United States
Department of
Agriculture

Forest Service

Pacific
Northwest
Region

Record of Decision and Final Environmental Impact Statement and Forest Plan Amendment #20

Gifford-Pinchot National Forest and Columbia River Gorge National Scenic Area (Washington Portion) Site-Specific Invasive Plant Treatment Project and Forest Plan Amendment

Skamania, Cowlitz, Lewis, Clark and Klickitat Counties in the State of Washington

March, 2008

Record of Decision

Introduction

This Record of Decision documents the joint decision of the Forest Supervisor for the Gifford Pinchot National Forest and the Area Manager for the Columbia River Gorge Scenic Area to carefully treat invasive plants on National Forest system lands in southwestern Washington. The project area encompasses the entire Gifford Pinchot National Forest (Forest), along with the portion of the Columbia River Gorge National Scenic Area (Scenic Area) that lies within the state of Washington.

With this decision, we are approving an active restoration project to control invasive plants. This project is intended to restore native plant communities in areas threatened by invasive plants now and into the future. We are approving use of a number of treatment tools including manual, mechanical, and herbicide use on 2,700 acres of known infestations, as well as future detections within and outside mapped treatment areas. The treatments will be done according to Project Design Criteria (PDC) that limit the extent and method of treatment depending on site conditions. Once the invasive plants are controlled, an active or passive restoration effort will re-establish the native plants.

Our decision considers the analysis contained in the 2008 Final Environmental Impact Statement (FEIS), along with public comments, interagency consultation, and government to government discussions with Indian tribes. The FEIS incorporates the best available science related to invasive plant management on National Forest system lands and is tiered to the Pacific Northwest Invasive Plant Program Final Environmental Impact Statement (R6 2005 FEIS).

Our decision approves herbicide use in combination with non-herbicide treatments and restoration to effectively control invasive plants. The decision to use herbicides will be based on the values at risk from invasive species; the biology of particular invasive plant species, the proximity to water and other sensitive resources, and the size of the infestation (these factors may change over time). Figures 1, 2 and 3 depict the way the Forest Service will approach herbicide use for this project. Herbicides will be used in conjunction with non-herbicide methods to most effectively treat target species. The project will be implemented over the next five to fifteen years, depending on funding, treatment effectiveness, and the amount of new infestations detected during the implementation period. Given adequate funding, the selected alternative could control invasive plants within five to six years (see FEIS Chapter 3.1 for details).

These invasive plant treatments will complement on-going invasive plant management efforts, including prevention practices such as cleaning heavy equipment, using weed-free straw and mulch, using pelletized or certified weed free feed, managing off road vehicle use and backcountry travel in some areas, and restoration of disturbed areas. Prevention and restoration are key elements of invasive plant management, as acknowledged in the R6 2005 FEIS and ROD. The Pacific Northwest Region has an objective to reduce reliance on herbicides over time. This objective is intended to be met through effective treatment and restoration of treated sites.

The following principles will guide invasive plant management on the Forest and Scenic Area:

- Invasive plants are threatening healthy native plant communities and their 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.
- In treating invasive plants, our highest priority will be minimizing risks to human health, drinking water, wildlife, and botanical species.
- Herbicide treatments will be used when necessary and in combination with non-herbicide methods as appropriate to increase treatment 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 respond to new invaders rapidly according to methods and design criteria that have been analyzed in the EIS.
- Site restoration will be considered in invasive plant treatment prescriptions.

Purpose and Need

Invasive species were identified by the Forest Service as one of the four threats to forest health (http://www.fs.fed.us/projects/four-threats). Invasive plants can displace native plants, destabilize streams, and reduce the quality of fish and wildlife habitat.

The purpose of this project is to control invasive plants in a cost-effective manner that complies with the new management direction. Restoration of native plant communities is a key component of this effort.

With this project, the Forest Service is responding to the need for timely containment, control, and/or eradication of invasive plants, including those that are currently known and those discovered in the future. Invasive plant spread is unpredictable and actual locations of target species may change abruptly over time. Thus, the Forest Service needs the flexibility to adapt to changing conditions, and rapidly respond to invasive plant threats that may be currently unknown. Timeliness of action is an important factor because the cost, difficulty, and potential adverse effects of controlling invasive plants increases with the size and extent of the population. In addition, restoration expenses rise and effectiveness decreases as size of the invasive population increases.

High priority target invasive species include knapweed, hawkweed, knotweed, Canada thistle, and reed canarygrass. These infestations are degrading habitat for native plant communities in or near the Columbia River Gorge National Scenic Area; Mount St. Helens National Volcanic Monument; Glacier View, Trapper Creek, and Indian Heaven; the Pacific Crest Trail and other trails; Tatoosh, Goat Rocks, William O Douglas, and Mount Adams Wildernesses; Botanical and Wildlife Special Areas, Research Natural Areas, and areas with sensitive plant and animal populations; campgrounds, and popular recreation areas. Existing populations of invasive plants also threaten neighboring areas such as Mount Rainier National Park, and other federal, State, tribal, and private properties. Without effective treatment, invasive plants would continue to spread within these and other natural areas on and adjacent to the National Forest.

Invasive plant treatments have been accomplished for several years; however, the toolbox available for the treatments was limited. Manual treatments have been accomplished over the years, with mixed results (Chandler, personal communication, 2005). The R6 2005 FEIS provided updated management direction for invasive plants on National Forests in the Pacific Northwest, including the Gifford Pinchot National Forest and the Columbia River Gorge National Scenic Area in Washington State. Part of the purpose and need for this project is to update invasive plant treatments to conformance with the 2005 direction.

The need for action includes a need to restore vegetation on sites where invasive plants have crowded out desired species. In some cases, removing the invasive plants is enough to allow native plants to re-occupy a site. Some sites will also need active restoration (mulching, seeding, planting) to ensure recovery of desired vegetation.

The Selected Alternative

We have decided to select Alternative B (the Proposed Action) described in the Site-specific Invasive Plant Project FEIS. Alternative B allows for a wide range of treatment options across the project area.[1] Non-herbicide treatments will continue to be used where appropriate. Herbicide use in conjunction with non-herbicide treatments is expected to greatly increase treatment effectiveness. However, since herbicide use carries some risks, the type, application method, application rates, and use of additives will be limited in sensitive areas (e.g. along streams, near roadside ditches with higher risk to deliver herbicides into streams, near botanical species of local interest). No floating or submerged aquatic invasives are included in this project; however target species emerging from streambanks or wetlands may be treated.

The decision includes a non-significant Forest Plan Amendment (#20), that makes standards and guidelines related to invasive plant management more consistent with regional direction.

Components of the selected alternative are *summarized* below. A detailed description of the selected alternative, including the implementation planning process; the full list of project design criteria; buffers for wet and dry streams and wetlands; and treatment area lists and maps; is in the FEIS, Chapter 2.5 and Appendix A.

[1] Treatment methods that are NOT approved include aerial herbicide application; herbicides other than the ten analyzed in the FEIS; prescribed burning; plowing/tilling/disking and/or digging with heavy equipment; flooding and/or drowning; and foaming and/or steaming. Further analysis would occur if such methods are needed in the future.

ROD Table 1. Components of the Selected Alternative

Component	FEIS Reference	Selected Alternative B (Proposed Action)
Estimated Acres of Invasive Plants (2004 Inventory)[2]	Chapter 2.1	2,710
Proportion of Current Inventory Where Broadcast Application Method Is Approved[3]	Broadcast treatments are subject to PDC and herbicide use buffers (Chapter 2.5.8).	35%
Proportion of Current Inventory Where Broadcast Application Method Is NOT Approved		65%
Treatment of Currently Undetected Infestations	EDRR is described in Chapter 2.5.7.	New infestations will be treated according to Project Design Criteria (PDC). New infestations found in the future may be prioritized over existing infestations. If new invaders are found outside existing mapped treatment areas, control methods and site conditions will be evaluated to make sure no site conditions exist that could result in dissimilar effects from those analyzed in the FEIS. New sites will be reviewed to determine if the environmental analysis and documentation should be corrected, supplemented, or revised, as per FSH 1909.15.
Forest Plan Amendment #20	see Chapter 2.5	One existing Gifford Pinchot National Forest Plan standard will be amended to allow for limited use of herbicides in riparian reserves, and one standard will be deleted to allow for summer/fall treatments along roads.
Consistency with Northwest Forest Plan and Aquatic Conservation Strategy (ACS)	See Chapter 1. For more information on standards and guidelines. See Chapter 3.4 for information on ACS.	Maintains and/or restores watershed condition and is consistent with ACS Objectives. Complies with riparian reserve standards and guidelines.
Consultation With Tribes	See Chapter 3.8 for more information 8on effects on tribes.	American Indian tribes will be notified annually as treatments are scheduled so that tribal members may provide input and/or be notified prior to gathering cultural plants. Individual cultural plants identified by tribes will be considered botanical species of local interest, with appropriate buffers applied. Treatment timing at Fisher Hill (Treatment Area 22-16) will be coordinated with the Yakama Nation.

[2]The infested acreage by treatment area shown in Appendix A is a compilation of field inventories that were mapped in 2004.
[3]Broadcasting would be prescribed within this portion of the project area only where warranted by large size, high density, and/or continuous distribution of invasive plants. Spot and selective treatments would be implemented where invasive plants are in small, scattered patches even in places where broadcasting is allowed.

Component	FEIS Reference	Selected Alternative B (Proposed Action)
Implementation Planning Process	See FEIS Chapter 2.5.8 for details	Appropriate Forest Service staff will develop annual treatment prescriptions to ensure that project design criteria are appropriately incorporated. Treatments strategies will be validated and site-specific prescriptions (including post-treatment restoration) will be developed; pre-project surveys will be conducted; and ongoing monitoring needs will be established. The implementation planning process applies to existing invasive plant sites along with those detected in the future. Appropriate non-herbicide or herbicide methods will be determined based on the biology of the target species and size of the infestations. A public notification plan will be adopted and implemented.
Restoration Plan	See Chapter 2.5.6 and Appendix F	Passive restoration is estimated to be effective on about one-third of the treatment sites. Mulching, competitive seeding and planting will be part of the prescription on approximately two-thirds of the treatment sites.
Herbicide Use	See FEIS Chapter 3.1 for information on herbicide properties. Risk assessments and the R6 2005 FEIS were incorporated into the design of the Proposed Action and herbicide effects analysis throughout Chapter 3.	Herbicides will be used in accordance with label instructions and advisories, except where more restrictive measures are required by PDC. Herbicide applications will only treat the minimum area necessary to meet site objectives. Herbicide formulations will be limited to those containing one or more of the following 10 active ingredients: chlorsulfuron, clopyralid, glyphosate, imazapic, imazapyr, metsulfuron methyl, picloram, sethoxydim, sulfometuron methyl, and triclopyr. Herbicide application methods include wicking, wiping, injection, spot, and broadcast, as permitted by the product label and PDC. The use of triclopyr is limited to spot and hand/selective methods. Herbicide carriers (solvents) are limited to water and/or specifically labeled vegetable oil.
Herbicide Application Rates	See Chapter 2.5.8 for PDC related to application rates. See FEIS Chapter 3.1 for application rates.	Lowest effective label rates will be used for each given situation. In no case will broadcast applications of herbicide or surfactant exceed typical label rates.
Surfactants	See Chapter 2.5.8 for PDC related to surfactants. FEIS Chapter 3.1 and 3.5 for detailed information on surfactants.	POEA surfactants, urea ammonium nitrate or ammonium sulfate will not be used in applications within 150 feet of surface water, wetlands or on roadside treatment areas having high potential to deliver herbicide to streams.
Herbicide Handling and Transportation Safety	See PDC G (Chapter 2.5.8)	An Herbicide Transportation and Handling Safety/Spill Response Plan is required.

Component	FEIS Reference	Selected Alternative B (Proposed Action)
Roadside Treatment Areas	See PDC in Chapter 2.5.8; discussion about potential herbicide delivery via roadside ditches is in FEIS Chapter 3.4, Appendix D, the Biological Assessment and FWS (2007) and NMFS (2008) Biological Opinions/	No broadcast of any herbicide and no use of picloram and/or triclopyr BEE (Garlon 4) will occur along roads that are identified as having high risk of herbicide delivery to streams (see Appendix D of the FEIS for a list of roads). Aquatic labeled herbicides will be used within roadside ditches. Aquatic labeled herbicides or herbicides associated with lower risk to aquatic organisms will be applied using spot or hand/selective methods within 15 feet of the edge of a wet roadside ditch. Aquatic labeled herbicides will be used for treatments of target vegetation emerging out of the wet roadside ditch.
Gas-Powered Equipment	See PDC table (Chapter 2.5.8)	Fueling of gas-powered equipment with gas tanks larger than 5 gallons will not occur within 150 feet of surface waters. Fueling of gas-powered equipment with gas tanks smaller than 5 gallons will not occur within 25 feet of any surface waters.
Goat Grazing	See PDC table (Chapter 2.5.8.)	Goat grazing will be limited to areas where invasive plants make up the majority of suitable forage species, away from any botanical species of local interest or other sites where adverse impacts from goats are likely to occur. Goats will be confined to specific areas and closely supervised. Goats will not be grazed at any one site for more than 30 consecutive days.
Wetlands	See PDC table Chapter 2.5.8, and discussions about treatment near streams, wetlands, lakes, ponds, wells and springs in Chapter 3.4 and 3.5.	Wetland vegetation will be treated when soils are driest. If herbicide treatment is necessary for emergent target plants when soils are wet, use aquatic labeled herbicides. Favor hand/selective treatment methods where effective and practical.
Lakes and Ponds		No more than half the perimeter or 50 percent of the vegetative cover or 10 contiguous acres around a lake or pond will be treated with herbicides in any 30-day period.
Wells and Springs		All wells and springs used for domestic water supplies will be protected with a 100 foot no herbicide buffer for wells and a 200 foot no herbicide buffer for springs.
Annual Caps		Treatments above bankfull will not exceed 10 acres along any 1.5 mile of stream reach within a 6th field subwatershed in any given year. In addition, treatments below bankfull will not exceed 7 acres total within a 6th field sub-watershed in any given year.

Monitoring

This project involves pre- and post- treatment record keeping, monitoring and reporting. Details are in FEIS Chapter 2.7. A project work plan will be developed and herbicide use will be reported to meet Forest Service requirements at FSH 2109.14. Appendix E of the DEIS included typical forms for herbicide use reporting.

Post-treatment reviews will occur to determine whether treatments were effective, whether or not passive/active restoration is occurring as expected, and whether PDC were appropriately applied. Non-target vegetation (e.g. botanical species of local interest) will be evaluated on sample sites before and immediately after treatment, and two to three months later. Contract administration and other existing mechanisms will be used to correct deficiencies. Re-treatment and active restoration prescriptions will be developed based on post-treatment results.

Candidates for monitoring under the Regional Framework (R6 2005 ROD) will be submitted for higher risk situations (e.g. emergent vegetation treatment or broadcast spray of aquatic labeled imazapyr and/or glyphosate within 100 feet of streams). Additional monitoring may be included as part of the Gifford Pinchot National Forest Annual Monitoring Plan or other ongoing programs such as state water quality monitoring.

Public Involvement

This project has been in development for several years. The project was first listed in the Gifford Pinchot National Forest Schedule of Proposed Actions in 2004. A Notice of Intent (NOI) to prepare an EIS requesting public input was published in the Federal Register on February 23, 2004. The NOI proposed a project with a geographic scope covering the Gifford Pinchot National Forest and entire Columbia River Gorge National Scenic Area, along with two other National Forests. Individuals, organizations, agencies, businesses, and local and Tribal governments were contacted by letter and solicited for comments on the proposal.

A Draft EIS was published in 2006, followed by an extended comment period. All substantive comments are shown in Appendix G of the FEIS, along with agency responses. All of the public comments agreed that Alternative B should be selected, although there were many substantive comments urging more analysis or additional layers of caution integrated into herbicide use in the project, especially in riparian areas.

In response to interagency and public comments, some changes have been made to the design criteria or other descriptions of Alternative B since release of the Draft EIS. The Forest Service addressed the public and interagency comments with additional analysis in the FEIS and modifications to the Proposed Action. My staff and I have worked closely with the U.S. Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS) to develop PDC to minimize effects on fish and other aquatic organisms and flesh out analysis methods.

Reasons for this Decision

Factors influencing our decision include:

(1) The effectiveness of treatments in reducing acreage of invasive plants compared to the current inventory

(2) How well the alternative avoids or minimizes potential adverse effects to human health and the environment; and

(3) Cost-efficiency of the alternative, as indicated by the effectiveness analysis in FEIS Chapter 3.2 and the financial analysis in Chapter 3.7.

I have selected Alternative B because it allows for the most effective treatments that reduce acreage of invasive plants compared to the current inventory. It minimizes adverse effects to human health and the environment through implementation of project design criteria and herbicide use buffers. It is the most effective and economically efficient of all the alternatives in reducing acreage of invasive plants compared to the current inventory. It restricts broadcasting on the two-thirds of the project area that lie within riparian reserves and along roads with high potential for herbicide delivery to streams, but allows broadcasting where needed on a portion of the area, decreasing costs by approving this cost-effective method along some roadsides in upland areas. Alternative B is most likely of all the alternatives to control the invasive plants that are degrading special areas on the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area.

Forest Plan amendments approved in Alternative B will allow for effective treatments within riparian reserves and along scenic roadsides.

Alternative B responds to public concerns expressed during two scoping periods (2004 and 2005) and the DEIS comment period (2006). It follows terms and conditions set forth in a Biological Opinion for this project issued by the FWS and NMFS.

Alternatives Considered

Two alternatives to the proposed action were considered in the FEIS: No Action (Alternative A) and Alternative C.

Why Alternative A Was Not Selected

Alternative A would have implemented treatments according to existing plans; no new invasive plant treatments would be approved (effective treatments are currently approved on approximately 400 of 2,710 estimated acres needing treatment). Alternative A would not have amended the Forest Plan to allow for herbicide use in riparian reserves or summer/fall treatments along scenic roads. Alternative A would not have approved effective, timely treatments of newly discovered infestations. Alternative A would not have included a plan for restoring native plant communities.

Alternative A was not selected because it was the least effective of the alternatives. Without effective treatment, invasive plants would have continued to spread within and adjacent to the National Forest. The cost, difficulty, and potential adverse effects of controlling invasive plants would have continued to increase. Alternative A would not have allowed effective treatments within riparian reserves or along scenic roads because current Forest Plan standards would continue to hamper timely and effective herbicide use in these areas.

Alternative A would have allowed limited use of 3 herbicides, as compared to 10 in Alternatives B and C. The limited number of herbicides has comparatively less effectiveness and may result in herbicide resistance (R6 2005 FEIS Chapter 4.2, Site-specific FEIS Chapter 3.2). There would have been no explicit strategies to reduce herbicide reliance over time, restore native plant communities, or achieve long-term control. Alternative A would not include mulching, seeding or planting to re-establish native plant communities.

Invasive plants would likely continue to degrade special areas on the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area under Alternative A.

Why Alternative C Was Not Selected

Alternative C was developed to resolve many public concerns related to herbicide use by eliminating herbicide application on about two-thirds of the National Forest system lands. Under Alternative C, only very limited herbicide use would have been permitted within riparian reserves and near roadside ditches. Alternative C would not have approved any broadcast treatment in any situation.

Alternative C would have minimized or eliminate risks of herbicide affecting non-target resources, but would have increased treatment costs and decreased treatment effectiveness. Alternative C would have retained current Forest Plan prohibitions on herbicide use in riparian reserves. Alternative C would have amended the Forest Plan to allow for summer/fall treatments along scenic roads.

Alternative C was not selected because it would have not have been as effective or timely in controlling invasive plants. It would have reduced potential impacts related to herbicide use, but at too great an expense. The FEIS estimates that treatment cost per acre would increase by an average of approximately 43 percent under Alternative C as compared to Alternative B.

Invasive plants would likely continue to invade and degrade native plant communities in riparian reserves on the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area under Alternative C. Effective treatments may be possible without herbicide for some species in riparian reserves, but the financial costs may be prohibitive. Non-herbicide methods emphasized in Alternative C could also result in more ground disturbance than the Selected Alternative.

We find that the herbicide use approved in the Selected Alternative would improve, rather than degrade the condition of riparian reserves.

Alternative Comparison – Decision Factors

Effectiveness of Treatments in Reducing Acreage of Invasive Plants Compared to the Current Inventory (see FEIS Chapter 3.2 for detailed analysis)

The analysis of treatment effectiveness in the FEIS Chapter 3.2 focuses on several indicators: 1) the percentage of current inventory that may be treated with herbicides under each alternative; 2) the number of herbicides available for use; and the potential effectiveness of treatment based on whether or not all treatment tools are allowed at a given site. Treatment effectiveness increases with the number of treatment options available across the largest area.

Alternative A provides three herbicide options that may be used on 17 percent of the project area. Under Alternative A, about 2,100 acres would be treated in year one using manual methods. About 330 acres would be treated using selective herbicide treatments and 70 acres using broadcast, based on the most ambitious scenario available given current NEPA decisions.

These treatments are assumed to reduce infestation size by 50 percent, meaning that approximately half the population is predicted to be eradicated each year of treatment. The lower percentage than the Proposed Action is based on the emphasis on manual treatments that may not be fully effective.

In contrast, Alternative B provides ten herbicide options on the entire (100 percent) project area. Alternative B has the greatest potential to be effective in reducing acreage of invasive plants at any one place and time; it was estimated to reduce invasive plants at a given treatment site by 80 percent per year (FEIS Chapter 3.2). Assuming unlimited funding, Alternative B is estimated to nearly eliminate the known acres of infestation within five years. The potential for reinfestation would be reduced by passive and active restoration of native plant communities at treatment sites.

Alternative C is more effective than Alternative A (because it includes a greater selection of herbicides to choose from), however, it is less effective than Alternative B because herbicides would not be an option over 65 percent of the project area and no broadcast would be approved. Alternative C provides ten herbicide options on approximately 35 percent of the project area. Assuming unlimited funding, Alternative B is estimated to nearly eliminate the known acres of infestation within five years. The potential for reinfestation would be reduced by passive and active restoration of native plant communities at treatment sites.

Alternative C could also eliminate infestations of many invasive plants, however the effectiveness of some treatments would be compromised due to restrictions on herbicide use over two-thirds of the project area. Alternative C would be so expensive as to be cost-prohibitive, and some target species may not be eradicated effectively even with an unlimited budget, because herbicides would be needed in combination with other methods to be fully effective in eradicating many invasive plant species (see FEIS Chapter 3.2 and Appendix B for more information).

Potential for Adverse Effects on Human Health and the Environment (FEIS Chapters 3.2 – 3.8)

Alternative A poses the least risks to human health and the environment from herbicide treatment (because herbicide would be approved for use on far fewer acres) however its lack of treatment effectiveness means that invasive plants would continue to threaten native plant communities and habitats on the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area. Impacts from currently approved treatments (not considered significant or of high public concern) would be possible.

Alternative B increases risk to human health and the environment from herbicide use compared to Alternative A because more acreage may be treated using herbicide. However, the layers of caution added to herbicide use (see FEIS Chapter 3.1); project design criteria and buffers (FEIS Chapter 2.5); following guidance in the Forest Plan and Scenic Area management plans; using well trained applicators; and maintaining reasonable herbicide transportation and handling safety practices will serve to minimize these risks.

Peer-reviewed risk assessments using the best available scientific methods and analysis show no harmful exposure scenarios to people or drinking water associated with proposed herbicide use in Alternative B. Potential conflicts between treatments and forest product gathering areas will be minimized through newspaper announcements, individual notification, fliers, and posting signs at project site boundaries. Implementation of PDC results in no exposure exceeding thresholds of concern for people.

No populations of botanical species of local interest will be adversely impacted (FEIS Chapter 3.2.4). The project design criteria minimize drift; however individual common non-target plants may be exposed to herbicides and in some cases, individual non-target plants may die.

Wildlife species may also be inadvertently exposed to herbicides; however potential impacts will be minimized by restricting treatment during certain times of the year (e.g. owl nesting season) and avoiding use of certain herbicide ingredients and additives in habitats for species of local interest.

Similarly, Alternative C would have minimized adverse impacts on human health and eliminate risk to the aquatic environment from herbicide treatment by avoiding herbicide use within riparian reserves and along roads with high potential to deliver herbicide to streams, which amounts to no herbicide use on 65 percent of the project area.

This restriction would have reduced the effectiveness of Alternative C, and unless budgets were unlimited; invasive plants would likely continue to degrade riparian and other habitats. Even with unlimited budgets, the restrictions on herbicide use would make eradication of key target species such as (not limited to) hawkweed, knotweed, reed canarygrass, and purple loosestrife improbable.

In addition, risks to the aquatic environment from disturbance, erosion and sediment would continue to occur from non-herbicide treatments.

Monetary Costs and Financial Efficiency, as Indicated By the Economic Efficiency Analysis (FEIS Chapter 3.7)

Alternative A is estimated to cost approximately $1.81 million ($780 per acre) under the most ambitious conceivable treatment scenario over a five year period, about $13,000 per year more than Alternative B. Alternative A would cost about 20 percent more per acre than Alternative B, so fewer acres could be treated at a constant budget. No site restoration would be included at that price. The higher cost comes from the emphasis on manual treatments that are labor intensive and need to be repeated more often.

The most ambitious treatment scenario under Alternative B is estimated to cost about $1.77 million over a five year period, with a per acre treatment cost about $656 per acre, including restoration. Alternative C is estimated to be far more expensive, with its most conceivable treatment scenario costing $2.86 million over five years to implement (including restoration). It is associated with the most expensive per acre treatment costs at $1177 per acre (almost double the per acre cost of Alternative B).

We have selected Alternative B because it is the least expensive/most effective alternative on a per acre basis.

Alternative Comparison – Public Issues

In making this decision, we considered the way each alternative responded to public issues. Five issue groups were identified in the FEIS:

Issue Group 1 – Human Health and Worker Safety; Issue Group 2 – Treatment Strategy and Effectiveness; Issue Group 3 – Social and Economic; Issue Group 4 - Non-target Plants and Animals; and Issue Group 5 - Effects on Soils, Water and Aquatic Organisms.

See ROD Table 2 for a detailed alternative comparison in terms of these issues.

Issue Group 1 – Human Health and Worker Safety

None of the alternatives contemplated for this project would have adversely affected human health. Many layers of caution were embedded into the project to ensure that no harmful exposures of herbicide would occur (see FEIS Chapter 3.1 for details). Layers of caution include limiting the application rate and/or method for certain herbicide active ingredients or additives; adhering to an herbicide transportation and handling safety plan; and complying with state, regional, and national policies related to herbicide use. The analysis for human health and worker safety is tiered to the R6 2005 FEIS (see Chapter 4.5 and Appendix Q), which includes detailed discussions about herbicide risk assessments that support our finding that people will not be exposed to harmful doses of herbicide from use approved in this decision.

Issue Group 2 – Treatment Strategy and Effectiveness

Alternative B allows for the use of herbicides as needed across the project area. The Common Control Measures (prescription key – see Appendix B of the FEIS); PDC and buffers (see FEIS Chapter 2.5) and decision process regarding use of herbicides (see Figure 1 below) ensure that herbicide use will be appropriate and limited to sites where it is needed to effectively treat invasive plants.

The other alternatives would avoid herbicide use on the majority of the Forest and Scenic Area, which would have continued to limit our ability to control invasive plants.

We are approving treatments for new sites beyond the 2004 inventory, as long as they are done according to the PDC, buffers, and other implementation planning guidance provided in Chapter 2.5 of the FEIS. This will minimize the amount of time between detection and treatment and treat infestations when they are smallest. This will reduce treatment cost, increase effectiveness, and minimize adverse effects of treatment because the larger the population size, the more difficult to treat effectively while minimizing unwanted impacts.

We are approving seeding, mulching and planting where needed as part of the invasive plant treatment project so that desirable vegetation can be restored and reinfestation avoided. We will consider surrounding land uses and vectors of invasive plant spread and integrate prevention into all land uses as a part of the invasive plant management program. The implementation planning process detailed in Chapter 2.5 shows how we will identify the specific objectives for treatment (eradication, control, containment, etc.). High priority target species and sites will be treated first where possible.

The Gifford Pinchot National Forest Supervisor is amending the National Forest Plan to eliminate standards for herbicide use that are inconsistent with management direction in the R6 2005 ROD as directed by the Regional Forester (see FEIS 2.5.9).

FEIS Chapter 3.2 discusses the reasons why Alternative B is more effective than the other alternatives in potentially meeting the need to control invasive plants. Restrictions on use of herbicides as in Alternatives A and C would restrict our treatment toolbox and reduce the potential for success in this program.

Issue Group 3 – Social and Economic

We have selected Alternative B because it has the best cost-effectiveness of all the alternatives. It is more effective than the other alternatives because it 1) allows for the greatest flexibility in applying integrated weed management techniques; 2) allows for use of herbicides within riparian reserves and along all roadsides; 3) includes seeding, planting and mulching to hasten site restoration. Each treatment is estimated to reduce population size by 80 percent. Given unlimited funding, invasive plants could be controlled within the project area in five years. With current (limited) budgets, the highest priority infestations will likely be treated and full control of all target species would take longer than five years.

Under Alternative B, we are approving use of herbicides and other invasive plant treatment methods in wilderness and research natural areas, along scenic roads, and within recreation areas. PDC ensure that the impacts of treatments will not seriously impact recreation use on the Forest and Scenic Area. As discussed in Chapter 3 of the FEIS, invasive plants themselves pose a greater threat to natural areas than the treatments proposed.

We find that the selected alternative adequately protects scenic, recreation and wilderness values. As discussed in Chapter 3.8 of the FEIS, containing, controlling and/or eradicating invasive plants would improve scenic, recreation and wilderness values. The disturbance related to invasive plant treatment would be minor and short lived.

Invasive plant treatments may be done in special forest product gathering areas (such as places where mushrooms are harvested). We acknowledge that some people may have to move to other areas during the treatment period. People would be notified as part of the permitting process, through newspaper or other public media, and through posting of fliers and signs. These measures will minimize inadvertent exposure to herbicides. Even if someone missed the signs and other notification and entered a sprayed area, the plausible amount of herbicide exposure would be minimal, and effects on human health would be unlikely.

Native American tribes would also be consulted to identify areas within the Forest or Scenic Area used for subsistence or traditional purposes that may need to be treated each year. In general, tribal members have expressed support for effectively treating invasive plants that threaten healthy ecosystems.

FEIS Chapter 3.8 also demonstrates that there would be no disproportionate effects from this project to minorities or low income people. Workers who historically have performed invasive plant treatments (often country crews) do not tend to come from any one racial group or nationality.

Issue Group 4 – Non-target Plants and Animals

We have selected Alternative B because it minimizes potential adverse effects on non-target species, while effectively treating invasive plants. As discussed in FEIS Chapter 3.2 and 3.3, invasive plants pose a great threat to native plant and animal species of local interest. None of the treatments proposed are likely to adversely impact or affect plants or terrestrial wildlife species of local interest. PDC Group I focus on botanical species of local interest and PDC Group J focus on terrestrial wildlife species of local interest. The Botanist and Wildlife Biologist on the project found that the PDC would minimize adverse effects and that controlling invasive plants would improve conditions for species of local interest.

Issue Group 5 – Fish and Aquatic Organisms

We have selected Alternative B because it includes sufficient buffers and PDC to minimize potential for herbicide to be delivered to surface waters in concentrations above a threshold of concern. Herbicide use would be limited near water to specific ingredients and application rates and methods are also restricted. PDC Group H (see FEIS Chapter 2.5.8) provides appropriate flexibility to be effective while minimizing adverse effects. While small concentrations of herbicides may reach water, the risk of harm to fish is very low. This is due to limitations on the amount of herbicide that may be used near fish habitat, the limited ingredients available for use near streams, the limited application rates and methods, the preference toward herbicides of low risk to aquatic organisms, and other PDC associated with herbicide use in Alternative B. Herbicide risk assessments indicate potential for non-lethal effects on fish, along with the potential for adverse effects on elements of the aquatic ecosystem such as aquatic plants, from small amounts of herbicide.

Herbicide contact with water cannot completely be avoided, especially during emergent vegetation treatments, and fish species of local interest may be adversely affected by herbicides, sediment, or disturbance from streambank treatments.

ROD Table 2. Alternatives Compared

Issue Component	Issue Indicator	No Action (Alternative A)	Proposed Action (Alternative B)	Alternative C (Limited Herbicide)
Issue Group 1 – Human Health and Worker Safety				
1a - Exposure to Herbicides	Qualitative discussion.	No significant impact (FONSI) was documented for existing herbicide use.	Alternative B will not expose people to harmful levels of herbicide ingredients.	Same as B
1b – Drinking Water	Qualitative discussion.	No significant impact (FONSI) was documented for existing herbicide use.	Drinking water will not be adversely affected.	Same as B
Issue Group 2 - Treatment Strategy and Effectiveness				
2a - Effectiveness of Treatment Methods	Acreage/Percent of Area Where all Options (including herbicides) are allowed	400/ 15% Herbicide use on a very small portion of the existing inventory of invasive plants	2,710/ 100% - herbicides may be used in all sites, subject to PDC and buffers (see FEIS Chapter 2.5.8)	940/ 35% - Herbicide use allowed on more sites than under No Action; fewer than Proposed Action.
	The Number of Herbicides Available for Use	3	10 - All herbicides are available, subject to PDC and buffers (see FEIS Chapter 2.5.8)	Same as B
	Acres of Invasives in 2011 (*assuming most ambitious conceivable treatment and unlimited funding*)	Estimated at 407 acres remaining to be treated after 2012, potential for new infestations would be high.	Estimated at 6 acres, minimal acreage would need to be treated after 2012 and potential for new infestations greatly reduced.	Estimated at 84 acres to be treated after 2012, potential for new infestations would be greatly reduced but hard to control infestations may never be fully eradicated.

Issue Component	Issue Indicator	No Action (Alternative A)	Proposed Action (Alternative B)	Alternative C (Limited Herbicide)
2b - Long Term Strategy Reduce Reliance on Herbicides Over Time, restore native plant communities, achieve long-term control	Qualitative discussion.	No explicit strategies to reduce herbicide reliance over time, restore native plant communities, or achieve long-term control.	Long-term control strategy applied to individual sites within treatment areas; active and passive restoration will be considered as part of the treatment prescription. Reliance on herbicide will decline over time.	Long-term control strategy applied to individual sites within treatment areas; active and passive restoration will be considered as part of the treatment prescription. Reliance on herbicides will decline on about 35 percent of the project area. There will be no reliance on herbicides over most of the project area.
2c - Treatment Priority	Qualitative discussion.	High priority administrative and recreation sites are included.	Treatment area priorities are shown in Appendix A. Funding will have to be increased above current levels to effectively treat all high priorities.	Fewer high priority treatment areas will be effectively treated.
2d - Early Detection/ Rapid Response	Qualitative discussion.	Does not allow for use of herbicides on new detections.	Allow for use of herbicides on new detections according to PDC.	Allow for use of herbicides on new detections according to PDC; however herbicides will not be allowed on about 65% of the project area.
2e - Forest Plan Amendment	Whether or not herbicides may be used within riparian reserves.	Does not amend the Gifford Pinchot National Forest Plan. Herbicides generally use will not be used within riparian reserves.	Amends the Gifford Pinchot National Forest Plan to allow herbicide use within riparian reserves according to management direction in the R6 2005 ROD.	Does not amend the Gifford Pinchot National Forest Plan. Herbicides generally use will not be used within riparian reserves.
Issue Group 3 – Social and Economic				
3a - Treatment Costs and Financial Efficiency	Total Cost in Dollars for the Most Ambitious Program (2007-2011)	$1,810,000	$1,763,000	$2,859,000

Issue Component	Issue Indicator	No Action (Alternative A)	Proposed Action (Alternative B)	Alternative C (Limited Herbicide)
	Average Annual Cost in Dollars for the Most Ambitious Program (2007-2011)	$499,000	$486,000	$788,000
	Average Cost Per Acre (2007-2011)	$780 (does not include restoration which would increase cost by more than $300 per acre)	$656 (includes restoration)	$1,117 (includes restoration)
3b – Effects of Invasive Plant Treatment on Scenic, Recreation and Wilderness Values	Qualitative discussion.	No significant impact (FONSI).	Containing, controlling and/or eradicating invasive plants will improve scenic, recreation and Wilderness values over the long run. Project Design Criteria limit potential short term adverse impacts.	Same as B
3c – Special Forest Products and Gatherers	Qualitative discussion.	No significant impact (FONSI).	Conflicts between treatments and gathering areas would be minimized through newspaper or individual notification, fliers, and posting signs. No exposure exceeding thresholds of concern for people are plausible.	Same as B

Issue Component	Issue Indicator	No Action (Alternative A)	Proposed Action (Alternative B)	Alternative C (Limited Herbicide)
3d – Effects on American Indian Tribes and Treaty Rights, Potential for Disproportionate Effects to Minority and Low-Income Populations, and Civil Rights and Environmental Justice	Qualitative discussion.	No significant impact (FONSI).	No disproportionate effects on any group of people, ongoing government-to-government consultation with tribes.	Same as B
Issue Group 4 – Non-Target Plants And Wildlife				
4a -Effects of Herbicide on Non-Target Botanical Species of Local Interest	Estimated Proportion of Project with Potential Broadcast Application	20% - risks to non-target plants are greatest with broadcasting; few sites to be treated this way.	35% risks to non-target plants are greatest with broadcasting, however buffers and PDC are expected to protect Botanical Species of Local Interest (see Chapter 2.5.8)	0% - Least risk to non-target plants from broadcasting. No broadcasting included.
	Approximate Treatment Acreage Where All Options (including herbicide) are allowed	400 – Options for herbicide use very limited on Gifford Pinchot National Forest.	2,710 – All known infested sites could be treated with herbicide; however PDC and buffers limit the herbicide ingredients and method of application near certain habitats.	940 – Options on certain roads and within Riparian Reserves would be limited to non-herbicide methods. This reduces potential effectiveness of this alternative.
	Number of Herbicides Available for Use	3 – Few herbicide options limit effectiveness and increases potential for herbicide resistance.	10 – All herbicides available according to PDC and buffers (see Chapter FEIS 2.5.8)	Same as B

Issue Component	Issue Indicator	No Action (Alternative A)	Proposed Action (Alternative B)	Alternative C (Limited Herbicide)
4b – Effects of Herbicide on Terrestrial Wildlife Species of Local Interest	Qualitative discussion.	No significant impact (FONSI).	Not likely to adversely affect wildlife species of local concern, including mollusks and salamanders. PDC (see FEIS Chapter 2.5.8; PDC Group J) are specific to habitats of interest on the Forest and Scenic Area in Washington state.	Same as B
Issue Group 5 – Effects on Soils, Water and Aquatic Organisms				
5a – Potential Adverse Effects of Invasive Plant Treatment on Soils	Qualitative discussion.	No significant impact (FONSI).	PDC avoid herbicide concentrations of concern in soils; limitations on herbicide selection depending on site-specific soil conditions See FEIS Chapter 2.5.8, PDC group H.	Same as B
5b - Potential for Herbicide Delivery to Streams, Lakes, Rivers, Floodplains, and Wetlands	Character of Herbicide Use Within Aquatic Influence Zones	Restricted to hand applications of aquatic glyphosate.	Buffers restrict broadcasting near perennial and intermittent streams; treatment of wetland emergent or streamside target vegetation will require low aquatic risk or aquatic labeled herbicides.	Same as A
	Estimated Acres Herbicide Use Within Aquatic Influence Zones	Limited to hand treatments with aquatic formulations in administrative/ recreation sites.	412	Same as A

Issue Component	Issue Indicator	No Action (Alternative A)	Proposed Action (Alternative B)	Alternative C (Limited Herbicide)
	Estimated acreage where herbicide treatment may occur on roadside treatment areas with high potential to deliver herbicides to surface water	100 or less	940	Same as A
5c - Potential for Adverse Effects to Aquatic Organisms from Herbicide	Potential for fish to be exposed to harmful concentrations of herbicide	Very Low, limited herbicide treatment near fish habitat, existing treatments are not likely to adversely affect aquatic species of local interest	Low, treatment of emergent vegetation near fish habitat carries some risk of herbicide contacting water, concentrations expected to be below a threshold of concern.	Very Low, limited herbicide treatment near fish habitat, emphasis on non-herbicide treatments may increase sediment to fish habitat at some sites.

The Forest Service worked closely with the regulatory agencies (Fish and Wildlife Service – FWS and National Marine Fisheries Service - NMFS) to develop the PDC and buffers. Both regulatory agencies found the viability of listed fish species would not be jeopardized (see Biological Opinions - FWS 2007 and NMFS 2008) and included mandatory terms and conditions to minimize the taking of any listed fish. The selected alternative incorporates these terms and conditions, which are mainly restatements of the PDC or provide direction on how to report treatments occurring in or near fish habitat to the regulatory agencies before and after implementation.

Environmentally Preferred Alternative

We find that Alternative B is the environmentally preferred alternative in accordance with Council on Environmental Quality (CEQ) regulations (40 CFR Part 1505.2 (b)). Alternative A and C are not environmentally preferred because both are too restrictive to effectively control invasive plants that currently threaten environmental quality. By prohibiting herbicide use on 85% and 65% of the project area respectively, Alternatives A and C are more costly and less likely to be effective long-term than Alternative B. PDC and buffers minimize the risks of adverse effects associated with herbicide use proposed in Alternative B to a low level. The relatively greater cost-effectiveness in restoring native plant communities associated with Alternative B outweighs its low level of risk. Thus, the selected alternative incorporates all practicable means for minimizing adverse effects to the environment while meeting the need to control invasive plants.

Findings Required by Laws and Regulations

Our decision is consistent with all other current laws, regulations and policies guiding invasive plant programs and other management activities on National Forest System lands within the Forest and Scenic Area. This includes but is not limited to: the Clean Water Act and Safe Drinking Water Act; the Wilderness Act; the National Historic Preservation Act; and Executive Orders 11988, 11990 and 12898.Specific findings and rationales required by law follow.

Clean Water and Safe Drinking Water Acts

The Selected Alternative will meet and conform to the Clean Water Act as amended in 1982 and Safe Drinking Water Act as amended in 1996 (FEIS, Chapter 3, Section 3.9). The Clean Water Act 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. This project will meet and conform to these Acts; although the project may result in some herbicide entering surface or ground waters, the amount would be below a threshold of concern for beneficial uses because of the restrictions on certain herbicides near streams, PDC and the nature of the type of infestations treated.

