have been attempted in the past as the sole way to control invasive plants and the effect has been met with very minor successes….This alternative still puts the species that rely on the early successional habitat at more risk from habitat loss, compared to the risk that a few individuals could receive a toxic dose of an herbicide treatment." (DEIS 3-177). However, we see no concrete evidence that the reason for the failure of past non-chemical methods of control was the method itself, rather than the product of the construction of new forest roads, or of clearcut logging, or of poorly executed mechanical treatment methods, or lack of follow-up on removal projects.	habitats on a regular or frequent basis" (Section 3.11 – Wildlife). Also, the wildlife analysis demonstrated that the habitats being treated are not the primary habitat for any species analyzed, except deer, elk, blue grouse, Pacific pallid bat, and band-tailed pigeons. The EIS discloses that these species could occasionally forage in treated areas, and could be exposed to herbicide (See Table 3-36 in Section 3-11). Some species may occasionally travel into the sprayed habitats when dispersing from their primary habitat; however, this effect also would be minor (See Table 3-36 in Section 3-11). The EIS points to several examples of invasive plants where manual and mechanical treatments have been attempted and were unsuccessful. Both The Nature Conservancy and the Montana State University Extension Service recommend against using manual and mechanical treatments for certain invasive plants. See Section 3.6 – Botany and Treatment Effectiveness for more details. See responses to Comments 23.2 and 23.3 (Issue: Prevention) for discussion of management activities.
23.22	Wildlife	The Forest Service is apparently willing to risk the well-being of threatened and sensitive species such as the Northern Spotted Owl and the Crater Lake Tightcoil ("It is possible that some individuals may be removed from the population" (DEIS 3-204) as well as from other mollusk populations). It is willing to experiment with the health of the populations of various salamanders and turtles, when the effects of herbicides on amphibians and reptiles is not as well understood. It is also willing to use herbicides on areas known to be frequented by deer and elk, knowing that they sometimes tend to forage repeatedly in the same areas and that they tend to	Section 3.11 - Wildlife discloses that in rare situations some species may be affected by herbicides. In the case of the Northern Spotted Owl, there would be no individuals harmed, harassed, killed, or injured by herbicides. There would be no impact to any of the primary constituent elements of spotted owl habitat. The indirect effect of noise and disturbance would be negligible due to the very small area of suitable habitat and low noise created by mechanical and sprayers in the project area. The majority of the invasive plant treatments that would create noise occur along roads and openings.

ISSUE: Wildlife Species			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
		ingest more herbicides than any other animal, due to their grazing on leafy herbs. Triclopyr is especially toxic to ungulates, but will nevertheless still be used as a spot spray.	In the case of the Crater Lake Tightcoil, the EIS discloses that there is a rare possibility that some individuals may be killed by invasive treatment in riparian areas. The analysis shows that the toxicology studies indicated that there would be no effect to mollusk from herbicide treatment. The wildlife analysis also points out that the footprint of the treatment is small and that PDC would assist in reducing this risk. Section 3.11 discusses that some deer or elk may be exposed to herbicides due to their foraging habits. If herbicides are used in openings of any type there is a high probability that deer and/or elk would ingest some herbicides. Since triclopyr is the most toxic to deer and elk the use of spot spraying would reduce the dosage that the deer or elk would receive. It is still possible for these animals to receive a dose that could cause harm or make them more susceptible to predators. The number affected is anticipated to be very small.

ISSUE: Soil Productivity			
Healthy soil organisms are fundamental to the ability of soil to provide water and nutrients to plants. All herbicides potentially can affect soil microorganisms. Manual and mechanical treatments may cause soil disturbance and/or erosion. Due to these potential impacts and the removal of vegetation, slope stability may be impacted.			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
11.17	Soils	Table 3-17: In regard to Imazapyr and soil persistence: I am unsure of what your data source is for the table, but it appears old soil persistence data was used (original data submitted to EPA). Prior to the knowledge that imazapyr was degraded in soil by micro-organisms, sterile soil was used for persistence studies. Obviously with no microorganisms in the soil, imazapyr was not broken down. Typically imazapyr has a half-life in soil of three months, similar to other Imis and SUs. There are no cases of imazapyr and imazapic having been detected in ground water.	This comment is correct. Based upon updated data, Table 3-17 has been changed to reflect the new information. The rankings in the table remain the same. The updated data can be found at: http://tncweeds.ucdavis.edu/products/handbook/17.imazapyr.pdf.
23.8	Soils & botany	The DEIS does not adequately consider both cumulative and general impacts to plants and soils. The current DEIS fails to show how past herbicide use and invasive species management activities have negatively or positively affected the environment. NFMA requires monitoring "at intervals established in the plan, implementation shall be evaluated on a sample basis to determine how well objectives have been met and how closely management standards and guidelines have been applied." 36 CFR 219.12(k). Vague or general statements of impact are not sufficient, impact from projects must be discussed on an individualized basis. Lands Council, 395 F. Supp. At 1028.	The cumulative and general impacts to plants are discussed in Section 3.6, and the impacts to soils are discussed in Section 3.8. Monitoring would occur to ensure that the treatments are meeting the prescriptions and to ensure that implementation has occurred according to our management standards. This is required for all activities. New language has been added to the document clarifying the role and extent of monitoring (see Section 2.3).

ISSUE: Soil Productivity			
Comment Number	Comment Summary/Topic	Comment Text	Response to Comment
		NFMA clearly directs the Forest Service to create regulations to “insure research on and (based on continuous monitoring and assessment in the field) evaluation of the effects of each management system to the end that it will not produce substantial and permanent impairment of the productivity of the land.” 16 U.S.C. § 1604(g)(3)(C); Sierra Club v. Martin, 168 F.3d 1 (11th Cir. 1999). There is no evidence that the Forest Service thoroughly monitored and assessed each particular invasive plant control action previously undertaken, as required by law. We instead read anecdotal comments about how such actions have failed in the past due to the restricted use of herbicides. Detailed data about how past Forest Service land use and management practices have affected vegetation is also lacking. (DEIS 4-206.) For example, we cannot know for sure that new weed infestations were a result of a pure failure of non-herbicide methods of control. They may have been the product of the construction of new forest roads, or of clearcut logging, or of spotty mechanical treatment methods, or lack of follow-up on removal projects. Such vagueness in analysis is impermissible.	Evaluation as to how well this has been conducted in the past is contained in the annual Forest Plan monitoring reports for the Forest and Scenic Area. The annual monitoring reports for the Forest are available on-line at: http://www.fs.fed.us/r6/mthood/publications/. The results of the monitoring reports are considered in the existing conditions sections contained in each resource area. In addition, impacts on individual sites have been disclosed in Chapter 3 in the EIS. Limited monitoring information is available regarding treatment effectiveness since neither the Forest or Scenic Area has had the authority for widespread treatment. Furthermore, the Invasive Plant ROD (2006b) requires that invasive plants be a consideration in all land use assessments as required by Standard 1 (Appendix A). As an example, any major road work (e.g., construction or decommissioning) must consider invasive plant prevention and treatment.
23.11	Law and regulations & soils	The DEIS must adequately analyze the impact of herbicides on soil resources and productivity. NEPA requires that an EIS contain “high quality information and accurate scientific analysis…If there is incomplete or unavailable relevant data, the [EIS] must disclose this fact” up-front. Lands Council, 395 F.3d at 1031-32 (citing 40 C.F.R. § 1502.22). Decisions based on fuzzy science should be unacceptable to the public. The Forest Service admits that “the effect of an herbicide treatment on the soil depends on the particular characteristics of the herbicide used, how it is applied, and soil physical, chemical, and biological conditions.” (DEIS	Council on Environmental Quality directs agencies to “evaluate reasonably foreseeable significant adverse effects on the human environment in an environmental impact statement and if there is incomplete or unavailable information, the agency shall always make clear that such information is lacking” (Section 1502.22). Each resource area includes an “incomplete and unavailable information” section (See Sections 3.3.3, 3.5.8, 3.6.6, 3.7.5, 3.8.8, 3.9.7, 3.10.4, 3.11.11, 3.12.5, 3.13.5, 3.14.6, and 3.15.9). Section 3.8.8 discloses the incomplete and unavailable information related to soil productivity.

ISSUE: Soil Productivity			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
		3-70). Generalizations about herbicide effects, then, are not permitted, and they are often attempts to minimize the lack of available data on the topics.	Section 3.8 – Soil Productivity provides information and analysis on the characteristics of the herbicide used, how it is applied, and soil physical, chemical, and biological conditions that would result in impacts. The potential impacts are summarized in Table 3-16, Table 3-17, and Appendix U. Appendix U provides a detailed report of the impacts of each herbicide on specific soil types. In addition, the PDC (Section 2.2) are designed to minimize or eliminate effects from invasive plant treatments, in part to provide added protection for the uncertainties associated with herbicides.
23.12	Soils	In one paragraph, the Forest Service says three different things: that herbicides are harmless, that they are less harmful than other methods of control, and that they really do not know much about the effect of herbicides on soil biology. Which statement is the public to believe? The Forest Service ultimately states that “it is likely that all herbicide treatments would have some effect on soil biota, but these effects would be more or less transitory depending on the timing, frequency, and herbicide used.” Basically, we are told that what we don’t know, won’t hurt us. This is unacceptable under NEPA.	

ISSUE: Tribal/Treaty Rights and Environmental Justice			
Protecting and maintaining traditional uses of plants, animals, fish, and water rights on tribal reservation lands and the treaty rights of American Indian Tribes is a trust responsibility of the Federal Government. The Confederated Tribes of Warm Springs have rights outside the bounds of their Indian reservation on ceded as well as usual and accustomed sites on the Forest. Invasive plant treatments have varying impacts to culturally significant plants, which include huckleberries (*Vaccinium membranaceum*), blue camas (*Camassia species*), and possibly bitterroot (*Lewisia rediviva*) for the Confederated Tribes of Warm Springs, Yakama Nation, Confederated Tribes of the Grand Ronde, Nez Perce Tribe, and Confederate Tribes of the Umatilla Indian Reservation.			
Comment Number	**Comment Summary/ Topic**	**Comment Text**	**Response to Comment**
26.10	Tribal	We appreciate the effort undertaken by the Forest Service to engage the Tribes, but recommend that the final EIS clarify the status of communication with the tribes that did not consult.	No comments were received from any tribe or tribal members during the 45-day public comment period. All Tribes were sent a letter inviting them to comment on the EIS and informing them of the comment period. The comment period expired and the USDA Forest Service did not receive comments from The Grand Ronde, Yakama, Umatilla and Nez Perce tribes allowed.

ISSUES OUTSIDE THE SCOPE

ISSUE: Implementing Invasive Plant Management

Some members of the public suggested that the USDA Forest Service have a budget adequate to control the spread of invasive plants. The budget would be supplemented by developing partnerships and using volunteers or other workforces. Partners and volunteer groups would provide assistance and expertise in the management and treatment of invasive plants.

Comment Number	Comment Summary/Topic	Comment Text	Response to Comment
1.2	Comment/ opinion/ position statement	Let's get this job done this year. Too much time & money is spent on this already & not much field work has been accomplished that I know of.	The USDA Forest Service must comply with laws and regulations, including NEPA before the project can be implemented.
14.1	Outside the Scope	I trust that your tool kit contains all proven treatment methods. In some cases, that may mean a crew/day armed with shovels & pruning shears. Some sites may best be treated with a controlled burn. While other sites may involve chemicals (1) applied via hand sprayer, quad sprayer or helicopter.	Comment noted.
18.2	Comment/ opinion/ position statement	Successful weed control requires a combination or sequential use of several methods (integrated weed management – IWM). IWM techniques are the least harmful and the most beneficial methods for weed control. Patterns of weed spread indicate that many species have a lag phase following introduction before they spread explosively. Therefore, early detection and	Comment noted.

ISSUE: Implementing Invasive Plant Management			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
		treatment before explosive spread will prevent many future problems and avoid the necessity of truly aggressive chemical management of an otherwise uncontrollable infestation	
20.2	Outside the scope	It is also important to fund the early protection/rapid response mechanism in order to follow through with invasive management.	USDA Forest Service funding is outside the scope of this EIS. Funding for invasive plant management on the Forest and Scenic Area would vary each year as budget levels change, information and knowledge concerning invasive plants improves, and invasive plant infestations are reduced. Appropriated treatment dollars are augmented and would continue to be augmented with partner and volunteer contributions.
20.3	Outside the scope	In the Sandy River Basin, there should be coordination with The Nature Conservancy knotweed eradication effort.	The Nature Conservancy has received all mailings and updates from the USDA Forest Service regarding this project. In addition, USDA Forest Service has been working with The Nature Conservancy in the Sandy River Basin, prioritizing and strategizing for the implementation of invasive plant treatments through a challenge cost share program. The challenge cost share program resulted in the development of a 5-year agreement between the Forest, Scenic Area, and The Nature Conservancy to eradicate invasive plant species in the Sandy River Basin in a holistic manner to achieve basin-wide ecosystem restoration objectives.
20.4	Outside the scope	When uses such as powerline corridors contribute to invasives, their special use permits should include funding support for the control and treatment efforts.	Project implementation is outside the scope of this EIS.
24.2	Comment/ opinion/ position statement	ODA is pleased to see an early detection and rapid response approach has been included in the DEIS and strongly supports this approach for invasive species management.	Comment noted.

ISSUE: Implementing Invasive Plant Management			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
25.2	Outside the scope	The continued success of our removal efforts on the lower river depends on timely treatment of known knotweed sites with the Clackamas basin on the Mt. Hood NF and identified in the DEIS. We are very concerned that if treatment continues to be delayed, fragments from plants growing upstream of River Mill Dam could re-colonize areas already treated by us downstream.	Comment noted.

ISSUE: Aquatic Invasive Plants			
Invasive plants floating or submerged in water.			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
12.3	Outside the scope	And in particular with the Soil and Water Conservation District, we are concerned about aquatic weeds. In addition to the purple loosestrife that we have had for a couple of years, various types of knotweed have taken hold in our area. There are a couple sites down in the Scenic Area down on Tanner and Maupin creeks that are not present on your maps, and I am hoping that those sites will be treated as well.	Invasive plants floating or submerged in water are currently being addressed through other federal actions in cooperation with the State; as such, these plants are not included in this analysis. (See response to comment 26.7 for more details.) All other invasive plant species, including purple loosestrife and knotweed, are included in this EIS. Only invasive plant infestations identified in the November 2004 inventory are analyzed in this site-specific EIS. Additional sites and species (e.g., purple loosestrife) can be considered for treatment using the EDRR as described in Sections 1.3, 2.1.3, and 2.1.4.
26.7	Outside the scope	On page 1-27 of the DEIS it is noted that the document will not address invasive plants floating or submerged in water because aquatic invasives, "are currently being addressed through other federal actions in cooperation with the states." Since aquatic invasives are an emerging issue on National Forest land and elsewhere, please provide more specific information about the efforts underway to address aquatic invasives. Should the efforts under development prove insufficient to address aquatic invasives; the FS will need to revisit this issue.	Currently, invasive plants floating or submerged in water are not present on the Forest or Scenic Area. These species are primarily a problem on larger waterways (e.g., Columbia River), where agencies, including U.S. Fish and Wildlife Service, NOAA Fisheries, and U.S. Army Corps of Engineers are conducting in-water treatments of invasive plants. In addition, the Invasive Species Council created by the State of Oregon House Bill 2181 works to prevent and minimize the effects of invasive species within the state. If aquatic invasive become established on either the Forest or Scenic Area, the USDA Forest Service would need to reassess the problem and potentially conduct additional NEPA to allow treatment.

ISSUE: Aerial Herbicide Application or Prescribed Fire			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
3.5, 4.3, 6.7	Toxicology; Treatment methods	If you must use them, it should be done by backpacks ONLY. Truck and aerial spraying are so harmful and the chances of accidental poisoning are great. What if someone is hiking or working in the area when the planes spray or the trucks fog? What about the animals? There is no way to control drift.	PDC minimize adverse effects to people and the environment. Aerial spraying is not proposed. Fog spraying is not proposed. Drift from broadcast spraying would be managed through use of low pressure systems and maximum nozzle size. Licensed applicators (compliance with Invasive Plant ROD Standard 15 [2005b]) ensure applicators are knowledgeable about drift management. The Forest would notify the public prior to spraying and inadvertent public exposure would be minimized (compliance with Invasive Plant ROD Standard 23 [2005b]). All Invasive Plant ROD standards (2005b) are listed in Appendix A. The proposed invasive plant treatments not have any effects to human health, including hikers and workers. See Section 3.5 – Human Health and Safety.
13.3	Treatment methods	The draft EIS specifies that use of prescribed fire is Outside the Scope of this proposal. Would that prevent the use of hand torches in the treatment of puncturevine? From personal experience in an ag setting, one of the most effective treatments for relatively small areas of puncturevine where seeds have already been produced is to burn the ground with a hand torch (not a drip torch) to "roast the nuts". Would that be allowed?	Prescribed fire was not considered or analyzed as a treatment method in the EIS and, therefore, cannot be used. Prescribed fire could be used as a treatment method in the future if additional NEPA analysis confirms its effectiveness and appropriateness for treating invasive plants.

ADDITIONAL ISSUES			
ISSUE: General Comments on DEIS/Purpose & Need			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
1.1	Comment/ opinion/ position statement	I do not have any technical comments concerning the eradication of these "weeds", however the USDA Forest Service "Proposed Action" plan sounds very well thought out so go ahead with this proposal	Comment noted.

ISSUE: General Comments on DEIS/Purpose & Need			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
1.3	Comment/ opinion/ position statement	I wonder if there is any merit in studying invasive species? I have a small woodland in Clackamas County & have many varieties of these plants to deal with. They appear to be very hardy, resilient to disease, & provide habitat for small animals, I have discovered. I use crossbow to dispose of these plants but wonder sometimes if let alone these plants would eventually be shaded out by trees etc. It is a very challenging problem I admit so keep up your work & take time to smell the Roses.	Comment noted.
3.1, 4.1, 6.2	Comment/ opinion/ position statement	I understand the need to control non-native species, but I strongly oppose any chemical means of doing so.	Comment noted.
3.2, 4.2, 6.3	Toxicology	Chemical pesticides are detrimental to area flora and fauna as well as to the water systems and the people in the forests or surrounding areas.	Scientific peer-reviewed risk assessments have been prepared for the herbicides proposed for use. The risk assessments indicate that the formulations proposed for use would not be detrimental to people, drinking water, and/or flora and fauna. PDC ensure the project complies with Invasive Plant ROD Standards 19 and 20 (2005b) to minimize or eliminate negative adverse impacts to non-target plants, animals and water. The Invasive Plant ROD standards (2005b) are listed in Appendix A, and the PDC are listed in Section 2.2. For more information, see Section 3.5 – Human Health and Safety.
3.4	Comment/ opinion/ position statement	My guess is that you'll use the pesticides anyway, even though herbicides don't really work. (If they did, you wouldn't have to keep using them.)	Effective measures for treating invasive plants are proposed. Common Control Measures (Mazzu, 2005) summarize proven effective control measures for treating invasive plants. These methods are the basis for treatments proposed in this project. The common control measures are summarized in Appendix G. All treatments would be followed by either active or passive restoration, and the restoration would be monitored over time. The restoration is aimed at

ISSUE: General Comments on DEIS/Purpose & Need			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
			establishing native plant communities, which would reduce and eliminate the need to use herbicides over time. The restoration approach for each treatment area is listed in Appendix F.
3.6, 4.4, 6.8	Toxicology	Please use the precautionary principle when making this decision.	Many layers of caution have been added to the proposal to use herbicides. The layers of caution are discussed in Section 3.3 and illustrated in Figure 3-2. These layers include label requirements, federal and state laws, EPA approval process, SERA Risk Assessment, Invasive Plant FEIS (2005a) and ROD (2005b), treatment methods, and PDC. Also, the project is guided by PDC that ensure herbicide use would be done in a cautious manner.
7.1	Comment/ opinion/ position statement	On invasive plants I'm for the "proposed action" <u>NO HERBICIDE</u>	Comment noted.
8.4	Comment/ opinion/ position statement	PS Somethings got to be done about <u>ScotBloom</u> [sic]	Scotch broom (*Cytisus scoparius*) is included in the list of invasive plants proposed for treatment in this EIS (see Table 2-3). Scotch broom is highly invasive and widespread within the Forest and Scenic Area, especially along highways and roads and in disturbed areas (e.g., clearcuts and quarries). In the Pacific Northwest, Scotch broom is considered "naturalized," meaning an invasive non-native that is now common and widespread. Thus, only a few treatment sites contain Scotch broom (see Appendix F). Additional Scotch broom populations within the Forest and Scenic Area may be treated in the future, but at present other invasive plant species identified in the EIS are of higher priority because of their ability to spread out of control rapidly (e.g., knotweeds, hawkweeds, butter and eggs, yellow star thistle).