Wilderness Act

The Selected Alternative includes 60 acres of treatment within congressionally designated wilderness areas and trailheads near wilderness boundaries. Any treatment within wilderness would be aimed at preserving or protecting wilderness character. Mechanized equipment would not be proposed for this project. Handheld backpack pumps may be used to spot treat some invasive plants on wilderness trails. Minimum impact treatment methods will be selected as per PDC D2 (see Attachment 1 for list of PDC).

The National Historic Preservation Action

The USDA, Forest Service, Advisory Council on Historic Preservation and the Washington State Historic Preservation Office (Office of Archaeology and Historic Preservation), have a programmatic agreement addressing the management of cultural resources on National Forests in the state of Washington (Agreement Number 97-06-59-10). There are several actions that were determined to have little or no potential to affect historic properties ; examples of these actions include fence construction, planting on disturbed areas, aerial seeding, pre-commercial thinning, encroachment thinning using hand methods to lop branches and cut small trees, and reforestation planting by hand.

While invasive weed eradication is not specifically itemized in the Programmatic Agreement between the Forest Service and the Washington SHPO, the techniques, methods and effects appear similar. Consultation with the Washington SHPO and affected Tribes in a letter dated February 10, 2006 proposed to classify the following actions with those that have little or no potential to affect cultural resources:

- Herbicide Application Methods (selective/hand, spot and broadcast spray).
- Cultural Methods limited to goat grazing in this proposal.
- Manual/Mechanical Methods (mowing, weed whipping, and hand pulling)
- Manual/Mechanical Methods (grubbing and wrenching) in areas that occur on landslides, flood deposits, previously surveyed areas where no archaeological sites have been found, skid trails, landings and road cuts and fills.

Most of the treatment methods proposed are not ground disturbing and therefore would have no direct or indirect effect on cultural or heritage resources. The exception may be weed wrenching and grubbing, manual techniques that have minor potential to disturb heritage resources. Project design criteria (PDC) would minimize or eliminate potential impacts from weed wrenching and grubbing. PDC M2 applies to minor ground disturbing actions such as weed wrenching and grubbing with a shovel in areas that are outside landslides, flood deposits, previously surveyed areas, skid trails, landings, road shoulders, cuts and fills, etc. Weed wrenching and grubbing areas will be assessed annually and the Forest Archaeologist will have an opportunity to review project locations to determine if any cultural resources could be affected. Weed wrenching and grubbing techniques will not be used in known archaeological sites. Alternative treatment methods will be selected from those that would have low potential to affect cultural resources. With application of the PDC, no important direct or indirect adverse effects to cultural resources are predicted, and no contribution to cumulative adverse effects would occur. PDC would adequately protect cultural resources where new detections are identified for similar treatments.

Executive Orders 11988 and 11990: Flood Plains and Wetlands

Proposed invasive plant treatments within riparian areas are discussed in FEIS Chapter 3.4 and 3.5. The project is intended to restore native plant communities and habitats within riparian and upland areas. No serious adverse effects are anticipated to occur to wetlands and floodplains from treatment in the Selected Alternative B. The project is consistent with the Aquatic Conservation Strategy (ACS), Invasive Plant Treatment Standards, and other applicable guidance in the Gifford Pinchot National Forest Plan (see FEIS Chapter 1 for more information on ACS and applicable Forest Plan standards)

Executive Order 12898: 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. FEIS, Chapter 3.6 and 3.8, discusses the potential impacts of this project on these groups. With the implementation of any action alternative, there is the potential for some impact to Hispanic, Asian and American Indian communities. Harvesters of non-timber forest products tend to come from Asian, Hispanic and American Indian communities. These groups may be disproportionately exposed to herbicide treatments in areas available for picking their products (see FEIS Chapters 3.6 and 3.8).

The potential for harmful exposure of herbicide to any person is eliminated by PDC that require public notification including posting treatment areas and limitations on herbicide and surfactant selection, application rate, and application method. Inadvertent exposures will occur rarely and will not adversely affect anyone's livelihood or health.

Secretary of Agriculture Memorandum of 1827: Prime Farmland, Rangeland, Forestland and Parkland

No prime farmlands, rangelands, forestlands or parklands are within the project area, thus there would be no direct, indirect or cumulative effects on these lands.

Endangered Species Act

Consultation with the Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS, also referred to as NOAA Fisheries) has been completed for this project. The Forest Service worked with these agencies from project inception throughout the planning process. The FWS concurred with the Forest Service that the Proposed Action was not likely to adversely affect any terrestrial wildlife species listed under the Endangered Species Act (or proposed for listing). The FWS and NMFS concurred with the Forest Service that a portion of the project may adversely affect listed fish species and/or their habitat.

The Biological Assessment was sent to FWS and NMFS in January 2007, covering proposed actions that were considered both "not likely" and "likely" to adversely affect aquatic species listed or proposed for listing under the Endangered Species Act. Each agency (FWS and NMFS) prepared Biological Assessments in response to the BA (FWS December 2007 and NMFS January 2008). The BO's concluded that the project is not likely to jeopardize the continued existence of any listed or candidate species, and would not result in the adverse modification or destruction of designated critical habitat.

"Reasonable and Prudent Measures" necessary to minimize the taking of federally listed fish are documented in the BO's. The Reasonable and Prudent Measures do not substantively change the Proposed Action and the Forest Service will follow these recommendations during implementation of this project. . The BA, letters of concurrence and BO's are available hard copy on request or via the Forest Service website: http://www.fs.fed.us/gpnf/04projects/pinchotprojects.

FEIS Chapter 3.4 and 3.5 detail the effects on terrestrial and aquatic animal species of local interest, including federally listed species. The biologists analyzing this project have noted that without effective treatment, invasive plants are likely to adversely affect habitats on which federally listed fish and wildlife species depend.

Magnuson-Stevens Fishery Conservation and Management Act (MSA)

The National Marine Fisheries Service (NMFS) also completed an essential fish habitat (EFH) consultation, prepared in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801, et seq.), and implementing regulations at 50 CFR 600.

NMFS found that the proposed action may result in adverse impacts to a variety of habitat parameters important to salmonids where herbicides are "applied in drainages, riparian areas, and ditches upstream from occupied habitat. In addition, herbicides that enter streams are occasionally expected to reach concentrations that cause transient sublethal toxic effects in the above listed salmon and steelhead. However, appreciable water contamination is expected to be infrequent and limited in area and duration due to the relatively small amounts and rates of chemicals that will be applied in a given area, implementation of PDC to reduce water contamination, and the limited amount of acreage treated relative to the overall watersheds (NMFS 2008 BO)."

NMFS noted that "the herbicides proposed for use are generally transported readily in water and circumstances where herbicides are mobilized such as wind, rain and snow are likely to occur before all of the herbicides have broken down. Consequently, site-specific circumstances such as soil characteristics, vegetation, topography and weather during and following herbicide application will determine the frequency, severity, and duration of habitat impairment due to water contamination by herbicides." NMFS (ibid.) determined that the action will have adverse effects on EFH for Chinook salmon, coho salmon, and pink salmon as follows:

1. Short-term degradation of water quality (chemical) from in-water, ditch and riparian herbicide treatments.

2. Short-term reduction in salmon food sources as a result of herbicide treatments to control invasive plant species.

NMFS found that following conservation recommendations they made for endangered species will minimize potential adverse effects to essential fish habitat (ibid.). The Forest Service will follow these recommendations during implementation of this project. The EFH analysis in the NMFS BO is available hard copy on request or via the Forest Service website: http://www.fs.fed.us/gpnf/04projects/pinchotprojects.

Consistency with Forest Service Policies and Plans

The proposed project is consistent with all Forest Service policies and existing plans. No conflicts with existing plans have been noted. A recent lawsuit Washington Toxics Coalition et al. v EPA, regarding the lack of Endangered Species Act consultation on use of certain herbicides, was resolved by requiring certain buffers near streams. Herbicide use on federal land was exempt from the buffer zone requirement because such use already "implements safeguards routinely required" by the regulatory agencies.

The conclusions and findings in this analysis are supported by the best scientific information available. The FEIS (and the broader scale R6 2005 FEIS to which it is tiered) identifies methods used, discusses responsible opposing views, and discloses incomplete or unavailable information, scientific uncertainty, and risk (See 40 CFR, 1502.9 (b), 1502.22, 1502.24).

Invasive plant treatments are no longer subject to the requirements of the 1989 Mediated Agreement that affected removal of unwanted vegetation in Region Six. The R6 2005 ROD vacated the mediated agreement; replacing it with management direction for invasive plant prevention, treatment, restoration and monitoring. In April 2007, Northwest Coalition for Alternatives to Pesticides, the lead signer in the 1989 Mediated Agreement, agreed it was willing to dissolve the Mediated Agreement for purposes of controlling invasive plants in Region 6. The Portland Audubon Society (July 2, 2007) and the Oregon Environmental Council (October 15, 2007) have also agreed in writing to dissolve the Mediated Agreement for invasive plant control."

Consistency with CRGNSA

We conclude that the Selected Alternative is consistent with the Columbia River Gorge National Scenic Area Management Plan (Columbia River Gorge Commission and USDA Forest Service, 1993 and 2004). The basis for this conclusion is the findings of consistency with the applicable Management Plan standards and guidelines contained in Appendix D. The Selected Alternative, as described in FEIS, Chapter 2.5 meets all applicable guidelines.

Forest Plan Amendment #20

Our decision authorizes two changes to the Gifford Pinchot National Forest Plan:

> 1. <u>Current Standard:</u> Herbicides and other pesticides will not be applied in riparian reserves.
>
> Amendment: Herbicides and other pesticides will not be applied in riparian reserves, except to treat invasive plants according to standards listed in the *Pacific Northwest Region 2005 Record of Decision for Managing and Preventing Invasive Plants*.
>
> *The existing wording would be retained for **native** vegetation management.*
>
> 2. <u>Current Standard:</u> Vegetation adjacent to the designated travel route or recreation site [in visual emphasis area V] should be controlled in a visually inconspicuous manner, primarily by hand or machine methods. Any use of chemicals should be timed to avoid vegetative brownout (e.g., a dormant spray used in the fall).
>
> Amendment: This standard would be deleted in its entirety.

Both of these changes are intended to allow for effective treatment in accordance with the R6 2005 ROD. The R6 2005 ROD does not exclude treatment in riparian areas; rather, it provides guidance to minimize adverse effects of treatments in all ecosystem types. The R6 2005 ROD includes a monitoring plan framework to use of herbicides in riparian areas for the purpose of invasive plant treatment.

The reason the brown out standard is proposed for deletion in its entirety is that the temporary effects of brown out are not important to scenery management. Scenery analysts and managers emphasize that restoration of native plant communities and natural landscapes is a more suitable and productive approach to meeting visual objectives.

The existing brown out standard could conflict with effective restoration and the potential, temporary impacts of brown out are far outweighed by the need for restorative action. Analysis for future herbicide use proposed on the National Forest, whether to treat invasive or other vegetation, would consider impacts on scenery.

The Forest Plan amendment was developed consistent with procedural requirements of NFMA (36 CFR 219). The proposed amendment would bring existing Standards and Guidelines into conformance with the R6 2005 ROD. No changes in management area boundaries or prescriptions are proposed. None of the multiple use goals or objectives outlined in the Forest Plan would be affected. Thus, this is considered a non-significant Forest Plan amendment (see Forest Service Manual 1926.51 and 1922.52).

All proposed treatments of invasive plants will occur on National Forest System (NFS) lands under the Selected Alternative. All activities that will occur on NFS lands as described in this ROD and accompanying FEIS are in compliance with the relevant management requirements set forth in the National Forest Management Act (36 CFR 219). We are making this Forest Plan Amendment decision during the transition period described in 36 CFR 219.14(e). As such, the provisions of the planning regulations in effect prior to November 9, 2000 apply, except as otherwise provide in 36 CFR 219.14(f).

This amendment will take place as of the signing of this Decision, and apply to proposed and future invasive plant treatments across the Forest and Scenic Area in Washington. This amendment will help achieve the multiple use goals and objectives by controlling invasive plants and restoring native ecosystems.

Consistency with Northwest Forest Plan

We have determined that the Selected Alternative is consistent with the Standards and Guidelines for the Northwest Forest Plan Record of Decision (USDA and USDI, 1994), and subsequent 2001 Record of Decision regarding Survey and Manage Species (USDA and USDI, 2001) and 2004 Record of Decision regarding the Aquatic Conservation Strategy (USDA and USDI 2004).

The Aquatic Conservation Strategy (ACS) objectives are discussed in FEIS, Chapter 3.4, which also discusses the existing conditions of riparian reserves, including the important physical and biological components of the fifth field watershed and the effects to riparian resources. We find that the Selected Alternative is consistent with the recommendations of the watershed analyses and the riparian reserve standards and guidelines, and will contribute to maintaining and restoring the fifth field watershed over the long term. Further, we find that this project is consistent with each of the ACS indicators, as well as with the objectives as a whole.

We have reviewed the Survey and Manage information and recommendations provided by resource specialists and concur with their findings. Information concerning Survey and Manage Species is available in FEIS, Chapter 3.2 and 3.3. This project is consistent with the 2001 Record of Decision for Survey and Manage standards and guidelines.

Implementation

Implementation Date

If no appeals are filed within the 45-day time period, implementation of the decision may occur on, but not before, 5 business days from the close of the appeal filing period. When appeals are filed, implementation may occur on, but not before, the 15th business day following the date of the last appeal disposition.

Administrative Review or Appeal Opportunities

This decision is subject to appeal pursuant to Forest Service regulations at 36 CFR 215. Any individual or organization who submitted comments during the comment period specified at 36 CFR.6 may appeal. Written notice of appeal must be postmarked or received by the Appeal Deciding Officer, Regional Forester Linda Goodman, ATTN: Appeals, USDA Forest Service, PO Box 3623, Portland, OR 97208-3623 within 45 days of the date of publication of notice regarding this decision in The Columbian and The Oregonian newspapers (Vancouver, Washington and Portland, Oregon).

The appeal must state that the document is an appeal pursuant to 36 CFR 215 and at a minimum must meet the content requirements of 36 CFR 215.14. Those requirements state that an appeal must include the name and address of the appellant, and must identify the decision by title, subject, date of decision, and name of the Responsible Official. The appeal narrative must be sufficient to identify the specific change(s) to the decision sought by the appellant or portions of the decision to which the appellant objects, and must state how the Responsible Official's decision fails to consider comments previously provided. If applicable, the appeal should state how the appellant believes this decision violates law, regulation, or policy.

Appeals (including attachments) may be filed by regular mail, fax, e-mail, hand delivery, express delivery, or messenger service. The publication date of the notice regarding this decision in the newspaper of record is the sole means of calculating the appeal filing deadline, and those wishing to appeal should not rely on dates or timelines from any other source. E-mail appeals must be submitted to: appeals-pacificnorthwest-regional-office@fs.fed.us, and must be in one of the following three formats: Microsoft Word, rich text format (rtf) or Adobe Portable Document Format (pdf). FAX appeals must be submitted to: 503-808-2255. Appeals may be hand-delivered to the Resource Planning and Monitoring Office, 333 SW First Ave., Portland, between 8:00 AM and 4:30 PM Monday-Friday.

It is the responsibility of all individuals and organizations to ensure their appeals are received in a timely manner. For electronically mailed appeals, the sender should normally receive an automated electronic acknowledgement from the agency as confirmation of receipt. If the sender does not receive an automated acknowledgement of the receipt of the appeal, it is the sender's responsibility to ensure timely receipt by other means.

Contact People

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3/14/08

Daniel Harkenrider — Date
Area Manager
Columbia River Gorge

3/17/08

Claire Lavendel — Date
Forest Supervisor
Gifford Pinchot National Forest

ROD Figure 1a: The Decision to Use Herbicides

Is the target population associated with a size, phenology, density or distribution that warrants herbicide use (alone or in combination with other methods)?

Yes

To determine appropriate herbicide, review common control measures coupled with local experience. Review herbicide properties, risks, label directions and project design criteria. Consider non-target vegetation surrounding treatment sites and use selective herbicides as appropriate. Consider soil conditions at the treatment site. Consider previous treatments that have occurred on the site. Were they effective? Would another herbicide or combination of methods be more effective? Consider wildlife habitats in the area and implement seasonal restrictions if required.

Go to Next Page

No

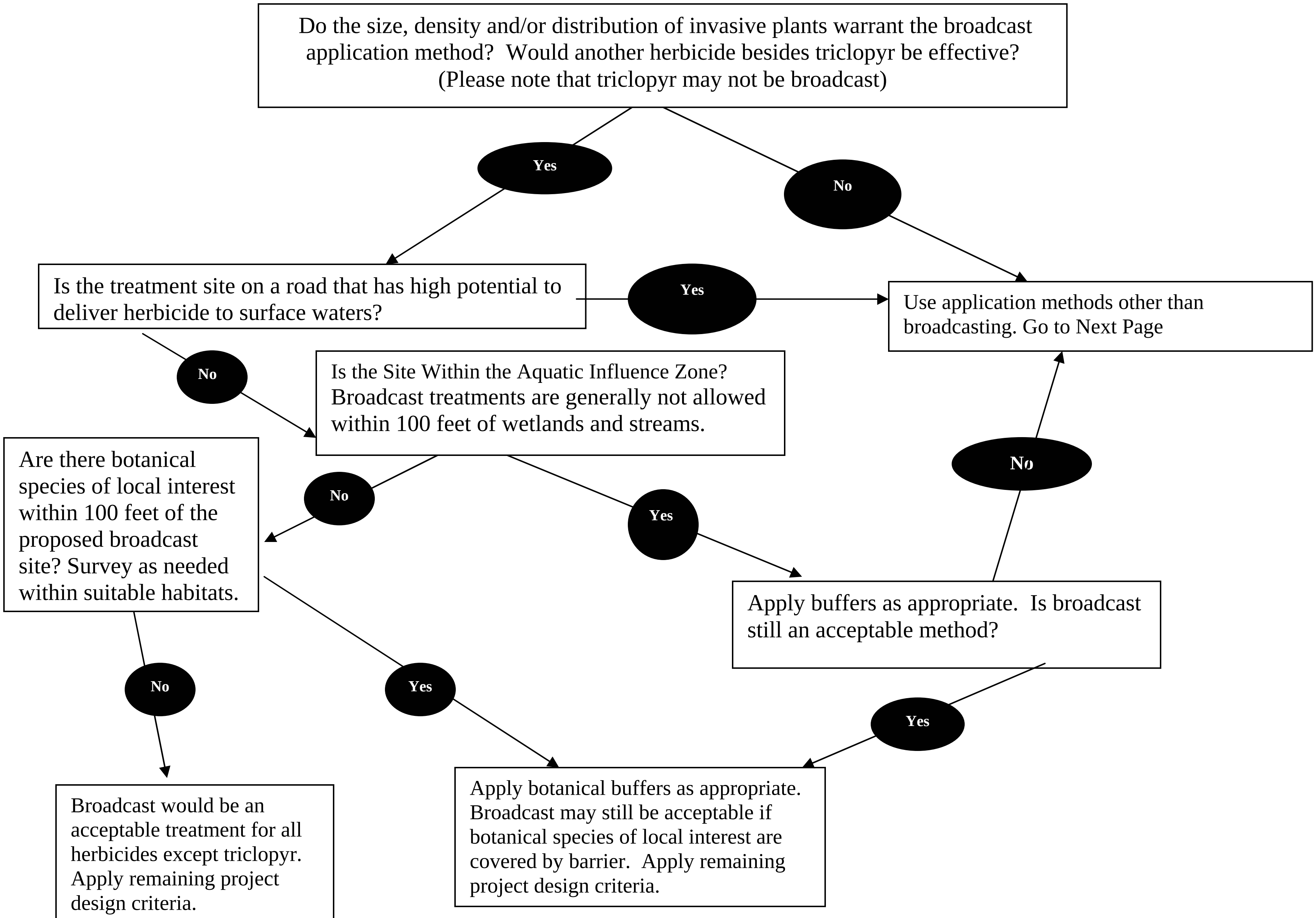
Would use of herbicides substantially increase cost-effectiveness of treatment? Consider whether volunteers may be available to reduce the cost of manual treatments.

Yes → (To determine appropriate herbicide…)

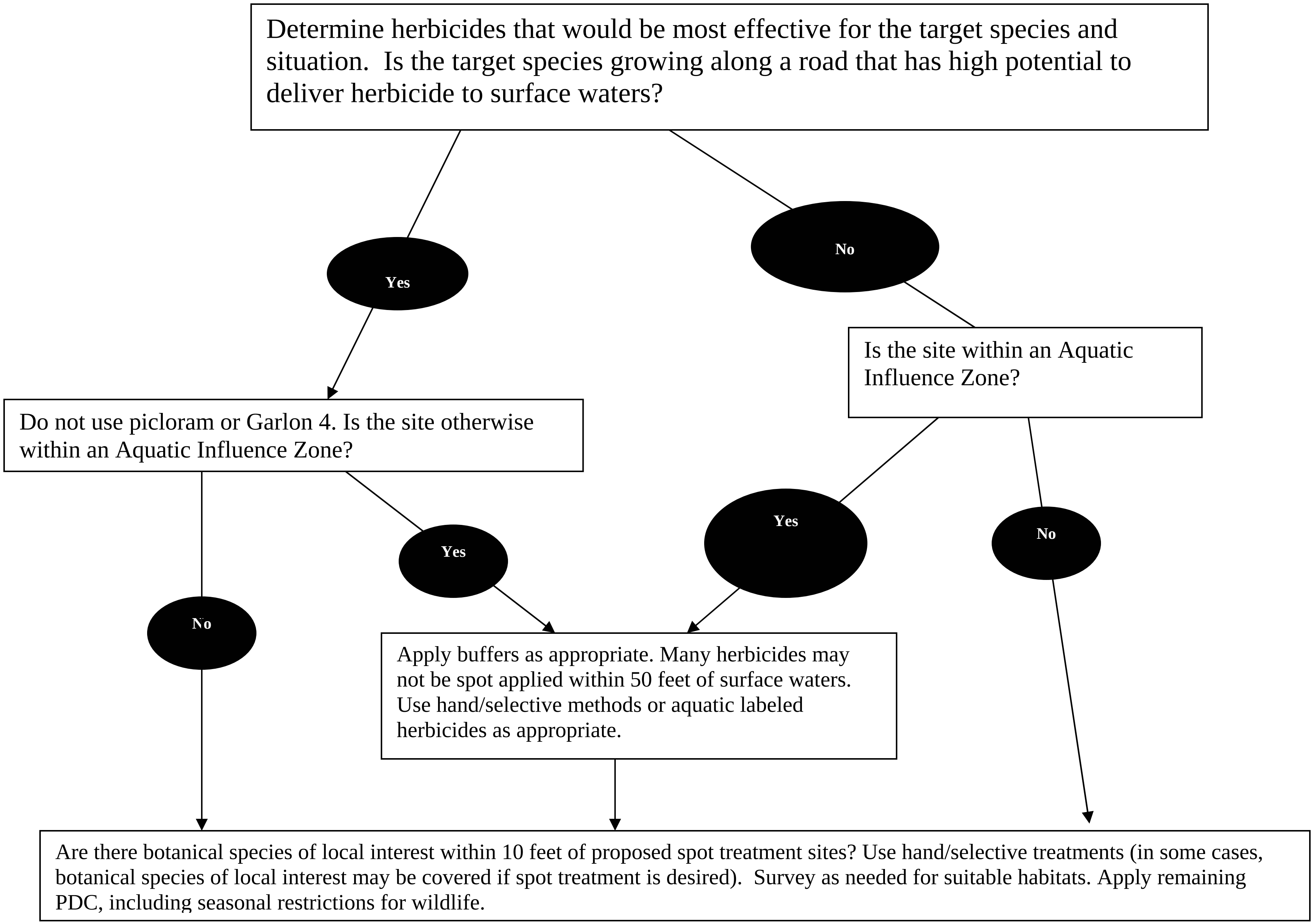
No

Use non-herbicide (manual, mechanical or cultural) methods.

ROD Figure 1b: Process for Prescribing Broadcast Herbicide Application Method



ROD Figure 1c: Process for Prescribing Spot/Hand Herbicide Applications



Final Environmental Impact Statement

Site-Specific Invasive Plant Treatment Project and Forest Plan Amendment #20

Skamania, Clark, Cowlitz, Lewis, and Klickitat Counties, State of Washington

Lead Agency:	**USDA Forest Service**
Responsible Officials:	**Dan Harkenrider, Columbia River Gorge National Scenic Area Manager**
	Claire Lavendel, Gifford Pinchot National Forest Supervisor
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Forest website:	http://www.fs.fed.us/gpnf/04projects/pinchotprojects

Abstract

This Final Environmental Impact Statement (FEIS) discloses the effects of treating invasive plants on the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area. Invasive species were identified by the Chief of the Forest Service as one of the four threats to forest health (for more information see http://www.fs.fed.us/projects/four-threats). Invasive plants are displacing native plants, destabilizing streams, reducing the quality of fish and wildlife habitat; and degrading natural areas. While invasive plant prevention is an integral part of the invasive plant program, the focus of this FEIS is on the part of the program that has a need for action beyond prevention.

The Forest Service is responding to a crucial need for timely containment, control, and/or eradication of invasive plants, including those that are currently known and those discovered in the future. The purpose of this project is to treat invasive plants in a cost-effective manner that complies with environmental standards.

Approximately 2,700 acres are currently estimated to need treatment, including but not limited to knapweeds, hawkweeds, knotweeds, and reed canarygrass. The priority and intensity of treatment needed varies widely based on site conditions, values at risk from invasion, and the range and aggressiveness of individual target species. Flexibility is needed to respond to a range of conditions across the project area.

This Final Environmental Impact Statement includes detailed consideration of three alternatives. No Action (also referred to as Alternative A) would implement treatments according to existing plans; no new invasive plant treatments would be approved.

The Proposed Action (also referred to as Alternative B) would apply an initial prescription, along with re-treatment in subsequent years, until the site was restored with desirable vegetation. Herbicide treatments would be part of the initial prescription for most sites, but the use of herbicides would be expected to decline in subsequent entries as populations became small enough to treat manually or mechanically.

Ongoing inventories would confirm the location of specific invasive plants and effectiveness of past treatments. Treatment prescriptions would be strict enough to ensure that adverse effects are minimized, while flexible enough to adapt to changing conditions over time. Alternative B would allow invasive plant treatments in all land allocations, including wilderness and riparian reserves, across the National Forest. Project design criteria for the Proposed Action restrict certain treatment methods depending on the land allocation and other site conditions such as proximity to surface water bodies, wildlife habitats, botanical species of local interest, etc.

Alternative B would amend the Gifford Pinchot National Forest Plan (non-significant amendment) by removing standards and guidelines that are inconsistent with current invasive plant management adopted in the Pacific Northwest Region of the Forest Service in 2005.

One action alternative (Alternative C) was developed to resolve most concerns related to herbicide use by eliminating herbicide application on about two-thirds of the National Forest System lands. Under Alternative C, only very limited herbicide use would be permitted within riparian reserves and near roadside ditches. Alternative C would minimize herbicide impacts, but would increase treatment costs and decrease treatment effectiveness. Alternative C would include the amendment to the Gifford Pinchot National Forest Plan regarding scenic management but would retain restrictions on herbicide use in riparian reserves.

The Forest Service Preferred Alternative is the Proposed Action (Alternative B). Some changes have been made to the design criteria or other descriptions of the Proposed Action since release of the Draft EIS in response to interagency and public comments (see Appendix G for Public Comments and Agency Responses).

Cover Photo: Roadside infestation of spotted knapweed.

Guiding Principles for Invasive Plant Treatment
Gifford Pinchot National Forest
Columbia River Gorge National Scenic Area

- Invasive plants are threatening healthy native plant communities and their 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.

- In treating invasive plants, our highest priority will be minimizing risks to human health, drinking water, wildlife, and botanical species.

- Herbicide treatments will be used when necessary and in combination with non-herbicide methods as appropriate to increase treatment 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 respond to new invaders rapidly according to methods and design criteria that have been analyzed in the EIS.

- Site restoration will be considered in invasive plant treatment prescriptions.

TABLE OF CONTENTS

APPENDICES

TABLE OF FIGURES

TABLE OF TABLES

Beyond Prevention: Invasive Plant Treatment Project
Vicinity Map
Gifford Pinchot National Forest
Columbia River Gorge National Scenic Area

Final Environmental Impact Statement

Gifford Pinchot National Forest and

Columbia River Gorge National Scenic Area (Washington side)

Site-Specific Invasive Plant Treatment Project and

Non-significant Forest Plan Amendment #20

Summary

Land managers for the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area (Washington side) propose to treat invasive plants and restore treated sites (competitive seeding/mulching/planting).

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

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

The purpose of this project is to control invasive plants in a cost-effective manner that complies with the new management direction. Proposed treatment methods include a limited amount of herbicide broadcast along roadsides, and spot and selective herbicide treatments that target individual invasive plants in combination with manual, mechanical and cultural (goat grazing) treatments.

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

Approximately 2,700 acres are currently estimated to need herbicide treatment in combination with non-herbicide treatments and passive/active restoration. High priority target invasive species include knapweed, hawkweed, knotweed, Canada thistle, and reed canarygrass (Table 12 lists estimated acres by target species). More common invasives such as scotch broom and Himalayan blackberry may also be treated.

The acreage estimate is based on invasive plant surveys documented in the November 2004 inventory and data base, refined to incorporate predicted rates of spread. The estimate does not include widespread, naturalized non-native species (such as oxeye daisy and tansy ragwort) or those that may be effectively treated under existing NEPA decisions.

Treatment of unpredictable new infestations is also proposed. Project design criteria would be applied to new infestations that occur within treatment areas, or in similar sites outside treatment areas, to ensure that treatments are within the scope of this EIS.

Three alternatives are considered: the No Action (also referred to as Alternative A), the Proposed Action (also referred to as Alternative B), and one additional action alternative, Alternative C.

Under the No Action Alternative (Alternative A), no new treatments beyond those previously approved would be implemented. On the Gifford Pinchot National Forest, this equates to about 100 acres of herbicide use and about 2,100 acres of non-herbicide treatment currently approved. On the Washington side of the Columbia River Gorge National Scenic Area, about 300 acres of herbicide treatments combined with non-herbicide treatments are currently approved, however the selection of herbicides is limited to three (glyphosate, picloram, triclopyr).

The Proposed Action (Alternative B) is the Preferred Alternative. Alternative B would approve an effective range of treatment methods according to project design criteria that *minimize* the risk of adverse effects from herbicide and other types of treatment. Herbicide would be a treatment option in all situations where it is needed (an estimated 2,710 acres are proposed for herbicide treatment combined with non-herbicide treatment). Alternative B would amend the Gifford Pinchot National Forest Plan (non-significant amendment) by removing standards and guidelines that are inconsistent with current invasive plant management adopted by the Pacific Northwest Region of the Forest Service in 2005.

Under Alternative C, the risk of adverse effects from herbicide use would be substantially reduced compared to the Proposed Action because herbicide use would not be allowed over approximately 65 percent of the project area (no herbicide use within Riparian Reserves, nor along roadsides deemed to have a high risk of herbicide delivery to streams). Please see Chapter 3.4 for details about these roads. \

Ongoing manual and mechanical treatments could continue to occur, similarly to the No Action Alternative. Alternative C would include the amendment to the Gifford Pinchot National Forest Plan regarding scenic management; however it would retain restrictions on herbicide use in riparian reserves.

The analysis in the FEIS considers a range of treatments applied to a range of conditions throughout the road systems and other areas that are vectors of invasive plant spread. Project design criteria have been developed to limit the potential for adverse effects associated with treatments. Buffers would limit herbicide selection and method application to ensure exposures are below thresholds of concern for people and the environment (See Tables 15-19, Chapter 2).

This FEIS focuses on treatment of invasive plants and restoration of treated sites. It is tiered to the broader scale 2005 *Pacific Northwest Invasive Plant Program Final Environmental Impact Statement* (USDA 2005a, R6 2005 FEIS), which addresses other aspects of the invasive plant management program including preventing invasive plant spread during land uses and management activities.

Chapter 1. Purpose of and Need for Action

1.1 Introduction

Land managers for the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area propose to treat invasive plants over the next five to fifteen years in compliance with new Forest Plan management direction. This Environmental Impact Statement (EIS) has been prepared to consider the site-specific environmental consequences of taking this action. The project area is the Gifford Pinchot National Forest and National Forest System lands within the portion of the Columbia River Gorge National Scenic Area that is in Washington State (see vicinity map)[1].

The main body of the EIS is organized into four chapters:

- *Chapter 1. Purpose and Need for Action:* This chapter includes information on the background and purpose of and need for the project. This section also details how the Forest Service informed the public of the proposal and the issues identified through public scoping.
- *Chapter 2. Alternatives, including the Proposed Action:* This chapter provides a more detailed description of the Proposed Action as well as alternative methods for meeting the need for action. These alternatives were developed based on issues raised by the public and other agencies. This section provides a summary table of the design components that compares the relative risks and benefits of each alternative.
- *Chapter 3. Affected Environment and Environmental Consequences*: This chapter describes the current situation and the resources that are at risk from invasive plants on the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area (Washington Side). It also details the environmental effects of implementing the Proposed Action and other alternatives.
- *Chapter 4. Consultation and Coordination:* This chapter provides a list of preparers, and agencies and people consulted during the development of the environmental impact statement.

The FEIS summarizes specialist input and analysis completed for botany, hydrology, fisheries, soils, wildlife, and heritage resources, as well as for cost effectiveness and effects to human health. The analysis files contain records of interagency and public correspondence, including documents related to Section 7 Endangered Species Act Consultation with National Marine Fisheries Service (NMFS or NOAA Fisheries) and the United States Fish and Wildlife Service (USFWS or FWS).

This FEIS is tiered to the broader scale *Pacific Northwest Invasive Plant Program Final Environmental Impact Statement* (USDA 2005a, referred to herein as the R6 2005 FEIS). 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 (36 CFR 1508.28). As required, this "subsequent statement" summarizes issues discussed in the broader statement (R6 2005 FEIS) and concentrates on site-specific issues. The R6 2005 FEIS considered the best available scientific information from herbicide risk assessments and other reliable scientific sources.

The broader scale R6 2005 FEIS considered prevention standards to be applied to all land uses and management activities, and the Regional Forester decided to amend the Gifford Pinchot National Forest Plan and add standards that all projects must meet (USDA 2005b, the *Pacific Northwest Invasive Plant Program Record of Decision*, referred to herein as the R6 2005 ROD).[2]

[1] The Klickitat Rails to Trails Treatment Area includes a small piece land that outside the National Scenic Area boundary.
[2] The Gifford Pinchot National Forest Plan applies to National Forest System lands in the Columbia River Gorge National Scenic Area in Washington.

1.2 Proposed Action

The Forest Service Proposed Action is to increase the range of invasive plant treatment options available within National Forest System lands in the project area in compliance with new management direction approved in the R6 2005 ROD (Appendix 1). The Proposed Action would also amend the Gifford Pinchot National Forest Plan to allow herbicide use within riparian reserves in accordance with management direction in the R6 2005 ROD (ibid.), and eliminate a standard regarding visual effects of herbicide treatments on roads. For a full description of the Proposed Action (also referred to as Alternative B), see Chapter 2.

Under the Proposed Action, site-specific treatments would be implemented over the next three to fifteen years, based on Common Control Measures (see Table 12 and Appendix B) and project design criteria (see Table 15). Prescriptions would vary depending on the values at risk from invasive species; the biology of particular invasive plant species, the proximity to water and other sensitive resources, and the size of the infestation (these factors may change over time).

The Proposed Action would be implemented over several years as funding allows, until treatments were no longer needed or until conditions otherwise changed sufficiently to warrant this EIS outdated. Site-specific conditions are expected to change within the life of the project, without necessitating further analysis: for instance, treated infestations would be reduced in size, untreated infestations would continue to spread and/or new invasive plants could become established within the project area.

The effects analysis considers a range of treatments applied to a range of site conditions to accommodate the uncertainty associated with the project implementation schedule. Treatment prescriptions would be strict enough to ensure that adverse effects are minimized, while flexible enough to adapt to changing conditions.

The Proposed Action would allow for treatment of infestations that are not currently inventoried, even those found outside mapped treatment areas (see Appendix A). An implementation planning process would be applied to new infestations to ensure that treatments are within the scope of the analysis and eventual decision. The project design criteria were developed to minimize the potential for adverse effects no matter how many acres may be selected for treatment in a given season.

Under the most ambitious conceivable treatment scenario, approximately 2,700 acres of current infestations would be treated within the next five years. Infested areas would be treated with an initial prescription and retreated in subsequent years, depending on the results, until control objectives were met. The most ambitious conceivable treatment scenario would require at least a two-fold increase in funding every year. Thus, the Proposed Action will more likely be implemented over a longer period. See Chapter 3.2 and 3.7 for more information on the life of the project and funding estimates.

1.3 Purpose and Need for Action

1.3.1 Need for Action

This FEIS focuses on the site-specific effects of using the expanded range of tools that were made available through the R6 2005 ROD. The purpose of this project is to use these tools to control invasive plants in a cost-effective manner that complies with environmental standards. The project would implement a combination of manual and mechanical treatments, grazing with goats, herbicide applications and active and passive restoration of non-invasive plants.

With this project, the Forest Service is responding to the need for timely containment, control, and/or eradication of invasive plants, including those that are currently known and those discovered in the future. About 2,700 acres within the treatment areas are currently proposed for treatment. This estimate incorporates predicted rates of spread of known invaders within treatment areas.

High priority target invasive species include knapweed, hawkweed, knotweed, Canada thistle, and reed canarygrass (Table 12 lists estimated acres by target species, Appendix A provides maps and data tables indicating treatment area type, target species currently present, and priority for treatment within each treatment area). More common invasives such as scotch broom and Himalayan blackberry may also be treated. Very widespread species such as tansy ragwort and oxeye daisy would only be treated in limited, specific situations.[3] The priority and intensity of treatment needed varies widely based on site conditions, values at risk from invasion, and the range and aggressiveness of individual target species.

Infestations are degrading habitat for native plant communities in or near the Columbia River Gorge National Scenic Area; Mount St. Helens National Volcanic Monument; Glacier View, Trapper Creek, and Indian Heaven; the Pacific Crest Trail and other trails; Wilderness areas such as Tatoosh, Goat Rocks, William O Douglas, and Mount Adams; Botanical and Wildlife Special Areas, Research Natural Areas, and places with sensitive plant and animal populations; campgrounds, and popular recreation sites. Existing populations of invasive plants also threaten neighboring areas such as Mount Rainier National Park, and other federal, State, tribal, and private properties. Without effective treatment, invasive plants would continue to spread within these and other natural areas on and adjacent to the National Forest. Chapter 3 details site-specific values at risk from invasive plants, and describes places where invasive plants are most likely to spread to neighboring lands.

The R6 2005 ROD provided increased options for treatment intended to increase treatment effectiveness. The Forest Service has treated invasive plants with limited use of herbicides for many years and has not fully eradicated, controlled or contained them. Invasive plants are currently spreading at a rate of 8 to 12 percent annually (R6 2005 FEIS, Section 4.2.3). This rate is predicted to be reduced by half through prevention, early detection and rapid response, treatment and restoration.

Partnerships between the Forest Service, Counties and others have resulted in effective manual treatment exceeding 1,000 acres on the Gifford Pinchot National Forest over the past three years. However, manual treatment alone would not result in effective treatment of some 2,700 acres that have been identified across the Gifford Pinchot National Forest and the Washington side of the Columbia River Gorge National Scenic Area.

[3] Some invasive species are too widespread to treat affordably using the methods considered in this EIS. The EIS is focused on infestations where herbicide use is proposed in combination with other methods. This would not be an appropriate treatment for thousands of acres of daisy and tansy known on the Forest. Such species may be treated in certain situations (e.g. tansy ragwort is considered a new invader in Klickitat County). Biological controls have been released in the counties and continue to be an effective method for containing widespread, established invasive populations such as tansy ragwort. NEPA for these releases is completed by APHIS, and implementation is coordinated at the state and county levels.

Invasive plant spread is unpredictable and actual locations of target species may change abruptly over time. Thus, the Forest Service needs the flexibility to adapt to changing conditions, and rapidly respond to invasive plant threats that may be currently unknown. Timeliness of action is an important factor because the cost, difficulty, and potential adverse effects of controlling invasive plants increases with the size and extent of the population. The ability to detect and destroy new infestations when they are small is crucial to control of invasive species (R6 2005 FEIS page 3-78). Timely treatments are also important to help meet the Forest Plan objective of reduced herbicide use over time.

Thus, the need for action applies to known/predicted infestations based on the 2004 Inventory,[4] **along with new detections that are discovered during the life of the project.** The extent of new detections, by definition, cannot be predicted.

Not all invasive plants are equally threatening to environmental and social values; priority for treatment and treatment strategy[5] varies depending on the biology of the invasive species, size of the infestation, and the values at risk from the infestation now and in the future. Treatment intensity and restoration requirements are highly variable. As a result, the need for action is multi-faceted and more complex than simply "killing weeds." The need for flexibility is important to the success of this project, which contributes to the complex analytical approaches herein.

Invasive plant treatments have been accomplished for several years; however, the toolbox available for the treatments was limited. Manual treatments have been accomplished over the years, with mixed results. The R6 2005 FEIS provided updated management direction for invasive plants on National Forests in the Pacific Northwest, including the Gifford Pinchot National Forest and the Columbia River Gorge National Scenic Area in Washington State. Part of the purpose and need for this project is to update invasive plant treatments to conformance with the 2005 direction.

1.3.2 Environmental Standards and Policies

Several broad federal policies require the control of invasive plants. Executive Order 13112 (1999) directs federal agencies to reduce the spread of invasive plants. Invasive species were identified by the Chief of the Forest Service as one of the four threats to forest health (for more information see http://www.fs.fed.us/projects/four-threats). The Forest Service Pesticide Use Handbook (FSH 2109.14) provides agency guidance on planning, implementation, and reporting of projects that include herbicide (see Appendix E for more information).