ISSUE: General Comments on DEIS/Purpose & Need			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
9.1	Comment/ opinion/ position statement	I am in receipt of the draft proposals for invasive plant treatments around Mt. Hood Forest and the Columbia Gorge. I own a cabin near Government Camp on Forest Road 31. In reading the abstract, as well as the more detailed documents on the proposed treatments, alternative 3, the restricted herbicide use alternative seems most appropriate. That would be my preference. Thank you for soliciting our comments.	Comment noted.
10.1	Comment/ opinion/ position statement	I am writing to provide comments on the Mt. Hood and Columbia River Gorge National Scenic Area's DEIS. Empiric evidence strongly suggests that both the Mt. Hood National Forest and the CRGNSA are being threatened by invasive weeds from outside their boundaries, most notable garlic mustard, false brome, and knotweed. These, and other invasives are moving at an alarming rate and in my estimation, it is critical that you have all the tools possible at your disposal to militate against these threats. Therefore, I am in favor of Alternative 2, the proposed action.	Comment noted.
11.6	Early Detection / Rapid Response strategy	Throughout the document 'road right-of-ways' are specifically included in the management plan. 'Utility right-of-ways' must be given the same management options due to the travel use by both utility company and general public (assuming Mt Hood NF has utility right-of-ways).	The Mt. Hood National Forest has Bonneville Power Administration (BPA) and Portland General Electric (PGE) utility corridors. Both BPA and PGE utility corridors are included in the EIS. Appendix F provides a description of the utility corridors analyzed (sites #61-041, 61-093, 66-008, 66-016, 66-089, 69-013, 69-027). BPA powerlines are located within the Scenic Area sites #22-01, 22-05, and 22-12. Additional portions of the utility corridors can be treated in the future, if necessary, using the EDRR as described in Sections 1.3, 2.1.3. and 2.1.4.

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11.13	Early Detection / Rapid Response strategy	The EDRR described throughout the document is unacceptable, too limiting to address unknown future events and out of context. In the true sense of EDRR, when action is taken quickly against a new invading plant (very small acreage treated), impact to the environment, no matter what control strategy is implemented, is negligible. When the impact is negligible, a new or amended section to this EIS should not be required. At most, an Environmental Assessment or Pesticide Use Permit should be quickly completed to allow for rapid action, even if that action requires the use of an herbicide not in this EIS. An EIS is only for when an environmental impact is anticipated. Time taken to secure resources for a survey, conduct the survey, compare control measures and site description to the current EIS, etc., will allow the plant to seed and spread. Immediate action is needed to keep the impact negligible.	The EDRR establishes a series of treatment caps to help ensure that the adverse effects associated with treating uninventoried invasive plant infestations are within the scope of the effects disclosed in this EIS. The basis for these caps is the current infestations as identified in the inventory completed in November 2004. These caps are discussed in Sections 2.1.3, Appendix J and Table 2-9. If the effects are within the scope of this EIS, no additional NEPA would be required. If the effects are beyond the scope of this EIS, then additional NEPA would be required. The Forest and Scenic Area would follow USDA Forest Service Handbook 1909.15, Section 18. Section 18.2 requires the USDA Forest Service to “prepare supplements to either draft or final environmental impact statements if: (i) The agency makes substantial changes in the Proposed Action that are relevant to environmental concerns; or (ii) There are significant new circumstances or information relevant to environmental concerns and bearing on the Proposed Action or its impacts.” The EDRR discussions in Sections 1.3, 2.1.3 and 2.1.4 have been modified based on the comments received.
12.1	Comment/ opinion/ position statement	I would like to support the more aggressive weed treatment for these areas. Invasive weeds have become a terrible problem for our region and it is a big problem on the National Forest. So, I would urge you, even through I am an organic orchardist and do not use herbicides on my own place – I would urge the National Forest to use them. I believe that you guys can abide by the labels and use them properly. And I think there is a real need to get out there and to treat this invasion of noxious weeds.	Comment noted.

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13.1	Comment/ opinion/ position statement	Let me say that the City supports efforts to control invasive plants on forest lands including treatments in municipal watersheds. And overall, I am impressed with the proposed action outlined in the draft EIS.	Comment noted.
15.1	Treatment methods & correction	I am concerned about the announced proposal "to treat invasive infestations on 13,000 acres" of the described areas. To comment effectively, one would have to know just how the terms "invasive" and "infestations" are specifically defined. One would need to know exactly which "208 sites" are involved, and exactly what the "variety of treatments" are. The terms "eradicate" and "contain" and "control" are vague, and without specificity, they are meaningless in terms of an adequate public comment. There is no described application methodology, nor how the application is to be itself "curtailed".	All of the cited terms in the comment are defined in the document (glossary and/or text). Several definitions in the glossary were clarified. Also, the treatment methodology is described and summarized in Table 2-2.
16.1	Comment/ opinion/ position statement	We all must rely on folks such as yourself, in such positions of power to do the “correct” and “life-sustaining” things toward the future of ALL involved	Comment noted.
16.3	Comment/ opinion/ position statement	Large-scale spraying of chemical pesticides and herbicides are not the answer. They may be faster but they are never better.	Comment noted.
17.1	Comment/ opinion/ position statement	I feel the proposed action is much too conservative to both stop the spread of invasive weeds and restore public lands to a long-term healthy ecosystem condition. The proposed action, Alternative 2, should be expanded to include much more land and include funding strategies for long term management and monitoring of National Forest lands.	Comment noted.

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17.2	Comment/ opinion/ position statement	I feel the DEIS and the proposed action are a good start, well planned and on the right track. I'm very confident there will be sufficient care taken with herbicide usage. The proposal is cost effective and appears to adequately protect humans and the natural environment.	Comment noted.
17.3	Comment/ opinion/ position statement	The cost and environmental impact of no action is much too weakly assessed and described. The impacts to the natural environment of doing nothing need to be displayed in terms the general public can relate to and understand. I recommend using similar allegories and facts used to describe the effects of wildfire on human and natural communities. The science must touch the hearts of the public to get their concern and support.	The No Action Alternative adequately described the current invasive plant treatments on the Forest and Scenic Area (Section 2.1.2). The impacts to the "natural environment of doing nothing" are described in Section 1.2.
17.8	Prevention	Knapweed is rampant and needs aggressive treatment. Unknowingly, hikers, bikers and their dogs are spreading weed seeds.	Comment noted.
17.9	Laws and regulations	The Columbia River Gorge Commission should be listed as a consulting partner. Their responsibilities in the Scenic Area should be coordinated with these weed control efforts. The Forest Service should give a special presentation to the Commission to consult with them and get their input.	The USDA Forest Service presented the project to the Columbia River Gorge Commission as part of the Scenic Area Manager's report in March 2006. The USDA Forest Service made a presentation at a Gorge Commission meeting on October 10, 2006. The Gorge Commission staff and each Commissioner were included in all public notifications. The Gorge Commission has been added as a consulting partner in Chapter 4.
18.1	Comment/ opinion/ position statement	The Hood River Soil and Water Conservation District strongly supports Alternative 2, the "Proposed Action Alternative" as the most viable solution to the invasive weed problem in the Columbia Gorge and Mt. Hood National Forest. As indicated by the expanding invasive weed problem in these areas, the current management practice is not working to control the problem. Alternative 3, the	Comment noted.

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		"Restricted Herbicide Use Alternative" is not a cost effective or realistic means to control the invasive weed problem.	
20.1	Comment/ opinion/ position statement	We support manual and mechanical invasive plant treatments, and the use of cultural (goat) treatments.	Comment noted.
21.1	Comment/ opinion/ position statement	The Department of the Interior has reviewed the Draft Environmental Impact Statement for the Site-Specific Invasive Plant Treatments for Mt. Hood National Forest and Columbia River Gorge National Scenic Area in Oregon, Including Forest Plan Amendment #16, Clackamas, Hood River, Multnomah, and Wasco Counties, Oregon. The Department does not have any comments to offer.	Comment noted.
23.5	Early Detection / Rapid Response strategy	The Forest Service may not exempt itself from the requirements of NEPA by substituting its "Emergency Detection and Rapid Response" plan for national law. The Forest Service, claiming that "the NEPA process does not allow for rapid response," (DEIS 2-33), has set up a method for permitting herbicide treatments to be used on all land allocated to the forest and any plant species found to be invasive, including those not listed among the nineteen in the DEIS. This is a disturbing prospect for the following reasons. First, it is estimated that the 2004 survey only looked at about 50% of those forest lands likely to be infested with invasives. (DEIS 1-12). Second, new populations of plants are likely to have developed in the 2 year interim since 2004. That leaves, disappointingly, thousands of acres of potentially infested land unaccounted for. "Combining the known infestations (13,000 acres), future estimate (13,000 acres), and expansion acres	The EDRR is based on the premise that the impacts of similar treatments are predictable, even though the precise location or timing of the treatment may be currently unpredictable. The current inventory is likely representative of future infestations. The EDRR is not exempt from the requirements of NEPA. The requirements of NEPA and scientific analysis are incorporated into the EDRR using the known infestations, treatment areas and analysis conducted in Chapter 3. The methodology includes a consistency analysis (See Figure 1-4) to determine if the sites identified under the EDRR and the anticipated environmental effects fall within those analyzed in this EIS. If the anticipated environmental effects are not analyzed in this EIS, new NEPA would be required (See Section 1.3). The EDRR is also summarized as three implementation project design criteria (PDC), which are incorporated in both action alternatives. The PDC are <u>not</u> optional and are incorporated in the effects analysis (See Section 2.2).