This EIS is tiered to findings and rationale within the R6 2005 FEIS, which covered a broad range of topics including effective prevention measures that would be applied to land uses and activities on National Forest System lands; average rates of spread of invasive plants; costs of treatment and treatment effectiveness; herbicide characteristics and risk assessments; and effects of non-herbicide methods.

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[4] The 2004 Inventory refers to a Map and Database depicting the current distribution of target species (summarized in Appendix A). The acreage estimates for the Proposed Action and action alternatives are based on the 2004 Inventory, however the acreage has been adjusted based on likely spread during the life of the project, anecdotal information, and extrapolations into uninventoried areas. EDRR refers to treatment needs beyond those described in Appendix A.

[5] Definitions of these treatment strategies are adapted from the 2005 R6 FEIS. Two additional strategies (tolerate and suppress) are also discussed in the 2005 R6 FEIS; treatments are not proposed to meet these strategies on the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area.

Eradicate: Totally eliminate an invasive plant species from a site. This strategy generally applies to the hardest to control invasive species and highest-valued sites over about 44 percent of the infested acreage.

Control: Reduce the acreage of the infestation over time. This strategy applies to about 48 percent of the project area.

Contain: No increase in acreage infested. This objective applies to about 8 percent of the infested acreage.

Priority is further discussed in Chapter 2.

The R6 2005 FEIS considered the invasive plant management program as a whole, covering 1) public education and coordination, 2) prevention of the spread of invasive plants during land uses and activities, 3) treatment of target species, 4) reducing reliance on herbicides over time, and 5) site restoration. The R6 2005 FEIS culminated in a Record of Decision (USDA 2005b, referred to herein as the R6 2005 ROD), which added new goals, objectives and standards to the Gifford Pinchot National Forest Plan.[6] Prevention, public education, and cooperation are other components of an integrated invasive plant management program. These components were addressed throughout the R6 2005 FEIS and are reflected in the management direction adopted in the ROD. The R6 2005 ROD (Appendix 1-1) added the following Desired Future Condition Statement to the Gifford Pinchot National Forest Plan:

"…Healthy native plant communities remain diverse and resilient, and damaged ecosystems are being restored. High quality habitat is provided for native organisms throughout the [Forest]. Invasive plants do not jeopardize the ability of [the Gifford Pinchot] National Forest to provide goods and services communities expect. The need for invasive plant treatment is reduced due to the effectiveness and habitual nature of preventative actions, and the success of restoration efforts."

As discussed previously, the R6 2005 ROD added invasive plant program management direction (goals, objectives, standards, etc) to the Gifford Pinchot National Forest Plan (the Gifford Pinchot National Forest Plan applies to National Forest System lands in the Columbia River Gorge National Scenic Area in Washington). New standards that apply to invasive plant treatment/restoration are shown in table 1, along with information about how project compliance would be documented.

Standards 1 – 10 are related to prevention and are not duplicated here. All projects on the Forest and Scenic Area will consider how to prevent or slow the spread of invasive plants. Prevention practices that are occurring on the National Forest include:

- Timber sale and other contracts require washing heavy equipment
- Weed free feed requirements in Wilderness, later throughout National Forest
- Weed free rock source requirements
- Increased coordination between road maintenance and invasive plant staff to ensure prevention practices are incorporated into road work.

In addition, on the National Scenic Area soil disturbance is minimized on all projects, which reduces the potential for invasive plants to become established. All areas with soil disturbance are reseeded or planted within one year with native plants.

[6] The management direction within the Gifford Pinchot National Forest Plan applies to both the Columbia River Gorge National Scenic Area in Washington State.

Table 1-R6 2005 ROD Treatment Standards

Standard #	R6 2005 Standard (Added to the Gifford Pinchot National Forest Plan)	Project Compliance
11	Prioritize infestations of invasive plants for treatment at the landscape, watershed or larger multiple forest/multiple owner scale.	Priority is driven by the values at risk from infestations. Existing treatment priorities are described herein (Chapter 2.5) and assigned to each treatment area (Appendix A). Priorities would be subject to revision over time. Detections outside of existing treatment areas would be prioritized against existing areas and documented in the project files.
12	Develop a long-term site strategy for restoring/revegetating invasive plant sites prior to treatment.	Treatment strategies and restoration plans are described in Chapter 2. Ongoing land uses and activities that may spread invasive plants would be considered when determining the long term strategy. Appendix B includes common control measures for invasive target species and Appendix F outlines the restoration approach.
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.	Revegetation (competitive seeding and planting) would occur as needed to replace invasive plants with native plant communities. Non-native, non-persistent species may be used infrequently as an interim measure to control erosion or prevent target species from returning on treated sites. Appendix F outlines the restoration approach including use of native plant materials.
14	Use only USDA Animal and Plant Health Inspection Service (APHIS) and State-approved biological control agents. Agents demonstrated to have direct negative impacts on non-target organisms would not be released.	Agents found to have negative impacts may not be distributed on the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area. A list is being updated annually through the Regional Office and will be discussed with adjacent landowners and county weed coordinators.
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 plans.	The elements of herbicide transportation and handling safety plans are listed in Chapter 2. Policies/compliance monitoring and reporting forms related to herbicide use are further discussed in Appendix E.

Standard #	R6 2005 Standard (Added to the Gifford Pinchot National Forest Plan)	Project Compliance
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.	See Chapter 2 for details about Project Design Criteria and buffers which add layers of caution and minimize or eliminate adverse effects related to use of herbicides. No aerial treatment is proposed in any alternative. Figure 2 shows a decision tree documenting how herbicide ingredients and application method would be determined.
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, 2002.	Adjuvants and inert ingredients would be from approved lists (see Chapter 3.1 for more information on adjuvants).
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.	Chapter 3 discusses how risks from herbicide use are abated by Project Design Criteria including buffers and restrictions on herbicide use and method of application near botanical species of local interest, certain wildlife habitats, Aquatic Influence Zones and/or roadside treatment areas that have high potential to deliver herbicide to streams and other water bodies.
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.	Chapter 3 discusses how potential adverse effects to Endangered Species and critical habitats from herbicide use are minimized by Project Design Criteria.
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).	No aerial application is proposed.
22	Prohibit aerial application of herbicides within legally designated municipal watersheds.	No aerial application is proposed. Coordination with water users would occur in accordance with Municipal Watershed Plans (more information in Chapter 3).

Standard #	R6 2005 Standard (Added to the Gifford Pinchot National Forest Plan)	Project Compliance
23	Prior to implementation of herbicide treatment projects, National Forest 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.	Chapter 2 lists Project Design Criteria, including public notification requirements. Policies/compliance monitoring and reporting forms related to herbicide use are further discussed in Appendix E.

*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.

Forest Plan Land Allocations

The National Forest is divided into five general allocations by the Northwest Forest Plan. Estimated treatment acreage by land allocation is shown in table 2 below. All acreages are approximate and are based on ocular estimate of infestation, expanded for predicted spread. Geographic information system (GIS) mapping of Northwest Forest Plan allocations were overlaid with treatment areas and applied to estimated treatment acres.

Riparian Reserves overlap approximately 33 percent of this acreage (about 900 acres). Table 3 shows additional standards from the Gifford Pinchot National Forest Plan (as amended by the 1994 Northwest Forest Plan)[7] that apply specifically to riparian reserves (which include Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area lands within an area reaching upslope approximately one to two times the average height of a tree on either side of a creek or water body).

Table 2-Estimated Treatment Acres by Land Allocation

Land Allocation	Estimated Treatment Acres
Administratively Withdrawn	335
Columbia River Gorge Land Outside Spotted Owl Range	150
Adaptive Management Areas	290
Congressionally Withdrawn Areas (Includes wilderness and adjacent trailheads)	60
Late-Successional Reserves	790
Managed Late Successional	80
Matrix	1,005
Total	**2,710**

Columbia River Gorge National Scenic Area Management Plan

Northwest Forest Plan land allocations apply to about 210 proposed treatment acres within the National Scenic Area, which are considered Administratively Withdrawn for the purposes of late successional species management. The Northwest Forest Plan does not apply to the remaining 148 acres, because the treatment areas are outside the range of the Northwest Forest Plan (other Gifford Pinchot National Forest land management requirements apply to these areas), or as in the case of treatment area 22-16, the land is not part of the National Forest System.

The proposal must be consistent with the applicable land use designations, landscape settings, and scenic, natural, cultural and recreation resource guidelines of the Management Plan for the Columbia River Gorge National Scenic Area. The Plan does not apply specific regulations to herbicide use, however as per Wildlife and Plants Policy 4: “County, state and federal regulations for air and water quality and for pesticide use shall be followed.”

[7] The Northwest Forest Plan is formally referred to as the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl (USDA/USDI 1994).

The manual, mechanical and cultural treatment methods are subject to the Management Plan requirements. Appendix D contains the Columbia River Gorge National Scenic Area Management Plan consistency determination.

Late Successional Reserves

Invasive species were mentioned as a threat to native plant ecosystems in Late-Successional Reserves. The Gifford Pinchot National Forest Late-Successional Reserve Assessment (LSRA) (Gifford Pinchot National Forest 1997) considered conditions across eight separate LSR areas:

"The desired future condition of vegetation includes a decline of noxious weeds and introduced plants to thresholds that do not adversely affect native plants and animals. Noxious weed introductions will be prevented[8] and controlled (page 3-3). Noxious weeds alter the species composition, structure, and diversity of a site. They are generally most invasive in disturbed areas with high light levels. As the forest canopy closes, noxious weed populations of upland species often decline. In younger stands, noxious weeds compete with native vegetation reducing biological diversity of plants and animals that depend on them. Noxious weeds may also compete with conifer plantings for light, nutrients, and water. Growth rates may be reduced where noxious weed density is high. Purple loose strife may eliminate nesting sites and nesting material for wetland-inhabiting birds (Chapter 3 page 3, Chapter 5 page 48)."

Table 3-Gifford Pinchot National Forest Plan Standards

Existing Gifford Pinchot National Forest Plan Standard	How the Proposed Action would Comply with the Standard
Herbicides and other pesticides will not be applied in riparian reserves. 1990 Gifford Pinchot Land and Resource Management Plan, IV-73	Page 3 of the R6 2005 ROD acknowledged that there may be inconsistencies between the new and existing standards that would need to be reconciled on a case by case basis. The riparian reserve land allocation may be larger than the buffers needed to reduce potential risks to surface waters from broadcast spraying (R6 2005 ROD)." The R6 2005 FEIS stated that (Chapter 3-35): "Invasive plants that form a monoculture in riparian areas can deposit large amounts of organic matter into streams over a short time. In contrast, diverse riparian communities deposit varying quantities and kinds of organic matter over a longer time period. Sudden introduction of large amounts of organic matter can influence pH by increasing the concentration of organic acids; increase biological oxygen demand, reducing the available oxygen for stream biota; and increase dissolved carbon dioxide due to respiration (Peters et al., 1976)." This demonstrates why treatments are needed in these areas. R6 3005 FEIS Chapter 3-46 stated: "Riparian areas which tend to have higher species diversity than uplands are also more susceptible [to invasion] (Planty-Tabacchi et al., 1996; DeFerrari and Naiman, 1994)." Chapter 4-20 stated: "If such herbicide treatments are avoided in riparian areas, where other methods are known to be ineffective, invasive plants would continue to have adverse effects. These citations provide the reasons for amending this standard to allow some herbicide use within riparian reserves for invasive plant treatment. Alternatives A and C would not amend this standard. The current, very limited use of herbicides (stem injection of aquatic glyphosate) in riparian reserves in administrative sites and campgrounds would continue.

[8] All alternatives would implement prevention practices as directed. Some people and groups have expressed the opinion that treatment decisions cannot be made without evaluating the effectiveness of prevention practices. Prevention practices are not considered connected actions because they would occur regardless of alternative selected for invasive plant treatment. The R6 ROD FEIS included the finding that both treatment and prevention are needed to effectively control invasive plants (Appendix 2-1).

Existing Gifford Pinchot National Forest Plan Standard	How the Proposed Action would Comply with the Standard
Vegetation adjacent to the designated travel route or recreation site [in visual emphasis area V] should be controlled in a visually inconspicuous manner, primarily by hand or machine methods. Any use of chemicals should be timed to avoid vegetative brownout (e.g., a dormant spray used in the fall). 1990 Gifford Pinchot National Forest Plan, IV-73	Both action alternatives would amend the Gifford Pinchot Forest Plan to omit this standard in its entirety. This standard is impractical and does not help achieve the desired condition on the Forest. Invasive plant treatments would improve visual quality by restoring native vegetation along roads and other areas. The benefit of this restoration far outweighs concerns about invasive plant brown-out. This finding is the unanimous consensus of scenic quality specialists across the Forest (personal communication with Doug Jones, 2005). A map of visual emphasis area V and list of affected treatment areas in the project record.
The Forest Plan incorporates the Pacific Northwest Region's FEIS for Managing Competing and Unwanted Vegetation (1986). In addition upon implementing the Forest Plan through project activities, the Forest will comply with the Record of Decision issued by the Regional Forester dated December 8, 1988, and the Mediated Agreement of May 1989. Use of vegetation treatment methods (biological, mechanical, prescribed burning, or herbicides) is allowed only when other methods (i.e., prevention) are ineffective or will unreasonably increase project costs. Emphasis must be on prevention and early treatment of unwanted vegetation and full public involvement in all aspects of project planning and implementation. Information about the vegetation management FEIS, ROD, and Mediated Agreement are available at the Forest Supervisor's Office. 1900 Gifford Pinchot National Forest Plan, IV-100	This standard no longer applies to invasive plant treatments as per the R6 2005 ROD (page 2): "Under this decision, all National Forests in the Region will be released from direction established by the 1988…ROD and 1989 Mediated Agreement for invasive plant management."
Noxious weed management is in cooperation with the Washington Department of Agriculture as documented in the MOU signed by the Regional Office, for the GPNF, in February 1991. The Forest also cooperates with the Weed Control Extension Agents of Lewis, Skamania, Klickitat, and Pierce counties, and with farmers, ranchers, and neighboring landowners on the management of noxious weeds. There are 37 noxious weeds listed by the State which could or do occur on the Forest. These are listed according to priority of treatment. Class A weeds pose the most serious threat and the goal is eradicate the species and prevent seed production. Class B are serious threats, but more widespread and the goal is containment and eventual eradication (Class B weeds, which comprise the majority, are further broken down into sub-categories of higher and lower priorities). Class C weeds are any other noxious weeds and the level of control is at the counties' discretion. In addition to the State lists, management responsibility includes problem weeds of Federal designation. Two separate but related documents, the FEIS for Managing Competing and Unwanted Vegetation (1988) and the Mediated Agreement on Vegetation Management (1989), provide further management requirements. 1990 Gifford Pinchot Land and Resource Management Plan, IV-68a	The last sentence of this standard no longer applies to invasive plant treatments as per the R6 2005 ROD (page 2): "Under this decision, all National Forests in the Region would be released from direction established by the 1988…ROD and 1989 Mediated Agreement for invasive plant management." The Proposed Action has been developed in cooperation with state and county noxious weed experts in Washington. This standard applies to Cowlitz County as well as the other counties listed.

Existing Gifford Pinchot National Forest Plan Standard	How the Proposed Action would Comply with the Standard
Noxious weeds and all unwanted vegetation will be treated by one or more of the following strategies, depending on the degree to which the infestation has progressed: prevention, early treatment, maintenance, correction, or deferred action. Prevention is the preferred treatment. Integrated Vegetation Management (IVM) methods available for use are: education, preventative measures, physical or mechanical methods, cultural methods (including prescribed fire), biological agents and herbicides. 1990 Gifford Pinchot Land and Resource Management Plan, IV-68a	This standard is consistent with the new management direction adopted with the R6 2005 ROD and does not require additional documentation or disclosure. This project focuses on noxious weeds that need herbicide as part of the treatment due to their aggressiveness, distribution, density, growth habit, or because volunteer labor is not available to help accomplish cost-effective treatment without the use of herbicide. Prevention would be addressed through adherence to the R6 2005 ROD standards that apply to various land use activities. Prevention would also be addressed through local prevention practices which are currently being considered on the Forest and Scenic Area.
Apply silvicultural practices for riparian reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives. 1995 Gifford Pinchot National Forest Plan Amendment 11, 2-57	Invasive species are degrading native plant communities and habitats within about 900 acres of riparian reserves. The adverse impacts of invasive plants are discussed under "Affected Environment" in each section of Chapter 3. Invasive plants can retard or prevent recovery of native plant communities and decrease diversity of plant communities in riparian areas. Vegetation management (including herbicides) is necessary within riparian reserves to restore native plant communities that have been affected by invasive plants. The EIS analysis (Soil and Water, Chapter 3) demonstrates that adverse impacts to water quality would be avoided and attainment of ACS objectives would not be prevented or retarded.
Herbicides, insecticides, and other toxicants, and other chemicals shall be applied [within riparian reserves] only in a manner that avoids impacts that retard or prevent attainment of Aquatic Conservation Strategy objectives. 1995 Gifford Pinchot National Forest Plan Standard, Amendment 11, 2-57	

Aquatic Conservation Strategy

Part of the Northwest Forest Plan Aquatic Conservation Strategy is that watershed analysis recommendations should be considered in project planning. All watershed analysis documents on the Forest were reviewed for recommendations regarding invasive plants. Two of the watershed analysis documents specifically mentioned invasive plants:

The 1998 Upper White Salmon Watershed Analysis, page IV-15, states:

> "Noxious weeds cause considerable damage by suppressing conifer growth, altering native habitat for plants and animals, lessening forage for cattle, being deleterious to some animals, and by helping to increase run-off and soil erosion."

Recommendations in the Watershed Analysis include:

> "Reduce noxious weed populations, while establishing other vegetation to prevent re-colonization by noxious weeds. The reduction of noxious weeds aids native plant populations, improves range forage, and may reduce erosion…In all cases; revegetation efforts should follow eradication projects to encourage occupation of disturbed sites by native plants."

The 2001 Upper Washougal Watershed Analysis, page 38, states:

> "Noxious weeds pose a serious threat to the environment if left unchecked. Federal and state laws mandate that action be taken to counter noxious weed infestations… the long term goal in this watershed for noxious weeds is to control and eradicate all weed populations…part of the Washougal watershed is included in a roadless area. Current treatment of the area should actively prevent introduction of weed species into the roadless area."

Recommendations regarding invasive plants were considered in the design of this project. Passive and active restoration is proposed for treated sites and eradication of invasive plants in roadless areas was prioritized in the Upper Washougal Watershed.).

Chapter 3.4 discusses how the project would maintain and/or restore Aquatic Conservation Strategy Objectives.

Wilderness Areas

Any treatment within wilderness would be aimed at preserving or protecting wilderness character. Treatments using mechanized equipment would not be proposed in wilderness.

Roadless Areas

Invasive plant treatment areas are primarily along roads. The proposed treatments would maintain roadless area character.

Endangered Species Act

The Forest Service consulted with the FWS and NMFS to ensure that the project would not jeopardize the continued existence of federally listed species (or species proposed or considered candidates for listing). Formal records related to consultation include the Biological Assessment prepared by the Forest Service (FS 2007 BA), a Letter of Concurrence (October 2007) from the FWS for terrestrial wildlife species and some bull trout sites, a Biological Opinion from FWS for remaining bull trout sites (FWS 2007 BO, December 2007), and a Biological Opinion from NMFS (NMFS 2008 BO, January 2008). Each agency concluded that the project would not jeopardize any listed species. These records are available on request or by visiting the Gifford Pinchot National Forest website: http://www.fs.fed.us/gpnf/04projects/pinchotprojects.

1.4 Decision Framework

Two Responsible Officials will sign the Record of Decision for this project: the Forest Supervisor for the Gifford Pinchot National Forest and the Area Manager for the Columbia River Gorge National Scenic Area. Based on the analysis in this EIS, they will decide whether to implement the Proposed Action or apply herbicides according to project design criteria as part of an integrated treatment and site restoration prescription or an alternative. The Proposed Action would result in a Gifford Pinchot National Forest Plan amendment.

Factors influencing our decision include:

(1) The effectiveness of the alternative in reducing acreage of invasive plants compared to the current inventory

(2) How well the alternative avoids or minimizes potential adverse effects to human health and the environment; and

(3) Cost-efficiency of the alternative

1.5 Public Involvement

This project has been in development for several years. The project was first listed in the Gifford Pinchot National Forest Schedule of Proposed Actions in 2004. A Notice of Intent (NOI) to prepare an EIS requesting public input was published in the Federal Register on February 23, 2004. The NOI proposed a project with a geographic scope covering the Gifford Pinchot National Forest and entire Columbia River Gorge National Scenic Area, along with two other National Forests. Individuals, organizations, agencies, businesses, and local and Tribal governments were contacted by letter and solicited for comments on the proposal. Approximately 150 comments were received and reviewed by the Forest Service to identify key concerns.

In response, the Forest Service decided to prepare an EIS specific to the Gifford Pinchot National Forest and the Washington portion of the Columbia River Gorge National Scenic Area, and to reinitiate scoping in August 2005, following the public release of the R6 2005 FEIS. A new NOI was published on August 25, 2005, and a letter describing an updated proposal was widely circulated. The public was advised that their original comments would still be considered, along with any new comments. Approximately 15 comments were received during the second scoping period.

The following section (1.5.1) summarizes the significant issues identified through the scoping process and discusses how they are addressed in the EIS analysis. The issues are grouped into broad resource categories. Issue Group 1 relates to human health, Issue Group 2 relates to the effectiveness of treatments, Issue Group 3 relates to social and economic issues, Issue Group 4 relates to effects on non-target terrestrial plant and animal species, and Issue Group 5 relates to soils, water quality and aquatic organisms. Table 4 displays how each significant issue is addressed and the factors for alternative comparison. The project file includes scoping comments received during both scoping periods, and copies of each NOI.

1.5.1 Significant Issue Group 1 - Human Health and Worker Safety

Issue Components:

- 1a: – Exposure to Herbicides
- 1b: – Drinking Water
- 1c: – Worker Safety (Physical Injuries)

1a - Exposure to Herbicides

Issue Statement: People, including neighbors, visitors, and herbicide applicators, may become exposed to herbicides from invasive plant treatments and experience adverse health effects.

This issue has been resolved by the Standards in the R6 2005 ROD. Chapter 4.5 and Appendix Q of the R6 2005 FEIS provided detailed descriptions of the hazards associated with the herbicides proposed for use. The herbicides available for use (Standard 16) were selected because they pose comparatively low risks to people. Standard 15 requires that all projects be implemented by certified applicators who have been training in herbicide safety. Standard 23 requires public notification prior to using herbicides.

The Project Design Criteria in all alternatives further reduce risk by practices such as limiting herbicide application rates, favoring formulations with the lowest possible risks, and temporarily closing areas such as campgrounds or special forest product gathering areas to ensure no inadvertent contact between people and herbicides occurs. All alternatives would be implemented to follow pesticide use policies of the US Forest Service (see FSH 2109.14, Appendix E) intended to reduce risk to human health.

1b - Drinking Water

Issue Statement: Herbicides may contaminate drinking water through direct contact (a spill into a drinking water source), or indirectly through leaching, percolation, or run off.

This issue has been resolved by the Standards in the Forest Plan as amended by the R6 2005 ROD. The herbicide risk assessments and analysis in the R6 2005 FEIS, especially Appendix Q, demonstrate that there is very low risk of drinking water contamination or health impacts from the herbicides and types of applications proposed for use. Project Design Criteria for all alternatives ensure that herbicide mixing would occur away from streams and water sources. No herbicides would be applied near springs or wells. Safe transportation and handling of herbicides, and spill containment, would be addressed during implementation, with specific documentation requirements as per Appendix E. These issues are tracked through the FEIS with effects analysis documented in Sections 3.4 (Soil and Water) and 3.6 (Human Health).

1c - Worker Injuries

Issue Statement: Workers may be injured (sprains, strains, cuts and falls) during invasive plant treatments.

This issue is addressed by adherence to common Occupational Health and Safety Guidelines that are not generally documented in impact statements. Some people perceive that risks to workers are greatest from herbicide treatments due to potential chemical exposure (see Issue 1a). Others perceive that non-herbicide treatments are more likely to result in physical injuries since these methods tend to be more labor-intensive. However, injuries associated with non-herbicide work are not considered unusual and would be mitigated through accepted field safety practices. Therefore, this issue will not be tracked further in this document.

1.5.2 Significant Issue Group 2 – Treatment Strategy and Effectiveness

Issue Components:

- 2a – Effectiveness of Treatment Methods
- 2b – Long-term Strategy
- 2c – Treatment Priority
- 2d – Adaptive Management/Early Detection-Rapid Response
- 2e – Use of Herbicides in Riparian Reserves

2a – Effectiveness of Treatment Methods

Issue Statement: Restrictions on herbicide use tend to reduce treatment effectiveness and increase cost. Many invasive plants species do not respond effectively to manual and mechanical treatments without herbicide. Having more treatment options available for use creates a greater likelihood that the outcome will be effective.[9] The Proposed Action (Alternative B) would allow use of the greatest range of invasive plant treatment options. In contrast, Alternative C would rely on manual and mechanical methods over a greater proportion of the infested acreage, which would decrease the likelihood that treatment/restoration objectives would be met. If treatment/restoration objectives are not met, adverse effects of invasives would continue.

This is a key issue tracked throughout this document. The alternatives are compared by:

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[9] The R6 2005 ROD page 26 states that limitations on herbicide use increase treatment cost and reduce treatment effectiveness.

- Percent Of Treatment Acreage Where All Options (Including Herbicide) Are Allowed
- The Number Of Herbicides Available For Use
- Acres Of Invasives Predicted For The Year 2011[10]

2b – Long-term Strategy, Reduce Reliance on Herbicides Over Time

Issue Statement: Treated sites need to be restored to hasten recovery of native vegetation and reduce reliance on herbicides over time.

All action alternatives include restoration as part of treatment prescriptions (passive revegetation, mulching, competitive seeding, and planting). Restoration is discussed in Chapter 2, as well as Appendix A (restoration prescription by treatment area) and Appendix F. The effects analysis in Chapter 3 assumes restoration would occur as needed, and the economic analysis includes an estimate of the cost of active restoration applied to 65 percent of the treatment sites.

2c – Treatment Priority

Issue Statement: Treatments must be prioritized so that available funding can be utilized as efficiently as possible.

This issue is addressed through adherence to invasive plant treatment standard 11 in the Gifford Pinchot National Forest Plan as amended by the R6 2005 ROD (see table 1). The standards require that invasive plant treatments sites be prioritized. Treatment priorities are described in Chapter 2.5. Treatment priorities do not vary between alternatives and are subject to change through the life of the project.

2d –Adaptive Management/Early Detection-Rapid Response

Issue Statement: The Forest Service needs the ability to respond rapidly to new infestations that may not be within currently mapped treatment areas.

Both action alternatives would include a strategy for early detection-rapid response allowing treatment of unpredictable, new invaders within and outside currently mapped treatment areas. The project design criteria, buffers, and other features of each alternative would be applied to new infestations found in the future, and treatment effects can therefore be predicted even though the location or species of new infestations is unpredictable.

2e – Use of Herbicides in Riparian Reserves

Issue Statement: The Gifford Pinchot National Forest Plan currently restricts herbicide use within riparian reserves (approximately 30 percent of the project area).

The Proposed Action would amend the Gifford Pinchot National Forest Plan to allow for herbicide use in riparian reserves according to management direction in the R6 2005 ROD. Neither the No Action Alternative nor Alternative C would amend the Forest Plan regarding use of herbicides in riparian reserves. This is a key issue tracked throughout this document. The alternatives are compared by:

- Whether or not herbicides may be used within riparian reserves

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[10] The year 2011 is the earliest time that currently mapped infestations could be controlled under "the most ambitious conceivable treatment scenario." The most ambitious treatment scenario for each alternative is used as the basis for comparison of effects, however, may require a substantial increase in funding to implement. Use of the most ambitious scenario provides a consistent basis for effects analysis and highlights differences in effectiveness between the alternatives.

1.5.3 Significant Issue Group 3 – Social and Economic

Issue Components:

- 3a – Treatment Costs and Financial Efficiency
- 3b – Effects on Scenic, Recreation, and Wilderness Values
- 3c – Effects on Special Forest Products
- 3d – Effects on American Indian Tribes and Treaty Rights, Potential for Disproportionate Effects to Minority and Low-Income Populations, and Civil Rights and Environmental Justice

3a – Treatment Costs and Financial Efficiency

Issue Statement: Treatment costs vary depending on method. Labor intensive methods such as hand pulling or cutting with tools tend to be more expensive than herbicide methods. Herbicides can reduce the cost of non-herbicide treatment over time by reducing the size of target populations so that they may reasonably be treated manually or mechanically.

The Proposed Action would allow herbicide treatment to be a part of an integrated prescription throughout the Project Area. Under Alternative C, about 65 percent of the Project Area (Riparian Reserves and road segments deemed to have high risk of herbicide delivery – see Chapter 3.4 for more information) would be treated solely through non-herbicide methods, which decreases the cost-effectiveness of treatment. This is a key issue tracked throughout this document.

The alternatives are compared by:

- Total Cost For The Most Ambitious Conceivable Project
- Average Annual Cost For The Most Ambitious Conceivable Project
- Average Cost Per Acre Of Treatment

3b – Effects of Invasive Plant Treatment on Scenic, Recreation and Wilderness Values

Issue Statement: Invasive plant treatments may be visible along road corridors and in recreation areas and wilderness. Invasive plants may currently be found scattered throughout the Project Area. Treatments may cause brown patches of target vegetation and casual visitors may notice them. Some of these brown patches could occur on visually sensitive roads. A current Gifford Pinchot National Forest Plan standard states roadside vegetation treatments in certain areas should be visually inconspicuous and that use of chemicals should be timed to avoid vegetative brownout during tourist season (e.g., a dormant spray used in the fall).

The Proposed Action and Alternative C may conflict with this standard because herbicide treatments would occur when most effective, rather than be timed to avoid visibility. The project design criteria described in Chapter 2 are intended to reduce potential conflicts through public notification and temporary closure of areas during treatment. Over the long term, controlling invasive plants would improve scenic, recreation and wilderness values. Potential effects on these values are described in Chapter 3.

3c – Effects of Herbicide on Special Forest Products and Gatherers

Issue Statement: Herbicide treatments may leave residues on special forest products making them unsafe for consumption or unsuitable for collection.

This issue is addressed through adherence to invasive plant treatment Standards 15-23 in the Gifford Pinchot National Forest Plan and Columbia River Gorge National Scenic Area Management Plan, as amended by the R6 2005 ROD.

Standard 23 requires public education and a public notification strategy if herbicides are used. The project design criteria described in Chapter 2 ensure that conflicts between treatments and special forest products and gathering areas are minimized. Potential effects on special forest products and gatherers are described in Chapter 3.

3d – Effects on American Indian Tribes and Treaty Rights, Potential for Disproportionate Effects to Minority and Low-Income Populations, and Civil Rights and Environmental Justice

Issue Statement: Invasive plant treatments may harm culturally important plants or have disproportionate effects on cultures that rely on subsistence or special forest product gathering. Asian, Hispanic, and Native American communities may be impacted by invasive plant treatments. People who apply herbicides would be more likely to be exposed to chemicals than other groups.

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.

This issue is addressed in all action alternatives through project design criteria described in Chapter 2, including ongoing consultation with American Indian Tribes, outreach with subsistence and special forest product gathering communities, limitations on the rate and extent of broadcast application of some herbicides to reduce worker exposure, and public notification of herbicide treatments through the newspaper, onsite posting, and use of flyers. Effects analysis for these topics is in Chapter 3.6 and 3.8.

1.5.4 Significant Issue Group 4 – Effects on Non-Target Plants and Wildlife

Issue Components:

- 4a – Effects of Herbicides on Non-Target Botanical Species of Local Interest
- 4b – Effects of Herbicides on Terrestrial Wildlife Species of Local Interest

4a – Effects of Herbicide on Non-Target Botanical Species of Local Interest

Issue Statement: Herbicides may harm native plants due to drift (especially from broadcast treatments), runoff, and/or leaching. The potential for adverse effects to non-target species are dependent on the type of herbicide used and the application method chosen. Non-target vascular plants, lichens, bryophytes, and fungi in close proximity to invasive plants, especially species of local interest, are at particular risk.

This issue is specifically addressed through adherence to invasive plant treatment standard 19 in the Forest Plan as amended by the R6 2005 ROD. Chapter 2 describes the project design criteria intended to avoid potential harm and Chapter 3.2.4 characterizes the potential for adverse effects to non-target plants. This issue is tracked throughout this document.

Spot and hand treatments largely resolve issues with non-target vegetation – thus the amount of broadcast that may occur is an appropriate indicator for degree of risk. Thus, the alternatives are compared by:

- Estimated Proportion of Project With Potential Broadcast Application
- Approximate Treatment Acreage Where All Options (including herbicide) are allowed
- Number of Herbicides Available for Use

4b – Effects of Herbicide on Terrestrial Wildlife Species of Local Interest

Issue Statement: Invasive plant treatments may disturb wildlife or trample wildlife habitat. Wildlife may contact herbicides or ingest invasive plants treated with herbicide and become sick or die.

This issue is largely addressed through adherence to Invasive Plant Treatment Standards 15-23 in the Forest Plan as amended by the R6 2005 ROD. Chapter 2 describes the project design criteria intended to minimize potential harm to wildlife and Chapter 3.3 describes the terrestrial wildlife species of local interest, their habitats, and potential for herbicide exposure. While the components of the alternatives vary in terms of the extent of herbicide use allowed, these differences would not result in significant differences in risks to terrestrial wildlife.

Consultation with FWS was documented through the Forest Service Biological Assessment (BA). In a letter dated October 9, 2007, the FWS concurred with the FS effect determinations for marbled murrelet and northern spotted owl.

1.5.5 Significant Issue Group 5 – Effects on Soils, Water and Aquatic Organisms

Issue Components:

- 5a – Potential Adverse Effects of Invasive Plant Treatment on Soils
- 5b – Potential for Herbicide Delivery to Streams, Lakes, Rivers, Floodplains and Wetlands
- 5c – Potential for Herbicides to Result in Adverse Effects to Aquatic Ecosystems

5a – Potential Adverse Effects of Invasive Plant Treatment on Soils

Issue Statement: Invasive plants provide ground cover that may be disturbed by treatments. Herbicide use may harm soil organisms or soil biology. This issue is addressed through adherence to invasive plant treatment standard 19 in the R6 2005 ROD. Chapter 2 describes the project design criteria intended to protect soil productivity and Chapter 3.4 characterizes the potential effects on soils from herbicide.

5b – Potential for Herbicide Delivery to Streams, Lakes, Rivers, Floodplains and Wetlands

Issue Statement: Herbicides used near or within streams, lakes, rivers, floodplains and wetlands may enter surface or ground water through drift, runoff, leaching or direct contact. Roads with high potential to deliver herbicides can function as conduits for herbicide delivery to these water bodies.

This issue is primarily addressed through adherence to invasive plant treatment standards 15-23 in the Forest Plan as amended by the R6 2005 ROD. Chapter 2 describes the project design criteria intended to minimize the chance that herbicide concentrations of concern would enter streams. Chapter 3.4 characterizes the potential for herbicide delivery to water bodies.

Broadcast treatments have the greatest potential for off site movement of herbicides; spot and hand treatments result in far less risk of herbicide delivery to water bodies. Thus, project design criteria and buffers are proposed to limit broadcast within the aquatic influence zone.[11]

Endangered Species Act consultation required extensive analysis related to this issue. An invasive plant treatment BA was developed by an interagency consultation team (referred to as the Level 1 Team) including staff from the FS, NMFS), and the FWS. The Level 1 Team worked together periodically over the past two years to review and develop project design criteria that incorporate the best management practices to minimize adverse effects to aquatic resources. The BA describes and evaluates the effects of manual, mechanical and chemical invasive plant treatment methods (FWS 2007 BO, page 1.)

The alternatives are compared by:

- Character of Herbicide Use within Aquatic Influence Zones
- Estimated Acres of Herbicide Use within Aquatic Influence Zones
- Estimated Acreage of Herbicide Treatment On Roadside Treatment Areas with High Potential to Deliver Herbicides to Surface Waters

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[11] An Aquatic Influence Zone is defined as the inner half of a Riparian Reserve. Riparian Reserves are land allocations where certain management direction applies. Riparian Reserves lie along streams and encompass the area from a water body to a point approximately 1 to 2 times the height of a mature streamside tree – approximately 100 to 300 feet up slope. The size of the stream system and whether fish are present determines the size of the Riparian Reserves; larger, fish bearing streams have the largest Riparian Reserves. The width of the Aquatic Influence Zone ranges from 50 to 75 feet along intermittent streams and small wetlands to approximately 150 feet on each side of a fish bearing stream.

5c – Potential for Adverse Effects to Aquatic Organisms from Herbicide

Issue Statement: Herbicides that enter water bodies may harm aquatic organisms, including fish species of local interest.

Aquatic organisms may be exposed to herbicide applied within aquatic influence zones, (especially within the bankfull portion of streams and wetlands) and along roads with potential to deliver herbicide to water bodies. Such risks can be avoided by limiting the herbicide formulation and application rate, timing, and method. The alternatives vary as to the treatments allowed in aquatic influence zones. These differences influence the level of risk that herbicides will enter water bodies. The alternatives are compared by:

- Potential for fish to be exposed to harmful concentrations of herbicide

In addition, disclosures related to the Endangered Species Act are provided for each alternative.

1.5.6 Summary of Significant Public Issues and Alternative Comparison Factors

Table 4 summarizes how the issues are addressed and factors used to compare the effects of the alternatives.

Table 4-Significant Issues and How They Are Addressed

Issue Group	Issue Component	How Issue is Addressed
1 – Human Health and Worker Safety	1a – Exposure to Herbicides	The potential risks to human health from herbicide are addressed in the R6 2005 FEIS (Chapter 4.6 and Appendix Q) and in this FEIS in Chapter 3.6. Exposure scenarios that may harm workers and/or the public are avoided in all alternatives. No plausible scenarios for public harm due to drinking water contamination are associated with any alternative.
	1b – Drinking Water	
2 – Treatment Strategy and Effectiveness	2a – Effectiveness of Treatment Strategies	Analysis of differences in treatment effectiveness based on restrictions to herbicide use. Factors for alternative comparison include: • Percent of Treatment Acreage Where All Options (including herbicide) are Allowed • The Number of Herbicides Formulations Available For Use • Acres of Invasives Predicted for The Year 2011
	2b – Long-term Strategy, Reduce Reliance on Herbicides Over Time	All action alternatives include restoration (passive revegetation, mulching, competitive seeding, and planting). See Appendices A and F and Chapters 2.5 and 3.1.
	2c – Treatment Priority	Chapter 2.5 describes how invasive plant treatment areas are prioritized.
	2d – Adaptive Management/Early Detection-Rapid Response	Implementation planning, monitoring, and early detection-rapid response are discussed in Chapter 2.5. The proposed process would allow for treating infestations within and outside mapped treatment areas and refining treatments based on results.
	2e – Use of Herbicides in Riparian Reserves	The Proposed Action (Alternative B) amends the Forest Plan to allow herbicide use within riparian reserves, which comprise about 30 percent of the project area. The factor for comparison between alternatives is whether or not herbicides may be used within riparian reserves.
Issue Group 3 – Social and Economic	3a – Treatment Costs and Financial Efficiency	Analysis of the total and annual estimated costs of treatment and financial efficiency. The factors for comparison between alternatives are: • Total cost for the most ambitious conceivable project • Average annual cost for the most ambitious conceivable project • Average cost per acre of treatment

Issue Group	Issue Component	How Issue is Addressed
	3b – Effects on Scenic, Recreation, and Wilderness Values	Both action alternatives include public education and notification requirements to avoid conflicts between invasive plant treatments and public enjoyment of National Forest System lands. Both alternatives would amend the Gifford Pinchot National Forest Plan to allow for visible, effective treatments on all Forest roads.
	3c– Effects on Special Forest Products	This issue is addressed in all alternatives through public education, notification and outreach to special forest product gatherers. Project Design Criteria described in Chapter 2 include coordination and notification requirements.
	3d – Effects on American Indian Tribes and Treaty Rights, Civil Rights and Environmental Justice	This issue is addressed through consultation with tribes, outreach to subsistence gatherers, and extensive public notification (see Chapter 3.6).
Issue Group 4 – Non-Target Plants And Wildlife	4a – Effects of Herbicide on Non-Target Botanical Species of Local Interest	This issue is addressed through development of Project Design Criteria intended to avoid potential adverse effects to non-target plants. Factors for alternative comparison are: • Estimated Proportion of Project with Potential Broadcast Application • Approximate Treatment Acreage Where All Options (including herbicide) are allowed • Number of Herbicides Available for Use
	4b – Effects of Herbicide on Terrestrial Wildlife Species of Local Interest	This issue is addressed through development of Project Design Criteria intended to minimize potential adverse effects to terrestrial wildlife, including salamanders and mollusks.
Issue Group 5 – Effects on Soils, Water and Aquatic Organisms	5a – Potential Adverse Effects of Invasive Plant Treatment on Soils	This issue is addressed through Project Design Criteria intended to minimize potential harm to soils.
	5b – Potential for Herbicide Delivery to Streams, Lakes, Rivers, Floodplains and Wetlands	This issue is addressed through Project Design Criteria intended to minimize herbicide delivery to water bodies. Factors for alternative comparison are: • Character of herbicide use within Aquatic Influence Zones • Estimated acres of herbicide use within Aquatic Influence Zones • Estimated acreage where herbicide treatment may occur on roadside treatment areas with high potential to deliver herbicides to surface water
	5c – Potential for Herbicides to Result in Adverse Effects to Aquatic Organisms	This issue is addressed through Project Design Criteria intended to minimize herbicide delivery to water and minimize or eliminate risk of concentrations above a threshold of concern to fish and aquatic ecosystems. Treatment situations likely to result in herbicide concentrations of concern to fish are minimized in all alternatives. Factors for alternative comparison are: • Potential for fish to be exposed to harmful concentrations of herbicide

1.5.7 Comments to the DEIS

The public was invited to comment on the Draft Environmental Impact Statement from August 9, 2006 through November 22, 2006. Appendix G displays the content of the public and agency comments and specific Forest Service responses, along with copies of all letters received from government agencies. Comments were received from one federal agency (Environmental Protection Agency), three local counties (Lewis, Klickitat and Skamania Counties), one coalition of environmental groups (Gifford Pinchot Task Force, Friends of the Columbia River and Columbia Riverkeepers; aka GPTF et al), and three individuals. All of the commenters expressed agreement with using integrated tools for treating invasive plants.