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		(4,000), the total landscape assessed to be treated is 30,000 acres on the Forest and Scenic Area over the next 15 years." (DEIS 1-12). This means that over *half* of forest lands infested with invasive plants may be treated with herbicides without following the careful scientific analysis mandated by NEPA. It is possible for the Forest Service to both follow the law and implement creative solutions to the invasives problem – if it would look seriously at such plans of action as a Better Management Alternative, and refuse to immediately reject suggestions to "suspend…logging projects until a comprehensive EIS is completed that fully addresses the existing problem and 'root causes'" of invasive plant colonization (DEIS 1-26). The invasive plant crisis becomes partly the Forest Service's own making when it refuses to take a hard look at the true causes of the problem and allows constant re-infestation of forest lands.	In part, the EDRR was developed because the time necessary to complete new and/or additional analysis can take six months to a year. In that time period, the invasive plant population could expand, treatment costs could increase and the opportunity for eradicating/controlling the invasive plant population could be lost. In addition to the methodology established in this EIS, the USDA Forest Service Handbook 1909.15, Section 18 addresses new information and changed circumstances. Section 18.1 states: "If new information or changed circumstances relating to the environmental impacts of the Proposed Action come to the attention of the responsible official after a decision has been made and prior to completion of the approved program or project, the responsible official must review the information carefully to determine its importance. If, after an interdisciplinary review and consideration of new information within the context of the overall program or project, the responsible official determines that a correction, supplement of revision to an environmental document is not necessary, implementation should continue. Document the results of the interdisciplinary review in the appropriate program or project file. If the responsible official determines that a correction, supplement, or revision to an environmental document is necessary, follow the relevant direction in Sections 18.2-18.4." The consistency determination of the EDRR is designed to meet this regulation. Finally, the EDRR is consistent with recommendations presented in "Adaptive Management – A Strategy for Site Specific Environmental Analysis When Events and Circumstances Are Uncertain" (Beard & Carbone, 2001). The EDRR discussions in Sections 1.3, 2.1.3 and 2.1.4 have been modified based on the comments received. Also, see response to Comment 23.2 (Issue: Prevention).

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23.13	Analysis	Throughout the DEIS, the Forest Service asserts that the Proposed Action will result in improved water quality and protection of animal life, including human life. The DEIS, however, focuses on the long term goal and not the short term effects that may hamper those goals. 40 C.F.R. 1508.7 states that the agency must analyze not only the direct impacts of a proposed action, but also the indirect and cumulative impacts of "past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions." While the Forest Service does include some analysis on the future effects, the DEIS gives too much credit to the long term goals of restored ecosystems, while downplaying the short term effects – such as destruction of desirable insect and animal species, or water contamination -- that may make the long term goals impossible.	The EIS analyzes and discloses short-term, long-term direct, indirect, and cumulative effects of the proposed invasive plant treatment methods. When effects are anticipated by a treatment method, the EIS discloses the impacts. The PDC were developed to minimize or eliminate the negative effects of treatment. Also, the EIS discloses that there is not sufficient scientific information to make authoritative statements. These analysis and disclosures are throughout the document. (Example: Section 3.11.5.6 Oregon Slender Salamander) Water quality: The potential adverse effects of the action alternatives on dissolved oxygen, water temperature, stream turbidity, peak flows, low flows, water yield, and water chemistry are presented in Section 3.9. For example, the adverse effects include potential to disturb or displace soils, making the soil more vulnerable to erosion. The PDC minimize any potential adverse effect; as such the impacts to water quality would be negligible. Wildlife: Section 3.11 in the EIS discloses the potential adverse effects, including the loss of individuals. All of the herbicides in this EIS are excreted rapidly (often within 24 to 48 hours), and do not accumulate up the food chain. This reduces, but does not eliminate, the potential for effects to wildlife species. By properly implementing the Invasive Plant ROD standards (2005b), and PDC (Section 2.2), these effects largely should be avoided. Human Health: As Section 3.5 discusses, all potential impacts to human health and safety have been fully mitigated. As such, there are no short- or long-term effects to human health.

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23.16	Toxicology	The risk assessments for surfactants, adjuvants, and inert ingredients are incomplete or unavailable. It is alarming that human beings will be exposing themselves and their environment to chemicals whose effects have never been thoroughly studied. Moreover, the public has no idea what amount of these supposedly innocuous chemicals is being applied to public lands. The EIS does not estimate the number of acres treated with surfactants, adjuvants or inert ingredients for each alternative because only limited use information is available on these chemicals. Additionally, various herbicides potentially could be used at any treatment area, so the adjuvant, surfactants and inert ingredients used may vary. Again, the Forest Service must not make the mistake treating the symptoms of a disease (invasive plant colonization) without eradicating the disease itself (less than perfect management practices).	Section 3.3 discusses surfactants, adjuvants and inert ingredients. Section 3.3.3 discloses the incomplete and unavailable information related to these chemicals. Risk assessments considered active ingredients, additives, surfactants, metabolites and inerts. Uncertainties are appropriately addressed through PDC that limit the rate, type and method of herbicide application sufficiently to eliminate exposure scenarios that would cause concern. Section 3.5 found that there were no impacts from chemicals analyzed (including active ingredients, additives, surfactants, metabolites and inerts) to humans when invasive plant treatments were completed in conjunction with required PDC. Table 2-7 provides information on the typical application rate of the NPE surfactant. Each resource area in Chapter 3 analyzes the impacts of surfactants. Also, see response to Comment 23.2 (Issue: Prevention).
23.23	Laws and regulations	The Forest Service must comply with the Management Plan for the Columbia River Gorge National Scenic Area. Forest Service land in the NSA is predominantly designated Special Management Area (SMA) Forest or Open Space. In either case the Forest Service must follow the general resource protections guidelines for scenic, natural, cultural, and recreation resources. Revised Management Plan (RMP) at II-38 & II-58. The proposed action should be classified as a resource enhancement project and must comply with the guidelines for Resource Enhancement Projects. RMP at II-38 & II-58.	Appendix C provides a determination of consistency of the project with the Management Plan for the Columbia River Gorge National Scenic Area, as revised. It addresses the applicable resource protection guidelines. The project has been determined to be a resource enhancement project. Appendix C addresses the applicable Resource Enhancement Project guidelines. The project does not need to comply with the Special Management Area (SMA) Forest Practice guidelines because it does not meet the glossary definition of a forest practice. The project does not affect native forest tree or shrub species; the project affects nonnative shrub and herbaceous species.

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		Because this would be a project "conducted on or pertaining to forest land and relating to forest ecosystem management" the Forest Service must also comply with the Forest Practice guidelines. RMP at II-38 & II-58; RMP Glossary at 9. For any site where noxious weed treatment is proposed the Forest Service must also consult the applicable SMA Open Space plan. If a treatment site lies within an area that does not have a completed SMA Open Space plan then all treatment must comply with the noxious weed treatment provisions in the RMP. RMP at II-59.	Appendix C has been revised to address consistency with SMA Open Space Plans.
24.1	Comment/ opinion/ position statement	The Oregon Dept. of Agriculture (ODA) strongly supports the proposed action, that is less restrictive of the uses of herbicide and is more effective at controlling and reducing invasive weed infestations while promoting and restoring healthy native communities and their natural functions.	Comment noted.
24.4	Comment/opinion/ position statement	Despite a considerable body of data on acute exposure effects from the proposed list of herbicides, it is important to recognize that the chronic and sublethal risks are not yet well characterized. Because of these unknown risks, we encourage use of non-chemical alternatives with known risks wherever feasible. DEQ believes that use of non-chemical control, such as biological and cultural control should be considered first for treating widely spread invasive species infestations.	Comment noted.
24.5	Early Detection / Rapid Response strategy	A flow chart that describes the decision making process would be helpful for land managers to consider trade-offs.	The decision key (Figure 1-4) for the EDRR has been expanded to incorporate treatment of known and future infestations. The decision key outlines treatment methods preference, site conditions, implementation, monitoring, and restoration.

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26.4	Treatment methods	Page 2-23 of the DEIS indicates that the proposed alternative would utilize an Integrated Weed Management (IWM) strategy. We encourage the FS to embrace the full suite of options available to treat invasive plants, including biological controls and prescribed fire. Where herbicides are used we recommend the FS review progress on an annual basis toward reducing reliance on herbicides.	Section 2.1.3 addresses non-herbicide treatment methods that would be used in combination with herbicides. The effectiveness of the treatments would be reviewed and re-treatment needs considered each year (see Figure 1-4). Biological control agents have already been analyzed by the U.S. Department of Agriculture, Agricultural Plant Health and Insect Service (APHIS). The Oregon Department of Agriculture releases biological control agents for all land ownerships across the State of Oregon. Also, prescribed fire was not found to be the most effective treatment method for any of the invasive plants currently found within the Forest and Scenic Area (see Table 2-3 and Appendix G). As such, this analysis does not consider prescribed fire as a treatment method and prescribed fire is outside the scope. Finally, Each invasive plant treatment site would be either actively or passively restored with native plants, as defined in Appendix F. The restoration effects would be important to ending the continued reliance on herbicides in the future.
26.8	Treatment methods	Expand the discussion of site-specific prescriptions into a decision key. This would be helpful both in terms of understanding the document, and ensuring consistency in how future infestations are treated. This decision key should prioritize available control tools and clearly define the basis for moving from one tool to the next. Every control option has pros and cons that need to be carefully considered when deciding which control to use.	See response to Comment 24.5 (Issue: General Comments on DEIS/Purpose & Need).