GPTF, et al requested a meeting with the Forest Service, which occurred on February 14, 2007. The group asked questions, explained their comments, expressed concerns about the project and made recommendations for addressing prevention of invasive plants and restoration of treated sites. Their input, along with letters from all commenters resulted in some changes to the Proposed Action and analysis in the FEIS.

The FWS and NMFS consulted with the Forest Service on the design of the Proposed Action and analysis relevant to species listed under the federal Endangered Species Act. Their input also resulted in some substantive changes between the Draft and Final EIS. Over the course of 2006 and into early 2007, there [were] a series of meetings and negotiations between the FS, FWS, and NMFS staff to develop the project description and finalize the Biological Assessment (FWS 2007 BO).

The types of changes made between Draft and Final EIS include:

- Modifications to PDC to make them more implementable and/or stringent
- Clarification of the role of invasive plant prevention measures applied to National Forest System land uses
- Supplemental discussion about post-treatment restoration and the prescription process
- Supplemental analysis regarding herbicide delivery to surface waters, and effects on fish.

1.6 Non-Significant Issues

The Council of Environmental Quality (CEQ) requires federal agencies to identify and eliminate from detailed study the issues that are not significant (40 CFR 1501.7). Issues are eliminated from further analysis when the issue is outside the scope of the EIS; is already decided by law, regulation, Forest Plan, or other higher level decision; is not clearly relevant to the decision to be made; or is conjectural and not supported by credible scientific or factual evidence.

The Gifford Pinchot National Forest Supervisor and the Columbia River Gorge National Scenic Area Manager determined that the following public issues would be eliminated from further analysis:

1.6.1 Funding and Partnerships for Managing Invasive Plants on Private Land

Some people expressed that invasive plant treatments on private lands should be funded or technical assistance provided for private landowners, and that management of noxious weeds can also be improved on both public and private lands by the formation and participation in weed management areas. This issue is outside the scope of this analysis and is therefore not significant to the project analysis.

The Forest Service supports establishing weed management areas in partnership with others. All alternatives would be consistent with such partnerships and the likelihood of success would certainly be increased.

However, establishment of weed management areas is an administration action that may be accomplished without consideration in an EIS. The Klickitat Rails to Trails project on the Columbia River Gorge National Scenic Area would use Forest Service funding or resources for work off-National Forest System lands, so this is evaluated as a connected action.

1.6.2 Funding Sources and Commitments

Several commenters mentioned that project effectiveness is directly related to funding. Funding secured for the past several years is not adequate to fully implement any action alternative. While this is an important issue relevant to the ability of the Forest Service to meet the purpose and need, it is outside the scope of this EIS because it cannot be resolved through the NEPA process.

Funding is dependent on many unpredictable factors and some sources may become available once a NEPA decision has been made. Financial efficiency analysis displays estimated costs of treating all known infestations over a five-year period. The average cost of a treatment acre is also disclosed. This information can be used to demonstrate funding that would be needed over time to complete the project, however this NEPA document cannot guarantee that all planned work would be funded.

1.6.3 Linking the Project to Other Initiatives

Some comments suggested linking this invasive plant project to the Fuels Reduction and Healthy Forest Initiatives or other initiatives to provide a more strategic approach to controlling invasive plants than a stand alone document.

Invasive plant treatments may be implemented together with projects intended to improve forest health or reduce fuels. Treatments may continue to be funded with other projects (for example, stewardship agreements) and future NEPA documents may incorporate the analysis herein, so that integrated resource management can be achieved in the best way possible. However, this project level analysis focuses on the needs, issues, alternatives, and effects related to invasive plant treatment, specifically with herbicides, which exist independent of other initiatives.

1.6.4 Job Creation

Some comments suggested that manual and some mechanical treatments should be favored because they tend to be more labor-intensive and would thus create more jobs than herbicide treatment methods. Some treatments do require more person days to accomplish and would tend to employ more people, assuming unlimited funding. Jobs would tend to be short term and seasonal and opportunities would decrease each year after initial treatment. The Responsible Officials have determined that this is not a significant issue that should be tracked in this document.

1.6.5 Required Disclosures for an EIS

The topics listed here do not reflect issues brought forward with this proposal, but are required disclosures for EIS documents. These are addressed in Chapter 3.

- Congressionally Designated Areas
- Prime Farm and Forest Lands
- Cultural Resources
- Effects to Wetlands
- Relationship Between Short-term Uses and Long-term Productivity
- Conflicts with Other Policies, Plans, Jurisdictions
- Irretrievable and Irreversible Commitment of Resources
- Adverse Effects that cannot be Avoided

Chapter 2. Alternatives, Including the Proposed Action

2.1 Introduction

Chapter 2 describes and compares alternatives considered for invasive plants treatment on the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area in the state of Washington. Chapter 2 focuses on the resource trade-offs associated with differences between the alternatives.

2.2 Alternative Development Process

In 2004, all known invasive plant sites (field surveys were completed on main vectors) were mapped and entered into an inventory data base.[12] Infested sites were aggregated into treatment areas, and control measures, strategies, objectives and priorities were determined. The treatment areas were then classified by the type of site (e.g., roads, administrative sites, meadows) and prioritized considering the threat posed by existing invasive species and the potential for effective treatment. Treatment methods (herbicide and non-herbicide) and strategies were identified based on the location, extent and biology of the existing invasive plant species. The treatment priorities, methods and strategies in the Proposed Action were developed based on the R6 2005 FEIS (Chapter 3.3).

In 2004 and 2005, the public was asked to provide scoping input on the Proposed Action. Public issues were identified (see Chapter 1), and project design criteria (see Chapter 2.5.8) were developed so that invasive plant treatments using herbicide would comply with the recently adopted treatment and restoration standards and resolve public issues to the extent possible.

Alternative C was developed to further resolve public concerns about herbicide use. Alternative C would eliminate most adverse effects from herbicide by 1) eliminating broadcast applications, which account for most of the concern/uncertainty related to herbicide use and 2) eliminating use of herbicide within riparian reserves and along roadsides that cross or follow streams. Eliminating such herbicide use resolves nearly all public issues related to adverse effects of herbicide.

Other alternatives were considered (no herbicide at all, follow no project design criteria beyond label advisories) but were eliminated from detailed study. These are discussed at the end of this chapter.

2.3 Invasive Plant Treatment Methods

All of the alternatives (including No Action) employ a variety of invasive plant treatment methods.[13] This section offers a brief description of the different methods proposed for manual/mechanical and herbicide treatments in all alternatives, including No Action. These descriptions are based on Tu et al. 2001.

[12] The Forest Service is aware of one site (less than an acre) where an aggressive new invader (mouse ear hawkweed) has been found that did not occur in the 2004 Inventory. Otherwise, the Proposed Action appears to accurately characterize the current situation in light of spread since 2004.

[13] The alternatives vary as to the total and relative amount of herbicide treatment approved and some alternatives do not approve some treatment options listed. Appendix A displays likely treatment methods within treatment areas based on the current inventory. These are subject to change given local conditions at the time of implementation.

Cultural Methods

Grazing with Goats - Grazing animals are limited to goats in this proposal. Goats prefer broadleaf plants such as blackberry, ivy, leafy spurge, knapweed, and toadflax.

Competitive Seeding – Competitive seeding is part of the restoration plan addressed in 2.5 below.

Manual and Mechanical Methods

Manual methods include the use of hand-operated tools (e.g., axes, brush hooks, hoes, shovels, hand clippers) to dig up and remove noxious species (USDI 2003). Some manual techniques in the Proposed Action include hand pulling, clipping, or digging. Mechanical methods involve chain saws, mowers, or other mechanized equipment, such as brush cutters, or other machinery with various types of blades to remove plants. See Appendix A for manual and mechanical methods currently proposed within each treatment area based on the November 2004 invasive plant inventory.

These techniques tend to minimize damage to desirable plants and animals, but they are generally labor and time intensive. Treatments must typically be administered several times a year over several years to prevent the weed from re-establishing. Manual and mechanical techniques are generally favored to treat small infestations and/or in situations where a large pool of volunteer labor is available. They are often used in combination with other techniques.

Weed Pulling - Pulling or uprooting plants can be effective against some shrubs, tree saplings, and herbaceous weeds. Annuals and some tap-rooted plants can be controlled by hand-pulling. Weed wrenches and other tools are surprisingly powerful and can enable a person to control large saplings and shrubs that are too big to be pulled by hand.

Weed pulling is not as effective against many perennial weeds with deep underground stems because roots are often left behind to re-sprout.

The advantages of pulling include the small ecological impact, minimal damage to neighboring plants, and low (or no) cost for equipment or supplies. Pulling is extremely labor intensive, however, and is effective only for relatively small areas, even when abundant volunteer labor is available. Hand pulling is easy to plan and implement, and is often the best way to control small infestations, such as when a weed is first detected in an area. Hand pulling may be a good alternative in sites where herbicides or other methods cannot be used.

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. Hand pulling is not effective on plants with deep and/or easily broken roots.

Most weed-pulling tools are designed to grip the weed stem and provide the leverage necessary to pull its roots out. Tools vary in their size, weight, and the size of the weed 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.

Clip - "Clip" means to cut or remove seed heads and/or fruiting bodies to prevent germination. This method is labor intensive but effective for small and spotty infestations. This method is labor intensive but effective for small and spotty infestations.

Clip and Pull - "Clip and pull" 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.

Mowing, Cutting, Brush Hog, Raking, Trimming, Weed-eating - Mowing and cutting can reduce seed production and restrict weed 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.

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.

Girdling - Girdling is often used to control trees or shrubs that have a single trunk. It involves cutting away a strip of bark several centimeters wide all the way around the trunk. The removed strip must be cut deep enough into the trunk to remove the vascular cambium, or inner bark, the thin layer of living tissue that moves sugars and other carbohydrates between areas of production (leaves), storage (roots), and growing points.

Steaming or Foaming - Pouring boiling hot water onto weeds, or subjecting weeds to hot steam, is a method of weed control that has been practiced for some time. A New Zealand company has marketed a hot foam system for steam-killing vegetation that employs hot foam to deliver and trap superheated steam onto foliage to kill weeds. It is an effective treatment for annuals, and with repeated treatments, may be effective for some perennials. No steaming or foaming treatments are currently prescribed in any treatment area.

Restoration - Treatment site restoration may include hand or machine mulching (machines limited to areas that are on roads), seeding (see cultural above), and/or planting with hand tools, or may be passive in situations where desirable vegetation can naturally replace target invasive species removed.

Herbicide Application Methods

The environmental impacts of three types of herbicide application methods are evaluated in this EIS:

Broadcast (includes but not limited to boom spray) - Broadcast treatments would be used to treat dense or continuous patches of target vegetation. A boom, a long horizontal tube with multiple spray heads, may be mounted or attached to a tractor, all terrain vehicle (ATV) or other vehicle. The boom is then carried above the weeds 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. Two alternatives (No Action and Alternative C) do not approve any broadcast treatment.

Not all broadcast methods include a boom; boom-less nozzles are currently in use that can reduce the risk of non-target effects.

A decision tree is provided in Chapter 2.5 to display the thought process behind use of broadcast versus a more selective application method. Broadcast methods are associated with more drift, runoff and leaching than spot or hand/selective methods and are therefore the focus of wider buffers and more stringent PDC in the Proposed Action. No broadcast would be allowed under Alternative C.[14]

Spot spray - Herbicide is sprayed directly onto small patches or individual target plants; non-target plants are avoided. These applicators range from motorized vehicles with spray hoses to backpack sprayers, to hand-pumped spray or squirt bottles, all of which can target very small plants or parts of plants. Drift is far less of a concern because the applicator ensures that spray is directed immediately toward the target plant.

Hand/Selective - Hand/selective methods treat individual target plants, reducing the potential for herbicide to impact soil or non-target organisms. Hand/selective methods include wicking and wiping; foliar application; basal bark treatment; frill (hack and squirt), stem injection, and/or cut-stump methods.

Wicking, Wiping, and other stem and/or leaf application - Involves using a sponge, spray bottle, paint brush, cloth and/or a wick on a long handle to wipe or apply herbicide onto individual foliage and/or stems. Use of a wick or other tools mentioned above eliminates the possibility of spray drift and minimizes potential for droplets falling on non-target plants. Small amount of herbicide can drip or dribble from some wicks.

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 a wick.

Frill, 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.

Stem Injection - Herbicides or pellets can be injected into invasive plants using specialized tools. Higher concentrations of active ingredients may be needed for effective stem injection, e.g. maximum label rate of aquatic labeled glyphosate, may be required to effectively kill knotweed by stem injection (Lucero presentation, May 2005).

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.

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[14] Currently approved projects on the Columbia River Gorge (see No Action) include about 80 acres of broadcast.

Methods not Considered in Any Alternative

The following invasive plant methods are not considered in any alternative because these treatments are not needed for the existing inventory. These methods would not be available as part of the Early Detection-Rapid Response Approach. Future proposed use of these methods would constitute a changed condition relative to Section 18 of the FSH 1909.15 (NEPA) and subject to additional NEPA and ESA requirements.

- Aerial Herbicide Application
- Herbicides other than the ten analyzed in this document
- Prescribed Burning
- Plowing/Tilling/Disking/Digging With Heavy Equipment
- Flooding/Drowning
- Foaming and Steaming (described in section above)

2.4 No Action

The No Action Alternative is also known as Alternative A.

Alternative A Description

- Approximate Acreage Where All Treatment Options, Including Herbicide, Are Approved: 400
- Approximate Acreage Where Only Manual Treatments Are Approved (no herbicide): 2,100

Under Alternative A, the No Action alternative, invasive plant treatments would be implemented according to existing NEPA decisions. On the Gifford Pinchot National Forest, a 2004 Decision Memo (Gifford Pinchot National Forest) approved spot and hand glyphosate (and aquatic glyphosate) treatments of 16 administrative sites and 32 recreation sites. Within riparian reserves as defined by the Northwest Forest Plan, treatments have been limited to stem injection or cut-stem application methods only in areas where there are no federally listed fish species, proposed critical habitat for bull trout, and Essential Fish Habitat. Few acres have been treated to date.

In addition, a Categorical Exclusion (USDA 2002) approved manual treatments (hand pulling) along road sides and trails across the Forest. Some portion of the 2,000 roadside acres proposed for herbicide treatment would be treated by hand pulling under No Action.

The analysis assumes all 2,100 acres would be treated manually; however in many cases, this treatment would not fully eradicate or control invasive plants, and in some cases, may actually lead to spreading invasive plants (see Chapter 3.2).

On the Gifford Pinchot National Forest, from 2003 to 2005, approximately 1,420 acres of manual treatments were reported within administrative sites, roadsides, and the South Prairie and Cave Creek meadow areas. Re-treatment of infested areas continues to be needed.

Table 5-Past Accomplishments, Gifford Pinchot National Forest/Counties/RAC

Year	2003	2004	2005	Total
Reported Cost	$175,000	$160,000	$263,000	**$598,000.00**
Treated Acres	215	320	885	**1,420**

On the Columbia River Gorge National Scenic Area, existing NEPA decisions for site-specific restoration projects have approved herbicide combined with manual and/or mechanical treatments on approximately 300 of the 360 acres in the current inventory (documents on file at the Columbia River Gorge office in Hood River, Oregon).

Under existing decisions, herbicide formulations are limited to picloram, glyphosate and triclopyr – applied by broadcast (70 acres) and spot/hand methods (230 acres). Implementation of these projects has been inconsistent for a variety of reasons, including disagreement on the part of adjacent landowners and counties regarding the priority and cost-effectiveness of treatment of National Forest System lands (Dobson, unpublished report 2006). Limited broadcast treatment may occur on the Columbia River Gorge National Scenic Area (about 70 acres of a total of 300 acres where herbicide use is already approved).

Table 6-Estimated Acres of Herbicide/Broadcast in Alternative A

Administrative Unit	Approximate Acres Where All Treatment Options Approved, Including Herbicide	Proportion of Estimated Herbicide Acres that May Be Broadcast
Columbia River Gorge National Scenic Area (Washington side)	300	23% / 70 acres
Gifford Pinchot National Forest	100	0% - no broadcasting
Total	**400**	**18% / 70 acres**

Biological Controls

Table 7 displays the biological control (biocontrol) agents that County Weed Coordinators have reportedly released adjacent to the Forest and Scenic Area. Releases and redistribution of these biological agents would be expected to occur regardless of alternative selected for this project, including No Action (Alternative A).

Canada thistle defoliating beetle (*Cassida rubiginosa)* has been reported as distributed within adjacent counties; however it has not been approved by the Animal and Plant Health Inspection Service (APHIS). The thistle head weevil (*Rhinocyllus conicus*) was released historically, but is no longer approved for distribution because it may have direct, negative impacts on native plants.

No releases of biological agents are currently proposed on National Forest System lands as a part of any action alternative; however, agents do not recognize property boundaries and may be occupying host species within the Project Area. Biocontrols may be proposed in the future to treat tansy ragwort or other widespread species as part of the integrated weed management program on the Forest and Scenic Area.

Table 7-Biological Controls that Are Currently Distributed

Target Species	Biocontrol Agents
Diffuse Knapweed	Lesser Knapweed Weevil (*Larinus minutus*) and Seedhead Weevil (*Bangasternus fausti*)
Tansy Ragwort	Cinnabar Moth (*Tyria jacobaeae*)
Canada Thistle	Stem-Gall Fly (*Urophora cardui*)
St. John's Wort	Klamath Weed Beetle (*Chrysolina hyperici*)
Dalmatian Toadflax	Stem-Boring Weevil (*Mecinus janthinus*)
Yellow Starthistle	Yellow Starthistle Hairy Weevil (*Eustenopus villosus*)

2.5 The Proposed Action

The Proposed Action is also known as Alternative B.

Alternative B Description

- Approximate Acres All Treatment Options Approved, Including Herbicide: 2,710
- Estimated Proportion of Project Area Broadcast Herbicide Approved: 35%
- Estimated Proportion of Project Area Spot/Hand Herbicide Approved: 65%

The Proposed Action (Alternative B) was developed to respond to the need for action by approving a wider range of treatment options, including herbicides, to eradicate, control, and/or contain the spread of invasive plants. The Proposed Action would replace existing direction for 400 acres already approved for herbicides under No Action. Herbicide use would also be approved on an additional 2,310 acres of invasive plants estimated as needing such treatment. Appendix A lists the treatment methods currently prescribed for each treatment area.

The Proposed Action would approve a combination of herbicide and non-herbicide treatments based on Common Control Measures (see table 12 in this section). Any of ten herbicides would be used (see table 14) according to project design criteria (table 15) and buffers listed in tables 16 - 19. Similar treatments could occur on new detections found on the Forest and Scenic Area over the next five to fifteen years according the design criteria.

Broadcast application methods would not be approved on about 65 percent of the project area (the 65 percent represents roadsides associated with high potential for herbicide delivery to surface water; additional areas of no broadcast buffers may apply).

The Gifford Pinchot National Forest contains invasive species that are not included in the treatment acreage estimates. These species include tansy ragwort and oxeye daisy. These species are associated with a treatment objective of "tolerate" at this time, because they are so widespread as to be considered naturalized. Although these species are not the focus of this analysis, they may be treated in the course of implementation. These species may be treated in high-valued areas (such as wilderness, RNA and Botanical Areas) and/or places where they are currently uncommon.

Within wilderness, non-herbicide treatments are limited to manual methods. Herbicide applications would be limited to spot or hand methods using backpacks or hand tools, accessed on foot or on horseback.

2.5.1 Areas Treated in the Proposed Action

Treatment areas are geographic assemblages of inventoried and anecdotal invasive plant sites that have been prioritized and prescribed for treatment. About 110 treatment areas are mapped; the majority of the infestations are along roadsides and other disturbed areas. Appendix A provides data tables showing the description for each treatment area. Table 8 displays Treatment Area acres that may be broadcast for each administrative unit. Tables 9 and 10 provide some details for that information. The databases for the Columbia River Gorge National Scenic Area and the Gifford Pinchot National Forest were developed independently and the treatment area description terminology has not been consistently applied between the two units. For instance, clearings and/or wetlands on the Columbia River Gorge National Scenic Area include conditions described as meadows on the Gifford Pinchot National Forest.

Table 8-Proposed Action Treatment Acres

Administrative Unit	Total Acres All Treatment Options Available, Including Herbicide	Proportion of Estimated Herbicide Acres that May be Broadcast
Columbia River Gorge National Scenic Area (Washington side)	360	26% or 95 acres
Gifford Pinchot National Forest	2,350	35% - 814 acres
Total	**2,710**	**34% - 909 acres**

Table 9-Infested Acres by Treatment Area Description, Columbia River Gorge NSA, Washington Side

Treatment Area Description	Total Acres All Treatment Options Available, Including Herbicide	Proportion of Estimated Herbicide Acres that May be Broadcast
Clearings, Fields and Grasslands	180	25% or approx. 45 acres (Mount Pleasant area)
Recreation Areas	162	31% or approx. 50 acres (Balfour Day Use Site)
Forested Areas	13	0% - no broadcasting is proposed for the Collins Slide forested site
Wetlands	5	0% - no broadcasting would be proposed in wetlands
Total Acres	**360**	**26% or approx. 95 acres**

Table 10-Infested Acres by Treatment Area Description, Gifford Pinchot NF

Treatment Area Description	Total Acres All Treatment Options Available, Including Herbicide	Proportion of Estimated Herbicide Acres that May be Broadcast
Roadside	2,000	37% or approx. 740 acres
Quarries	29	34% or approx. 10 acres
Meadow	104	0% - no broadcasting would be proposed in meadows
Administrative Sites	12	33% or approx. 4 acres of developed areas
Campgrounds and Camping Areas	102	39% or approx. 40 acres
Viewpoints and Parking Areas	52	No broadcasting is currently proposed in these areas.
Roads and Landings in Managed Timber Stand	51	39% or approx. 20 acres
Total Acres	**2,350**	**35% or approx. 814 acres**

2.5.2 Treatment Priority and Strategy

Each treatment area was also assigned an overall priority based on the location and other characteristics of current and estimated/predicted infestations within the project area (see data tables in Appendix A that display the relative priority of each treatment area). Higher priority treatment areas have a greater urgency or necessity for treatment. Priority varies depending on location of the infestation, the environmental or social values that may be threatened, and the aggressiveness of the invasive species. About two-thirds of the currently infested acreage is considered high priority.

Higher priority sites include infested natural areas that serve as habitat for species of local interest such as Mardon skipper (*Polites mardon*) and pale blue-eyed grass (*Sisyrinchium sarmentosum*); wilderness areas, Wind River Experimental Forest, Peterson Prairie, Cave Creek, and Mt. St. Helens National Volcanic Monument on the Gifford Pinchot National Forest; and wetlands and ecological restoration sites on the Columbia River Gorge National Scenic Area. Other examples of higher priority sites include infestations on roads that cross land ownerships and/or roads that lead to special areas.

High public use areas such as campgrounds, parking areas, and viewpoints containing aggressive target species (e.g. butter 'n' eggs, puncturevine, knapweeds, knotweeds, houndstounge, hawkweeds, and purple loosestrife) are also assigned a high priority.

Priority is also based on "newness" of the invader; new invaders are given a higher priority and smaller infestations are often prioritized over more widespread species. Priority would also be given to target species or locations that threaten weed free areas (e.g. knotweed at a road stream crossing high in the watershed that may spread downstream).

In general, higher priority treatments would be favored, and are most likely to be accomplished. Current funding would have to increase substantially to eradicate/control all high priority target species within a five year period (see Botany and Treatment Effectiveness Chapter 3.2, and Financial Analysis Chapter 3.7). New detections would be prioritized against existing priorities and priorities are subject to change over time.

Target species within each treatment area were also assigned a treatment strategy. These strategies vary depending on the potential negative impacts of a given invasive species and the value or sensitivity of the treatment site (or adjacent lands) and are related to priority shown above. Susceptibility to infestation from surrounding land uses and activities and ongoing vectors of invasive plants such as roads are also considered when determining long term strategy.

Treatment strategies considered for the Proposed Action include:[15]

- *Eradicate*: Totally eliminate an invasive plant species from a site. This objective generally applies to small infestations of aggressive species such as knotweed, knapweed, houndstounge, and hawkweed; and/or higher priority treatment areas. At some point, larger infestations can become impossible to eradicate.
- *Control*: Reduce the size of the infestation over time; some level of infestation may be acceptable. This objective applies to target species such as everlasting peavine, deer vetch, and star thistle that have become established on the Forest and Scenic Area.
- *Contain*: Prevent the spread of the weed beyond the perimeter of patches or infestation areas mapped from current inventories. This objective applies target species such as reed canary grass and blackberry on the Columbia River Gorge that are commonly found throughout the project area.

[15] Two other possible strategies exist: suppress and tolerate. These strategies apply to widespread non-native species such as tansy ragwort and oxeye daisy that are inventoried in large acreages within treatment areas. The types of treatments proposed in this EIS are not appropriate on a large enough scale to contain, control or eradicate these species. However, these species would not be protected as non-target vegetation. In high valued areas such as Wilderness, Mount Saint Helens, Botanical or RNAs, tansy ragwort, oxeye daisy or other widespread, non-native species may be treated along with higher priority species. The treatment acreage estimates for higher priority target species account for treating additional target species in selected areas.

Table 11 displays the approximate number of acres proposed for each treatment strategy. Treatment cost estimates and assumptions vary by strategy (more information in Chapter 3.7). Treatments of infestations with a strategy of eradicate would tend to be the most costly and labor intensive and require more recurring treatments.

Table 11-Acres by Treatment Strategy

Approximate Acreage by Treatment Strategy				
Administrative Unit	**Total Acres**	**Eradicate**	**Control**	**Contain**
Columbia Gorge in Washington	360	20	240	100
Gifford Pinchot National Forest	2,350	1,300	1,050	0
Total Project	**2,710**	**1,320**	**1,290**	**100**

2.5.3 Target Species/Common Control Measures

Effective treatment methods (Common Control Measures) for invasive plant species known or suspected within Washington and Oregon is in Appendix B. The source of the documentation supporting the effective use of various herbicides is also in Appendix B. Table 12 summarizes this information for invasive species documented within the project area. The estimated acreage to be treated is based on the 2004 Inventory but has been adjusted and increased to account for predicted rate of spread.

The Common Control Measures are the starting point for site-specific invasive plant treatment and restoration prescriptions. Non-herbicide methods would be used where they would be cost-effective.

Additional invasive species are noted in the 2004 Inventory Data Base including tens of thousands of acres of oxeye daisy and tansy ragwort. Widespread, low priority species such as tansy ragwort are not the focus of this EIS. Treatment of these established populations using manual, mechanical, and cultural or herbicide treatment would be cost-prohibitive; however, there would be no *prohibition* on treating these species, and such treatment is possible in conjunction with higher priority treatments in the same area, in high priority areas (e.g. Wilderness, Botanical Area) or where it is currently not well known (i.e. tansy ragwort moving into Klickitat County, where it is considered a new invader).

The Common Control Measures would be applied to site-specific conditions as part of the Implementation Planning process. The Common Control Measures are intended to be refined over time based on local treatment results. Refinements, and additional prescriptions associated with new invaders, would be limited to methods within the scope of this EIS.

Some treatment methods listed in the Common Control Measures are not proposed at this time. Only those methods listed in 2.3 would be approved under the Proposed Action.

Table 12-Common Control Measures Summary

Target Species – Common and *Scientific Names* and Growth Habit	Estimated Treatment Acres	Integrated Control Measures	When/How to treat with Herbicides	Documented Effective Herbicides
Spotted knapweed (*Centaurea biebersteinii)* **Diffuse knapweed (*Centaurea diffusa*)** **Meadow knapweed (*Centaurea debeauxii*)** **Brownray knapweed (*Centaurea jacea*)** **Biennial or perennial**	696 (Gifford Pinchot) 133 (Columbia River Gorge)	- Hand pull or dig small populations or when volunteer labor is available. Multiple entries per year are required. - Manual Disposal: Remove entire root system from the site, as re-growth can occur. -Mowing is possible, but timing is critical. - Manual treatments may take up to ten years due to long term seed viability. - Revegetate with desirable species in accordance with the Restoration Plan.	Roadsides: Broadcast spray in dense cover or where dominant plant community is non-native. Otherwise, spot spray on smaller, less dense, patchy roadside infestations. Follow PDC: they may require a less impacting treatment choice. Non-roadside sites: Spot or hand treat. Treat in spring before bud stage. Yearly revisits would be necessary; the number of which is dependent on the chemical used and the seed bank.	A - Clopyralid B - Picloram C - Aquatic labeled Glyphosate
Yellow star thistle (*Centaurea solstitialis*) **Annual**	286 (Columbia River Gorge)	- Manual removal is most effective with small patches or where plants are sporadically located. Best time for manual removal is after the plants have bolted and before they produce viable seed. It is important to detach all above ground stem material. Leaving even a two inch piece of stem can result in re-growth if leaves and buds are still attached at the base of the plant. - For large populations, remove plants at the outward edge, working in towards the interior. - Manual Disposal: Remove all flower heads (at any stage of maturity) from site. - Mowing is possible, but timing is critical. Plants must be developed to where the stem branches are above the mowing height, otherwise flowers might still develop. -Manual treatments may take up to ten years due to long term seed viability. - Revegetate with desirable species in accordance with the Restoration Plan.	Roadsides: Broadcast spray in dense or continuous target vegetation or where dominant plant community is non-native. Otherwise, spot spray on smaller, less dense, patchy roadside infestations. Follow PDC: they may require a less impacting treatment choice. Non-roadside sites: Spot or hand treat. Treat in spring before bud stage. Yearly revisits would be necessary; the number of which is dependent on the chemical used and the seedbank.	A - Clopyralid B - Picloram C - Aquatic labeled Glyphosate

Target Species – Common and *Scientific Names* and Growth Habit	Estimated Treatment Acres	Integrated Control Measures	When/How to treat with Herbicides	Documented Effective Herbicides
Japanese knotweed (*Polygonum cuspidatum*) **Giant Knotweed *(Polygonum sachilinese)*** **Perennial**	12 (Gifford Pinchot) 2 (Columbia River Gorge)	- 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). - Manual Disposal: Remove all plant parts from site, as stems and rhizomes can bud into new individuals. - Revegetate with desirable species if surrounding cover is primarily non-native, in accordance with the Restoration Plan.	Stems > 3/4": Stem injection; Stems < 3/4": Stem injection or Foliar spray Treat June through September Stem injection may require one or more revisits, and foliar spray may require at least one, depending on the seed bank.	A – Glyphosate (upland and aquatic labeled) B – Triclopyr (upland and aquatic labeled) C - Aquatic labeled Imazapyr
Hawkweed (*Hieracium pratense*) **Perennial**	38 (Gifford Pinchot)	- Herbicide treatment is most effective. - Some manual removal possible for small infestations. - Manual Disposal: All plant parts should be removed, as new plants can bud from root, stolon, and rhizome fragments. -Covering with a plastic tarp may also work for small infestations. - Nitrogen fertilization after treatment would encourage native plant growth if done in the spring. - Revegetate with desirable species in accordance with the Restoration Plan (see Section 2.5.4).	Spot spray whenever possible. Broadcast spray in areas of dense cover or where dominant plant community is non-native. Follow PDC: they may require a less impacting treatment choice. Treat in spring after most basal leaves emerge but before buds form. Fall treatment may also be effective, but research is limited. Yearly revisits would be necessary; the number of which is dependent on the chemical used and the seedbank.	A - Clopyralid B - Picloram C - Aquatic labeled Glyphosate
Butter 'n' eggs (*Linaria vulgaris*) **Toadflax *(Linaria sp.*)** **Perennial**	4 (Gifford Pinchot)	- Hand pull or dig small populations or volunteer labor is available. -Manual Disposal: Plants can be left on site, but may reduce germination of desirable species due to mulching effect. If plants have flower heads with seeds (immature as well), bag and remove them from site. -Cutting stems in spring or early summer would eliminate plant reproduction, but not the infestation. - These treatments may take up to ten years due to long term seed viability. - Revegetate with desirable species in accordance with the Restoration Plan. Plant communities in good condition may recover without replanting.	Broadcast spray would generally not be necessary: this species tends to be scattered. Apply during active growth in spring before bloom or in late summer or fall during re-growth. Revisits would be necessary; the number of which is dependent on the chemical used and the seedbank. This control could vary by site. Even after three years of consecutive treatments, control may range widely.	A - Metsulfuron methyl (forested sites) B - Imazapic (in native grasses) C - Aquatic labeled Glyphosate

Target Species – Common and *Scientific Names* and Growth Habit	Estimated Treatment Acres	Integrated Control Measures	When/How to treat with Herbicides	Documented Effective Herbicides
Houndstongue (*Cynoglossum officinale*) **Perennial**	45 (Gifford Pinchot)	- Hand pull or dig small populations. - Manual Disposal: 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). - Manual treatments may take up to five years. - Revegetate with desirable species in accordance with the Restoration Plan.	Roadsides: Broadcast spray in dense cover or where dominant plant community is non-native. Otherwise, spot spray on smaller, less dense, patchy roadside infestations. Large non-sensitive sites: ATV Broadcast spray Follow PDC: they may require a less impacting treatment choice. Apply during active growth, preferably basal rosette stage. Revisits would be necessary; the number of which is dependent on the chemical used and the seedbank.	A - Metsulfuron methyl (forested sites) B - Imazapic (in native grasses) C - Aquatic labeled Glyphosate
Scotch broom (*Cytisus scoparius*) **False Indigo *(Amorpha fruticosa)*** **Perennial**	780 (Gifford Pinchot) 58 (Columbia River Gorge)	- Hand pulling, cutting, weed wrenching or digging of small populations or when volunteer labor is available. Hand-pulling or weed wrenching is most effective in moist soils. Cutting would require multiple visits in one year. -Manual Disposal: Plants can be left on site if no seed pods are present (seed can remain viable for several years). - Manual treatments may take up to ten years due to long term seed viability. - Revegetate with desirable species in accordance with the Restoration Plan.	Larger plants: Cut and paint. Smaller plants: Spot spray where hand-pulling or weed wrenching is not feasible. Apply during active growth preferably in the spring to young plants. Yearly revisits would be necessary; the number of which is dependent on the chemical used and the seedbank.	A – Triclopyr (upland and aquatic labeled) B - Clopyralid C - Picloram D - Aquatic labeled Glyphosate
Puncturevine *(Tribulus terrestris*) **Annual**	1 (Columbia River Gorge)	- Hand pulling is as effective as chemical control. - Manual Disposal: If flowering, remove plants from site. - Manual treatments may take up to ten years due to long term seed viability. - Mowing is ineffective due to the prostrate growth habit. - Revegetate with desirable species in accordance with the Restoration Plan.	Spot spray whenever possible. Broadcast spray in areas of dense cover or where dominant plant community is non-native.) Follow PDC: they may require a less impacting treatment choice. Apply herbicide in early spring during active growth. Yearly revisits would be necessary; the number of which is dependent on the chemical used and the seedbank.	A – Metsulfuron methyl B – Imazapic (if native grasses are present) C – Chlorsulfuron D - Aquatic labeled Glyphosate

Target Species – Common and *Scientific Names* and Growth Habit	Estimated Treatment Acres	Integrated Control Measures	When/How to treat with Herbicides	Documented Effective Herbicides
Mat Sandbur (*Cenchrus longispinus)* **Annual**	1 (Columbia River Gorge)	- Digging or pulling before flowering is effective, and may take up to ten years due to long term seed viability. - Manual Disposal: If flowering, remove plants from site. - Mowing is ineffective as plant (grass) would re-grow and produce seed. -If chemical treatment is not an option, repeated mowing (every three weeks) is necessary and may still not be effective. Bag and remove cut material. - Revegetate with desirable species in accordance with the Restoration Plan.	Spot spray whenever possible. Broadcast spray in areas of dense cover or where dominant plant community is non-native. Follow PDC: they may require a less impacting treatment choice. Apply herbicide in early spring during active growth. Yearly revisits would be necessary; the number of which is dependent on the chemical used and the seedbank.	A - Glyphosate (upland and aquatic labeled)
Reed canarygrass (*Phalaris arundinaceae*) **Perennial**	10 (Gifford Pinchot) 3 (Columbia River Gorge)	- Use a combination of herbicides and manual, mechanical, or cultural 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. -Manual Disposal: As reed canary grass can regenerate from short pieces of rhizome, remove all plant parts from site. - 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.	Hand wipe or spot spray whenever possible. Broadcast spray in dense cover or where dominant plant community is non-native. Follow PDC: they may require a less impacting treatment choice. Apply in early spring when just sprouting before other wetland species have emerged. Yearly revisits would be necessary; the number of which is dependent on the chemical used and the seedbank.	A - Aquatic labeled Glyphosate B- Sulfometuron methyl (upland sites only)
Canada thistle (*Cirsium arvense*) **Perennial sowthistle (*Sonchus arvensis*)** **Perennial**	426 (Gifford Pinchot) 135 (Columbia River Gorge)	- Herbicide treatment is most effective. - The only manual technique would be hand cutting of flower heads, which only suppresses seed production. -Manual Disposal: bag and remove flower heads form site. -Mowing may be effective in rare cases if done monthly (this intensity would damage native species). -Covering with a plastic tarp may also work for small infestations. - Revegetate with desirable species in accordance with the Restoration Plan.	Broadcast spray in dense cover or where dominant plant community is non-native. Spot spray whenever possible. Follow PDC: they may require a less impacting treatment choice. Apply in spring to rosettes and prior to flowering. Or apply in fall to rosettes; season is dependent upon herbicide used. Yearly revisits would be necessary; the number of which is dependent on the chemical used and the seedbank.	A - Clopyralid B – Picloram C – Chlorsulfuron D - Aquatic labeled Glyphosate (best in fall)

Target Species – Common and *Scientific Names* and Growth Habit	Estimated Treatment Acres	Integrated Control Measures	When/How to treat with Herbicides	Documented Effective Herbicides
Herb robert (*Geranium robertianum)* **Annual, Biennial or Perennial**	31 (Gifford Pinchot)	- Hand-pulling is most effective if the entire plant is pulled. -Manual Disposal: Plant can be left on site, if not in flower. If in flower, bag and remove. - Care must be taken not to pull desirable vegetation which is usually intermingled.	On large, dense infestations: broadcast spray; on small, scattered infestations: spot spray. Herbicide application most effective in the early spring. Yearly revisits would be necessary; the number of which is dependent on the chemical used and the seedbank.	A - Glyphosate (upland and aquatic labeled)
Purple loosestrife (*Lythrum salicaria*) **Perennial**	2 (Gifford Pinchot)	- Herbicide treatment is most effective. - Hand removal of small populations or isolated stems is possible, but only if entire rootstock is removed. -Manual Disposal: All plant parts must be removed from site, as broken off pieces can re-root. - The only other technique would be hand cutting of flower heads, which only suppresses seed production. - Revegetate with desirable species in accordance with the Restoration Plan.	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 would be necessary; the number of which is dependent on the chemical used and the seedbank.	A - Aquatic labeled Glyphosate
Himalayan blackberry (*Rubus discolor*) **Perennial (canes die off annually)**	35 (Gifford Pinchot) 162 (Columbia River Gorge)	- Use a combination of herbicides and manual and/or mechanical treatments. Usually mechanical removal of large biomass in the summer (using a mower, or brush hog), followed by manual removal of resprouting 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. - Revegetate with desirable species in accordance with the Restoration Plan.	Cut and paint larger canes. Broadcast spray is possible after canes are cut if non-targets are not an issue. Spot spray whenever possible. Yearly revisits would be necessary; the number of which is dependent on the chemical used and the seedbank.	A - Triclopyr (upland and aquatic labeled) B - Aquatic labeled Glyphosate
Butterfly bush (*Buddleja* sp.) **Perennial**	2 (Gifford Pinchot)	-Use manual and manual treatments combined with herbicides. Smaller plants can be hand pulled or dug. - Manual Disposal: All portions of the plant should be removed. - For large plants, cutting and painting with herbicide is most effective. - Revegetate with desirable species in accordance with the Restoration Plan.	Cut and paint stumps. Use foliar spray on smaller stems that can't be hand pulled. Yearly revisits would be necessary; the number of which is dependent on the chemical used and the seedbank.	A - Glyphosate (upland and aquatic labeled)

Target Species – Common and *Scientific Names* and Growth Habit	Estimated Treatment Acres	Integrated Control Measures	When/How to treat with Herbicides	Documented Effective Herbicides
Bull thistle (*Cirsium vulgare*) **Spiny plumeless thistle (*Carduus acanthoides*)** **Biennial**	233 (Gifford Pinchot)	- Use manual, mechanical or chemical control or a combination. - Any manual method that severs the root below the soil surface would 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. -Manual Disposal: Bag and remove from site if plant has a flower head. - Timing of mowing is critical (within 2 days of full flowering for musk thistle). - Biological controls may be helpful to suppress populations in combination with other methods. - Revegetate with desirable species in accordance with the Restoration Plan.	Spot spray whenever possible. Apply to rosettes in either the spring or fall. Yearly revisits would be necessary; the number of which is dependent on the chemical used and the seedbank.	A - Clopyralid, B - Picloram C - Aquatic labeled Glyphosate
Lesser burdock (*Arctium minus*) **Biennial**	17 (Gifford Pinchot)	- Use a combination of manual and herbicide. - Hand pull or dig small populations or when volunteer labor is available. - If chemicals are used, manual treatments could be used for follow-up. Relative amounts of herbicide to manual treatments would decline over time. - Revegetate with desirable species in accordance with the Restoration Plan.	Spot spray whenever possible. Treat as a biennial. Treat in spring after rosettes are formed when non-targets are dormant or treat fall rosettes. * Very little was found on this species.*	A- Metsulfuron methyl B – Triclopyr + Clopyralid C - Aquatic labeled Glyphosate (not found as effective in the literature)
Yellow nutsedge *(Cyperus esculentus)* **Perennial**	9 (Gifford Pinchot)	- Hand digging is effective if done before root tubers form. -Manual Disposal: All parts of the root system should be removed. - Out-competing through revegetation is the most effective means.	Spot spray whenever possible. Apply during active growth in midseason but before tubers begin to form. Yearly revisits would be necessary; the number of which is dependent on the chemical used and the seedbank. Most information from the turf grass industry.	Aquatic labeled Glyphosate

Target Species – Common and *Scientific Names* and Growth Habit	Estimated Treatment Acres	Integrated Control Measures	When/How to treat with Herbicides	Documented Effective Herbicides
Everlasting Peavine *(Lathyrus latifolius*) **Birdfoot Deervetch (*Lotus corniculatus)*** **Aaron's Rod (*Thermopsis villosa*)** **Perennial**	6 (Gifford Pinchot)	-Herbicide treatment most effective. -Hand control possible with repeated effort or combined herbicide/hand treatment. - Hand removal must be repeated for several years. -Manual Disposal: Entire root system must be removed. - Revegetate with desirable species Revegetate with desirable species in accordance with the Restoration Plan.	Roadsides: Broadcast spray in dense cover or where dominant plant community is non-native. Otherwise, spot spray on patchy, diffuse roadside infestations. Follow PDC: they may require a less impacting treatment choice. Apply in the spring or early summer before bud stage or in the fall before the leaves start drying. Yearly revisits would be necessary; the number of which is dependent on the chemical used and the seedbank.	A - Clopyralid B - Picloram C -Triclopyr (upland and aquatic) D - Imazapyr (upland and aquatic labeled on sites without grass cover) E - Aquatic labeled Glyphosate
Approximate total acreage to be treated (Gifford Pinchot) = 2,350 Approximate total acreage to be treated (Columbia River Gorge) = 360 Acres are estimated from field inventories documented in the 2004 Inventory Data Base. Acreages have been adjusted to account for spread since 2004, anecdotal information, and extrapolation into uninventoried areas. Columbia Gorge acres by targets species may overlap and therefore add up to more than 360 total acres.				