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26.9	Early Detection / Rapid Response strategy	Page 1-6 of the DEIS indicates that the FS has surveyed approximately 50% of the areas likely to be infested. The DEIS should give some discussion to how treatment sites in the remaining, uninventoried areas will be identified. Given limited resources, consideration should be given to how to best utilize existing tools (NRIS/Terra database) and existing monitoring programs in order to systematically identify new infestations.	Identifying new infestations, utilizing existing tools and monitoring programs, and training staff in plant identification would all be considerations in implementation. See response to Comment 17.6 (Issue: Monitoring and Maintenance).

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12.2	Prevention	We have a lot powerlines that come through from Bonneville that allow an easy transfer of weed seeds.	See response to Comment 11.6 (Issue: General Comments on DEIS/Purpose & Need).
18.4	Prevention	The importance of proper cleaning of equipment before entering and leaving infested sites cannot be emphasized enough. Equipment should include everything from clothing and shoes to spray equipment and vehicles.	PDC B.5. requires that "equipment used in off-road operations for invasive plant treatment activities would be properly cleaned prior to entering National Forest System land and upon leaving infested sites. Also, an herbicide transportation and handling plan would be required to ensure spay equipment is properly cleaned (see PDC B.2.). In addition, both the Forest and Scenic Area are implementing new prevention standards and guidelines through the adoption of the Invasive Plant ROD (2005b), which took effect in March 2006 (Appendix A). Also, both the Forest and Scenic Area have local prevention standards contained in Appendix D. Both sets of standards include specific requirements for cleaning of equipment.
22.2	Prevention	The best way to eliminate the spread of invasive plants is to discontinue road building and other ground disturbing activities.	See response to Comment 23.2 (Issue: Prevention).
23.1	Prevention	The DEIS is thorough and the examined alternatives have been well-researched. However, the Commenters are still concerned that the DEIS does not do enough to resolve the invasive plant problem. The project is not entirely in compliance with the applicable laws, and it should be revised or withdrawn entirely until those laws can be observed. Most importantly, the Forest Service must recognize that the true root of the invasive plant problem is improper forest management, and that even the most responsible use of herbicides to control invasive plant populations will only relieve the symptoms of the disease – not ultimately cure it.	This project is in compliance with all applicable laws and regulations. See Section 1.4 – Management Direction and Section 3.15 – Specifically Required Disclosures. See response to Comment 23.2 (Issue: Prevention) for discussion of forest management activities.

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23.2	Prevention & laws and regulations	This DEIS fails to abide by Section 1502.14 of NEPA, if it fails to consider a reasonable alternative. While it analyzes a Restricted Herbicide Use Alternative, it fails to analyze an alternative which includes better land management practices (Better Management Alternative) to avoid further invasive plant infestation. Such an alternative would meet the purpose and need of the project by describing herbicides that should be available for vegetation treatment on public lands, and, conditions and limitations that apply to herbicide use – including using those herbicides as a last resort, after management alternatives and non-herbicide alternatives have failed. In failing to adequately consider prevention as an alternative, the Forest Service violates NEPA, which requires that the Forest Service meet the requirement for high quality scientific analysis when producing an EIS. 40 C.F.R. § 1502.22. Without addressing these causes of the introduction of invasives – in fact *refusing* to take a "hard look" at these causes using such scientific analysis – the Forest Service cannot hope to meet a stated purpose of the project: "to eradicate, contain and control invasive plant infestations." In restricting the range of alternatives evaluated and considered, the Forest Service violates the very purpose of NEPA's alternative analysis requirement, which is to foster informed decision-making and full public involvement. 42 U.S.C. §§ 4331, 4332(2)(E); 40 C.F.R. § 1508.9(b). The public should be made aware if there are safer, more effective, or more creative alternative management plans in existence from which to choose. Thus the existence of a viable but unexamined alternative can ultimately	An alternative emphasizing prevention, including "better land management practices", was considered in the Invasive Plant FEIS (2005a) and ROD (2005b). This site-specific EIS tiers to theses documents as stated in Section 1.4. The USDA Forest Service Handbook 1909.15 Section 22.31 states: "Agencies are encouraged to tier their environmental impact statements to eliminate repetitive discussions of the same issues and to focus on the actual issues ripe for decision at each level of environmental review (§1508.28). Whenever a broad environmental impact statement has been prepared (such as a program or policy statement) and a subsequent statement or environmental assessment is then prepared on an action included within the entire program or policy (such as a site specific action) the subsequent statement or environmental assessment need only summarize the issues discussed in the broader statement and incorporate discussions from the broader statement by reference and shall concentrate on the issues specific to the subsequent action. The subsequent document shall state where the earlier document is available. (40 CFR 1502.20)." As a subsequent action, this site-specific project-level EIS does not need to repeat analysis. Alternative B in the Invasive Plant FEIS (2005a) analyzed a balance between prevention and treatment. The alternative would have increased emphasis on reducing conditions related to land uses and activities on National Forest System lands that contribute to invasive plant introduction, establishment and spread. Herbicide use was a "tool of last resort" in this alternative. Alternative B in the Invasive Plant FEIS (2005a) represents the "Better Management Alternative" discussed in this comment. Prevention practices on the Forest and Scenic Area would follow the prevention standards analyzed and

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		render an EIS inadequate. *Alaska Wilderness Recreation and Tourism v. Morrison*, 67 F.3d 723, 729 (9th Cir. 1995).	adopted in the Invasive Plant ROD (2005b), which includes guidance on preventing the introduction and spread of invasive plants through land management activities. For example, prevention practices specially would be considered in all land use assessments as per Standard 1. These standards are included in Appendix A. Further, prevention alone does not meet the purpose and underlying need for action, as explained in Section 2.5.1. Part of the stated purpose is "to eradicate, contain and control invasive plant infestations," as stated in the comment. The treatment strategies of eradicate, contain and control as defined in Section 1.2 include treating a known infestation in some way. Prevention is defined as: "To detect and ameliorate conditions that establishment, or spread of invasive plants." Prevention alone, therefore, does not incorporate the underlying need for treatment as defined by the purpose and need for action. Although prevention does not meet the purpose and need, it is an important component of invasive plant management and integral to implementing successful treatments. The Forest and Scenic Area have a set of prevention standards, in addition to the Invasive Plant ROD (2005b) standards, that are incorporated into management activities on both units. These standards are included in Appendix D. See response to Comment 23.7 (Issue: Prevention) for discussion of range of alternatives.
23.3	Prevention	In contrast to a Better Management Alternative, the Proposed Action in the DEIS merely describes the disembodied use of herbicides for eradication and control. This action alternative is given a detailed analysis which seems much like a justification for its choice – especially when considering that the management plans of Alternative C, Reduced Herbicide Use Alternative, are given far less	Alternative 3 – Restricted Herbicide Use Alternative modifies the Proposed Action to reduce the risks associated with herbicides (See Section 2.1.4). As a modification of the Proposed Action, rather than an entirely new alternative, the analysis for Alternative 3 uses the analysis completed for the Proposed Action as a starting point.

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		attention. In fact, rather than analyzing what can be accomplished by Alternative C -- the less herbicide-intensive Action and one more comparable to a Better Management Alternative – the Forest Service focuses more on what the Action does not do. For example, the Forest Service repeatedly concludes that such a plan would not provide effective control of invasive plants over as great an acreage as Alternative B. It claims that manual and mechanical means of control have been and will be ineffective. However, there is no data to conclusively show that herbicides are the perfect solution. Alternative C offers the positive consequences of *less* potential for harm to human beings, flora, and fauna. Yet the Forest Service glosses over this fact in its abstract, stating that "all of the action alternatives protect human health and the environment," and makes similar statements throughout the body of the DEIS.	Alternative 3 does offer the positive consequences of less potential for harm to human beings, flora and fauna. These methods, however, are less effective. The effectiveness of manual, mechanical, and cultural methods is discussed in the No Action Alternative analysis (Section 2.1.2) and Section 3.6 Botany and Treatment Effectives. Both the positive and negative impacts of Alternative 3 are analyzed and discussed in each of the resource areas in Chapter 3 of the EIS.
23.4	Prevention	The Forest Service fails to analyze the active, positive control of invasive species that has been and can be accomplished with, 1) prevention of the conditions that favor the introduction, establishment, and/or spread of invasive species, and, 2) passive treatments in conjunction with, or sometimes obviating the need for, 3) use of herbicides. In order to effectively analyze a less herbicide intensive alternative, the Forest Service needs to examine what has happened to invasive species and lands threatened with invasive species throughout the seventeen western states and elsewhere in the world when, a) prevention-focused management, invasive species treatment and restoration of ecosystems have been practiced together, and, comparatively, b) where herbicide treatments have been employed without altering conditions that have favored	All alternatives analyze an integrated weed management (IWM) approach, where herbicides are only one proposed tool for treating invasive plants. IWM is a process by which one selects and applies a combination of management techniques (manual, mechanical, and herbicide for example) that, together, would control a particular invasive plant species or infestation efficiently and effectively, with minimum adverse impacts to non-target organisms. It is species-specific, site-specific and designed to be practical with minimal risk. See responses to Comment 23.2 and 23.7 (Issue: Prevention) for more information.