2.5.4 Treatment Site Restoration

Restoration and competitive plantings of native flora is essential to long term control of invasive plants. Restoration can be accomplished in some areas by removing competition from invasive plants and allowing native flora to occupy a site. Other areas would require active restoration, which would include competitive seeding with native plants, mulching, and/or outplanting.

Passive restoration is expected to be successful on about 35 percent of the treatment sites, with the majority (65 percent) expected to require mulching, competitive seeding, and/or infrequent planting. This proportion is based on the range of situations evident surrounding the inventoried invasive plant populations known across the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area. Meadows and forested areas are most likely to respond favorably to passive restoration, while roadsides and other highly disturbed areas may require active assistance through mulching and/or competitive seeding/planting with desirable vegetation. The intent is to re-establish competitive local, native vegetation post-treatment to promote resilient habitat conditions that are less susceptible to invasive plants.

The Common Control Measures (Table 12 and Appendix B) emphasize the role of competitive seeding in restoration:

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

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

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

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

Table 13 shows the restoration activities currently estimated for various treatment areas. These are also depicted in Appendix A. The Implementation Planning Process outlined in Chapter 2.5.7 integrates restoration into the prescription development process.

Table 13-Preliminary Restoration Treatment by Treatment Area Type

Treatment Area Type	Preliminary Restoration Treatment
Gifford Pinchot NF	
Roadside Treatment Areas	Varied, portions of roadsides may require competitive seeding, mulching or planting
Meadow	Passive restoration except in rare conditions
Dispersed Campground	Passive restoration except in rare conditions
Campground	Mulching, competitive seeding, and/or planting
Admin	Mulching, competitive seeding, and/or planting
Plantation	Passive restoration except in rare conditions
Parking	Passive restoration except in rare conditions
Quarry	Passive restoration except in rare conditions
Viewpoint	Passive restoration except in rare conditions
Columbia River Gorge NSA	
Clearing	Passive restoration except in rare conditions
Wetland	Mulching, competitive seeding, and/or planting
General Forest	Varied, some areas may require competitive seeding, mulching or planting

Appendix F is excerpted from an unpublished document (2003) *Draft Guidelines for Revegetation of Invasive Weed Sites and Other Disturbed Areas on National Forests and Grasslands in the Pacific Northwest (*the full document is in the analysis files). This document provides further information on methods and guidelines for revegetation of invasive weed sites and disturbed areas. Steps are outlined for assessing existing and potential site conditions, and for developing long-term revegetation strategies that are effective, affordable, and consistent with the ecological context and land management objectives of the site and surrounding landscape. This document promotes the use of local native plant materials to establish competitive plant cover and meet the long-term objective to restore ecosystem functioning.

2.5.5 Herbicide Selection

Table 14 displays typical application rates for herbicides proposed for use in the Proposed Action. The effective rate varies depending on many factors (application method, herbicide characteristics, target species, site conditions). The lowest effective rate would be used. Greater application rates would be used infrequently and only where necessary to be effective. For instance, Lucero (personal communication, 2005) reported that stem injection with the highest application rates of glyphosate were required to effectively treat knotweed. In no case would herbicide concentrations be greater than maximum label rate. Broadcast applications and spot applications within aquatic influence zones would never exceed typical rates (see PDC below). Three of the ten herbicides (glyphosate, imazapyr and triclopyr) are labeled for aquatic use.

Table 14-Typical Herbicide Application Rates

Herbicide	Typical Application Rate (lbs. a.i./acre)
Chlorsulfuron	0.056
Clopyralid	0.35
Glyphosate	2.0
Imazapic	0.13
Imazapyr	0.45
Metsulfuron Methyl	0.03
Picloram	0.35
Sethoxydim	0.3
Sulfometuron Methyl	0.045
Triclopyr	1.0

2.5.6 Early Detection/Rapid Response Approach

The Early Detection/Rapid Response process under the Proposed Actions allows for treatment “within the scope of the EIS” to occur on new, unknown, and unpredicted infestations found over the next five to fifteen years. The analysis for the Proposed Action considered treatment of 2,710 acres estimated as the current inventory. However, invasive plants are likely to spread to additional acreage beyond the current inventory within and outside mapped treatment areas.

Under the Early Detection/Rapid Response approach, new or previously undiscovered infestations would be treated using the range of methods described in this EIS, according to the project design criteria listed later in this section. This approach is needed because 1) the precise location of individual target plants, including those mapped in the current inventory, are subject to rapid and/or unpredictable change, and 2) the typical NEPA process would not allow for rapid response; infestations may grow and spread into new areas during the time it usually takes to prepare NEPA documentation. The intent of the Early Detection/Rapid Response approach is to treat new infestations when they are small so that the likelihood of adverse treatment effects is minimized.

The approach 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. The Early Detection/Rapid Response approach would allow the Forest Service to treat new infestations using approved methods anywhere on the Forest that the need exists. The Implementation Planning process detailed in the following section is intended to ensure that PDC and buffers are appropriately applied and that effects are within the scope of those disclosed in this EIS.

The November 2004 invasive plant inventory and database was developed to provide site-specific basis for the Proposed Action. Infested sites were aggregated into treatment areas. See Appendix A for data tables that correspond to maps depicting each treatment area. The interdisciplinary team considered the range of site conditions encountered throughout the treatment areas and analyzed the effects of applying a range of treatment prescriptions to these situations.

The interdisciplinary team developed project design criteria intended to minimize potential for significant adverse effects to such a degree that even though precise treatment locations may be uncertain, the character of the impacts can be predicted, and pose low risk to people and/or the environment. These PDC were developed considering conditions throughout the predictable vectors of spread across the National Forest and Scenic Area.

If new invaders are found outside existing mapped treatment areas, control methods and site conditions would be evaluated to make sure no site conditions exist that could result in dissimilar effects. FSH 1909.15, Chapter 18, provides guidance of review of ongoing projects to determine if the environmental analysis and documentation should be corrected, supplemented, or revised.

2.5.7 Implementation Planning

This section outlines the process that would be used to ensure that the selected alternative is properly implemented. The methodology follows Integrated Weed Management (IWM) principles (R6 2005 FEIS, 3-3) and satisfies pesticide use planning requirements at FSH 2109.14. It applies to currently known infestations and new sites found within or outside currently mapped treatment areas during ongoing inventory. Appropriate Forest Service staff would develop annual treatment prescriptions to ensure that project design criteria are appropriately incorporated.

1. Characterize invasive plant infestations to be treated

- Map and describe target species, density, and extent. Determine treatment strategy and priority (see Chapter 2.5.2).
- Add or refine target species information to database.
- Validate affected environment at the treatment site and ensure no extraordinary site conditions exist that were not considered in EIS. New treatment areas found during future inventories need to be evaluated for extraordinary site conditions that may trigger additional NEPA requirements. For example, new information may reveals that an action may affect listed species in a way not previously considered; or methods needed to be effective would not follow PDC and/or buffers. Considering specific site conditions, such as soil type and depth to groundwater, is included in steps for developing site-specific prescriptions.

2. Develop site-specific prescriptions

- Consider whether active restoration may be necessary (see Chapter 2.5.4 and Appendix F for restoration considerations).
- Use Integrated Weed Management principles to identify possible effective treatment methods. Considerations include the biology of the target species and surrounding environment (these items are also evaluated when invasive plant infestations are characterized). The Common Control Measures listed above (see Chapter 2.5.3 and Appendix B) are the starting place for prescriptions.
- Determine whether effective methods are within the scope of those analyzed in the EIS (See Chapter 2.3). If preferred methods have effects that are outside the scope of those analyzed in the EIS, additional NEPA would be required.
- Prescribe herbicides and application method as needed based on the biology of the target species and size of the infestations. Broadcast would not occur on any road systems identified as having high potential to deliver herbicide to streams or near stream channels, lakes, and wetlands (see PDC and buffers below). Figure 2 displays how herbicide and application method would be selected.
- Apply appropriate PDC from section 2.5.8 based on:
    - The size of the infestation, its treatment history and response to past treatment
    - Proximity to species of local interest or their habitats
    - Proximity to streams, lakes, wetlands
    - Whether the treatment site is along a road associated with high risk of herbicide delivery to surface water
    - Soil conditions
    - Municipal watersheds and/or domestic water intakes
    - Places people gather (recreation areas, special forest product and special use areas)
    - Effective herbicide (or mixture) and method of application needed
- Review compliance criteria for Forest Plan and other environmental standards that apply to a given treatment site.
- If treatments would not be effective once PDC are applied, further NEPA would be required to authorize the effective treatment.
- Review manual Scotch broom treatments to ensure no effect on heritage resources.
- Complete Form FS-2100-2 (Appendix E), Pesticide Use Proposal. This form lists treatment objectives, specific herbicide(s) that would be used, the rate and method of application, and PDC that apply. Apply for an herbicide application permit from the Washington State Department of Agriculture (WSDA) as needed.
- Determine need for pre-project surveys for species of local interest and/or their habitats.
- Coordinate with adjacent landowners, water users, agencies, partners, and tribal governments.
- Document the public notification plan.

3. Accomplishment and Compliance Monitoring

- Develop a project work plan for herbicide use as per FSH 2109.14.3. This work plan presents organizational and operational details including the precise treatment objectives, equipment, materials, and supplies needed; the herbicide application method and rate; field crew organization and lines of responsibility; and interagency coordination.
- Ensure contracts and agreements include appropriate prescriptions and that herbicide ingredients and application rates meet label requirements, R6 2005 ROD, and site-specific PDC. Contracts and agreements will include the appropriate PDC, buffers, including herbicide and additive limitations.
- Document and report herbicide use and certified applicator information in the National pesticide use database, via the Forest Service Activity Tracking System (FACTS). A pesticide use report extracts data from FACTS.[16]
- Implement the public notification plan and document accomplishments.

4. Post-treatment Monitoring and Recurring Treatments

- Monitoring would occur during implementation to ensure project design criteria are executed as planned. Post-treatment reviews would occur to determine whether treatments are effective and whether or not passive/active restoration is occurring as expected.
- Contract administration and other existing mechanisms would be used to correct deficiencies. Herbicide use would be reported as required by the FSH 2109.14 and FACTS (see Appendix E).
- Post-treatment monitoring would also be used to detect whether PDC were appropriately applied, and whether non-target vegetation impacts were within tolerable levels.
    - Re-treatment and active restoration prescriptions would be developed based on post-treatment results. Changes in herbicide or non-herbicide methods, all within the scope of the EIS, would occur based on results. For instance, an invasive plant population treated with a broadcast herbicide may be retreated with a spot spray, or later manually pulled, once the size of the infestation is sufficiently reduced following the initial treatment.
    - Treatment buffers would be expanded if damage were found outside buffers as indicated by a decrease in the size of any non-target plant population, leaf discoloration or chlorophyll change, or mortality to individual species of local interest or non-target vegetation. The findings would be applied to buffers for waterbodies. Buffers may be adjusted for certain herbicides/application methods and not others, depending on results.
- Additional monitoring may be included as part of the Gifford Pinchot National Forest Annual Monitoring Plan or other ongoing programs such as state water quality monitoring. The R6 2005 ROD adopted a monitoring framework to ensure that R6 standards are followed and PDC are effective in minimizing adverse effects to listed species. Treatments within riparian areas may be selected for monitoring as part of this regional, interagency effort.

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[16] See Appendix E for example forms.

2.5.8 Project Design Criteria and Buffers

The following project design criteria (PDC) minimize the potential impacts of invasive plants treatment as per the Gifford Pinchot Forest Plan as amended by the R6 2005 ROD Standards 19 and 20, and provide sideboards for early detection/rapid response. The PDC were developed to respond to the site-specific resource conditions within the treatment areas, including (but not limited to) the current invasive plant inventory, the presence of special interest species and their habitats, potential for herbicide delivery to water, and the social environment. Implementation of the PDC would be mandatory to ensure that treatments would have effects within the scope of those disclosed in Chapter 3. PDC have been amended since release of the DEIS to respond to public comments (see Appendix G) and interagency consultation under the Endangered Species Act (ESA).

Table 15-Project Design Criteria

PDC Reference	Project Design Criteria	Purpose of PDC	Source of PDC
A	**Pre-Project Planning**		
A1	Prior to treatment, confirm species/habitats of local interest, watershed and aquatic resources of concern (e.g. hydric soils, streams, lakes, roadside treatment areas with higher potential to deliver herbicide, municipal watersheds, domestic water sources), places where people gather, and range allotment conditions.	Ensure project is implemented appropriately.	This approach follows several previous NEPA documents. Pre-project planning also discussed in the previous section.
B	**Coordination with Other Landowners/Agencies**		
B1	Work with owners and managers of neighboring lands to respond to invasive plants that straddle multiple ownerships. Coordinate treatments within 150 feet of Forest boundaries, including lands over which the Forest has right-of-way easements, with adjacent landowners.	To ensure that neighbors are fully informed about nearby herbicide use and to increase the effectiveness of treatments on multiple ownerships.	The distance of 150 feet was selected because it approximates the Aquatic Influence Zone for fish bearing streams.
B2	Coordinate herbicide use within 1000 feet (slope distance) of known water intakes with the water user or manager.	To ensure that neighbors are fully informed about nearby herbicide use.	The distance of 1000 feet was selected to respond to public concern. Herbicide use as proposed for this project would not contaminate drinking water supplies.
B3	Coordinate herbicide use with Municipal Water boards. Herbicide use or application method may be excluded or limited in some areas.	To ensure that neighbors are fully informed about nearby herbicide use and standards for municipal watersheds are met.	1990 Gifford Pinchot National Forest and existing municipal agreements.
C	**To Prevent the Spread of Invasive Plants During Treatment Activities**		
C1	Ensure vehicles and equipment (including personal protective clothing) do not transport invasive plant materials.	To prevent the spread of invasive plants during treatment activities	Common measure.
D	**Wilderness Areas**		
D1	No cultural, mechanical or motorized treatments would occur in Wilderness areas.	To maintain Wilderness character and meet environmental standards.	Wilderness Act, 1990 Gifford Pinchot National Forest Plan

PDC Reference	Project Design Criteria	Purpose of PDC	Source of PDC
D2	Choose minimum impact treatment methods	To maintain Wilderness values (e.g. solitude, unimpeded natural processes) and comply with environmental laws and policies.	Wilderness Act, 1990 Gifford Pinchot National Forest Plan
E	**There are no Design Criteria under "E".**		
F	**Herbicide Applications**		
F1	Herbicides would be used in accordance with label instructions and advisories, except where more restrictive measures are required as described below. Herbicide applications would only treat the minimum area necessary to meet site objectives. Herbicide formulations would be limited to those containing one or more of the following 10 active ingredients: chlorsulfuron, clopyralid, glyphosate, imazapic, imazapyr, metsulfuron methyl, picloram, sethoxydim, sulfometuron methyl, and triclopyr. Herbicide application methods include wicking, wiping, injection, spot, and broadcast, as permitted by the product label and these Project Design Criteria. The use of triclopyr is limited to spot and hand/selective methods. Herbicide carriers (solvents) are limited to water and/or specifically labeled vegetable oil.	To limit potential adverse effects on people and the environment.	Standard 16, 2005 R6 ROD; Pesticide Use Handbook 2109.14
F2	Herbicide use would comply with standards in the Pacific Northwest Regional Invasive Plant Program – Preventing and Managing Invasive Plants FEIS (2005), including standards on herbicide selection, restrictions on broadcast use of some herbicides, tank mixing, licensed applicators, and use of adjuvants, surfactants and other additives. See Appendix B for tank mixture analysis.	To limit potential adverse effects on people and the environment.	2005 R6 ROD Treatment Standards (see Chapter 1).
F3	POEA surfactants, urea ammonium nitrate or ammonium sulfate would not be used in applications within 150 feet of surface water, wetlands or on roadside treatment areas having high potential to deliver herbicide.	To protect aquatic organisms.	The distance of 150 feet was selected because it is wider than the largest buffer and approximates the Aquatic Influence Zone for fish bearing streams.
F4	Lowest effective label rates would be used for each given situation. In no case would broadcast applications of herbicide or surfactant exceed typical label rates. NPE would never be broadcast at a rate exceeding 0.5 lbs. active ingredient per acre, and other classes of surfactants besides NPE would be favored wherever they are expected to be effective. In no case would imazapyr exceed 0.70 lbs.	To eliminate possible herbicide or surfactant exposures of concern to human health, wildlife, and/or fish.	SERA Risks Assessments, Appendix Q of the R6 2005 FEIS
F5	Herbicide applications would occur when wind velocity is between two and eight miles per hour. During application, weather conditions would be monitored periodically by trained personnel.	To ensure proper application of herbicide and reduce drift.	These restrictions are typical so that herbicide use is avoided during inversions or windy conditions.

PDC Reference	Project Design Criteria	Purpose of PDC	Source of PDC
F6	Use low nozzle pressure; apply as a coarse spray, and use nozzles designed for herbicide application that do not produce a fine droplet spray, e.g., nozzle diameter to produce a median droplet diameter of 500-800 microns.	To ensure proper application of herbicide and reduce drift.	These are typical measures to reduce drift. The minimum droplet size of 500 microns was selected because this size is modeled to eliminate adverse effects to non-target vegetation 100 feet or further from broadcast sites.
F7	F7 was omitted, it was found to be inconsistent with label advisories and counter productive to effective treatment timing in some situations, such as stem injection. Glyphosate, for example, will not be washed off a plant if rain were to fall as soon as 6 hours past the time of application.		
G Herbicide Transportation and Handling Safety/Spill Prevention and Containment An Herbicide Transportation and Handling Safety/Spill Response Plan would be the responsibility of the herbicide applicator. At a minimum the plan would: ✓ Address spill prevention and containment. ✓ Estimate and limit the daily quantity of herbicides to be transported to treatment sites. ✓ Require that impervious material be placed beneath mixing areas in such a manner as to contain small spills associated with mixing/refilling. ✓ Require a spill cleanup kit be readily available for herbicide transportation, storage and application (minimum FOSS Spill Tote Universal or equivalent). ✓ Outline reporting procedures, including reporting spills to the appropriate regulatory agency. ✓ Ensure applicators are trained in safe handling and transportation procedures and spill cleanup. ✓ Require that equipment used in herbicide storage, transportation and handling are maintained in a leak proof condition. ✓ Address transportation routes so that traffic, domestic water sources, and blind curves are avoided to the extent possible. ✓ Specify conditions under which guide vehicles would be required. ✓ Specify mixing and loading locations away from water bodies so that accidental spills do not contaminate surface waters. ✓ Require that spray tanks be mixed or washed further than 150 feet of surface water. ✓ Ensure safe disposal of herbicide containers. ✓ Identify sites that may only be reached by water travel and limit the amount of herbicide that may be transported by watercraft.		To reduce likelihood of spills and contain any spills.	FSH 2109.14, Bonneville Power Administration Biological Assessment, Buckhead Knotweed Project, Willamette NF Biological Assessment
H	**Soils, Water and Aquatic Ecosystems**		
H1	Herbicide use buffers have been established for perennial and wet intermittent steams; dry streams; and lakes and wetlands. These buffers are depicted in the tables below. Buffers vary by herbicide ingredient and application method. Tank mixtures would apply the largest buffer as indicated for any of the herbicides in the mixture.	To reduce likelihood that herbicides would enter surface waters in concentrations of concern. Comply with R6 2005 ROD Standards 19 and 20.	Buffers are based on label advisories, and SERA risk assessments. Buffer distances are based on the Berg's 2004 study of broadcast drift and run off to streams, along with Washington State Dept. of Agriculture's DOA's 2003-2005 monitoring results.

PDC Reference	Project Design Criteria	Purpose of PDC	Source of PDC
H2	The following treatment methods are shown in order of preference (if effective and practical), within roadside treatment areas having high risk of herbicide delivery and aquatic influence areas, especially adjacent to fish bearing streams: (1) Non-herbicide (e.g, hand pulling, grazing). (2) Application of clopyralid, imazapic, and metsulfuron methyl, aquatic glyphosate, aquatic triclopyr, aquatic imazapyr. (3) Application of chlorsulfuron, imazapyr, sulfometuron methyl. (4) Application of glyphosate, triclopyr, picloram, and sethoxydim. (See H3, no picloram or non-aquatic triclopyr would be used on roadside treatment areas that have a high risk of herbicide delivery).	To protect aquatic organisms by favoring lower risk methods where effective.	Herbicides were classed into low, moderate and higher risk to aquatic organisms based on SERA Risk Assessments. Lower risk herbicides are preferred where effective. Non-herbicide methods have the least potential for impact, therefore they would be preferred.
H3	No use of picloram or triclopyr BEE and no broadcast of any herbicide on roadside treatment areas that have a high risk of herbicide delivery to surface waters (see Appendix A for map and list of these roads).	To ensure herbicide is not delivered to streams in concentrations that exceed levels of concern.	SERA Risk Assessments, R6 2005 FEIS Fisheries Biological Assessment Extra caution is warranted on the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area (Washington side) because of the many aquatic Species of Local Interest in Forest streams.
H4	Aquatic labeled herbicides or herbicides associated with lower risk to aquatic organisms would be applied using spot or hand/selective methods within 15 feet of the edge of a wet roadside ditch. Aquatic labels would be required for treatments of target vegetation emerging out of the wet roadside ditch. NEW PDC	To ensure herbicide is not delivered to streams in concentrations that exceed levels of concern.	SERA Risk Assessments R6 2005 FEIS and Fisheries Biological Assessment BPA Columbia River Biological Opinion Extra caution is warranted on the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area (Washington side) because of the many aquatic species of local interest in Forest streams.
H5	Vehicles (including all terrain vehicles) used to access or implement invasive plant projects, would remain on roadways, trails, parking areas or other previously disturbed areas to prevent damage to riparian vegetation and soil, and potential degradation of water quality and aquatic habitat.	To protect riparian and aquatic habitats.	BPA Columbia River Biological Opinion
H6	Avoid use of clopyralid on high-porosity soils (coarser than loamy sand).	To avoid leaching/ground water contamination.	Label advisory.
H7	Avoid use of chlorsulfuron on soils with high clay content (finer than loam).	To avoid excessive herbicide runoff.	Label advisory.

PDC Reference	Project Design Criteria	Purpose of PDC	Source of PDC
H8	Avoid use of picloram on shallow or coarse soils (coarser than loam.) No more than one application of picloram would be made within a two-year period, except to treat areas missed during initial application.	To reduce the potential for picloram to enter surface and/or ground water and/or accumulate in the soil. Picloram has the highest potential to impact organisms in soil and water, and tends to be more persistent than the other herbicides.	SERA Risk Assessment. Based on quantitative estimate of risk from worst-case scenario.
H9	Avoid use of sulfometuron methyl on shallow or coarse soils (coarser than loam.) No more than one application of sulfometuron methyl would be made within a one-year period, except to treat areas missed during initial application.	To reduce the potential for sulfometuron methyl accumulation in the soil. Sulfometuron methyl has some potential to impact soil and water organisms and is second most persistent.	SERA Risk Assessments. Based on quantitative estimate of risk from worst-case scenario.
H10	Lakes and Ponds – No more than half the perimeter or 50 percent of the vegetative cover or 10 contiguous acres around a lake or pond would be treated with herbicides in any 30-day period.	To reduce exposure to herbicides and uncertainty regarding effects to reptiles and amphibians by providing some untreated areas for some organisms to use.	SERA Risk Assessments. Based on quantitative estimate of risk from worst-case scenario.
H11	Wetland vegetation would be treated when soils are driest. If herbicide treatment is necessary for emergent target plants when soils are wet, use aquatic labeled herbicides. Favor hand/selective treatment methods where effective and practical. PDC amended	To reduce exposure to herbicides by providing some untreated areas for some organisms to use.	SERA Risk Assessments. Reduces exposure to herbicides by providing untreated areas for organisms to use. Abates risks associated with worst-case models for treatment of emergent vegetation.
H12	All wells and springs used for domestic water supplies would be protected with a 100 foot buffer for wells and a 200 foot buffer for springs. Follow label guidance relative to water contamination.	Safe drinking water.	Label advisories and state drinking water regulations (Washington State WAC 246-290-315).
H13	With the exception of hand/select methods, herbicides would be applied at typical (or lower) rates within Aquatic Influence Zones.	To ensure herbicide exposures are below thresholds of concern for aquatic ecosystems.	SERA Risk Assessments, Biological Assessment
H14	Treatments above bankfull would not exceed 10 acres along any 1.5 mile of stream reach within a 6th field subwatershed in any given year. In addition, treatments below bankfull would not exceed 7 acres total within a 6th field sub-watershed in any given year.	Limits the extent of treatment within the Aquatic Influence Zone so that adverse effects are within the scope of analysis.	Based on SERA risk assessment worksheets and emergent vegetation analysis.
H15	PDC H15 was in the DEIS but is omitted in the FEIS. The FS, FWS and NMFS are working together to address the need for rainfall delay specifications as a part of implementation planning.		
H16	Plan and schedule project activities to minimize disturbance of spawning fish or damage to redds. New PDC	Minimize adverse impacts within waterbodies.	Memorandum of Understanding between WDFW and USDA Forest Service, January 2005

PDC Reference	Project Design Criteria	Purpose of PDC	Source of PDC
H17	Limit the numbers of people on any one site at any one time while treating areas within 150 feet of creeks.	To minimize trampling and protect riparian and aquatic habitats.	The distance of 150 feet was selected because it approximates the Aquatic Influence Zone for fish bearing streams.
H18	Fueling of gas-powered equipment with gas tanks larger than 5 gallons would not occur within 150 feet of surface waters. Fueling of gas-powered equipment with gas tanks smaller than 5 gallons would not occur within 25 feet of any surface waters.	To protect riparian and aquatic habitats.	The distance of 150 feet was selected because it approximates the Aquatic Influence Zone for fish bearing streams. Filling of smaller tanks has inherently less risk.
I	**Vascular and Non-Vascular Plant and Fungi Species of Local Interest**		
I1	The buffer distances recommended in I2-I4 may be refined as needed in order to adequately protect perennial fungi, vascular and non-vascular plant Species of Local Interest (SOLI) and other non-target plants	To prevent any repeated effects to SOLI populations, thereby mitigating any long-term effects.	Broadcast buffer sizes are based on Marrs, R.H., 1989, based on tests on vascular plants. Spot and hand/selective buffer distances are based on reports from experienced applicators.
I2	Perennial fungi, vascular and non-vascular plant SOLI within 100 feet of planned broadcast would be covered by protective barrier, or broadcast application would be avoided in these areas (spot or hand herbicide treatment, or non-herbicide methods may be used).	To ensure SOLI are protected and surveys are conducted when appropriate.	Forest Service Manual 2670 Survey and Manage Species Direction.
I3	Perennial fungi, vascular and non-vascular plant SOLI within 10 feet of planned spot applications would be covered by protective barrier, or spot application would be avoided in these areas (hand herbicide treatment, or non-herbicide methods may be used). Under saturated or wet soil conditions present at the time of treatment, only hand application of herbicide is permitted within 10 feet of SOLI.	To ensure SOLI are protected and surveys are conducted when appropriate.	Forest Service Manual 2670 Survey and Manage Species Direction
I4	Prior to treatment, botanical surveys would occur to identify vascular and non-vascular plant and perennial fungi SOLI if unsurveyed suitable habitat is within 100 feet of planned broadcast treatments, 10 feet of planned spot treatments, and/or 5 feet of planned hand herbicide treatments (increased to 10 feet in saturated/wet soils).	To ensure SOLI are protected and surveys are conducted when appropriate.	Forest Service Manual 2670 Survey and Manage Species Direction
I5	Use special care when applying sulfonylurea herbicides due to their potency and potential to harm non-target vegetation. Do no use chlorsulfuron, metsulfuron methyl or sulfometuron methyl on dry, ashy, or light, sandy soils.	To protect non-target vegetation.	Label advisories.
J	**Wildlife Species of Local Interest**		
J1	**Bald Eagle**		
J1a	Treatment of areas within 0.25 mile, or 0.50 mile line-of-sight, of bald eagle nests would be timed to occur outside the nesting season of January 1 to August 31, unless treatment activity is within ambient levels of noise and human presence (as determined by a local specialist). Occupancy of nest sites (i.e. whether it is active or not) would be determined each year prior to treatments.	To minimize disturbance to nesting bald eagles and protect eggs and nestlings	Bald Eagle Management Guidelines for OR-WA (Dillon 1981); Programmatic Letter of Concurrence (U.S. Fish and Wildlife Service 2001)

PDC Reference	Project Design Criteria	Purpose of PDC	Source of PDC
J1b	Noise-producing activity above ambient levels would not occur between October 31 and March 31 near known winter roosts and concentrated foraging areas. Disturbance to daytime winter foraging areas would be avoided.	To minimize disturbance and reduce energy demands during stressful winter season	Bald Eagle Management Guidelines for OR-WA (Dillon 1981); Gifford Pinchot National Forest Programmatic Letter of Concurrence (U.S. Fish and Wildlife Service 2001)
J2	**Spotted Owl**		
J2a	Chainsaw use within 65 yards, and mower or heavy equipment use within 35 yards, of any nest site, activity center, or un-surveyed suitable habitat will be timed to occur outside the early nesting season of March 1 to June 30, unless treatment activity is within ambient levels of noise and human presence (as determined by a local specialist). There is no seasonal restriction on the use of roadside broadcast sprayers.	To minimize disturbance to nesting spotted owls and protect eggs and nestlings	Gifford Pinchot National Forest Programmatic Letter of Concurrence U.S. Fish and Wildlife Service 2001)
J3	**Marbled Murrelet**		
J3a	Chainsaw or motorized tool use within 45 yards, and mower or heavy equipment use within 35 yards of any known occupied site or un-surveyed suitable habitat will be timed to occur outside April 1 to August 5, unless treatment activity is within ambient levels of noise and human presence (as determined by a local specialist). There is no seasonal restriction on the use of roadside broadcast sprayers.	To minimize disturbance to nesting marbled murrelets and protect eggs and nestlings	Gifford Pinchot National Forest Programmatic Letter of Concurrence (U.S. Fish and Wildlife Service 2001)
J3b	After August 5 and before April 1, activities generating noise above 92 dB may occur within the disturbance distances listed above, but must still be conducted between 2 hours after sunrise and 2 hours before sunset.	To minimize disturbance to marbled murrelets returning to nest tree during the late breeding season.	Gifford Pinchot National Forest Programmatic Letter of Concurrence (U.S. Fish and Wildlife Service 2001)
J4	**Great Gray Owl**		
J4	Do not broadcast spray NPE surfactant in mapped opening habitat (i.e. within suitable portions of treatment areas 33-04, 33-05, 33-05a, 33-05m3, 33-05r3, and 33-12a).	To minimize exposure of owls to NPE surfactant from ingesting contaminated prey.	Tables 5 & 6 in Appendix P of R6 2005 FEIS
J5	**Peregrine Falcon**		

PDC Reference	Project Design Criteria	Purpose of PDC	Source of PDC
J5a	All invasive plant treatments would be seasonally prohibited within 0.5 miles of peregrine nest sites (primary nest zone). Invasive plant treatments involving motorized equipment and/or vehicles would be seasonally prohibited within 1.5 miles of known nest sites (secondary nest zones). This may include activities such as mulching, chainsaws, vehicles (with or without boom spray equipment) or other mechanically based invasive plant treatment. Non-mechanized or low disturbance invasive plant activities (such as spot spray, hand pull, etc.) may occur within the secondary nest zone, but would be coordinated with the wildlife biologist on a case-by-case basis to determine potential disturbance to nesting falcons and identify mitigating measures, if necessary.	To reduce disturbance to nesting falcons and protect eggs and nestlings. Agitated parents can damage the eggs with thin shells resulting in failed reproduction for that nest.	Pagel, J. (2006) Peregrine falcon nest site data, 1983-2006.
J5b	Seasonal restrictions would be waived within primary and secondary nest zones if the site is unoccupied or if nesting efforts fail and monitoring indicates no further nesting behavior.	To reduce disturbance to nesting falcons and protect eggs and nestlings. Agitated parents can damage the eggs with thin shells resulting in failed reproduction for that nest.	Pagel, J. (2006) Peregrine falcon nest site data, 1983-2006.
J5c	Seasonal restrictions would apply during the periods listed below based on the following elevations: Low elevation sites (1000-2000 ft) 01 Jan - 01 July Medium elevation sites (2001 - 4000 ft) 15 Jan - 31 July Upper elevation sites (4001+ ft) 01 Feb - 15 Aug Seasonal restrictions would be extended if monitoring indicates late season nesting, asynchronous hatching leading to late fledging, or recycle behavior which indicates that late nesting and fledging would occur.	To reduce disturbance to nesting falcons and protect eggs and nestlings. Agitated parents can damage the eggs with thin shells resulting in failed reproduction for that nest.	Pagel, J. (2006) Peregrine falcon nest site data, 1983-2006.
J5d	Protection of nest sites would be provided until at least two weeks after all young have fledged.	To protect falcon nest sites and fledglings.	Pagel, J. (2006) Peregrine falcon nest site data, 1983-2006.
J5e	Clopyralid would not be used within 1.5 miles of peregrine nest more than once per year. Picloram would not be used more than once every two years (see PDC H8).	To reduce exposure to hexachlorobenzene. This chemical has been detected in peregrine falcon eggs.	Pagel, J. (2006) Peregrine falcon nest site data, 1983-2006.
J6	**Oregon Spotted Frog**		
J6a	Avoid broadcast spraying of NPE-based surfactants within 100 feet of occupied spotted frog habitat or suitable wetland habitat. Follow herbicide use buffers for wetlands. Coordinate treatment methods, timing, and location with local biologist prior to implementation.	To minimize exposure of frogs to herbicides or surfactants that pose risk to frogs.	Appendix P of the R6 2005 FEIS; SERA 2003, 2004; Bakke 2003

PDC Reference	Project Design Criteria	Purpose of PDC	Source of PDC
J7	**Larch Mountain, Van Dyke's, Cope's Giant, and Cascade Torrent Salamanders**		
J7a	Avoid broadcast spraying of herbicide in talus or rocky outcrops, springs, seeps or stream margins. Utilize aquatic design criteria for suitable habitat in riparian areas, streams, and rivers. (see PDC– H1, H1a, H6-11)	To reduce likelihood of exposure to contaminated soil and water.	Herbicide characteristics and risk to amphibians in SERA risk assessments, and professional opinion of local biologists
J8	**Northwestern Pond Turtle**		
J8a	As part of the annual coordination meeting agreed to in the 2005 MOU, the Forest Service would review treatment locations, timing, and methods with Washington Department of Fish and Wildlife to minimize adverse impacts to pond turtles. Conduct treatments prior to April 1 or between August 1 and September 30, when effective for invasive plant control. Treat only portions of pond turtle habitat in any one season if treatment poses a risk of adverse impacts to pond turtles.	To minimize disturbance, trampling, and herbicide exposure to pond turtles.	2005 MOU between Washington Dept. of Fish and Wildlife and USDA Forest Service; David Anderson, WA Dept. of Fish and Wildlife, personal communication, 2005.
J9	**Mardon Skipper**		
J9a	Use only selective herbicide application methods and avoid use of ester formulations of herbicide and NPE-based surfactants in known mardon skipper habitat. Use herbicides on only a portion of a mardon skipper site in any one year. Coordinate treatment method, timing, and locations annually with the local biologist.	To minimize exposure to herbicides, surfactants, and trampling while effectively protecting and improving habitat	Herbicide characteristics and risk to insects in SERA risk assessments; Sucoff et al. 2001; Bramble et al. 1997; Bramble et al. 1999; and professional opinion of local biologists
J10	**Sensitive Mollusk Habitat (Warty and Malone jumping slug, blue-gray taildropper)**		
J10a	In known sites or high potential suitable habitat outside of roadside treatment locations, avoid manual, mechanical, or herbicide treatments when soil moisture is high (generally late fall to late spring).	To reduce risk of trampling and herbicide exposure	Herbicide characteristics in SERA risk assessments, and professional opinion of local taxa expert.
J11	Puget Oregonian		
J11a	Conduct manual or selective herbicide treatments within 50 feet of big-leaf maple trees that are larger than 20 inches dbh when soil moisture is low. Avoid broadcast spraying of herbicides within suitable habitat. Coordinate treatment method, timing, and locations annually with local biologist.	To reduce risk of trampling and herbicide exposure	Herbicide characteristics in SERA risk assessments, and professional opinion of local taxa expert.
K	**Public Notification**		
K1	High use areas, including administrative sites, developed campgrounds, visitor centers, and trailheads would be posted in advance of herbicide application or closed. Areas of potential conflict would be prominently marked on the ground or otherwise posted. Postings would indicate the date of treatments, the herbicide used, and when the areas are expected to be clear of herbicide residue.	To ensure that no inadvertent public contact with herbicide occurs.	These are common measures to reduce conflicts.
K2	The public would be notified about upcoming herbicide treatments via the local newspaper or individual notification, fliers, and posting signs. Forest Service and other websites may also be used for public notification.	To ensure that no inadvertent public contact with herbicide occurs.	R6 2005 ROD Standard 23 (see table 1).

PDC Reference	Project Design Criteria	Purpose of PDC	Source of PDC
L	**Special Forest Products**		
L1	Triclopyr would not be applied to foliage in areas of known special forest products or other wild foods collection.	To prevent public exposure to harmful doses of triclopyr.	Appendix Q of the R6 2005 FEIS
L2	Special forest product gathering areas may be closed for a period of time to ensure that no inadvertent public contact with herbicide occurs.	To prevent public exposure to harmful doses of herbicide.	R6 2005 ROD Standard 23
L3	Popular berry and mushroom picking areas would be posted prominently marked on the ground or otherwise posted.	To prevent public exposure to harmful doses of herbicide.	R6 2005 ROD Standard 23
L4	Special forest product gatherers would be notified about herbicide treatment areas when applying for their permits. Flyers indicating treatment areas may be included with the permits, in multi-lingual formats if necessary.	To prevent inadvertent public contact with herbicide occurs.	R6 2005 ROD Standard 23
M	**American Indian Tribal and Treaty Rights**		
M1	American Indian tribes would be notified annually as treatments are scheduled so that tribal members may provide input and/or be notified prior to gathering cultural plants. Individual cultural plants identified by tribes would be buffered as above for botanical species of local interest.	To ensure that no inadvertent public contact with herbicide occurs and that cultural plants are fully protected.	Government to government agreements between American Indian tribes and the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area.
M2	The Forest Archaeologist will annually assess proposed treatment areas where minor ground disturbing actions such as weed wrenching and grubbing with a shovel in areas that are outside landslides, flood deposits, previously surveyed areas, skid trails, landings, road shoulders, cuts and fills, are proposed. The Forest Archaeologist will have an opportunity to review project locations to determine if any cultural resources could be affected. Weed wrenching and grubbing techniques will not be used in known archaeological sites. Alternative treatment methods will be selected from those that would have no potential to affect cultural resources.	To avoid conflicts impacts to cultural resources.	Common practice.
M3	Coordination of treatment timing at Fisher Hill (Treatment Area 2216) with the Yakama Nation.	To avoid conflicts with invasive treatments and tribal use of Fisher Hill fishery.	Government to government coordination between the Yakama Nation and Columbia River Gorge National Scenic Area.
N	**Grazing with Goats**		
N1	Goat grazing would be limited to areas where invasive plants make up the majority of suitable forage species, away from any botanical species of local interest or other sites where adverse impacts from goats are likely to occur. Goats would be confined to specific areas and closely supervised. Goats would not be grazed at any one site for more than 30 consecutive days NEW PDC	To ensure that there are no unintended adverse consequences from goat grazing.	Common practice.

Herbicide Use Buffers

Tables 16 – 19 display the restricted use areas (buffers) that would apply to aquatic influence zones and botanical species of local interest and under the Proposed Action. These buffers were developed considering results from the scenarios analyzed in the SERA risk assessments, risk level associated to aquatic organisms as identified in the R6 2005 FEIS Fisheries Biological Assessment (R6 2005 BA), differences in application methods, whether water is present at the treatment site or not, buffers from previous Section 7 ESA consultations on herbicide treatments, and monitoring results.

Neil Berg's 2004 Monitoring Report about herbicides used in forested settings across the U.S was used to validate the effectiveness of proposed buffers. The Washington State Department of Agriculture monitoring results also factored into the development of no broadcast buffers that provide a substantial degree of caution and minimize risks. WSDOA results indicate that very little, if any, glyphosate remains in the water near treatment sites under spot and hand/selective applications (WSDOA 2003).

Buffers in tables 16 – 19 represent horizontal (map) distances.