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		invasive species. When preventive actions and restorative treatments are part of the judicious use of herbicides, the latter will have far more lasting, positive results (i.e. efficacy) than spraying invasive species while leaving intact the activities that fostered the introduction, establishment and spread of invasive species. Yet this DEIS insists on disconnecting herbicide use from any other management on Forest Service lands and then purports to estimate the benefits of herbicide spraying. The benefits/costs of herbicide use alone versus herbicide use limited and conditioned by priorities for prevention and passive and/or active restoration must be analyzed in the DEIS.	
23.6	Laws and regulations	The DEIS Fails to Adequately Protect Plant and Soil Resources as Required by the National Environmental Policy Act, the National Forest Management Act, and the Endangered Species Act. 1. The DEIS alternatives fail to best protect plant and soil resources because they do not address the underlying cause of the spread of invasive plants. Ostensibly, the goal of the Forest Service is to effectively control the spread of invasive plants across public lands. However, the DEIS fails to consider all reasonable alternatives which would effectively provide this control. Specifically, it rejects alternatives which equally emphasize both the control of the symptoms of the spread of invasive plants (meaning, the eradication of invasive plant populations and the restoration of damaged plant communities) and the initial prevention of such invasions.	See response to Comment 23.2 and Comment 23.3 (Issue: Prevention).

ISSUE: Prevention

Comment Number	Comment Summary/Topic	Comment Text	Response to Comment
23.7	Laws and regulations	Disregarding viable alternatives that might more effectively protect plants and soils is inconsistent with NEPA's requirement that a range of alternatives be thoroughly considered. The Forest Service seems enthusiastic about experimenting with new chemical treatments of invasive plants, to the exclusion of other alternatives. It states that "although the first preference is non-herbicide, non-ground disturbing methods, this EIS focuses analysis on herbicide treatments." (DEIS 1-11). By claiming other treatment methods are/were ineffective, the Forest Service becomes automatically biased toward the Proposed Action – one that is more dangerous to plant and soil health and would expand existing herbicide use than less favored alternatives. `The Forest Service must remember that in determining the scope of alternatives to be considered, the Council on Environmental Quality (CEQ) advises that the emphasis [should be] on what is 'reasonable' rather than on whether the proponent or applicant likes or is itself capable of carrying out a particular alternative. Reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant.	The EIS considered 7 alternatives; the alternatives included prevention only and no herbicide use. These alternatives were dropped from further analysis (See Section 2.5) because neither alternative meets the purpose and need for this project (See Section 1.2). Additionally, the EIS considered the No Action Alterative which analyzes the impacts from treating invasive plants with limited herbicide use. The range of alternatives considered are: • No Action Alternative (limited herbicide use); • Proposed Action; • Restricted Herbicide Use Alternative; • Prevention Only; • No Herbicide Use; • No Amendment to the Mt. Hood Forest Plan; • Maximize Cost Efficiency; and, • Maximize Worker Jobs. The maximize cost efficiency alternative (alternative considered, but dropped from further analysis) is essentially the same as the Proposed Action (See Section 2.5). All other alternatives considered a level of herbicide use less than considered in the Proposed Action. See responses to Comments 23.2 and 23.3 for more information (Issue: Prevention).

ISSUE: Prevention			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
24.3	Prevention	DEQ encourages the USFS to consider adopting preventative measures to avoid infestation of new invasive species population on national forests, such as limiting OHV uses and closing or restricting access to non-essential roads where needed.	See response to Comment 23.2 (Issue: Prevention). The Forest will begin an OHV planning effort, which will designated specific OHV areas while closing other areas to OHV use, in fiscal year 2007; the Scenic Area will begin a similar effort in fiscal year 2008. Both planning processes consider the impacts of OHV on a variety of natural resource areas, including invasive plants.
26.6	Prevention	An effective invasive plant management program must include both active control/eradication of existing populations and prevention of new populations. There are important vectors for spread of invasives that are not addressed in existing standards and guidelines. Specifically, the FS should consider adopting a site-specific standard prohibiting cross-country use of off-highway vehicles and limiting the use of OHVs to designated routes and in designated areas, and closing, decommissioning, or seasonally restricting access to non-essential roads that are high-risk vectors for spread of invasive plants.	See response to Comment 18.4 and Comment 23.4 (Issue: Prevention)

ISSUE: Additional Technical Issues			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
5.1	Outside the scope	I believe that Japanese Knotweed should be rated as "T" on the noxious weed category list. It grows on my lot nearly 11' tall within the span of 5 to 6 weeks, and is taking over the entire lot between my cabin on Rd 12 Lot 79 and Still Creek. I have enclosed photos taken last year of a 3 week old growth. I would like to see the forest service develop a plan to irradiate this menace asap.	The Oregon Department of Agriculture (ODA) determines ratings for invasive plant species in the state. The ODA lists Japanese knotweed as a "B" designated weed (http://oregon.gov/ODA/PLANT/WEEDS/docs/weed_policy.pdf Invasive knotweeds (e.g., Japanese, giant, Himalayan) are considered high-priority species to be treated within the Forest and Scenic Area because of their ability to rapidly spread, drastically alter native plant communities, and negatively affect healthy functioning ecosystems. The EIS proposes to treat all presently known and future knotweed populations with the herbicide, aquatic glyphosate. Herbicide treatment has been demonstrated to be the most effective method for treating knotweeds.
11.2	Comment/ opinion/ position statement	I do not support the No Action alternative. Current herbicide use of only glyphosate, triclopyr, picloram and in some cases dicamba is unacceptable. Only two modes of action are represented and all herbicides are old chemistry requiring a high dose of active ingredient to control the weeds listed in the DEIS.	Comment noted.
11.7	Correction	Pg1-4 Within the weed list, I suggest changing Japanese knotweed (Polygonum cuspidatum) to Knotweed species (Polygonum spp). Several species of Polygonum are found in Oregon and they are rumored to have cross bread. All are extremely invasive and difficult to control. I suggest the change to avoid restrictions on control in case a knotweed plant has been miss identified as cuspidatum, when really Bohemian or a hybrid.	Alternatives 2 and 3 allow treatment of invasive plant species through either the identified treatment areas or the EDRR. The correction has been made throughout the document to prevent confusion.

ISSUE: Additional Technical Issues			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
11.8	Correction	Pg1-11 #2, first bullet. The last herbicide choice indicated appears to be a misspelling. This should be "aquatic imazapyr". There is no aquatic form of imazapic. This is correct on pg2-23.	The correction has been made.
11.9	Laws and regulations	Pg1-11 #2, third bullet. Rates of triclopyr and picloram can be greatly decreased, possible reduction by half, with the addition of OVERDRIVE® herbicide. OVERDRIVE is a combination of dicamba plus diflufenzopyr. Addition of 2oz to 6oz per acre of OVERDRIVE can reduce triclopyr and picloram rates by half, resulting in overall decrease in active ingredient. In addition, restriction to the amine form of triclopyr reduces control for some species, addition of OVERDRIVE to triclopyr can increase that control to equal or improved over triclopyr amine alone.	The Invasive Plant ROD (2005b) adds invasive plant management direction to all National Forest Land and Resource management Plans in the Pacific Northwest Region (Region Six). Standard 16 states: "Select from herbicide formulations containing one or more of the following 10 active ingredients: chlorsulfuron, clopyralid, glyphosate, imazapic, imazapyr, metsulfuron methyl, picloram, sethoxydim, sulfometuron methyl, and triclopyr." This site-specific EIS tiers to these standards. As such, only the ten active ingredients listed in this standard are proposed for use on the National Forest System lands, as such dicamba and diflufenzopyr are not approved for use.
11.10	Botany	Pg 2-20 Mechanical Methods In addition to mowing, etc. being used with herbicides to prevent root sprouting or mowing being used after herbicides to aid in further control, mowing is effective on species such as reed canarygrass or Japanese knotweed to remove old growth that could intercept herbicide spray. Mowing will also stimulate root sprouts that help deplete root reserves prior to an herbicide application. Allow the plants to re-grow to at least 2/3 their original height and spray the new shoots for a more effective treatment.	The comment is correct: mowing is used to reduce vegetative materials and to promote vigorous growth in order to decrease the amount of herbicide application needed and to increase herbicide effectiveness. This change has been noted in Table 2-2.

<table>
<tr><th colspan="4">ISSUE: Additional Technical Issues</th></tr>
<tr><th>Comment Number</th><th>Comment Summary/Topic</th><th>Comment Text</th><th>Response to Comment</th></tr>
<tr><td>11.11</td><td>Treatment methods</td><td>Pg2-22 Herbicide Methods, Hand/Selective (e), Pg3-4 Japanese knotweed, Pg3-28

Spot herbicide treatment and broadcast herbicide treatment should be considered prior to stem injection treatments. Although stem injection has been promoted for control of knotweed with glyphosate and triclopyr, recent studies have shown the per ace rate applied typically far exceeds the EPA label rate of the herbicide. Stem injection should only be considered if stem density is low and total product used does not exceed EPA labels rates. Under no circumstance should imazapyr be applied by stem injection. Foliar treatment, spot or broadcast, of imazapyr can achieve 95% control. The following table was presented at the Western Society of Weed Science, March, 2006. Note the total Herbicide used per acre.

<table>
<tr><th>Treat-ments</th><th>Average # Stems /100 sq ft plot</th><th>Time to Treat 100 sq ft</th><th>Herbicide used per Acre</th><th>% Control</th></tr>
<tr><td>3 qts of Habitat</td><td>533</td><td>1.9 sec</td><td>3 qts</td><td>95</td></tr>
<tr><td>1% Habitat Solution</td><td>700</td><td>27.8 sec</td><td>25.7 oz</td><td>95</td></tr>
<tr><td>Rodeo 5 mls/stem</td><td>617</td><td>30 min to 2 hrs</td><td>354.9 gal</td><td>30 to 90</td></tr>
</table>
</td><td>Proposed treatment for knotweed sites include hand/selective (stem injection) and spot spraying with a backpack sprayer. The potential herbicides include glyphosate, triclopyr, and imazapyr. This combination of potential treatments allows any of the treatments that you discussed. The treatments would be chosen based on the size of the infestation and site conditions.