Table 16-Herbicide Use Buffers for Wet Streams

Herbicide	Perennial and Wet Intermittent Stream Buffers		
	Broadcast (feet)	Spot (feet)	Hand/ Select (feet)
Chlorsulfuron	100	50	Bankfull
Clopyralid	100	15	Bankfull
Glyphosate	100	50	50
Glyphosate (Aquatic Formula)	*50*	*No buffer***	*No buffer*
Imazapic	100	15	Bankfull
Imazapyr	100	50	Bankfull
Imazapyr (Aquatic Formula)	*50*	*No buffer*	*No buffer*
Metsulfuron Methyl	100	15	Bankfull
Picloram	100	50	50
Sethoxydim	100	50	50
Sulfometuron Methyl	100	50	*Bankfull*
Triclopyr-BEE	None Allowed	150	150
Triclopyr-TEA (Aquatic Formula)	None Allowed	15	*No buffer*

**No buffer means that treatment may occur anywhere across the stream channel where target vegetation exists including backwater channels, braided streams, floodplains, etc even when water is present.

Table 17-Herbicide Use Buffers for Dry Streams

Herbicide	Buffers For Streams That Are Dry At The Time Of Treatment		
	Broadcast (feet)	Spot (feet)	Hand/ Select (feet)
Chlorsulfuron	*50*	15	Bankfull
Clopyralid	*50*	Bankfull	*No buffer*
Glyphosate	100	50	50
Glyphosate (Aquatic Formulation)	*50*	*No buffer***	*No buffer*
Imazapic	*50*	Bankfull	*No buffer*
Imazapyr	*50*	15	Bankfull
Imazapyr (Aquatic Formulation)	*50*	*No buffer*	*No buffer*
Metsulfuron Methyl	*50*	Bankfull	*No buffer*
Picloram	100	50	50
Sethoxydim	100	50	50
Sulfometuron Methyl	*50*	15	Bankfull
Triclopyr-BEE	None Allowed	150	150
Triclopyr-TEA (Aquatic Formula)	None Allowed	15	*No buffer*

**No buffer means that treatment may occur anywhere across the stream channel where target vegetation exists including backwater channels, braided streams, floodplains, etc even when water is present.

Table 18-Herbicide Use Buffers for Wetlands, High Water Table Areas, Lakes and Ponds

Herbicide	Wetlands, High Water Table Areas, Lakes and Ponds		
	Broadcast (feet)	Spot (feet)	Hand/ Select (feet)
Chlorsulfuron	100	50	Water's Edge
Clopyralid	100	15	Water's Edge
Glyphosate	100	50	50
Glyphosate (Aquatic Formula)	***50*****	*No buffer***	*No buffer*
Imazapic	100	15	Water's Edge
Imazapyr (Aquatic Formula)	***50*****	*No buffer*	*No buffer*
Imazapyr	100	50	Water's Edge
Metsulfuron Methyl	100	15	Water's Edge
Picloram	100	50	50
Sethoxydim	100	50	50
Sulfometuron Methyl	100	50	Water's Edge
Triclopyr-BEE	None Allowed	150	150
Triclopyr-TEA (Aquatic Formula)	None Allowed	15	*No buffer*

** If wetland, pond or lake is dry, there is no buffer. No buffer means that treatment may occur anywhere across the stream channel where target vegetation exists including backwater channels, braided streams, and floodplains.

Figure 1 illustrates how the aquatic influence zone restricts application methods and herbicides to only those approved for use in aquatic areas. "Aquatic influence zone" is not equal to the "buffer widths" listed in the tables above. The aquatic influence zone is defined by the innermost half of the riparian reserve, as defined by the Northwest Forest Plan. For instance, a 300 foot riparian reserve would have an aquatic influence zone of 150 feet. Establishing buffer widths reduces the potential for herbicides to come in contact with water via drift, leaching, and runoff at or near concentrations of concern.

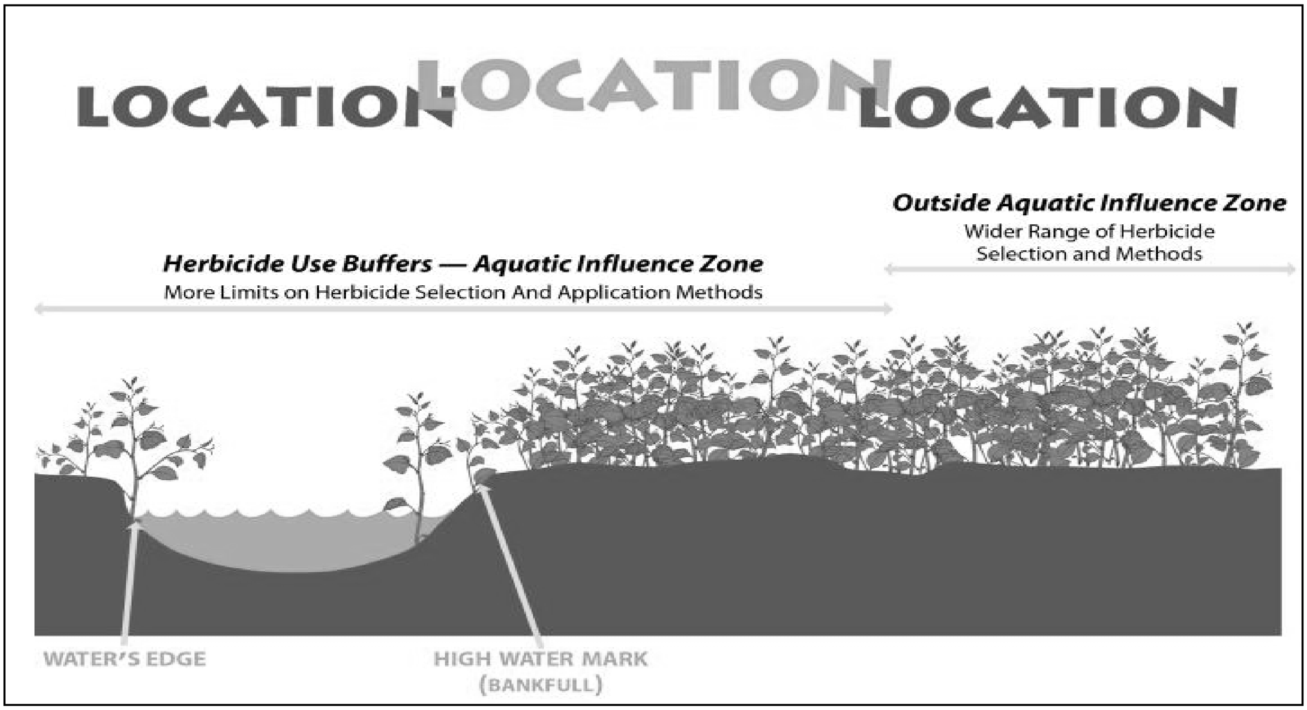


Figure 1-Schematic of Herbicide Use in Aquatic Influence Zones

Roadside Ditches

The illustration above in Figure 1 exemplifies a cross-section of either a stream or a roadside ditch that has a high potential for herbicide delivery. Roadside ditches can also act as extensions of the stream network when there is enough flow and depth in a ditch to deliver sediment. To reduce the potential for herbicides to come in contact with water via runoff at or near concentrations of concern, the following restrictions would apply to roadside treatments:

- No broadcasting of any herbicide on roads identified as a high potential for herbicide delivery (PDC H3)
- No use of picloram or Triclopyr BEE on roads identified as a high potential for herbicide delivery (PDC H3)
- Where there is standing water in a roadside ditch located outside the established buffers of a stream, apply a 15 foot buffer around the standing water and use only low risk herbicides within 15 feet of the edge of a wet roadside ditch. For treatments of target vegetation emerging out of the wet roadside ditch only aquatic labeled herbicides would be used (PDC H4).
- Apply appropriate buffer widths to road sections that cross streams (refer to buffer tables above)

Herbicide Use Buffers – Botanical Species of Interest

Table 19 displays the protection buffers specific to botanical species of local interest. These buffers would be applied in conjunction with herbicide use buffers where botanical species of local interest are in the aquatic influence zone.

Table 19-Protection Buffers for Botanical Species of Local Interest

Application Method and Distance from Botanical Species of Interest		
Further than 100 ft.	**100 ft to 10 ft.**	**Closer than 10 ft.**
All methods according to PDC.	Botanical SOLI would be shielded with a protective barrier during broadcast herbicide application. No additional limitations for spot and hand/selective treatments.	1. Broadcast application is not permitted. 2. If soils are saturated or wet at time of application, spot application is not permitted. Elsewhere, botanical SOLI would be shielded with a protective barrier during spot treatments. Hand application of herbicide and/or non-herbicide treatment permitted without protective shielding.

2.5.9 Forest Plan Amendment

The Proposed Action would amend one standard and eliminate another standard from the Gifford Pinchot National Forest Plan:

1. <u>Current Standard:</u> Herbicides and other pesticides will not be applied in riparian reserves.

Amendment: Herbicides and other pesticides will not be applied in riparian reserves, except to treat invasive plants according to standards listed in the *Pacific Northwest Region 2005 Record of Decision for Managing and Preventing Invasive Plants*.

The existing wording would be retained for ***native*** vegetation management.

2. <u>Current Standard:</u> Vegetation adjacent to the designated travel route or recreation site [in visual emphasis area V] should be controlled in a visually inconspicuous manner, primarily by hand or machine methods. Any use of chemicals should be timed to avoid vegetative brownout (e.g., a dormant spray used in the fall).

Amendment: This standard would be deleted in its entirety.

Both of these changes are intended to allow for effective treatment in accordance with the R6 2005 ROD. The reason the brown out standard is proposed for deletion in its entirety is that the temporary effects of brown out are not important to scenery management. Scenery analysts and managers emphasize that restoration of native plant communities and natural landscapes is a more suitable and productive approach to meeting visual objectives. The existing brown out standard could conflict with effective restoration and the potential, temporary impacts of brown out are far outweighed by the need for restorative action.

Figure 2a: The Decision to Prescribe Herbicides (Proposed Action)

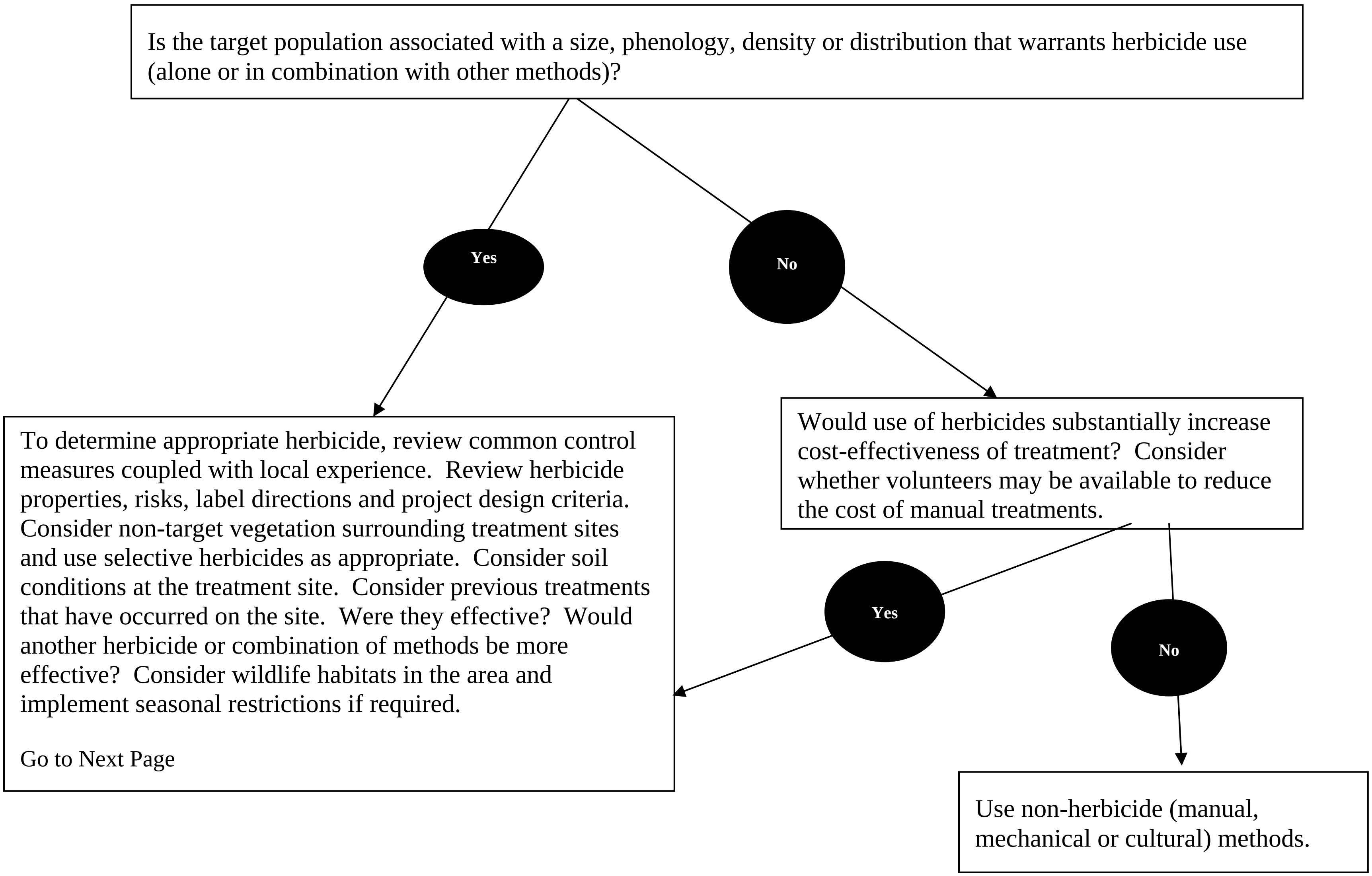


Figure 2b: Process for Prescribing Broadcast Herbicide Application Method Under the Proposed Action

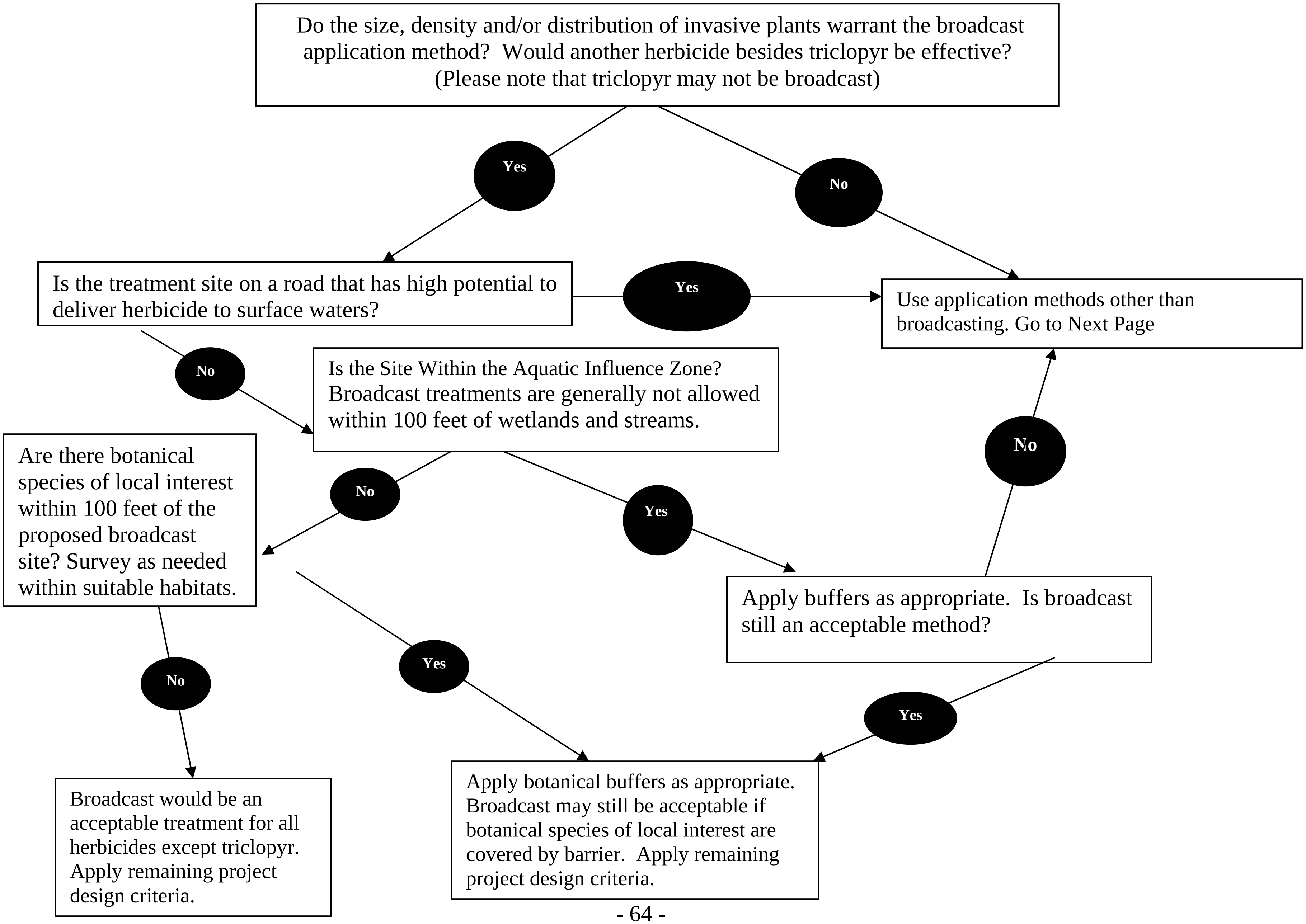
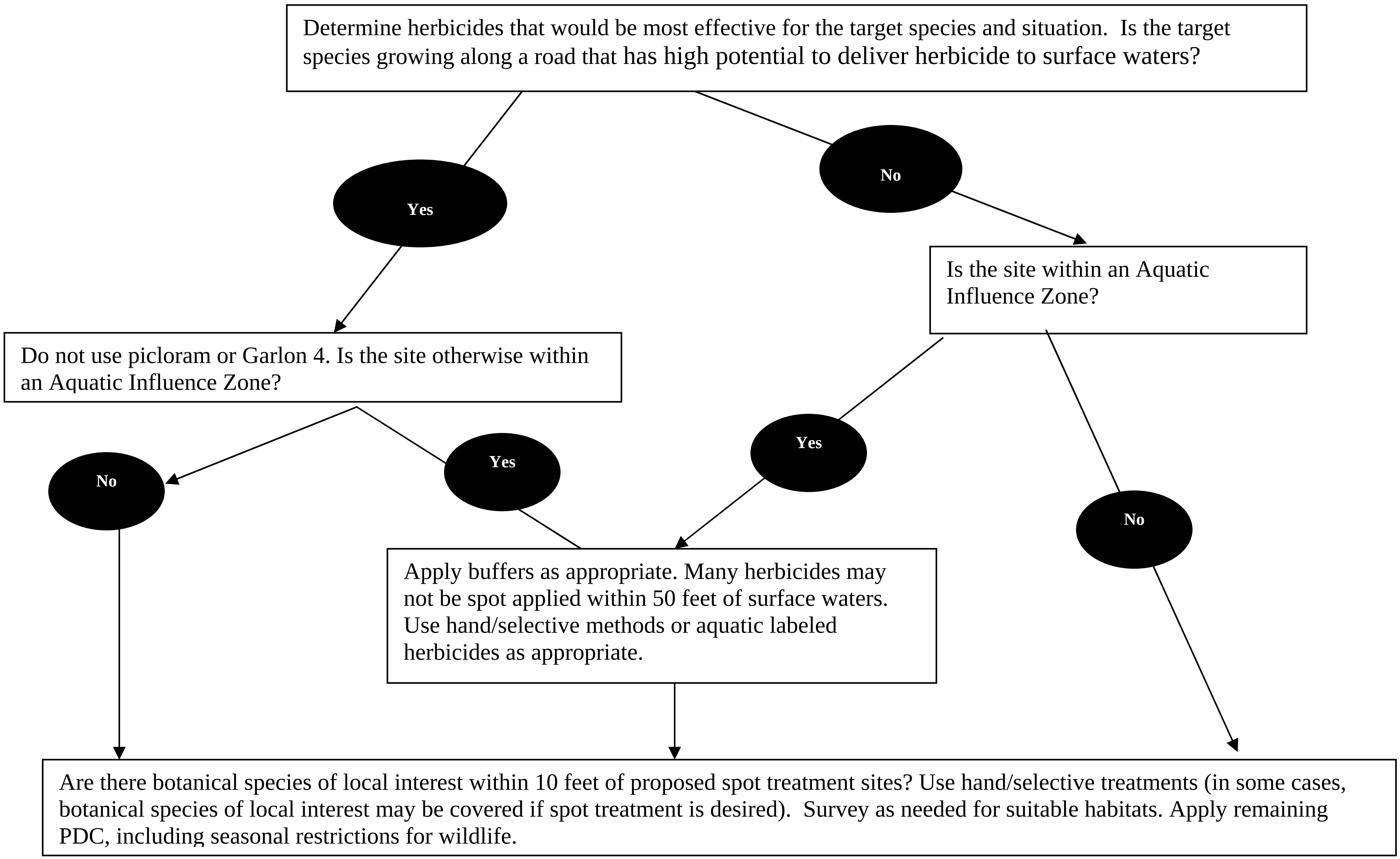


Figure 2c: Process for Prescribing Spot/Hand Herbicide Applications Under the Proposed Action



2.6 Alternative C - Less Herbicide Use Allowed

Alternative Description

- Total Acres Estimated Herbicide Treatment: 940
- Estimated Proportion of Herbicide Treatment Acres - Broadcast: 0%
- Estimated Proportion of Herbicide Treatment Acres - Spot/Hand: 100%

Alternative C was developed to increase the options available for treatment as compared to No Action, but fully resolve public concerns about herbicide use.[17] Alternative C would generally prohibit herbicide application within riparian reserves and along certain roadsides having high potential to deliver herbicides to surface waters on the Gifford Pinchot National Forest and prohibit herbicide application within 300 feet of all rivers and streams on the Washington side of the Scenic Area.[18] No broadcast treatments would be allowed anywhere in the project area. ***These prohibitions serve to restrict herbicide use to such a degree that uncertainties related to herbicide use would be resolved and risks from herbicide use would be as close to fully abated as possible.***

Under Alternative C, herbicide use would be limited to approximately 940 acres. This amounts to about 28 percent of the infested acreage on the Gifford Pinchot National Forest, and 77 percent of the infested acreage within the Washington portion of the Scenic Area. Work would otherwise consist of manual treatment along roads, with fewer than 10 acres of glyphosate stem injection allowed in riparian reserves as currently approved under No Action.

Table 20-Estimated Herbicide Acres – Alternative C

Administrative Unit	Acres Estimated of Herbicide Use as Part of Integrated Prescription	Proportion of Proposed Action Treatment Acres
Columbia River Gorge National Scenic Area (Washington side) Portion of the project area approximately 300 feet or more from rivers and streams.	275	Approx. 77% of 360 acres
Gifford Pinchot National Forest Portion of the project area within Riparian Reserves and along roads with high potential to deliver herbicide to streams.	665	Approx. 28% of 2,350 acres
Total	**940**	**Approx. 35% of 2,710 acres**

2.6.1 Treatment Areas, Priority and Strategy

Treatment would occur within the same treatment areas as the Proposed Action, but fewer of the infestations would have herbicides as a treatment option. The existing treatment strategy identified for some infestations may have to change if herbicides are not allowed because in some cases, herbicides are necessary to fully eradicate or control invasive plants (see Chapter 3.2 for more information on treatment effectiveness).

[17] Limited use of stem injection of aquatic glyphosate would continue to occur as per currently approved projects.
[18] No roads are considered high risk to deliver herbicide on the Scenic Area.

2.6.2 Common Control Measures and Treatment Site Restoration

Alternative C would draw upon the same common control measures and treatment site restoration approach as the Proposed Action in portions of the project area where herbicide use is permitted. Non-herbicide treatments would continue similarly to No Action on about two-thirds of the project area. Passive and active site restoration would occur in conjunction with treatments.

2.6.3 Implementation Planning and Early Detection-Rapid Response Approach

Alternative C would draw upon the same implementation planning and early detection-rapid response approach as the Proposed Action, except that treatment of future detections would be subject to herbicide prohibitions described above, for instance herbicides would not be used to treat unpredicted detections within riparian reserves on the Gifford Pinchot National Forest or within 300 feet of rivers and streams on the Columbia River Gorge National Scenic Area.

2.6.4 Herbicide Selection

Alternative C would allow for much less herbicide use overall (herbicides would not be used on about 65 percent of the project area); however the slate of herbicides and surfactants available would be the same as the Proposed Action.

2.6.5 Project Design Criteria and Buffers

All of the project design criteria in the Proposed Action would be adopted. In addition, 1) herbicides would generally not be used within riparian reserves or within roadside treatment areas having high risk of herbicide delivery to surface water on the Gifford Pinchot National Forest,[19] and/or 2) within 300 feet of rivers and streams on the Columbia River Gorge National Scenic Area. In addition, broadcast treatments would not be approved anywhere on National Forest System lands.

2.6.6 Forest Plan Amendment

Alternative C would amend the Gifford Pinchot National Forest Plan by eliminating the following standard:

“Vegetation adjacent to the designated travel route or recreation site [in visual emphasis area V] should be controlled in a visually inconspicuous manner, primarily by hand or machine methods. Any use of chemicals should be timed to avoid vegetative brownout (e.g., a dormant spray used in the fall).”

Alternative C would <u>retain</u> the following current standard:

“Herbicides and other pesticides will not be applied in riparian reserves.”

[19] Hand/selective methods using herbicides of least aquatic concern may be used to treat high priority species such as knotweed especially as a part of ongoing prescriptions developed in partnership with other landowners and agencies. Such treatments would be very limited in extent.

2.7 Alternatives Considered but Eliminated from Detailed Study

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 meet the Purpose and Need for Action, not be reasonably feasible or not viable, duplicative of the alternatives considered in detail, or were determined to cause unnecessary environmental harm. Therefore, the following alternatives were considered, but dismissed from detailed consideration..

2.7.1 Do Not Treat Invasive Plants, Focus on Prevention

Some comments expressed that the best approach for addressing invasive plant infestations is to eliminate disturbance caused by logging, grazing, road building, and vehicular traffic. These comments suggested that logging and other ground-disturbing projects should be suspended until a comprehensive EIS is completed that fully addresses the existing problem and 'root causes' of invasive plants.

A similar alternative was suggested in the R6 2005 FEIS but dismissed from detailed study in the R6 2005 FEIS because "suspending multiple-use activities [would be] inconsistent with current laws governing the management of National Forest System lands" (R6 2005 FEIS page 2-33).

Prevention is an important component of invasive plant management addressed throughout the R6 2005 FEIS and ROD, additional national and regional manual direction and policy statements, and the USDA-Forest Service Guide to Noxious Weed Prevention. All land use projects, assessments and plans must address prevention of invasive plant introduction, establishment and spread (R6 2005 ROD Appendix 1). The Regional Forester intended the prevention standards to reduce rates of spread of invasive plants, while still maintaining the Forest Service's ability to provide for existing uses and management activities on National Forest System lands (R6 2005 ROD page 9).

Invasive plant prevention practices will occur regardless of alternative selected for invasive plant treatment in this FEIS, including No Action. Washing equipment before entering the National Forest, scheduling activities to avoid moving between infested and uninfested areas, revegetating disturbed areas with native plants, managing off road vehicle use, and avoiding ground disturbance in certain areas are examples of current, ongoing invasive plant prevention practices.

However, these invasive plant prevention practices are not connected actions to the proposed treatments. The focus of this FEIS is on the project level issues, alternatives, and effects related to invasive plant treatment and restoration of treated sites. NEPA regulations encourage such narrowing so that impact statements are focused on issues that are ripe for decision:

> "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 (40 CFR 1502.20)."

In this case, the project analysis tiers to the broader scale R6 2005 FEIS regarding the alternative of suspending land uses in order to prevent the spread of invasive plants.

2.7.2 No Herbicide Use

Additional public comments suggested that herbicide use should be severely minimized or eliminated altogether. The No Action Alternative would not allow any use of herbicide except where already approved. Alternative C also addresses public concerns about herbicide use by severely limiting its use across two-thirds of the project area.

2.7.3 Follow Herbicide Label Directions – No Additional Design Criteria

Public comments expressed a concern that project design criteria proposed by the Forest Service are overly cautious and costly. All action alternatives must comply with new Forest Plan and other relevant invasive plant management direction. An alternative that only follows label directions may meet some, but not all of this management direction. In particular, all action alternatives must prescribe design criteria to minimize and/or eliminate adverse effects on non-target organisms.

2.8 Alternatives Compared

Table 21 displays the components for each alternative.

Table 21-Alternative Components Compared

Component	Alternatives		
	A (No Action)	B (Proposed Action)	C (Limited Herbicide)
Estimated Acres of Current Inventory Currently Approved Treatment or Proposed For Treatment	2,400	2,710	2,710
Estimated Acres of Herbicide Use Within Treatment Areas	400	2,710	971
Estimated Proportion of Herbicide Treatment – Broadcast Application Method	20%	35%	0%
Estimated Proportion of Herbicide Treatment – Spot/Hand Application Methods	80%	65%	100%
Early Detection/Rapid Response	Herbicide would not be a part of treatment scenario for future detections, manual treatments could occur on roadsides.	Herbicides may be used as part of integrated treatment prescriptions, according to PDC. New infestations found in the future may be prioritized over existing infestations.	Herbicides may be used on part of the project area as part of integrated treatment prescriptions, according to PDC. New infestations found in the future may be prioritized over existing infestations.
Restoration Plan	Restoration has occurred as part of existing manual treatment program.	Passive restoration is estimated to be needed on about one-third of the treatment sites. Mulching, competitive seeding and planting may be needed on two-thirds of the treatment sites.	Same as B
Forest Plan Amendment	No.	Yes, one standard amended (Herbicides in riparian reserves) and one deleted (no summer/fall brown out on certain roads).	Yes, one standard deleted (no summer/fall brown out on certain roads).

Table 22 shows how each alternative addresses public issues described in Chapter 1.

Table 22-Alternatives Compared in Response to Issues

Issue Component	Issue Indicator	No Action (Alternative A)	Proposed Action (Alternative B)	Alternative C (Limited Herbicide)
Issue Group 1 – Human Health and Worker Safety				
1a - Exposure to Herbicides	Qualitative discussion.	No significant impact (FONSI) was documented for existing herbicide use.	Project Design Criteria *eliminate* plausible harmful exposure scenarios.	Same as B
1b – Drinking Water	Qualitative discussion.	No significant impact (FONSI) was documented for existing herbicide use.	Project Design Criteria *eliminate* plausible harmful exposure scenarios.	Same as B
Issue Group 2 - Treatment Strategy and Effectiveness				
2a - Effectiveness of Treatment Methods	Acreage/Percent of Area Where all Options (including herbicides) are allowed	400/ 15%	2,710/ 100%	940/ 35%
	The Number of Herbicides Available for Use	3	10	10
	Acres of Invasives in 2011 (*assuming most ambitious conceivable treatment and unlimited funding*)	407	6	84
2b - Long Term Strategy Reduce Reliance on Herbicides Over Time, restore native plant communities, achieve long-term control	Qualitative discussion.	No explicit strategies to reduce herbicide reliance over time, restore native plant communities, or achieve long-term control.	Long-term control strategy applied to individual sites within treatment areas; active and passive restoration would be considered as part of the treatment prescription. Reliance on herbicide would decline over time.	Long-term control strategy applied to individual sites within treatment areas; active and passive restoration would be considered as part of the treatment prescription. Reliance on herbicides would decline on about 35 percent of the project area. There would be no reliance on herbicides over most of the project area.
2c - Treatment Priority	Qualitative discussion.	High priority administrative and recreation sites are included.	Treatment area priorities are shown in Appendix A. Funding would have to be increased above current levels to effectively treat all high priorities.	Fewer high priority treatment areas would be effectively treated.
2d - Early Detection/ Rapid Response	Qualitative discussion.	Does not allow for use of herbicides on new detections.	Allow for use of herbicides on new detections according to PDC.	Allow for use of herbicides on new detections according to PDC; however herbicides would not be allowed on about 65% of the project area.

Issue Component	Issue Indicator	No Action (Alternative A)	Proposed Action (Alternative B)	Alternative C (Limited Herbicide)
2e - Forest Plan Amendment	Whether or not herbicides may be used within riparian reserves.	Does not amend the Gifford Pinchot National Forest Plan. Herbicides generally use would not be used within riparian reserves.	Amends the Gifford Pinchot National Forest Plan to allow herbicide use within riparian reserves according to management direction in the R6 2005 ROD.	Does not amend the Gifford Pinchot National Forest Plan. Herbicides generally use would not be used within riparian reserves.
Issue Group 3 – Social and Economic				
3a - Treatment Costs and Financial Efficiency	Total Cost in Dollars for the Most Ambitious Program (2007-2011)[20]	$1,810,000	$1,763,000	$2,859,000
	Average Annual Cost in Dollars for the Most Ambitious Program (2007-2011)	$499,000	$486,000	$788,000
	Average Cost Per Acre (2007-2011)	$780 (does not include restoration which would increase cost by more than $300 per acre)	$656 (includes restoration)	$1,117 (includes restoration)
3b – Effects of Invasive Plant Treatment on Scenic, Recreation and Wilderness Values	Qualitative discussion.	No significant impact (FONSI).	Containing, controlling and/or eradicating invasive plants would improve scenic, recreation and Wilderness values over the long run. Project Design Criteria limit potential short term adverse impacts.	Same as B
3c – Special Forest Products and Gatherers	Qualitative discussion.	No significant impact (FONSI).	Conflicts between treatments and gathering areas would be minimized through newspaper or individual notification, fliers, and posting signs. No exposure exceeding thresholds of concern for people are plausible.	Same as B
3d – Effects on American Indian Tribes and Treaty Rights, Potential for Disproportionate Effects to Minority and Low-Income Populations, and Civil Rights and Environmental Justice	Qualitative discussion.	No significant impact (FONSI).	No disproportionate effects on any group of people, ongoing government-to-government consultation with tribes.	Same as B
Issue Group 4 – Non-Target Plants And Wildlife				

[20] This analysis assumed implementation would begin in 2007. Due to delays associated with consultation under the Endangered Species Act, implementation is now scheduled to begin in 2008. All dates associated with the life of the project would be advanced by one year.

Issue Component	Issue Indicator	No Action (Alternative A)	Proposed Action (Alternative B)	Alternative C (Limited Herbicide)
4a -Effects of Herbicide on Non-Target Botanical Species of Local Interest	Estimated Proportion of Project with Potential Broadcast Application	20%	35%	0%
	Approximate Treatment Acreage Where All Options (including herbicide) are allowed	400	2,710	940
	Number of Herbicides Available for Use	3	10	10
4b – Effects of Herbicide on Terrestrial Wildlife Species of Local Interest	Qualitative discussion.	No significant impact (FONSI).	PDC minimize adverse impacts.	Same as B
Issue Group 5 – Effects on Soils, Water and Aquatic Organisms				
5a – Potential Adverse Effects of Invasive Plant Treatment on Soils	Qualitative discussion.	No significant impact (FONSI).	Project Design Criteria avoid herbicide concentrations of concern in soils; limitations on herbicide selection depending on site-specific soil conditions.	Same as B
5b - Potential for Herbicide Delivery to Streams, Lakes, Rivers, Floodplains, and Wetlands	Character of Herbicide Use Within Aquatic Influence Zones	Restricted to hand applications of aquatic glyphosate.	Buffers restrict broadcasting near perennial and intermittent streams; treatment of wetland emergent or streamside target vegetation would require low aquatic risk or aquatic labeled herbicides.	Same as A
	Estimated Acres Herbicide Use Within Aquatic Influence Zones	Limited to hand treatments with aquatic formulations in administrative/ recreation sites.	412	Same as A
	Estimated acreage where herbicide treatment may occur on roadside treatment areas with high potential to deliver herbicides to surface water	100 or less	940	Same as A
5c - Potential for Adverse Effects to Aquatic Organisms from Herbicide	Potential for fish to be exposed to harmful concentrations of herbicide	Very Low	Low	Very Low

Chapter 3. Affected Environment and Environmental Consequences

3.1 Introduction

This chapter of the EIS describes the existing condition of the Project Area, and the environmental consequences that would affect Project Area resources, based on the alternatives described in Chapter 2. For ease of presentation and comparison, the analysis discussions are separated into individual resource areas, such as fish and fish habitat, water quality, soils, human and social resources, and botany. The focus of the analysis disclosed in each section is on the effects of no action and action alternatives based on the issues described in Chapter 1.

3.1.1 The Project Area

The Project Area encompasses the Gifford-Pinchot National Forest (approximately 1,368,000 acres) and the portion of the Columbia River Gorge National Scenic Area in Washington State (approximately 85,000 acres). Invasive plants have been found on approximately 2,350 acres of the Gifford Pinchot National Forest and 360 acres of the Washington State portion of the Columbia River Gorge National Scenic Area.

Treatment areas lie along road systems and railroads, within range allotments, in agricultural areas (both abandoned and present day), in high public use areas (parking areas, viewpoints), in managed areas such as plantations, and in areas utilized for recreation (campgrounds, dispersed recreation, on the Columbia River, etc.). About 2,000 acres (85 percent of the infestations inventoried on the Gifford Pinchot National Forest) are along roads, and additional acres lie within administrative sites, quarries, and other developed areas.

Invasive plants have been inventoried in four of the ten existing or proposed Research Natural Areas: Thorton T. Munger, Goat Marsh, Smith Butte (proposed) and Monte Cristo. Access points for Wilderness areas (Tatoosh, Goat Rocks, Trapper Creek, Indian Heaven, Mt. Adams and William O. Douglas) and the Pacific Crest Trail Corridor have been affected. Invasive plants have also degraded meadow systems (i.e., Peterson Prairie, Cave Creek, Lost, Gotchen, South Prairie). Plant community functioning has been disrupted and native vegetation has been completely replaced by invasive plants in some places. Without treatment, invasive plants would further displace native plant communities, and spread to new areas.

Appendix A (treatment area information) displays the invasive plant species that have been detected on the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area. The treatment acreage estimates in Appendix A have accounted for expected spread of invasive plants between the time of inventory and the first year of anticipated treatment under this EIS (2007).

3.1.2 Risk Assessments and Layers of Caution for Herbicide Use

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. Formal risk assessments were done by Syracuse Environmental Research Associates, Inc (SERA) using peer-reviewed articles from the open scientific literature and current Environmental Protection Agency (EPA) documents, including Confidential Business Information.

They considered worst-case scenarios including accidental exposures and application at maximum label rates. The risk assessments meet the requirements of the Pesticide Use Handbook, FSH 2109.14 Chapter 20. Although the risk assessments have limitations (see R6 2005 FEIS pages 3-95 through 3-97), they represent the best science available. Table 23 displays the risk assessments that may be accessed via the Pacific Northwest Region website at http://www.fs.fed.us/r6/invasiveplant-eis/Risk-Assessments/Herbicides-Analyzed-InvPlant-EIS.htm. The herbicides on the list are those listed in Standard 16 that was approved in the R6 2005 ROD. They were selected because they are the lowest risk herbicides that are effective against the full range of target species known within Region 6 (ROD page 23).

Table 23-Herbicide Risk Assessments

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

In addition to the analysis of potential hazards to human health from every herbicide active ingredient, Forest Service/SERA Risk Assessments evaluated available scientific studies of potential hazards of other substances associated with herbicide applications: impurities, metabolites, inert ingredients, and adjuvants. There is usually less toxicity data available for these substances (compared to the herbicide active ingredient) because they are not subject to the extensive testing that is required for the herbicide active ingredients under FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act). Some of the inerts are approved food additives (for instance, glacial acetic acid, monoethanolamine and isopropyl alcohol). Dyes (for example colorfast purple and hi-light blue) may be added to herbicide formulation to mark treated areas (see Bakke 2003).

Additives, Impurities and Inert Ingredients

Inert compounds are those that are intentionally added to a formulation, but have no herbicidal activity and do not affect the herbicidal activity. Inerts are added to the formulation to facilitate its handling, stability, or mixing. Impurities are inadvertent contaminants in the herbicide, usually present as a result of the manufacturing process. Adjuvants are compounds added to the formulation to improve its performance. They can either enhance the activity of an herbicide's active ingredient (activator adjuvant) or offset any problems associated with its application (special purpose or utility modifiers). Surfactants are one type of adjuvant that makes the herbicide more effective by increasing absorption into the plant. Many of the inert ingredients are proprietary in nature and have not been tested on laboratory species. However, confidential business information (i.e. the identity of proprietary ingredients) was used this information in the preparation of the herbicide risk assessments.

Only those adjuvants that are approved by the Washington State Department of Agriculture (WSDA) and Department of Ecology (WSDOE) (and also meet Standard 18) would be permitted within or immediately adjacent to streams. Adjuvants that are approved for used in the immediate Aquatic Influence Zone in Washington State meet the following criteria:

- The product must fulfill all requirements for registration of a food/feed use spray adjuvant in Washington
- The spray adjuvant must be either slightly toxic or practically non-toxic to freshwater fish (such as rainbow trout, coho salmon or other cold water species)
- The spray adjuvant must be moderately toxic, slightly toxic or practically non-toxic to aquatic invertebrates (such as Daphnia spp.)
- The spray adjuvant formulation must contain less than 10% alkylphenol ethoxylates (including phosphate esters)

Available information for the inerts contained in the proposed herbicides is as follows:

Chlorsulfuron - The identity of inerts used in chlorsulfuron are confidential, but SERA reviewed them for preparation of the risk assessment (SERA, 2003 Chlorsulfuron). EPA has not classified any of the inerts as toxic. These inert ingredients do not affect the assessment of risk.

Clopyralid - Identified inerts include monoethanolamine and isopropyl alcohol, both approved food additives. These inert ingredients do not impact the assessment of risk

Glyphosate - There are at least 35 glyphosate formulations that are registered for forestry applications (SERA, 2003 Glyphosate) with a variety of inert ingredients. SERA obtained clearance to access confidential business information (i.e. the identity of proprietary ingredients) and used this information in the preparation of the risk assessment. Surfactants (discussed below) were the only additives identified that impact risk (SERA, 2003 Glyphosate).

Imazapic - The identity of inerts used in imazapic formulations are confidential, but SERA reviewed them for preparation of the risk assessment (SERA, 2003 Imazapic). None of the inerts are classified by EPA as toxic.

Imazapyr - The NCAP website (http://www.pesticide.org/FOIA/picloram.html) identifies only glacial acetic acid as an inert ingredient. Isopropanolamine is also present, and it is classified as a List 3 inert.

Metsulfuron methyl - The identity of inerts used in metsulfuron methyl formulations are confidential, but SERA reviewed them for preparation of the risk assessment (SERA, 2003 Metsulfuron methyl). None of the inerts are classified by EPA as toxic.

Picloram - Tordon K and Tordon 22K contain the following inerts: potassium hydroxide, ethoxylated cetyl ether, alkyl phenol glycol ether, and emulsified silicone oil (NCAP website; http://www.pesticide.org/FOIA/picloram.html). Potassium hydroxide is an approved food additive. The other compounds are all on EPA's List 4B, inerts of minimal concern. They may also contain the surfactant polyglycol 26-2, which is on EPA's List 3: Inerts of Unknown Toxicity. The toxicity data on the formulations encompasses toxic risk from the inerts. Inerts in picloram formulations do not appear to pose a unique toxic risk (SERA, 2003 Picloram).

Sethoxydim - The formulation Poast® contains 74 percent petroleum solvent that includes naphthalene. The EPA has placed this naphthalene on List 2 ("agents that are potentially toxic and a high priority for testing"). Petroleum solvents and naphthalene depress the central nervous system and cause other signs of neurotoxicity (SERA, 2001). Poast® has also been reported to cause skin and eye irritation. There is no information suggesting that the petroleum solvent has a substantial impact on the toxicity of sethoxydim to experimental animals, with the important and notable exception of aquatic animals (SERA, 2001). Poast® is much more toxic to aquatic species than sethoxydim.

Sulfometuron methyl - The identity of inerts used in Oust are confidential, but SERA reviewed them for preparation of the risk assessment (SERA, 2003 Imazapic).

None of the inerts are classified by EPA as toxic. Based on comparison of the toxicities of the active ingredient and the formulation, there is no reason to suspect that Oust contains other ingredients that substantially affect the potential risk to the environment.

Triclopyr - Formulations contain ethanol (Garlon 3A) or kerosene (Garlon 4), which are known to be neurotoxic. However, the toxicity of these compounds is less than that of triclopyr, so the amount of ethanol and kerosene in these formulations is not toxicologically significant (SERA, 2003 Triclopyr).

The amount of inert ingredients in the formulations is generally not known, so exposure and dose estimates cannot be calculated.

Surfactants

The following types of surfactants have been reviewed in risk assessments and may be used to help herbicides adhere to target plants (Bakke 2003). Examples of trade names are also provided. Surfactants help reduce drift and abate risk of off site movement of herbicides. The effects of using these ingredients, along with other inerts and metabolites, have been disclosed in the R6 2005 FEIS (Chapters 4.4, 4.5, 4.7 along with Appendices P and Q; and the Biological Assessment prepared for ESA consultation).

Limitations are proposed for use of some surfactants associated with potential adverse effects on human health, wildlife and aquatic ecosystem elements (see discussions in Chapter 3).

Ethoxylated fatty amines (Cationic)

Entry™ II (Monsanto Company)

> POEA (Polyethoxylated Tallow Amine - Roundup® (non-aquatic glyphosate) has 15% POEA. The POEA is associated with adverse effects on aquatic ecosystems. These risks are abated by project design criteria.

Alkylphenol and Alcohol 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)

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.

Activator N.F. (Loveland Industries)

> Nonylphenol Polyethoxylate (NPE) is a common non-ionic surfactant associated with some risks to human health and the environment. These risks are abated by project design criteria.

Silicone-Based Surfactants

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

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. Blends normally include an alcohol ethoxylate, a defoamer, and propylene glycol.

Oils

Surfactants 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) consider 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.

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-K\ick 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 95-98% oil with 1-2% 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 (80-85%) and a nonionic surfactant (15-20%). 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 is found in the triclopyr formulation Garlon IV. This formulation would not be broadcast nor used within 150 feet of surface water bodies or wetlands.

Adjuvants Approved For Aquatic Emergent Target Species

Adjuvants that are approved for used in riparian areas in Washington State (see table 24 below) meet the following criteria:

- The product must fulfill all requirements for registration of a food/feed use spray adjuvant in Washington
- The spray adjuvant must be either slightly toxic or practically non-toxic to freshwater fish (such as rainbow trout, coho salmon or other cold water species)
- The spray adjuvant must be moderately toxic, slightly toxic or practically non-toxic to aquatic invertebrates (such as Daphnia spp.)
- The spray adjuvant formulation must contain less than 10% alkylphenol ethoxylates (including phosphate esters)

Table 24-Products Meeting Standard 18 That Are Approved by WSDA For Use Near Surface Waters

Product Name	Registrant	Principal Functioning Agent	Document Supporting Std 18
Agri-Dex	Helena Chemical Company	Petroleum Oil, polyoxyethylene sorbitant fatty acid ester, sorbitant fatty acid ester	SERA 1997, Bakke 2003
Competitor	Wilbur-Ellis Company	Modified vegetable (seed) oil, polyethylene glycol fatty acid ester, polyoxyethylene sorbitant fatty acid ester	SERA 1997, Bakke 2003
InterLock	Agriliance	Modified vegetable (seed) oil, polyoxyethylene sorbitant fatty acid ester, vegetable (seed) oil	SERA 1997, Bakke 2003
LI 700	Loveland Industries/Loveland Products	Phosphatidylcholine, propanoic (propionic) acid, alkylphenol ethoxylate	SERA 1997, Bakke 2003
Liberate	Loveland Industries/Loveland Products	Phosphatidylcholine, alcohol ethoxylate, modified vegetable (seed) oil	SERA 1997, Bakke 2003

Herbicide Toxicology Terminology

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

Exposure Scenario: The mechanism by which an organism (person, animal, fish) 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. Effects on wildlife and other organisms are considered insignificant and discountable when herbicide exposure is below the threshold of concern.

Hazard Quotient (HQ): A "toxicity threshold" was established for each herbicide (and NPE) to indicate the point below which adverse effects would not be expected for a variety of organisms (e.g. people, wildlife, fish). The predicted level of exposure from herbicide use is compared to the toxicity threshold and expressed in terms of a "hazard quotient (HQ)." The Hazard Quotient is the amount of herbicide or additives to which an organism may be exposed over a specified period, divided by that estimated daily exposure level at which no adverse health effects are likely to occur. In Region 6, the toxicity thresholds were lowered to account for risk to federally listed species, following protocol used by EPA (EPA 2004, p. 46). Thus, an HQ less than or equal to one indicates an extremely low level of risk. Toxicity thresholds are based on extrapolated laboratory results and accepted scientific protocols. The probability of harmful effects increases with HQ.

The R6 2005 FEIS addressed public debate and uncertainty associated with the use of herbicides. The risk assessments represent the best available scientific information related to herbicide impacts.

Layers of Caution Integrated Into Herbicide Use

Figure 3 displays the layers of caution that are integrated into herbicide use in the Pacific Northwest Region (Region Six). First, label requirements, federal and state laws, and the EPA approval process provide an initial level of caution regarding chemical use. Next, the SERA Risk Assessments disclosed hazards associated with worst-case herbicide conditions (maximum exposure allowed by the label).

The R6 2005 FEIS included an additional margin of safety by reducing the level of herbicide exposure considered to be of concern to fish and wildlife (see Appendix P – Summary of Herbicide Effects to Wildlife for further explanation). Herbicides such as 2,4-D and Dicamba were not approved for use in the R6 2005 ROD (page 23) and restrictions on application method for many herbicides were included in Standard 16 (ibid.). At the project scale, additional layers of caution would be integrated into herbicide use in both action alternatives:

1. Treatment methods would be limited to those necessary to eradicate, control or contain invasive plants on the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area; no aerial treatment is proposed and broadcast application would be limited to certain areas or prohibited altogether.

2. Project design criteria (PDC) would ensure proposed herbicide exposures do not exceed conservative thresholds of concern for people and botanical, wildlife, and aquatic Species of Local Interest. The analysis throughout Chapter 3 demonstrates that herbicide use under the most ambitious conceivable scenario under the Proposed Action is unlikely to result in exposures of concern. This is true for known infestations as well as those found in the future, because the PDC serve to limit the rate, type and method of herbicide application sufficiently to eliminate exposure scenarios that would cause concern, based on the site conditions at the time of treatment. Further analysis would be required if a new infestation would not be treated effectively according to the PDC (for instance, the herbicides available for use near streams were not effective for a new infestation).

3. The implementation planning and monitoring processes described in Chapter 2 ensure that effective treatments are completed according to PDC and undesired effects are indeed minimized.

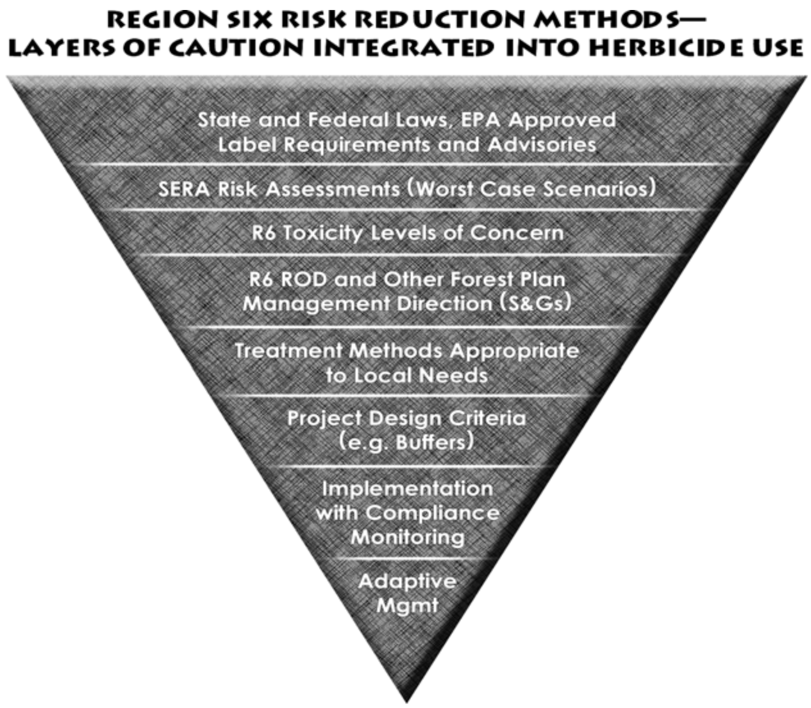


Figure 3-Layers of Caution Integrated into Herbicide Use

Table 25 displays the relative properties, risks and uses of each herbicide and indicates some of the PDC that address toxicological concerns by limiting application rate and herbicide exposure. Herbicide properties and risks are adapted from R6 2005 FEIS (pg. 3-91).

Table 25-Herbicide Ingredients, Properties, Uses, Risks and Selected Project Design Criteria

Active Ingredient Selected Herbicide Brand Names and Mode of Action	Properties	General Uses/ Known to be Effective on:	Risks	Selected Project Design Criteria to Minimize Risks
Chlorsulfuron (Telar, Glean, Corsair) Sulfonylurea-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, conifers. Some soil residue.	Use at very low rates on annual, biennial and perennial species; especially Dalmatian toadflax and houndstongue.	Moderate risk to aquatic organisms.	H-7 Avoid use of chlorsulfuron on soils with high clay content (finer than loam). I-5 Do not use on dry, ashy, or light, sandy soils H-2 Application of chlorsulfuron is the second to last choice within roadside treatment areas having high risk of herbicide delivery and, in wetlands, near aquatic influence areas, especially adjacent to fish bearing streams: H-4 No use within 15 feet of wet roadside ditches.
Clopyralid (Transline) Synthetic auxin -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, Solanaceae. Some species include knapweeds, yellow starthistle, Canada thistle, hawkweeds. Provides control of new germinants for one to two growing seasons.	Contains hexachlorobenzene (persistent carcinogen) in amounts below a threshold of concern this substance is ubiquitous in the environment. Highly mobile, but does not degrade in water. Lower risk to aquatic organisms.	H-6 Avoid use of clopyralid on soils with high clay content (finer than loam).
Glyphosate (35 formulations, including RoundUp, Rodeo, Accord XRT, Aquamaster, etc.) 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. Trans-locates to roots and rhizomes of perennials. While considered non-selective, susceptibility varies depending on species. Main control for purple loosestrife, herb Robert, English ivy and reed canary grass. Aquatic labeled formulations can be used near water.	Non-selective. Greater risk to aquatic organisms.	Aquatic labeled glyphosate may be used within Aquatic Influence Zones, which poses inherent risk of delivery to water. Along with buffers that restrict method of application, design criteria intended to keep herbicide from entering water in concentrations above a threshold of concern include: H-10 Lakes and Ponds –- No more than half the perimeter or 50 percent of the vegetative cover or 10 contiguous acres around a lake or pond would be treated with herbicides in any 30-day period. H-11. Wetland vegetation would be treated when soils are driest. If herbicide treatment is necessary for emergent target plants when soils are wet, use aquatic

Active Ingredient Selected Herbicide Brand Names and Mode of Action	Properties	General Uses/ Known to be Effective on:	Risks	Selected Project Design Criteria to Minimize Risks
				labeled herbicides. Favor hand/selective treatment methods where effective and practical. H-13 With the exception of hand/selective treatment methods, herbicide application within the Aquatic Influence Zone would not exceed typical label rates. H-14 Treatments above bankfull and within the aquatic influence zone (riparian area), would not exceed 10 acres along any 1.5 mile of stream reach within a 6th field subwatershed in any given year. In addition, treatments below bankfull would not exceed 6 acres total on an annual basis per 6th field sub-watershed.
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 can control leafy spurge, cheatgrass, medusa head rye, toadflaxes and houndstongue	More potential to kill non-target vegetation. Lower risk to aquatic organisms.	Follow label advisories and apply botanical buffers. No specific PDC for aquatic organisms.
Imazapyr (Arsenal, Arsenal AC, Chopper, Stalker, Habitat) 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, dyers woad, tamarisk, woody species, and spartina. Aquatic labeled formulations can be used near water.	More potential to kill non-target vegetation. Moderate risk to aquatic organisms. Human health hazard associated with higher label rates. More mobile.	F-4 Lowest effective label rates would be used for each given situation. In no case would broadcast applications of herbicide or surfactant exceed typical label rates. Do not exceed a rate of 0.70 lb active ingredient (a.i.)/acre with broadcast and spot applications. Aquatic labeled imazapyr may be used within Aquatic Influence Zones, which poses inherent risk of delivery to water. Along with buffers that restrict method of application, PDC intended to keep herbicide from entering water in concentrations above a threshold of concern include: H-10 Lakes and Ponds –- No more than half the perimeter or 50 percent of the vegetative cover or 10 contiguous acres around a lake or pond would be treated with herbicides in any 30-day period. H-11. Wetland vegetation would be treated when soils are driest. If herbicide treatment is necessary for emergent target plants when soils are wet, use aquatic labeled herbicides. Favor hand/selective treatment methods where effective and practical. H-13 With the exception of hand/selective treatment methods, herbicide application within the Aquatic Influence Zone would not exceed typical label rates.

Active Ingredient Selected Herbicide Brand Names and Mode of Action	Properties	General Uses/ Known to be Effective on:	Risks	Selected Project Design Criteria to Minimize Risks
				H-14 Treatments above bankfull and within the aquatic influence zone (riparian area), would not exceed 10 acres along any 1.5 mile of stream reach within a 6th field subwatershed in any given year. In addition, treatments below bankfull would not exceed 6 acres total on an annual basis per 6th field sub-watershed.
Metsulfuron methyl (Escort XP) Sulfonylurea -Inhibits acetolactate synthesis, protein synthesis inhibitor, and block 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). Safest sulfonylurea around non-target grasses.	Use at low rates to control such species as houndstongue, sulfur cinquefoil perennial pepperweed plant.	More potential to kill non-target vegetation. Lower risk to aquatic organisms.	I-5 Do not use on dry, ashy, or light, sandy soils
Picloram (Tordon K, Tordon 22K) Restricted Use Herbicide Synthetic auxin - 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.	Most mobile, but persistent in soil. Contains hexachlorobenzene (persistent carcinogen) in amounts below a threshold of concern this substance is ubiquitous in the environment. More potential to kill non-target vegetation. Greater risk to aquatic organisms. Human health hazard associated with higher label rates.	F4 Lowest effective label rates would be used for each given situation. In no case would broadcast applications of herbicide or surfactant exceed typical label rates. H-8 Avoid use of picloram on shallow or coarse soils (coarser than loam.) No more than one application of picloram would be made within a two-year period, except to treat areas missed during initial application. H-3 No use of picloram… on roadside treatment areas that have a high risk of herbicide delivery. H-4 No use within 15 feet of wet roadside ditches.

Active Ingredient Selected Herbicide Brand Names and Mode of Action	Properties	General Uses/ Known to be Effective on:	Risks	Selected Project Design Criteria to Minimize Risks
Sethoxydim (Poast, Poast Plus) Inhibits acetyl co-enzyme, a key step for synthesis of fatty acids.	A selective, post-emergent grass herbicide.	Would control many annual and perennial grasses such as cheatgrass.	Greatest risk to aquatic organisms.	H-2 Application of sethoxydim is the last choice within roadside treatment areas having high risk of herbicide delivery and, in wetlands, near aquatic influence areas, especially adjacent to fish bearing streams: H-4 No use within 15 feet of wet roadside ditches.
Sulfometuron methyl (Oust, Oust XP) Sulfonylurea -Inhibits acetolactase 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 canary grass, cheatgrass, and medusahead.	Persistent in soil. Toxic to soil organisms. More potential to kill non-target vegetation. Moderate risk to aquatic organisms. Human health hazard associated with higher label rates.	F4 Lowest effective label rates would be used for each given situation. In no case would broadcast applications of herbicide or surfactant exceed typical label rates. H-9 Avoid use on shallow or coarse soils (coarser than loam.) No more than one application within a one-year period, except to treat areas missed during initial application. I-5 Do no use on dry, ashy, or light, sandy soils.
Triclopyr (Garlon 3A, Garlon 4, Forestry Garlon 4, Pathfinder II, Remedy, Remedy RTU, Redeem R&P) Synthetic auxin - 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.	Effective for many woody species such as scotch broom and blackberry. Also effective on English ivy, Japanese knotweed. Amine formulation may be used near water	Greatest risk to aquatic organisms. Exposure may exceed thresholds of concern for workers and the public.	F-2 Comply with R6 2005 ROD requiring spot and hand/selective treatments only. L-1 Triclopyr would not be applied to foliage in areas of known special forest products or other wild foods collection. H-3 No use of …Triclopyr BEE, … on roadside treatment areas that have a high risk of herbicide delivery Aquatic labeled triclopyr may be used up to 15 feet from surface waters. Additional PDC intended to keep herbicide from entering water in concentrations above a threshold of concern include:

Active Ingredient Selected Herbicide Brand Names and Mode of Action	Properties	General Uses/ Known to be Effective on:	Risks	Selected Project Design Criteria to Minimize Risks
				H-10 Lakes and Ponds –- No more than half the perimeter or 50 percent of the vegetative cover or 10 contiguous acres around a lake or pond would be treated with herbicides in any 30-day period. H-11. Wetland vegetation would be treated when soils are driest. If herbicide treatment is necessary for emergent target plants when soils are wet, use aquatic labeled herbicides. Favor hand/selective treatment methods where effective and practical. H-13 With the exception of hand/selective treatment methods, herbicide application within the Aquatic Influence Zone would not exceed typical label rates. H-14 Treatments above bankfull and within the aquatic influence zone (riparian area), would not exceed 10 acres along any 1.5 mile of stream reach within a 6th field subwatershed in any given year. In addition, treatments below bankfull would not exceed 6 acres total on an annual basis per 6th field sub-watershed

3.1.3 Basis for Cumulative Effects Analysis

Cumulative effects analysis considers the additive, synergistic, or off-setting effects of other past, present, and foreseeable future actions in combination with the proposed project. Actions on neighboring lands can contribute to spread or containment of invasive plants on National Forests (and visa versa). Treatment areas on the Columbia River Gorge National Scenic Area are within 1,000 feet of non-federal land, typically private land.

About 60 percent of the 6th field watersheds that comprise the analysis area are National Forest System lands, and in general, treatment is only proposed for National Forest System lands. About five percent of acreage within mapped treatment areas is in other ownerships.

All roads and trails may be vectors of invasive plant spread between the National Forest and adjacent ownerships. The following roads are some of the more heavily traveled.

Gifford Pinchot National Forest: U.S. Highway 12, State Route 504, Forest Roads 25 (north & south ends); 30, 86; 8620, 90; in addition to Beaver Campground; and Kalama Horse Camp.

Columbia River Gorge National Scenic Area: State Route 14, State Route 141, State Route 142, Belle Center Road, Strunk Road, Smith-Cripe Road, Bergen Road, Girl Scout Road, and Old Highway 8 (Klickitat County Road 1230), None of these roads are National Forest System roads; they are state and county roads.

Only the portion of these roads on National Forest System lands would be treated in the action alternatives, however, the effectiveness of these treatments would be increased if adjacent lands were also treated. Ongoing coordination with landowners, land managers, and state and county weed coordinators would ensure that treatments occur as needed throughout 6th field watersheds containing National Forest System lands.

Herbicides and other chemicals are widely used for agricultural and industrial forest management, landscaping, and invasive plant management. Herbicide use occurs on tribal lands, state and county lands, private forestry lands, rangeland, utility corridors, and road rights of way. No central source exists for compiling invasive plant management information off National Forests within Washington State. No requirement for landowners or counties to report invasive plant treatment information exists, thus an accurate accounting of the cumulative acreage of invasive plant treatment for all land ownerships is unavailable. Herbicide use in proximity to treatments considered in this project cannot be precisely predicted, especially given the long time span and uncertain implementation schedule for the project. Many people express personal concern about their exposure to agricultural and industrial chemicals and the cumulative effects to human and environmental health from herbicide, pesticide and other chemical use in our society.

The proposed use of herbicides on and off National Forest System lands could result in additive doses of herbicides to workers, the general public, non-target plant species, and/or wildlife. However, additive doses would not likely result in cumulative adverse effects because the herbicides proposed for use are rapidly eliminated from people, wildlife, and fish and do not accumulate in fatty tissue. Risk assessments considered chronic exposure to herbicides, which is universally associated with less risk of harm to organisms than acute exposures due to the lack of potential bioaccumulation and other characteristics of the herbicides (acute and chronic exposure scenarios are described in Appendices P and Q in the R6 2005 FEIS and its associated Biological Assessment for Aquatic Organisms).

Uncertainty is also addressed in the R6 2005 FEIS, and is one of the reasons that reducing reliance on herbicide use is a goal for the National Forests in the region.

The risk of adverse effects from herbicide and other treatments on the National Forest would be minimized by utilizing PDC and buffers described in Chapter 2.5. The PDC minimize the risk that herbicide exposures would exceed thresholds of concern for people, wildlife and fish (ibid.). These thresholds are very conservative and account for uncertainty (see section on layers of caution above). Herbicide persistence is managed through PDC to avoid chemical loading in the soil over time at any one site. Buffers minimize risk of herbicide concentrations of concern in water.

Assuming PDC are appropriately applied, the spatial extent of effects of herbicide use would mainly be limited to the site of application, and governed by the extent of the target species to be treated. Herbicide would only be applied where needed; non-target vegetation and bare ground would not be treated. Drift from broadcast treatments is unlikely to harm non-target vegetation 100 or more feet away from treated areas. Spot and hand treatments are far less likely to move off site because the applicator can narrowly focus the spray.

The PDC sufficiently minimize risks to compensate for uncertainty about the impacts of herbicide use on neighboring lands.

Early detection-rapid response is part of all action alternatives, and considered in the direct, indirect and cumulative effects analysis. Effects of treatments under early detection-rapid response would not exceed those predicted because if new infestations required methods outside the scope of the project, or if PDC cannot be appropriately applied, further analysis would be necessary prior to treatment.

Table 26 displays information by resource area related to cumulative adverse effects. The EIS considers the effects of each alternative when combined with past, ongoing or future proposed actions. Cumulative adverse effects can occur if one or more activities occur close enough in time and space for impacts to be combined.

Table 26-Baseline, Spatial Scale and Temporal Scale

Resource	Baseline (existing condition)	Spatial Scale	Temporal Scale
Botany	No known threats to botanical SOLI from past and ongoing herbicide use in the analysis area.	Treatment effects are localized. All methods pose some risk of harming non-target botanical species. Mistakes can be made with all tools. Herbicide may drift or run off up to 15 – 100 feet from treatment site depending on application method.	Residual effects to vegetation are possible with longer-lived herbicides such as picloram and clopyralid.
Wildlife	No known threats to wildlife SOLI from past and ongoing herbicide use in the analysis area.	Treatment effects are localized. Herbicide may drift or run off up to 15 – 100 feet from treatment site depending on application method. Extent of treatment extremely low compared to extent of available habitats.	Exposures to low levels of herbicide are possible over the life of the project. The herbicides proposed for use do not accumulate in the bodies of animals, thus adverse effects from chronic exposures are not possible.
Soils	No adverse effects on soils from past and ongoing herbicide use in the analysis area.	Treatment effects are localized. Herbicide may drift or run off up to 15 – 100 feet from treatment site depending on application method.	Herbicides vary as to persistence in soils. Picloram, clopyralid and sulfometuron methyl are residually active in soil.

Resource	Baseline (existing condition)	Spatial Scale	Temporal Scale
Water Quality	No streams within analysis area listed for chemical contamination.	Cumulative effects are considered at the 6th field watershed scale. Treatments of emergent and riparian target and treatments along roads that have high potential to deliver herbicide to surface water bodies are areas where cumulative deliveries to streams are possible.	Herbicides may be persistent in water for months after treatment however quantities are far below amounts that would cause harm.
Aquatic Organisms	No known threats to aquatic SOLI from past and ongoing herbicide use in the analysis area.	Acute exposure is considered at the site-scale. Acute exposure is evaluated along a stream approximately 1.5 miles long. Acute exposure in a discrete contiguous wetland is also evaluated at the treatment area scale.	Potential acute effects are evaluated over the course of one day. After that, there is no potential for concentrations to exceed a level of concern. The herbicides proposed for use are metabolized and excreted faster than they can accumulate in the bodies of aquatic animals.
Human Health	No known threats to human health from past and ongoing herbicide use in the analysis area, however most humans are subject to some background level of chemical exposures.	Direct and indirect effects of treatment limited to 15 – 100 feet from treatment site.	People may be exposed to herbicide in a chronic manner (e.g. applicators) or through multiple exposure mechanisms (breath, skin, ingestion of contaminated meat, mushrooms or fruit). The herbicides proposed for use are metabolized and excreted faster than they can accumulate in human bodies.

3.2 Botany and Treatment Effectiveness

This section focuses on the relative likelihood that the treatment methods approved in each alternative would be effective in reducing threats to non-target vegetation from invasive plants (Issue Group 2). This section also discloses the risks to non-target vegetation, especially Botanical Species of Local Interest, from the treatment of invasive plants (Issue Group 4).

3.2.1 Introduction

The *Regional FEIS for Preventing and Managing Invasive Plants* describes the need for treating invasive plants: "Invasive plants are currently damaging biological diversity and ecosystem integrity of lands within and outside the National Forests of the Pacific Northwest. Invasive plants create a host of adverse environmental effects including displacement of native plants; reduction in habitat and forage for wildlife and livestock; loss of threatened, endangered, and sensitive species; increased soil erosion and reduced water quality; reduced soil productivity; and changes in the intensity and frequency of fires. Invasive plants spread between National Forest System lands to neighboring areas, affecting all land ownerships"(Page Summary-1).

The effects analysis is based in part on a detailed project database developed from invasive plant inventories (see Alternative Development Process, Chapter 2.2 for more information). This includes a treatment area specific database created to describe the resources at risk/affected condition from existing invasive species for each treatment area. Values included: wilderness, research natural areas, botanical areas, recreation sites, managed stands, etc.

From these databases, further analysis, and research from peer reviewed sources, botanical project design criteria were developed. The project design criteria eliminate or strictly limit the effects to vascular and non-vascular botanical local interest species, reduce effects to non-target vegetation, and use adaptive management to ensure that effects to unknowns are mitigated.

Botanical plant Species of Local Interest (SOLI) within 100 feet of treatment areas are displayed in tables 26 and 27. [21] Botanical SOLI are vascular and non-vascular plants and fungi that are:

a) Threatened and/or Endangered Species (federally listed or proposed for listing under the Endangered Species Act);[22]

b) Regional Forester Sensitive or Proposed Sensitive Species (Forest Service Manual 2670)

c) Plant species endemic to the Columbia River Gorge, and Washington State/Washington Natural Heritage Program endangered, threatened, or sensitive species; and

d) Survey and Manage Mitigation Measure Species.[23]

3.2.2 Affected Environment

The Columbia River Gorge is an 80 mile long and 4,000 foot deep river canyon, cutting the only sea level route through the Cascade Mountain Range. Carved by volcanic eruptions and Ice Age floods for over a 40 million year geologic period, the Scenic Area is characterized by steep basalt cliffs on its southern side (Oregon), and a more broken topography to the north (Washington). The physiography of the Scenic Area and the climate changes associated with the Cascade Range resulted in varied habitats over a relatively short distance. As water laden air moves off the Pacific Ocean and rises over the Cascade Mountains, the rain falls primarily on the west side creating wet forested habitats dominated by western hemlock, Douglas fir, and western red cedar at the lower elevations and Pacific silver fir and Mountain hemlock at higher elevations. West side rainfall can reach over 100 inches per year. As the clouds move east over the crest of the mountain range, the rainfall drops precipitously and in 30 miles is reduced to 12 inches per year. The vegetation changes quickly as hemlocks are replaced by Douglas fir which in turn is replaced by oak and Ponderosa pine. As moisture further lessens, only the shrub/steppe remains. Given this combination of physiography and climate, habitats are highly variable and retain a legacy of botanical diversity.

During drier climatic periods, Oregon oak with its set of associated flora (e.g., *Penstemon barretiae, Meconella oregano*), migrated through the Scenic Area from west to east. As the climate became wetter, the oaks clung to isolated micro-climates where the soils are droughty or where the conifers could not find a foothold. Other species (e.g., *Suksdorfia violacea*, and *Sullivantia oregano*) became established during the cold ice-age periods and have since found a niche in the cool cliffs of the Scenic Area– today these species are relics of the ice age periods. Thus, many species have become isolated in the Scenic Area and its environs, leading to a large number of endemic species (e.g., *Bolandra oregano*, and *Erigeron howellii*). This isolation, for some species, led to disjunct populations.

The Columbia River Gorge includes a swathe of land parallel to either side of the Columbia River, in Oregon and Washington. River front land has always been highly desired for its productivity, water access, ease of transportation, and food availability. For over 30,000 years, the Columbia River Gorge has supported flourishing human populations.

Archeological excavations have provided evidence of the Folsom and Marmes people, who crossed the Bering Sea land bridge from Asia, and human occupation of prime salmon fishing sites for more than 10,000 years. Ancestors of today's Yakima, Warm Springs, Umatilla, and Nez Pierce tribal nations lived and fished along the river's banks. The Columbia Gorge has been and still is a major

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[21] Databases and records from the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area, Washington State Natural Heritage Program, Oregon Natural Heritage Program, and ISMS (Interagency Species Management System) database were used to overlay Species of Local Interest with the invasive plant inventory.

[22] No federally listed plant species are known to grow within 100 feet of treatment areas.

[23] "Survey and Manage" is a mitigation measure in the Northwest Forest Plan.

transportation route across the Cascades. Canoes, rafts, steamboats, railroads, and highways have provided and currently provide for the movement of people and goods. Lumber, wool, and flour mills, as well as fish and fruit canneries have been part of the landscape, and goods continue to be transported by river (Columbia River Gorge National Scenic Area website - http://www.fs.fed.us/r6/columbia/forest/).

This movement of people, equipment, and vehicles contributed to invasive weed introductions across a landscape that was already heavily managed by the people who lived there. Habitat for SOLI species on the Columbia River Gorge (see table 28) has been modified again and again over time as early people managed the landscape to optimize their survival. Currently, invasive species continue to alter habitats and vegetation types across the landscape. For example, on the east side of the Scenic Area, cheat grass and yellow star thistle, two aggressive invasive plants, have altered the vegetation permanently and become naturalized. These two species have likely caused some mortality to all SOLI vascular eastside species (table 28), as habitat has been encroached and existing vegetation replaced. This occurred before protection of rare plant species was considered essential and monitored. For this reason, all vascular SOLI species on the Scenic Area are deemed impacted with some mortality having occurred. As discussed under the general No Action discussion in Chapter 2.4, current NEPA has allowed for the use of some herbicides to treat and protect SOLI species from further invasive encroachment.

Invasive plants are currently a threat to populations of rare plants (i.e., *Cimicifuga elata, Sisyrinchium sarmentosum, Corydalis aquae-gelidae,* etc.) on the Gifford Pinchot National Forest and the Scenic Area; one Botanical Special Interest Area, South Prairie, is known to have invasive species (the others have yet to be surveyed). The function of the plant communities in these areas has been disrupted, and native vegetation has been completely replaced by invasive plants in some places. Without treatment, these weed sites will further displace native plant communities, and spread to new areas.

Invasive plants can spread far distances. The spread rate and direction is not continuous or even across the landscape (see Chapter 3 and Appendix D of the R6 2005 FEIS for a full discussion on vectors and causes of invasive plant spread). Roads are the most obvious vector for introduction, establishment, and spread of invasive plants in areas where they were previously unknown. Most of the current infestations are along roads. Gifford Pinchot National Forest System roads also serve to introduce invasive species into Mount St. Helens National Volcanic Monument and Mount Rainier National Park; both places where native plant communities and ecological integrity are highly valued.

Railroads and commercial and recreational boating on the Columbia River are additional vectors for the spread of invasive plants, providing for their transport and dispersal (e.g., seeds and vegetative reproductive parts attached to vehicles).

Houndstongue is widespread in Klickitat County, but found in low population pockets in Skamania County. The first houndstongue pioneers probably originated in Klickitat and moved into Skamania through State Highway 141; tansy ragwort did just the opposite, moved to Klickitat where it is little known, from Skamania, where it is widespread; Scotch broom is invading new territory as it moves east along Gifford-Pinchot National Forest Road 54. Knapweed is moving along Highway 12 onto the Wenatchee National Forest. The Wenatchee National Forest has aggressive treated knapweed (on their side), while the Gifford Pinchot National Forest is now proposing an effective treatment program.

Timber harvest, livestock grazing, road building, and other activities on National Forest System lands contribute to the spread of invasive plants through ground-disturbance, creating habitat conditions that are more susceptible to invasion, and/or spreading invasive plant materials via livestock or equipment. Early detection of populations of invasive species is critical before they become larger and spread.

The most effective action against invasive plants is early intervention; otherwise, populations increase in number and size, becoming more difficult and costly to control.

Appendix A displays the invasive plant species that have been detected on the Gifford-Pinchot National Forest and Columbia River Gorge National Scenic Area. The next section focuses on potential conflicts between invasive plants and Botanical Species of Local Interest.

Botanical Species of Local Interest (SOLI)

Botanical Species of Local Interest (SOLI) include vascular and non-vascular plants and fungi identified under the Survey and Manage Mitigation Measure in the Northwest Forest Plan and the proposed or current list of Regional Forester Sensitive Species (Forest Service Manual 2670) along with Washington State Special Status Species.

Databases and records from the Gifford-Pinchot National Forest, Columbia River Gorge National Scenic Area, Washington State Natural Heritage Program, Oregon Natural Heritage Program and ISMS (Interagency Species Management System) database were used to overlay botanical SOLI sites with the invasive plant inventory. Local botanists Andrea Ruchty, Robin Dobson and John Scott assisted in identifying SOLI within 100 feet of invasive plant treatment areas. Invasive plants are competing for habitat or otherwise threatening seven botanical Species of Local Interest at approximately 50 sites.

Table 27 displays fungi, lichen, bryophyte and plant SOLI on the Gifford-Pinchot National Forest, Table 28 displays lichen, bryophyte and plant SOLI known on the Columbia River Gorge National Scenic Area. Appendix C provides further details and along with the environmental consequences section below, comprises the Biological Evaluation for this project.

Table 27-Botanical Species of Local Interest, Gifford-Pinchot NF

Species of Local Interest (SOLI) Scientific Name Status	Habitat	Number of SOLI plant sites near invasive plant treatment areas	Threat from Invasive Plants
Fungi			
Albatrellus ellisii **Sensitive**	Fungi; on ground in conifer woods	1 (1 site recorded on Gifford-Pinchot NF)	Impacting habitat, no direct threats to known populations.
Albatrellus flettii **Survey and Manage**	Fungi; on ground in mixed woods and conifers	5 (of 82 sites located within the Northwest Forest Plan)	No documented threats from invasives. Potential future impact to host species from spread of invasives.
Cantharellus subalbidus **Survey and Manage**	Fungi; on ground in woods, often under second growth conifers	7 (of 214 sites located within the Northwest Forest Plan)	No documented threats from invasives. Potential future impact to host species from spread of invasives.
Chrysomphalina grossula **Survey and Manage**	Fungi; on damp conifer wood substrates	1 (of 15 sites located within the Northwest Forest Plan)	No documented threats from invasives. Potential future impact to host species from spread of invasives.
Clavariadelphus ligula **Survey and Manage**	Fungi; in humus under conifers	1 (of 2 sites located within the Northwest Forest Plan)	No documented threats from invasives. Potential future impact to host species from spread of invasives.
Cortinarius boulderensis **Survey and Manage**	Fungi; on ground in woods	2 (of 10 sites located within the Northwest Forest Plan)	No documented threats from invasives. Potential future impact to host species from spread of invasives.

Species of Local Interest (SOLI) Scientific Name Status	Habitat	Number of SOLI plant sites near invasive plant treatment areas	Threat from Invasive Plants
Gastroboletus ruber **Survey and Manage**	Fungi; in forests with little shrubby understory	1 (of 28 sites located within the Northwest Forest Plan)	It is unknown whether there are threats to known sites from invasives. Potential future impact to host species from spread of invasives.
Helvella elastica **Survey and Manage**	Fungi; on ground in woods or in edges, particularly near streams and paths	2 (of 52 sites located within the Northwest Forest Plan)	No documented threats from invasives. Potential future impact to host species from spread of invasives.
Hypomyces luteovirens **Survey and Manage**	Fungi; on ground in woods often partially buried in duff	1 (of 12 sites located within the Northwest Forest Plan)	No documented threats from invasives. Potential future impact to host species from spread of invasives.
Leucogaster microsporus **Survey and Manage**	Fungi; in soil or duff under conifers	1 (of 9 sites located within the Northwest Forest Plan)	No documented threats from invasives. Potential future impact to host species from spread of invasives.
Mycena monticola **Sensitive**	Saprophytic fungi; forest floor	4 (of 6 sites recorded on Gifford-Pinchot NF)	Impacting habitat, no direct threats to known populations.
Otidea smithii **Sensitive**	Fungi; on forest floor with litter and large woody debris	1 (of 3 sites recorded on Gifford-Pinchot NF)	No documented threats from invasives.
Ramaria celerivirescens **Survey and Manage**	Fungi: on ground in woods often partially buried in humus	1 (of 82 sites located within the Northwest Forest Plan)	No documented threats from invasives. Potential future impact to host species from spread of invasives.
Ramaria rubrievanescens **Survey and Manage**	Fungi; at this site grows in association with lodgepole pine on forest floor	1 (of 51 sites located within the Northwest Forest Plan)	No documented threats from invasives.
Rhizopogon evadens var. subalpinus **Survey and Manage**	Fungi; in soil or duff uner conifers	2 (of 19 sites located within the Northwest Forest Plan)	No documented threats from invasives. Potential future impact to host species from spread of invasives.
Spathularia flavida **Sensitive**	Fungi; woody debris on forest floor	2 (of 5 sites on the Gifford-Pinchot NF)	No documented threats from invasives.
Lichens and Bryophytes			
Cetrelia cetrarioides **Sensitive**	Epiphytic lichen; moist riparian areas	1 (of 4 sites recorded on Gifford-Pinchot NF)	No documented threats from invasives. Potential future impact to host species from spread of invasives.
Dendriscocaulon intricatulum **Survey and Manage**	Lichen; on tree bark in humid intermontane old-growth forests at lower elevations	7 (of 584 sites located within the Northwest Forest Plan)	No documented threats from invasives. Potential future impact to host species from spread of invasives.
Dermatocarpon luridum **Sensitive**	Lichen; aquatic	3 (of 6 sites recorded on Gifford-Pinchot NF)	No documented threats from invasives.
Leptogium rivale **Survey and Manage**	Lichen; aquatic attached to submerged rocks	10 (of 170 sites located within the Northwest Forest Plan)	No documented threats from invasives.
Nephroma bellum **Sensitive**	Lichen; epiphytic, found on boles, lower limbs, and lower twigs of conifers.	1 (of 193 sites located within the Northwest Forest Plan)	No documented threats from invasives. Potential future impact to host species from spread of invasives.
Nephroma occultum **Sensitive**	Epiphytic lichen; Old growth forests dominated by Doug-fir- Western Hemlock	2 (of 7 sites recorded on Gifford-Pinchot NF)	No documented threats from invasives. Potential future impacts to host species (trees and shrubs) from spread of invasives.