All proposed treatments are listed in Appendix F and all potential herbicides are listed in Appendix H.</td></tr>
</table>

ISSUE: Additional Technical Issues			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
11.12	Treatment methods	Pg2-30 Imazapyr General Uses/Known to be effective on: For each herbicide the list of weeds controlled is near accurate, I would strongly recommend adding knotweed to Imazapyr.	Table 2-6: Active ingredients and commercial herbicide names is meant to be illustrative and not all inclusive. Imazapyr is proposed as a treatment option for all knotweed sites and has been added to Table 2-6. See Appendix F for a summary of the proposed treatments for each species, and Appendix H for a list of herbicides proposed at each treatment areas.
11.14	Treatment methods	Pg2-35 Third Priority of Treatment. I am concerned about the treatment priority list as related to roadsides. Goat grazing listed as number one is not safe for roadsides. Mechanical should be unacceptable for roadsides, since this is a main mechanism of weed spread. Herbicide use, as immediate control, should be a first consideration for roadside weed treatment.	The treatments in Table 2-8 are possibilities based on site-specific conditions. Thus, the comment is correct and herbicide treatment may be the first choice. The table has been changed to reflect the treatment order preference discussed in Section 1.3.
11.15	Botany	Pg2-41 & 42 All the assumptions made are very realistic. I am only concerned that seed life was not considered. After the 3 to 5 years to rid the area of established plants, long-term plans should include monitoring the area for the expected documented or observed seed life of the species. Seedling or first year plants can often be hand pulled.	Seed life/seed banks must be considered when treating invasive plants. Seed longevity in the soil is very long for some species: 5 to 10 years for orange hawkweed, St. Johnswort, and as much as 75 to 80 years for Scotch broom. See Section 3.6 for more information. Monitoring would be required to ensure establishment of desired vegetation as indicated in Chapter 2, Section "Site Restoration Strategy". Restoration and monitoring are incorporated into both action alternatives projects; therefore, both would continue for the life of the project (10 to 15 years).
11.16	Toxicology	Pg3-10, 3.3.1. Herbicide Risk Assessment, 3rd paragraph This section is misleading, stating that metabolites and inert ingredients are not as extensively tested as active ingredients. Although they are not as extensively tested, they are still extensively tested. The reduced toxicology focus can be attributed to	The statement is intended to reflect the fact that metabolite and inert ingredients are not required to be tested independently from active ingredients. The risk assessments reviewed inert ingredients, even those that may not be revealed to the public. Risk assessments considered additives, surfactants, metabolites and inert ingredients, and PDC address

ISSUE: Additional Technical Issues			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
		the much lesser degree they occur or are introduced in to the environment. A great deal of the cost to register a herbicide is identifying, isolating, and testing the metabolites. All inert ingredients are revealed to EPA and categorized by toxicology properties to be revealed to the pubic in 5 categories. Actual inerts are not revealed to the public because they are proprietary information. Few impurities are in modern manufacturer products due to quality control. Generic products may have a higher level of impurities.	use of surfactants shown to have possible adverse effects. Information regarding these chemicals is discussed in Section 3.3.2.
13.2	Correction	The draft EIS is pretty clear that precautions are to be taken to prevent application of herbicides to water, either directly or indirectly. Yet Table 2-10 indicates that an existing Standard and Guideline related to "Water (FW-076)", which I believe states the same objective, is proposed to be amended as part of this action. The language in that table gives the impression that "potentially detrimental materials" could be allowed to enter waters under the proposed standards. Is there more to the existing Standard and Guideline that requires its amendment? If so, perhaps there is a better way to amend the statement in Table 2-10 to avoid this misinterpretation.	The wording of the Forest Plan amendment has been changed to read as follows. "Water (FW-076*b*): Potentially detrimental materials associated with invasive plant treatments should ~~management activities (e.g. pesticides, fertilizers, and road surface treatments) shall~~ be prevented from entering water or other areas not intended for treatment*, according to standards in the Pacific Northwest Region: Preventing and Managing Invasive Plants Record of Decision (2005).*" The Invasive Plant ROD (2005b) Standard 19 addresses water quality and aquatic biota (See Appendix A). While the amount of herbicides and adjuvants expected to reach water area expected to be extremely low, the USDA Forest Service cannot conclude with certainty that the levels of chemicals potentially reaching streams would be zero. However, the amount is expected to be "biologically meaningless," as explained in Sections 3.9 – Water Quality and 3.10 – Aquatic Organisms and Habitat.

ISSUE: Additional Technical Issues			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
16.2	Treatment methods	For these invasive plants use goats or the like. I'm talking about natural means of controlling or ridding our problems. Not using chemicals like pesticides/herbicides that only destroy our environmental habitats. If 2-300 of these pygmy goats were fenced around these proposed areas that need attention (and I've seen this done in places to eat the invasive English ivy like in Lake Oswego), the goats would be well fed, the problem gets solved in a natural way, the environment gets re-fertilized at the same time.	Goats can be very effective control agents and, in many circumstances, have minimal impacts. Goat grazing is proposed at two sites (#22-01 and #22-07), and may be considered at other sites in the future under the EDRR.
17.4	Treatment methods	Weed eradication treatments must be repeated over many years	The maintenance schedule would be determined based on the invasive plant species present, site conditions, identified treatment strategy, and adopted treatment method. Several invasive plant treatment prescription assumptions were made regarding maintenance for analysis purposes. These assumptions are outlined in Section 2.1.3. The assumptions include treatment for a minimum of 5 years, and retreatment up to three times per year.
17.5	Restoration & Monitoring	Follow up eradication treatments with native grasses and herbaceous plant seedings and plantings. These plantings should be repeated over multiple years. Monitoring should be planned to go on forever. Weeds never sleep.	In many cases additional plantings of seedlings may be required to get the desired outcome and monitoring would be required to ensure establishment of desired vegetation as indicated in Chapter 2, Section "Site Restoration Strategy". Restoration and monitoring are incorporated into both action alternatives projects; therefore, both would continue for the life of the project (10 to 15 years).

ISSUE: Additional Technical Issues			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
19.1	Comment/ opinion/ position statement	My comments relate mainly to the fact that a lot of this did not have to happen. I have noted scotch broom just starting to become established at sites in F.S. Region 6 and have called this to the attention of Forest Service employees in the districts involved. However, I found that they did not respond and I suspect the infestations grew from a few plants to a real problem. In the future, lets hit these problems before they turn into major disasters.	Comment noted.
19.2	Treatment areas	I note there are now scotch broom plants along the shoulder of highway 26 east of Rhododendron.	Three treatment areas are located in the Highway 26 corridor (sites #69-001, 69-016, and 69-030). Figure 2-1 and 2-6 are maps illustrating treatment areas along the Highway 26 corridor, and more information on the individual treatment areas is available in Appendix F. If the sites of concern are not included, additional sites and species (e.g., purple loosestrife) can be treated using the EDRR as described in Sections 1.3, 2.1.3, and 2.1.4.
23.15	Laws and regulations	The Forest Service must comply with the applicable requirements for any invasive plant treatment within the National Scenic Area. Specifically, the Forest Service must determine the exact location of the water resource boundary and respect water resource buffer zones for any project location that may affect streams, ponds, lakes, wetlands, or other riparian areas in the Special Management Areas. RMP I-83–86.	The project is designed to meet the water resource boundary guidelines. The PDC of Section 2.2 defines treatment buffers and restrictions based on the herbicide and treatment method prescribed. Therefore, the exact location of water resource buffers do not need to be determined, as the project would enter the Management Plan water resource buffers. A no-practicable alternatives test and a water resource mitigation plan have been completed (See Appendix C).

ISSUE: Additional Technical Issues			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
25.1	Comment/opinion/ position statement	Strategies of eradication that have the least impact on the environment are preferred. However, the only known successful control of Japanese Knotweed at this time requires herbicides. Biological control agents are not yet available, and digging, cutting, and covering are ineffective. A combination of stem injection and foliar application results in approximately 80% reduction of stems in one season. Immediate action is needed to address this invasive plant	Comment noted.

ISSUE: Monitoring and Maintenance			
Comment Number	**Comment Summary/Topic**	**Comment Text**	**Response to Comment**
17.6	Monitoring	Create volunteer organizations to help with this effort, especially the long term monitoring	The USDA Forest Service would explore various methods of implementation. Specific implementation strategies are outside the scope of this EIS. Also see response to Comment 18.3 (Issue: Monitoring and Maintenance). The USDA Forest Service has active volunteers involved in various land management efforts, including monitoring activities. Such opportunities would continue to be pursued where volunteers have interest.
18.3	Monitoring & treatment methods	One concern regarding the success of Alternative 2 as outlined in the DEIS is the minimal elucidation of details regarding a monitoring and maintenance schedule. While the DEIS does indicate that follow-up will be performed for 5-15 years, no detail is given as to the frequency of treatment or monitoring. All invasive weed eradication takes years of follow-up maintenance to be successful. A commitment to the follow-up treatment is just an important as the initial action.	More information was added to the decision key (Figure 1-4) and monitoring framework (Section 2.3). The maintenance schedule would be determined based on the invasive plant species present, site conditions, identified treatment strategy, and adopted treatment method. Several invasive plant treatment prescription assumptions were made regarding maintenance for analysis purposes. These assumptions are outlined in Section 2.1.3. The assumptions include treatment for a minimum of 5 years, and retreatment up to three times per year.
26.5	Analysis & monitoring	We appreciate these cumulative impacts findings (page 3-6, DEIS) being included in the DEIS, and encourage the FS to use this knowledge to inform the cumulative impacts assessment. The FS should also look across the landscape and identify what assumptions will be used with respect to adjacent non-Forest/Scenic Area lands, as well as the mechanisms for cooperating with other land owners to disclose the sum of individual effects of all projects on the local environment. Cumulative effects analysis should also consider appropriate mitigation strategies to minimize adverse and to enhance beneficial cumulative	Section 3.4 – Basis for Cumulative Effects discusses the information used to inform the cumulative effects analysis. Estimates of herbicide use for each county as well as orchards in Hood River are used to inform the analysis. The cumulative effects analysis assumes that adjacent lands are effectively treated in cooperation with this project. This section was updated to provide additional information. Funding and implementation methods, including mechanisms for cooperation, for invasive plant management on the Forest and Scenic Area are outside the scope of this document. Funding and implementation would vary each year as budget levels

ISSUE: Monitoring and Maintenance			
Comment Number	Comment Summary/Topic	Comment Text	Response to Comment
		effects. Monitoring and evaluation of the mitigation strategies' effectiveness would also be an important component of the proposed action, especially if data obtained from such monitoring can be used to modify land management and to promote cost effectiveness in the expenditure of mitigation resources.	change, information and knowledge concerning invasive plants improves, and invasive plant infestations are reduced. The decision key (Figure 1-4) and monitoring framework (Section 2.3) discuss how monitoring would be incorporated and used in this project.

Z.4. Agency Comments

This section contains comment letters received from governmental agencies (federal, state, and local). The entire letter is included in this section per FSH 24.1.3. The responses to the substantive comments identified in these letters are contained in Section Z.3 of this Appendix.

Letter 13: City of The Dalles

06/19/2006 01:12 PM
"Dave Anderson" <danderson@netcnct.net>
To "Jennie O'Connor" <jmoconnor@fs.fed.us>
cc
Subject Invasive Plant Treatment draft EIS

Jennie-

As Water Quality Manager, and Watershed Manager, for City of The Dalles, I am writing to ask a couple quick questions regarding the draft EIS currently out for public comment. I'm also trying to decide if I should be planning to go to Sandy this evening for the public meeting.

First, before my questions, let me say that the City supports efforts to control invasive plants on forest lands including treatments in municipal watersheds. And overall, I am impressed with the proposed action outlined in the draft EIS. So, with that, here are my questions.

1. The draft EIS is pretty clear that precautions are to be taken to prevent application of herbicides to water, either directly or indirectly. Yet Table 2-10 indicates that an existing Standard and Guideline related to "Water (FW-076)", which I believe states the same objective, is proposed to be amended as part of this action. The language in that table gives the impression that "potentially detrimental materials" could be allowed to enter waters under the proposed standards. Is there more to the existing Standard and Guideline that requires its amendment? If so, perhaps there is a better way to amend the statement in Table 2-10 to avoid this misinterpretation.

2. The draft EIS specifies that use of prescribed fire is outside the scope of this proposal. Would that prevent the use of hand torches in the treatment of puncturevine? From personal experience in an ag setting, one of the most effective treatments for relatively small areas of puncturevine where seeds have already been produced is to burn the ground with a hand torch (not a drip torch) to "roast the nuts". Would that be allowed?

Thanks for any clarifications that you can provide.

Dave Anderson
Water Quality Manager
City of The Dalles

Letter 18: Hood River Soil and Water Conservation District

Hood River Soil & Water Conservation District
3007 Experiment Station Rd.
Hood River, OR 97031
541-386-4588
Email: hrswcd@gorge.net

June 15, 2006

To: Jennie O'Connor, Invasive Plant EIS
Mt. Hood National Forest
16400 Champion Way
Sandy, OR 97055

Re: Hood River Soil & Water Conservation District Comments on Draft EIS

Dear Ms. O'Connor,

It was a pleasure to meet you at the recent open house in Hood River for the Draft EIS. I appreciate you spending the time to explain some of the alternatives being proposed for this area. I would like to take this opportunity to provide comment on the report.

The Hood River Soil & Water Conservation District strongly supports Alternative 2, the "Proposed Action Alternative" as the most viable solution to the invasive weed problem in the Columbia Gorge and Mt. Hood National Forest. As indicated by the expanding invasive weed problem in these areas, the current management practice (Alternative 1) is not working to control the problem. Alternative 3, the "Restricted Herbicide Use Alternative" is not a cost effective ($7.3 million for an estimated 60% efficacy rate as opposed to $4.3 million for an estimated 80% efficacy), or realistic means to control the invasive weed problem. Additionally, active invasive weed management is supported by many of the documents that drive the work of the Soil and Water Conservation District:

- One of the goals of the Hood River Watershed Action Plan is to "promote the preservation of native plant communities."
- The Hood River Watershed Assessment endorses the removal of invasive noxious weeds as a means to protect and enhance wildlife habitat.
- One of the recommended practices in the Hood River Agricultural Water Quality Management Area Plan is to control noxious weeds.
- The Hood River Soil & Water Conservation District's mission is to "protect, conserve and restore natural resources."

"To provide educational, technical and financial assistance to our community for the protection, conservation and restoration of natural resources."

Letter 21: U.S. Department of Interior, Office of Environmental Policy and Compliance

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
ER06/545

July 6, 2006

Jennie O'Connor
Mt. Hood National Forest
16400 Champion Way
Sandy, OR 97055

Dear Ms. O'Connor:

The Department of the Interior has reviewed the Draft Environmental Impact Statement for the Site-Specific Invasive Plant Treatments for Mt. Hood National Forest and Columbia River Gorge National Scenic Area in Oregon, Including Forest Plan Amendment #16, Clackamas, Hood River, Multnomah, and Wasco Counties, Oregon. The Department does not have any comments to offer.

We appreciate the opportunity to comment.

Sincerely,

Preston A. Sleeger
Regional Environmental Officer

Letter 24: Oregon Department of Agriculture

JUL-13-2006 16:41 OR DEPT OF AGRIC. 503 986 4737 P.02/07

Oregon

Theodore R. Kulongoski, Governor

Department of Agriculture
Office of the Director
635 Capitol Street NE
Salem, OR 97301-2532
(503) 986-4552
FAX (503) 986-4750

July 13, 2006

Gary L. Larsen, Forest Supervisor
Mt. Hood National Forest
16400 Champion Way
Sandy, OR 97055

Daniel T. Harkenridge, Area Manager
Columbia River Gorge National Scenic Area
902 Wasco Ave
Suite 200
Hood River, OR 97031

Dear Gentleman:

The State of Oregon appreciates the opportunity to provide comments on the Draft Environmental Impact Statement (DEIS) Site Specific Invasive Plant Treatments for Mt. Hood National Forest and Columbia River Gorge National Scenic Area in Oregon including Forest Plan Amendment #16.

The state of Oregon believes it is essential to protect the state's natural resources from invasive plants and noxious weeds. Invasive noxious weeds are causing significant environmental impacts and are costing Oregon millions annually in economic losses. The Mt. Hood National Forest and Columbia River Gorge National Scenic Area are essential partners in addressing Oregon's invasive noxious weed problems.

The state of Oregon supports an integrated weed management approach and believes in utilizing all tools available including chemical, mechanical, and biological control methods as well as prescribed fire for control projects. The State asks the USFS to minimize negative effects on the environment by considering site-specific criteria in developing decisions for the use of the most effective tools. In all cases, impact on water quality must be considered to avoid surface and ground water contamination and to protect the beneficial uses.

The state also supports the Early Detection/ Rapid Response (EDRR) strategy in order to aggressively control new invasive species in a timely manner in effort to minimize both of the invasive weeds and of herbicide use across the landscape.

The following are specific comments from three state natural resource agencies that include: Oregon Department of Agriculture, Noxious Weed Control Program (ODA), Oregon Department of Forestry (ODF), and Oregon Department of Environmental Quality (DEQ).

26

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, WA 98101

July 17, 2006

Reply To
Attn Of: ETPA-088

Ref: 06-033-AFS

Ms. Jennie O'Connor
Invasive Plant EIS
Mt. Hood National Forest
16400 Champion Way
Sandy, OR 97055

Dear Ms. O'Connor:

The U.S. Environmental Protection Agency (EPA) has reviewed the draft Environmental Impact Statement (DEIS) for the Site-Specific Invasive Plant Treatments on Mt. Hood National Forest and Columbia River Gorge National Scenic Area, including Forest Plan Amendment #16 (CEQ # 20060204) in Clackamas, Hood River, Multnomah and Wasco Counties, Oregon. We are submitting comments pursuant to our responsibility under the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act. We appreciate your consideration of these comments.

The Mt. Hood National Forest (the Forest) and Columbia River Gorge National Scenic Area in Oregon (the Scenic Area) are proposing invasive plant treatments on 208 sites (approximately 13,000 acres). The purpose of this project is to eradicate, contain and control invasive plant infestations, to reverse the negative impacts caused by invasive plants, and to restore healthy, native plant communities and functions at the impacted sites in a cost-effective manner that meets current management direction. The document considers three alternatives:

1. Alternative 1 – No Action. This alternative would continue current invasive plant management occurring under existing NEPA documents on the Forest and Scenic Area. A total of 1,235 acres would be treated annually. Of those, 600 acres would be treated with herbicide.
2. Alternative 2 – Proposed Action. Under this alternative the FS would undertake ground-based herbicide application plus manual and mechanical and cultural control, and combinations of treatments on about 13,000 acres. Of the acres treated, up to 12,950 could be treated with herbicide.
3. Alternative 3 – Restricted Herbicide Use. This alternative would reduce the number of acres treated with herbicide to 4,047 per year, but retain manual, mechanical and cultural treatments on all 13,000 acres.

Based on the information provided, we are rating the DEIS as EC-1 (Environmental Concerns - Adequate). An explanation of this rating is enclosed. EPA favors aggressive treatment of invasive plant infestations, but encourages the Forest Service (FS) to embrace the