Species of Local Interest (SOLI) Scientific Name Status	Habitat	Number of SOLI plant sites near invasive plant treatment areas	Threat from Invasive Plants
Peltigera pacifica **Sensitive**	Foliose lichen; low elevation moist forests	2 (of 23 sites recorded on Gifford-Pinchot NF)	No documented threats from invasives. Invasive plants likely to spread to occupied habitats.
Pseudocyphellaria rainierensis **Sensitive**	Foliose lichen; moist old growth forest	5 (of 44 sites recorded on Gifford-Pinchot NF)	No documented threats from invasives. Potential future impact to host species from spread of invasives.
Racomitrium aquaticum **Survey and Manage**	Moss, forms mats on shaded, moist rocks and cliffs along shady streams or in forests, often in splash zones, but never in aquatic habitat	1 (of 31 sites recorded within the Northwest Forest Plan)	No documented threats from invasives. Future (within ten years) threats include loss of/competition for habitat.
Schistostega pennata **Sensitive**	Moss; upturned rootwads adjacent to standing water	4 (of 23 sites recorded on Gifford-Pinchot NF)	No documented threats from invasives.
Tetraphis geniculata **Sensitive**	Moss; Old Growth stumps and logs in moist areas	15 (of 60 sites recorded on Gifford-Pinchot NF)	No documented threats from invasives.
Usnea longissima **Survey and Manage**	Lichen; on trees in open or somewhat shaded humid forests	8 (of 278 sites recorded within the Northwest Forest Plan)	No documented threats from invasives. Potential future impact to host species from spread of ivasives.
Vascular Plants			
Botrychium lanceolatum **Sensitive**	Herbaceous; variety of habitats from wet meadows to mixed mature coniferous forests to disturbed sites	1 (of many sites recorded on Gifford-Pinchot NF)	Impacts to habitat, no mortality to individuals
Botrychium montanum **Survey and Manage**	Herbaceous; shady coniferous woods	5 (of 96 sites recorded within the Northwest Forest Plan)	No documented threats from invasives. Potential future impact to host species from spread of invasives.
Botrychium pinnatum **Sensitive**	Herbaceous; moist coniferous forests, mossy talus slopes under some canopy, subalpine meadows, and disturbed areas	1 (of many sites recorded on Gifford-Pinchot NF)	Impacts to habitat, no mortality to individuals
Chrysolepis chrysophylla **Sensitive**	Evergreen Oak Tree, Golden Chinkapin; Conifer Forest in drier Grand Fir zone (SE part of National Forest)	6 (of 11 sites recorded on Gifford-Pinchot NF)	No documented threats from invasives. Surveys are incomplete.
Cimicifuga elata **Sensitive**	Herbaceous; conifer forests on northern slopes	1 (of 2 sites recorded on Gifford-Pinchot NF)	Himalayan blackberry is directly competing with the *Cimicifuga elata* for space and resources, and probably has already caused mortality to this species. Continued mortality expected and without treatment, loss of population is likely.
Corydalis aquae-gelidae **Sensitive**	Herbaceous; stream edges	8 (of 40 sites recorded on Gifford-Pinchot NF)	Invasives occupy one known Corydalis aquae-gelidae site. Likely future mortality expected. Without treatment, loss of population is likely.
Cypripedium fasciculatum **Sensitive**	Herbaceous; open Douglas-fir forest	3 (of 8 sites recorded on Gifford-Pinchot NF)	Invasives impacting habitat (roadside).
Microseris borealis **Sensitive**	Herbaceous; wet meadows	2 (of 5 sites recorded on Gifford-Pinchot NF)	No documented threats from invasives. Moderate to high risk of impact as invasives spread.

Species of Local Interest (SOLI) Scientific Name Status	Habitat	Number of SOLI plant sites near invasive plant treatment areas	Threat from Invasive Plants
Montia diffusa **Sensitive**	Herbaceous; Moist woods at low elevations	2 (of 5 sites recorded on Gifford-Pinchot NF)	Invasives are directly competing with Montia diffusa for space and resources, and probably have caused mortality to this species at 1of 2 sites. Continued mortality expected.
Orthocarpus bracteosus **Washington Natural Heritage Program S1 – endangered within the State of Washington**	Herbaceous; low elevation meadows	1 (of 1 population recorded on the Gifford-Pinchot NF)	No documented threats from invasives. Invasive plants may spread to site and result in loss of this population.
Penstemon barrettiae **Sensitive**	Herbaceous; roadsides, rock outcrops	1 (of 1 population recorded on the Gifford-Pinchot NF,)	No documented threats from invasives.

Table 28-Species of Local Interest-Columbia River Gorge National Scenic Area

Species of Local Interest (SOLI) Scientific Name Status	Habitat	Number of SOLI plant populations near invasive plant treatment areas	Threat from Invasive Plants
Bryophytes			
Scouleria marginata Washington State Threatened	Aquatic	2 (of 2 known on the Columbia River Gorge)	No documented threats from invasives. Invasive plants likely to spread to occupied habitats.
Vascular Plants			
Artemisia camp. var wormskioldii Sensitive	Grass steppe	1 (of 2 known worldwide)	Habitat and sites have been impacted by cheat grass and yellow star thistle. Currently, invasives are not impacting *Artemisia camp. var wormskioldii* due to treatment.
Githopsis specularioides Sensitive	Grass steppe	2 (of 6 areas with known sites, good habitat for Githopsis yet to be surveyed on the Columbia River Gorge)	Currently, yellow star thistle, spotted knapweed, Himalayan blackberry, and cheatgrass are directly competing with *Githopsis specularioides* for space and resources, and probably have caused mortality to this species. Continued mortality is expected even with current treatment.
Lomatium suksdorfia Sensitive	Open dry slopes, grassy and herbaceous	2 (of 12 known on the Columbia River Gorge)	Mortality to individuals and habitat loss has resulted from impacts by cheat grass and yellow star thistle. Currently, treatment has eliminated impacts to *Lomatium suksdorfia* from invasives, but habitat encroachment has continued.

Species of Local Interest (SOLI) Scientific Name Status	Habitat	Number of SOLI plant populations near invasive plant treatment areas	Threat from Invasive Plants
Lomatium columbianum Sensitive	Dry, rocky, talus slopes	≈ 10 (of thousands known on the Columbia River Gorge)	Currently, yellow star thistle, whitetop, and cheatgrass are directly competing with *Lomatium columbianum* for space and resources, and probably have caused mortality to this species. Continued mortality is expected even with current treatment.
Heuchera grossulariifolia Sensitive	Cliff	3 (of 20 on the Columbia River Gorge)	Not currently threatened by invasive plants and encroachment is not likely as habitat is not suitable to invasives.

3.2.3 Treatment Effectiveness

Treatment effectiveness increases with the number of treatment options available across the largest area. The focus of this discussion is on the relative likelihood that the treatment methods approved in each alternative would be effective in reducing threats to native vegetation from invasive plants. Factors that influence effectiveness include number of options available and percentage of the infested landbase that would be treated. The alternatives differ in terms of treatment method flexibility.

In Integrated Invasive Plant (Weed) Management, the choice of treatment(s) is dependent on many variables linked to site specific conditions, economics, and desired future condition (includes restoration). To effectively treat an invasive plant requires the maximum set of tools from which to choose.

The R6 2005 FEIS specifically discussed the relationship between number of treatment options and effectiveness:

- Page 4-25: The alternative offering the best suite of herbicides…would control the widest variety of species and would have the most potential to restore and revegetate. Treatment costs are a factor.
- Page 4-18: Alternatives with the widest variety of herbicides and herbicide families available for use have the greatest potential to result in effective treatments.
- Page 4-20: If herbicides are treated as a last resort (if other methods are required to be used first unless shown to be ineffective) then delays in treatment and restoration may occur. If broadcast spraying is not allowed in riparian reserves, invasive plants will continue to have adverse effects in places where this method is necessary.
- Page 4-23 Greater variety of herbicides will result in fewer repeated entries.

Thus, a range of herbicide and non-herbicide options is necessary to effectively treat invasive plants. For instance, the herbicide glyphosate does not work effectively for all species of invasives. Glyphosate can be used against woody vegetation, but is not as effective as other herbicides such as triclopyr. On the Columbia River Gorge National Scenic Area, glyphosate was used at the Sandy River Delta for many years, and with many applications, but not with satisfactory results. With approval and use of triclopyr, the results were far more effective (Dobson 2005). Another example where glyphosate may be less effective than other herbicides is related to timing of application.

For blackberries, glyphosate must be applied in the fall, after the berries have dropped, to be effective, whereas triclopyr is effective applied at any time of year.

Nationwide, a number of invasives have been found to develop a tolerance to glyphosate, and its effectiveness has been markedly reduced. In Skamania County, along the Wind River (adjacent to Gifford-Pinchot National Forest) tolerance to glyphosate has been observed (Carol Chandler, personal communication, December, 2005) by county weed coordinators. Dr. Tim Miller, the Washington State Extension Weed Scientist in Mt. Vernon, Washington, reports tolerance to glyphosate in locations close to the Gifford-Pinchot National Forest and the National Scenic Area.

Invasive plant treatments that occur on parcels neighboring the National Forest System lands contribute to project effectiveness. Invasive plants flow between land ownerships and administrative units. Treatments must occur across land ownerships to optimize the effectiveness of these alternatives.

Effectiveness of Manual, Mechanical and Cultural Treatments

Manual, mechanical and cultural treatments can be effective in reducing populations of many invasive plants. Manual/mechanical treatments must occur several times during a growing season, for at least five years, to prevent seeds from being produced and dispersed, and to kill any germinants. However, manual and mechanical treatments can initially increase rather than decrease population numbers for many invasive plant species, including Canada thistle and knotweed. Mechanical methods can be effective for these species, but require constant mowing over a two year period, which may not be economically viable or feasible. Knotweed fragments must be collected and properly disposed of following mechanical treatment as stem fragments as small as a centimeter in diameter can easily propagate into new individuals.

Cultural treatments may also be effective combined with other control techniques. Large infestations would be reduced in size and small infestations could be eliminated. Grazing animals can be particularly useful in areas where herbicides cannot be applied (e.g., near water) or are prohibitively expensive (e.g., large infestations). Goats would be used as part of a restoration program by breaking up the soil and incorporating in seeds of desirable native plants. They 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 (Walker 1994). Goats can control woody species because they can climb and stand on their hind legs, and will browse on vegetation other animals cannot reach (Walker 1994).

Grazing would reduce the amount of herbicide used by reducing invasive plant biomass (e.g. blackberries on the National Scenic Area). Grazing would eliminate the need for mechanical treatment on these sites.

Common Control Measures in Chapter 2.5 and Appendix B offer a range of treatment options. Multiple integrated factors guide the choice of treatment.

Effectiveness of Biological Control Agents

Several biological agents have been approved for release on the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area (Washington side) (Andreas 2006). The analyses for effects of such tools have already been completed under documents developed by Agricultural Plant Health and Insect Service (APHIS) for approval of entry of such organisms.

Biological control is self-perpetuating, selective, energy self-sufficient, economical, and well suited to integration in an overall invasive plant management program. Introducing predators, parasites, or pathogens from a plants country of origin does not eradicate, but controls any given invasive plant (R6 2005 FEIS, 2-35 to 2-37).

The time frame for controlling invasives using biological controls is long, and would occur regardless of alternative. The effects of biological agents are described in Appendix J of the R6 2005 FEIS, and direct, indirect and cumulative effects are negligible (e.g. unlikely to result in adverse effects to aquatic species (page J-24), no direct effects on wildlife (page J-19), few examples of non-target effects (page J-16).

Effectiveness Rankings

Each alternative has been assigned an effectiveness ranking to model the cost of treatment and predicted results over time. The effectiveness ranking is based on the portion of a given invasive plant population that would be killed each year of treatment under the most ambitious treatment scenario conceivable based on the design of each alternative. No Action includes the use of three, rather than ten herbicides, and does not involve any herbicide use on at least half the acres currently slated for treatment on the Gifford Pinchot National Forest. Herbicides would not be used to respond to infestations that are not covered by a current NEPA decision, and treatments on the Gifford Pinchot National Forest would not necessarily be accompanied by restoration of native vegetation. Therefore, No Action was assigned a lower effectiveness ranking than the Proposed Action.

The Proposed Action (Alternative B) was assigned an effectiveness ranking of 80 percent, to reflect the wider range of herbicides that would be available, in combination with non-herbicide methods. The implementation planning process would improve the effectiveness of treatment compared to No Action because more information about effective control measures would be integrated into prescriptions (see Chapter 2 and Appendix B) and treatments would be accompanied by active restoration where needed. In addition, currently undetected infestations could be treated when small, which would improve the effectiveness of a given year’s treatment.

Effectiveness of Alternative A - No Action

Under No Action (Alternative A), about 2,500 acres could be treated under existing NEPA decisions (2,200 on the Gifford Pinchot National Forest, 300 on the Columbia River Gorge National Scenic Area). Of the 2,200 acres on the National Forest, about 100 have herbicide use approval. All 300 Scenic Area acres are currently approved for use of three herbicides, along with non-herbicide methods.

About 2,200 acres would be treated in the first year using hand methods based on the most ambitious treatment scenario under Alternative A. About 330 acres would be treated using selective herbicide treatments and 70 acres using broadcast, based on the most ambitious scenario available given current NEPA decisions.

These treatments are assumed to reduce infestation size by 50 percent, reflecting the concepts that some infestations cannot be effectively treated without herbicides, and the need for re-treatment is likely to be greater if herbicides are not available as part of the integrated prescription. It also reflects the limitations on the range of herbicide options (3) available under No Action. The R6 2005 FEIS estimated that invasive plants would spread at a rate of four to six percent annually; the more a population is reduced, the fewer acres would spread. Untreated areas would continue to spread unabated.

Under No Action, the values at risk from invasive plants would continue to be vast. Botanical Species of Local Interest would continue to be threatened by invasive plants and additional sites and species may become threatened. Infestations would continue to impact Wilderness, Botanical Area and Research National Area values. Meadow and riparian habitats would continue to be at risk.

This most ambitious treatment scenario would require a two-fold increase in funding over a five-year period. Over 400 acres would still remain to be treated, along with new infestations that were not manually treated on roads. The acreage remaining to be treated would more than double by 2011 given current funding estimates.

Table 29-Estimated Invasive Plant Acres, No Action, 2007-2011

Year	Acres Invaded	Acres Treated	50% Effectiveness	Acres Remaining	5% Spread
2007	2,710	2,500	1,250	1,460	1533
2008	1,533	1,312	656	877	921
2009	921	656	328	593	623
2010	623	328	295	390	407
2011	407				

Table 30-Summary of Effectiveness Indicators, No Action

Alternative A (No Action)		
Percent of Treatment Acreage Where Herbicide Allowed	**Number of Herbicide Options**	**Acres of Invasive Plants 2011**
17%	3	407

Early Detection and Rapid Response

The No Action Alternative does not approve herbicide use for new detections of invasive plants. Manual treatments could occur along roadsides on the Gifford Pinchot National Forest, which would not likely be effective in treating all new populations because of the high cost of labor, limited volunteer resources, and lack of effective response of some species to hand pulling (see Chapter 2.5 for control measures effective for each target species known within the Project Area).

Effectiveness of Alternative B – Proposed Action

Under Alternative B, all currently infested acres would be treated with integrated prescriptions that combine manual and mechanical invasive plant control methods with the use of herbicides. Given the most ambitious conceivable treatment under this alternative, and unlimited funding, each year population size would be reduced by an estimated 80 percent.

The following beneficial effects would be expected from treatment:

- Invasive plant establishment and spread would be reduced along roads, trails and other disturbed areas.
- Native plant communities and ecosystem functions would recover in meadows and forested areas.

- Many invasive populations would never gain a foothold to Wilderness, Botanical Special Interest Areas, or Research Natural Areas.
- Recreation and administrative sites would become less of a vector for invasive spread.
- Invasive plants would be far less likely to compete with botanical species of local concern.

Current infestations would be assumed to reach project objectives (including restoration) within five years under Alternative B, assuming the most ambitious treatment scenario and unlimited funding. Some infestations may still need to be treated after five years if there is a persistent seed bank. This would be considered maintenance treatments and require much less annual funding. Over time, reliance on herbicides would be reduced as target population size decreases.

Alternative B has an effectiveness ranking of 80 percent because it allows a relatively wide range of treatment options available at a given site. This most ambitious treatment scenario would require a two-fold increase in funding over a five-year period. Given current funding estimates, project objectives could be achieved within ten years.

Table 31-Estimated Invasive Plant Acres, Most Ambitious Treatment Scenario - Alternative B 2007-2011

Year	Acres Invaded	Acres Treated	80% Effectiveness	Acres Remaining	5% Spread
2007	2,710	2,710	2,168	542	569
2008	569	569	455	114	119
2009	119	119	95	24	24
2010	24	24	19	5	6
2011	6				

Table 32-Summary of Effectiveness Indicators, Alternative B

Alternative B Proposed Action		
Percent of Treatment Acreage Where Herbicide Allowed	**Number of Herbicide Options**	**Acres of Invasive Plants 2011-Unlimited Budget**
100% of 2,710 acres	10	6

Early Detection and Rapid Response

Unpredictable introduction, establishment and spread of invasive plants anywhere on the National Forest and Scenic Area are possible. While the existing inventory provides a snapshot of the likely types of infestations that would be detected and treated, there is likely to be additional or different infestations that would be treated using the Early Detection Rapid Response (EDRR) approach described in Chapter 2.5.6

Given an unlimited budget, all existing mapped infestations would be treated as soon as possible. Spread from key target population centers would be eliminated, and new introductions would be treated when small. If all infestations were effectively treated immediately, within approximately five years target populations would be contained, controlled, or eradicated to the extent desired, and treated sites would be restored.

Some infestations may still need to be treated after five years, if there is a persistent seed bank. Sites will likely have to be revisited in a given year to reach the interior of dense invasives such as knotweed, to accommodate invasive plant reproductive cycles that occur through the year, or to ensure treatment of individual plants that may have been skipped during the initial entry.

Restoration would be considered in treatment prescriptions to help reduce potential for reintroduction of invasives along roads. Under an unlimited budget, Early Detection-Rapid Response would be a small portion of the project.

Under a limited budget, full control of target populations may take longer than five years. Untreated infestations would continue to spread, increasing the acres needing treatment each year. Each year, priorities would be reevaluated, and new infestations would comprise a larger share of the treatment workload.

Effectiveness of Alternative C

Under Alternative C, herbicide use would be limited to approximately 940 acres, 35 percent of the estimated acreage that would be treated under the Proposed Action. The remaining 65 percent would be treated similarly to No Action: work would consist mainly of manual treatment with fewer than 10 acres of glyphosate stem injection allowed in riparian reserves within recreation and administrative sites across the Forest and Scenic Area.

Given an unlimited budget, Alternative C would still not be as effective as Alternative B because many target species would likely not be effectively treated. Examples of target species that are difficult to eradicate without herbicides include Japanese and giant knotweed; purple loosestrife; orange hawkweed; and meadow and brownray knapweed. Alternative C would have less potential to effectively treat these species if they are growing along road ditches and near streams where herbicides would not be used. The cost of manual and mechanical methods is significantly higher than herbicide application, and managers would likely find full eradication cost-prohibitive.

More than half of the infested acreage on the Gifford-Pinchot National Forest is associated with an objective of “eradicate,” which generally indicates the target species are hard to control. Examples include all three species of knotweed, reed canary grass, and meadow knapweed. Since Alternative C would not effectively eradicate any invasive plants, species with this treatment strategy are assumed not treated in this alternative.

The consequence of Alternative C would be that invasive species continue to flourish and spread (four to six percent per year), particularly for hard to treat target species and target species in riparian areas and along high aquatic risk roads. Waterways would continue to transport invasives downstream, and invasive dominance would increase along lakes, ponds, creeks, etc. These high aquatic risk roads would continue to act as corridors, transporting invasive seeds and propagules to new locations.

Many of the SOLI plant sites in proximity to invasives on both the Gifford-Pinchot National Forest and the Columbia River Gorge National Scenic Area are away from riparian habitats or are not immediately threatened by invasive plants. Thus, while the restrictions in Alternative C could make control of invasive plants in these areas more difficult, SOLI could be maintained at these sites.

In contrast, *Corydalis aquae-gelidae*, and *Sisyrinchium sarmentosum* on the Gifford-Pinchot National Forest, and *Scouleria marginata* on the Columbia River Gorge National Scenic Area are associated with riparian habitat. Habitat loss to *Corydalis aquae-gelidae* and *Sisyrinchium sarmentosum* has already occurred from invasive plants and continued spread could lead to extirpation of some populations. Habitat loss and mortality to *Scouleria marginata* will likely occur as reed canary grass spreads unchecked.

There has also been mortality to *Sisyrinchium sarmentosum* from direct competition with invasive species and their resultant displacement. Some SOLI may be at continued risk from infestations if manual treatment is not sufficient.

As with the other alternatives, the rate of invasive plant spread would be reduced via the implementation of prevention practices.

Invasive plant treatments that occur on parcels neighboring the National Forest System lands contribute to project effectiveness. Invasive plants flow between land ownerships and administrative units. Treatments must occur across land ownerships to optimize the effectiveness of this alternative.

The effectiveness ranking of 60 percent below reflects the assumption that where herbicides are allowed as part of the treatment option, each year of treatment, the size of a given invasive plant population would decrease by 80 percent. Where herbicides are not allowed (two-thirds of the analysis area) and solely manual/mechanical/cultural treatments would be approved, treatment effectiveness is reduced to 50 percent. This results in a weighted average of 60 percent over the project as a whole. Even with an unlimited budget, compared to Alternative B, invasive plants would take longer to control.

Alternative C has an effectiveness ranking of 60 percent. This reflects the assumption that where herbicides are allowed as part of the treatment option, each year of treatment, the size of a given invasive plant population would decrease by 80 percent. Where herbicides are not allowed (two-thirds of the analysis area) and only manual/mechanical/cultural treatments would be approved, treatment effectiveness is reduced to 50 percent. This results in a weighted average of 60 percent over the project as a whole. Even with an unlimited budget, compared to Alternative B, invasive plants would take longer to control.

Table 33-Estimated Acres of Invasive Plants, Alternative C, 2007-2011

Year	Acres Invaded	Acres Treated	60% Effectiveness	Acres Remaining	5% Spread
2007	2,710	2,710	1,630	1,080	1,134
2008	1,134	1,134	680	454	476
2009	476	476	286	190	200
2010	200	200	120	80	84
2011	84				

Table 34-Summary of Effectiveness Indicators, Alternative C

Alternative C		
Percent of Treatment Acreage Where Herbicide Allowed	**Number of Herbicide Options**	**Acres of Invasive Plants 2011 (Unlimited Budget)**
35%	10	84

Early Detection and Rapid Response

Given an unlimited budget, under Alternative C, all existing mapped infestations would be treated as soon as possible. The effectiveness of some treatments would be compromised due to restrictions on herbicide use over two-thirds of the analysis area. However, if funding were available, spread from many key target populations centers would be eliminated. New introductions would be treated when small, but these future treatments would be less effective because herbicide use restrictions would be applied. Restoration would be considered in treatment prescriptions to help reduce potential for reintroduction of invasives along roads. Thus, even with unlimited funding, Alternative C would not control invasive plants as quickly as the Proposed Action because of herbicide use restrictions.

Given limited budgets, only a portion of the existing inventory could be treated under Alternative C. Each year, priorities would be reevaluated, and new infestations would comprise a larger share of the treatment workload.

Alternative Comparison – Effectiveness Indicators

Table 35-Comparison of Alternatives, Effectiveness Indicators

Alternative	Percent of Treatment Acreage Where Herbicide Allowed	Number of Herbicide Options	Acres of Invasive Plants 2011 (Unlimited Budget)
Alternative A (No Action)	17% of 2,500 acres	3	407
Alternative B (Proposed Action)	100% of 2,710 acres	10	6
Alternative C	35% of 2,710 acres	10	84

3.2.4 Environmental Consequences of Invasive Plant Treatments on Non-target Plants

Introduction

All of the alternatives, including No Action approve some herbicide use. Herbicides are designed to kill plants, so some damage to non-target plant species is probable despite careful planning and implementation. Herbicides 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. The type of herbicide and the application method may also affect plant pollinators. A reduction or shift in pollinator species could also lead to changes in plant species composition or diversity (2005 R6 FEIS Chapter 4.27). For example, the repeated use of triclopyr, a broadleaf selective herbicide, might shift the species composition resulting in a reduction of woody vegetation and an increase in the herbaceous and grass component.

Herbicides can move off-site in water, soil, and wind, thereby affecting non-target vegetation. This can result from spray drift (broadcast and spot), runoff, leaching, or through groundwater movement. Herbicides can vary dramatically in their potential for movement. For example, picloram is highly soluble in water, is mobile under both laboratory and field conditions, is resistant to degradation, and has a high potential to leach to groundwater in most soils. While glyphosate, strongly binds to soil particles, which prevents it from excessive leaching or from being taken up from the soil by non-target plants; it also has a low potential for leaching into groundwater systems, and degrades quickly (2005 R6 FEIS Chapter 4, 4-29, 4-32).

Translocation of herbicide between rhizomatous same-species individuals, or from plant-fungi, rootlet-mycorrhizal interactions can also result in herbicide movement. The result may include mortality, reduced productivity (e.g., physiological, structural, and abnormal growth (2005 R6 FEIS Chapter 4.27). Effects, such as mortality, brown spots, and chlorotic coloration, may not be immediate, and may become apparent months later. Other non-visible effects (e.g., physiologic), may never be noticeable (Marrs, R.H 1989). Underground effects may never become evident.

The risk of adverse effects is dependent on the type of herbicide used and the application method chosen. Herbicides have different characteristics, degrees of selectivity, and modes of action. Potency of the herbicide and persistence also are a factor.

For instance, glyphosate is a general, non-selective herbicide, which may kill or damage species from all plant families, while clopyralid has little effect on the mustard family and grasses. Other herbicides are more selective and thus have less potential to adversely affect non-target plants. Glyphosate, which is generally non-selective, has no adverse effect on horsetail (non-flowering plant) and some species of algae (Cathy Lucero, personal communication, August 2005). Picloram is a persistent herbicide as it can remain active for several growing seasons post application. Other herbicides do not have this characteristic and break down rapidly.

The sulfonylurea herbicides contain an active ingredient with the potential to impact non-target vegetation more than any of other herbicides proposed. These herbicides include metsulfuron methyl, chlorsulfuron, and sulfometuron methyl. This class of compounds derives their effect by inhibiting the activity of acetolactate synthase — a key enzyme required for plant cell growth and whose inhibition prevents proteins from being synthesized. These herbicides all have the potential for mobility in water, transport by wind erosion, and potential for off-site drift. To effectively protect non-target vegetation, these herbicides would not be used where susceptible native plants make up a large component of an area slated for treatment.

The exception to this would be situations where the invasive plant is particularly aggressive (i.e., toadflaxes, houndstongue, perennial pepperweed, or reed canary grass) and have not been effectively treated by other methods. There is potential for the sulfonylurea herbicides to damage and/or cause mortality to non-target native vegetation is greatest with broadcast applications. Operations and post-treatment monitoring, would limit substantial negative effects to the first treatment, and if necessary buffers would be increased until negative effects were negligible.

The greater the range of tools available in the toolbox, the less likely non-target vegetation will be harmed. In some cases selective herbicides may be used close to non-susceptible non-target species without harm.

While the focus of this section is on the effects of herbicides on non-target vegetation, especially botanical Species of Local Interest (SOLI), non-herbicide methods can also adversely affect non-target vegetation. The removal of invasive plants using manual or mechanical techniques could directly affect native plants and plant communities. Direct negative effects would be unintentional removal or trampling of flowers, fruits, or root systems of native plants. These effects are expected to be minimal with properly trained crews (R6 2005 FEIS Appendix J).

Goat grazing also has the potential to impact non-target plants. PDC are established to minimize the risk of goats damaging non-target plants.

As noted previously, invasive plants themselves, also pose threats to native plant communities.

Bryophytes and Lichens

Broadcast drift from herbicide application may potentially harm sensitive vascular and non-vascular species (lichens, and bryophytes) if herbicide particles are transported to non-target vegetation. Bryophyte and lichens are more prone to injury from drift due to their unique structure and physiology. They lack a cuticle, a tissue layer which regulates substances entering cells from the atmosphere (air) and acts as a selectively permeable barrier at the organism-atmosphere interface. The cuticle in vascular plants is analogous to human skin. Bryophytes lack this protective membrane and substances from the air and atmosphere can diffuse in and out, as bryophytes are generally only one cell layer thick. Bryophytes and lichens lack roots and vascular tissue for absorbing and conducting water and nutrients directly from the atmosphere, which makes them highly susceptible and sensitive to herbicide drift. Newmaster et al. (1999) raised concern that drift from glyphosate could affect the long term sustainability of populations of lichens and bryophytes. Lichens such as *Usnea longissima*, can be particularly susceptible to herbicide contamination because of their particularly high surface-to-volume area ratio.

The potential for an herbicide to affect non-vascular species is also dependent on the mechanism of action the herbicide uses. For example, clopyralid mimics auxins, a plant growth hormone and stimulates abnormal growth. Metsulfuron methyl works by inhibiting the activity of an enzyme called acetolactate synthase, an enzyme necessary for plant growth. Glyphosate has been found to have no effect on horsetails (non-flowering plants) and some species of algae (Cathy Lucero, personal communication).

Fungi

In general, herbicides are not expected to affect the fruiting bodies of fungi (Pilz 2005). However, herbicide residues can be translocated from fungal hyphae to sporocarps (fungal fruiting bodies), where they bioaccumulate and can potentially present a human health risk if consumed. Fungi that are edible and/or SOLI can be saprobic, mycorrhizal, or pathogenic (e.g., *Armillaria ostoyae*, honey mushroom), all with an extensive underground hyphal network that potentially can translocate substances (herbicides) to fruiting bodies. The effect of individual herbicides on the hyphal networks of fungal species is largely unknown; and as a result effects on future populations of fungi remain unknown. Studies have revealed that herbicide effects on mycorrhizae vary, running the gamut of effect, including: stimulation of mycorrhizal growth, no effect, and inhibition of mycorrhizae (Estok, D. et al, 1989; Busse, M.D. et. al, 2001). This variability in effect is due to variation in the type of herbicide and concentration used, the fungal species involved, and environmental factors.

In addition, fungi hyphal networks can extend for long distances, and it is uncertain how to adequately buffer for these organisms. Broadcast treatments of herbicide might effect hyphae several hundred feet or more from the SOLI site, or not have an effect at all. The duration of the effect is also unclear, and would be variable depending on the type and concentration of the herbicide utilized, as well as on environmental factors (microbial activity, organic content, soil type, etc.).

It is unknown how herbicides might affect underground hyphal networks, a key to future populations. Effects on perennial fungi may be evident after treatment, however underground effects are not likely to be seen.

As extent of herbicide exposure increases, impacts to fungi would also be expected to increase, but the amount or significance of this is not known. No measures are available to resolve these uncertainties at the project scale.

Drift Management

The risk to non-target vegetation varies with the herbicide application method. Spot and hand application methods substantially reduce the potential for loss of non-target vegetation because there is little potential for drift. Drift is most associated with broadcast treatments and can be mitigated to some extent by the applicator. Droplet size is key to drift as larger droplets are heavier and therefore less affected by wind and evaporation. Figure 4 demonstrates the relationship between droplet size and buffer distance. As droplet size increases, the distance herbicide may travel in concentrations sufficient to harm plants decreases.

Dr. Harold Thistle, a physical scientist from the USDA in Morgantown, WV, specializes in computer modeling of herbicide drift. He modeled the potential for glyphosate to impact non-target vegetation from drift. The model predicted a 100-foot broadcast buffer would prevent glyphosate from harming plant species that are further away.

Factors affecting droplet size are nozzle type, orifice size and spray angle, as well as spray pressure, and the physical properties of the spray mixture. Wind speed restrictions also substantially contribute to a reduction in drift (Spray Drift Task Force, 2001). By simply changing the type of nozzle (diameter of pore size) used during broadcast treatments, the drift potential of herbicide can be effectively and substantially decreased as the droplet size forced out the nozzle is increased in size (Thistle 2006).

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

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

Marrs, R.H., in the 1989 publication, "Assessment of the Effects of Herbicide Spray Drift on a Range of Plant Species of Conservation Interest," examined the distances drift affected non-target vascular plants using broadcast treatment methods similar to those considered in this EIS. Their observations are consistent with drift-deposition models in which the fallout of herbicide droplets has been measured. The maximum safe distance at which no lethal effects were found was 20 feet, but for most herbicides the distance was 7 feet. Generally, damage symptoms were found at greater distances than lethal effects, but in most cases there was rapid recovery by the end of the growing season. No effects were seen to vascular non-target vegetation further than 66 feet from the broadcast treatment zone. Little information is available for how drift distances may effect non-vascular non-target vegetation. The distance spray drift will travel can vary substantially based on wind speed, topography, temperature, the herbicide applied, and the vegetation present.

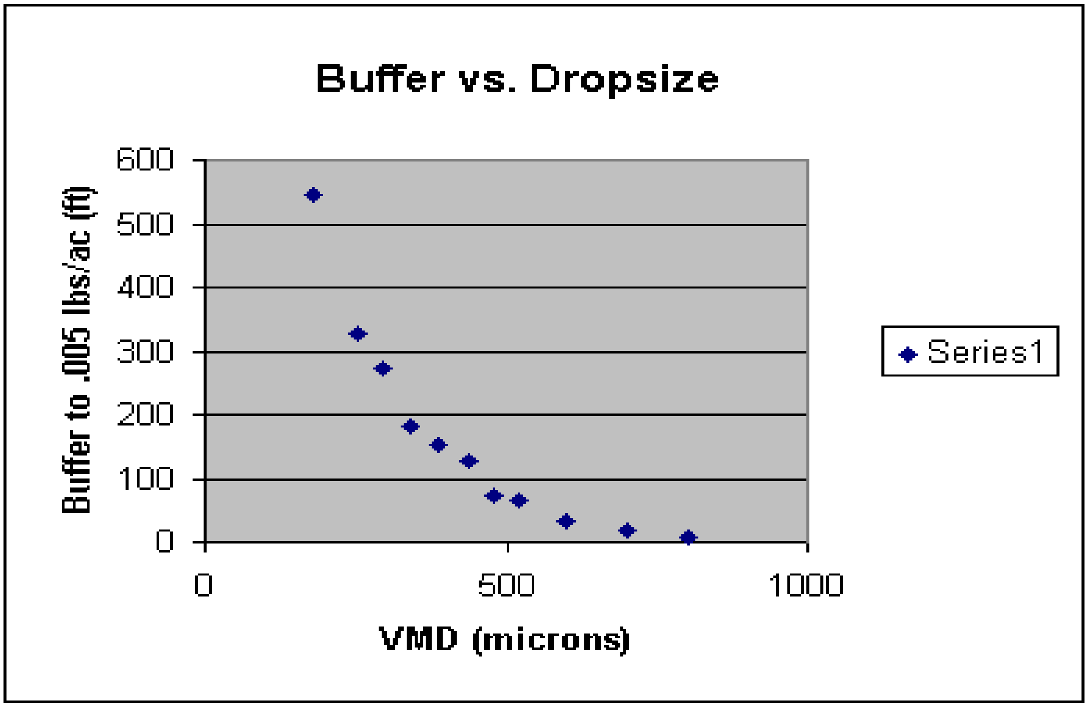

Figure 4. Relationship Between Droplet Size and Drift Distance

Special Forest Products

The most popular forest products gathered on the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area (Washington side) are berries, beargrass, salal, mushrooms and medicinal plants. Two of these species are target invasive plants (e.g. St. John's wort, Himalayan blackberries). Both of these species are widespread and are likely to persist within the project area.

The Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area (Washington side) are currently authorized to use herbicide treatments on 86 acres with no adverse effects on special forest products noted. Non-target special forest products would be protected by the project design criteria in all action alternatives, and increases in herbicide use conceivable in all alternatives would not likely result in adverse effects to non-target special forest products. However, forest products such as berries that are also invasive species would be killed under the most ambitious treatment scenarios.

Impact Determination for Regional Forester Sensitive Species

All alternatives have the potential to inadvertently harm individual Regional Forester Sensitive Plant Species in close proximity to treatment sites. The project design criteria minimize the likelihood that detectable adverse effects would occur and monitoring would ensure that any unintended consequences are quickly remedied. Uncertainty about effects on non-vascular plants would be addressed through monitoring. All alternatives are associated with the determination of: May Impact individual Regional Forester Sensitive Species, but none of the alternatives are expected to adversely impact populations or lead to listing of any plant species under the Endangered Species Act.

Effects from Herbicides to Botanical SOLI by Alternative

Direct and Indirect Effects of No Action

No Action would continue approved herbicide use on approximately 400 acres, of which about 100 acres are on the entire Gifford Pinchot National Forest. On the Columbia River Gorge National Scenic Area, nearly all the existing treatment areas could be treated under No Action, albeit with a smaller range of herbicides (3 compared to 10). Limited broadcast treatments have been approved on the Columbia River Gorge National Scenic Area. Limited herbicide use within the riparian reserves has also been approved on the Forest and Scenic Area.

The risk of adverse effects to non-target vegetation from No Action is very small on the Gifford Pinchot National Forest due to the small extent of treatment and lack of broadcast applications. Herbicide treatments have also not resulted in adverse effects to non-target vegetation on the Scenic Area because measures have been taken to protect desired vegetation, especially SOLI.

Native plants have been protected by using selective herbicides (eg. triclopyr kills broadleaf plants but does not affect grasses) and favoring non-herbicide treatments close to individual SOLI.

One drawback of No Action on the Scenic Area is that the more limited the range of herbicides available, the less likely a selective herbicide may be used that poses less risk to non-target vegetation.

Table 36-Indicators For Effects to Non-target Plants - No Action

Alternative	Estimated Proportion of Project with Potential Broadcast Application	Approximate Treatment Acreage Where All Options (including herbicide) are allowed	Number of Herbicides Available for Use
No Action	20%	400	3

Direct and Indirect Effects of Alternative B (Proposed Action)

The Proposed Action would increase the number of herbicides available for use, and far increase the availability of herbicide use in general as compared to No Action. The increase in use of herbicides would increase potential exposure and inadvertent harm to non-target vegetation. While the increase in herbicides partially mitigates the risk to non-target vegetation by allowing several options, Alternative B also allows use of several new herbicides (chlorsulfuron, metsulfuron methyl, sulfometuron methyl, imazapic, and imazapyr) that can harm non-target vegetation at low doses (R6 2005 FEIS, 4-27 to 4-33). Drift would be carefully managed (see PDC table in Chapter 2.5) when using these (as with all) herbicides.

On the Gifford Pinchot, Alternative B increases the acreage where herbicides could be used from 100 acres to 2,350 acres. This increases the potential for harm to SOLI as compared to No Action on the Forest; however, this potential is reduced by following the Common Control Measures, PDC and protection buffers described in Chapter 2. Using the lowest effective application rate and the smallest effective extent of application would further reduce the risk of unintentional effects.

Surveys would be completed as needed to identify vascular and non-vascular plant and perennial fungi SOLI if suitable habitat lied near a treatment sites. Broadcast treatments would be surveyed to 100 feet away from the treatment site; spot treatments would be surveyed to 10 feet of treatment sites, and hand treatments would be surveyed to within 5 feet of treatment sites (this would be increased to 10 feet in saturated/wet soils). Special care would be taken to manage drift when using sulfonylurea herbicides (sulfometuron methyl, metsulfuron methyl, chlorsulfuron). These herbicides would not be broadcast within 100 feet of susceptible native non-target vegetation.

Broadcast treatments carry some risk of harming non-target vegetation. However, broadcasting would not occur unless target species covered a large portion of a treatment site (estimated as 70 percent or more, see Chapter 2.5).   Broadcast treatments would be monitored to ensure that buffers were effective in protecting botanical SOLI, and to make sure that impacts are limited to 100 feet of the treatment site. Adjustments in application method or other variables (nozzle size) would be made if effects are greater than predicted in this FEIS.

Early Detection and Rapid Response under Alternative B (Proposed Action)

The PDC would ensure that treatment of currently undetected infestations would not harm botanical SOLI species. Surveys would be done depending on the treatment proposed and the type of habitat to be treated. Risks would be greatest adjacent to broadcast treatments.

Table 37-Indicators For Effects to Non-target Plants- Alternative B

Alternative	Estimated Proportion of Project with Potential Broadcast Application	Approximate Treatment Acreage Where All Options (including herbicide) are allowed	Number of Herbicides Available for Use
Alternative B	35%	2,710	10

Direct and Indirect Effects of Alternative C

Alternative C is more restrictive in the use of herbicides than Alternative B, which helps resolve concerns about non-target impacts. Cultural, manual and mechanical methods of treatment would be applied to 65 percent of the project area where herbicides would not be used. These methods of treatment are less likely to harm adjacent non-target vegetation than herbicide (see Appendix J of the R6 2005 FEIS for a full assessment of impacts of these treatments on non-target vegetation; such impacts are generally limited in extent and quickly remedied). However, as noted previously, these treatments may not cost-effectively control invasive plants.

Alternative C would not approve broadcast treatments anywhere in the project area, which would reduce the likelihood of non-target vegetation impacts as compared to Alternative B. Spot and hand/selective treatments could occur within about 35 percent of the area. PDC and buffers associated with spot and hand/selective treatment would be implemented and subject to adaptation depending on results (see Chapter 2, Implementation Planning).

Table 38-Indicators for Effects to Non-target Plants – Alternative C

Alternative	Estimated Proportion of Project with Potential Broadcast Application	Approximate Treatment Acreage Where All Options (including herbicide) are allowed	Number of Herbicides Available for Use
Alternative C	0	940	10

Early Detection and Rapid Response under Alternative C

PDC Group I (see Chapter 2.5) would ensure that treatment of currently undetected infestations would not harm botanical SOLI species. Surveys would be done depending on the treatment proposed and the type of habitat to be treated. Risks would be limited due to the prohibition on broadcast treatments.

Cumulative Effects of Herbicide Use on Non-target Plants and Fungi

The Affected Environment describes the limited range of some botanical SOLI. While past activities may have contributed to the limited extent of botanical SOLI within the analysis area, the pre-disturbance condition is not known. Therefore, the baseline for comparison of effects to botanical SOLI is the current inventory. Treatments under all the alternatives would not contribute to population losses of Species of Local Interest compared to the current inventory given the methods of application and associated buffers and design criteria.

The No Action does not pose any additional risk to botanical SOLI from treatment above baseline conditions. The 1998 EA/DN found that the currently approved treatments under No Action would have no significant impact on non-target vegetation.

While some adverse effects on non-target vegetation are possible from treatments considered in the action alternatives, they are unlikely to be significant because the extent and threats posed by treatment are generally very small compared to the known range of botanical species, including SOLI. Project design criteria mitigate known risks and the monitoring and adaptive management plan would ensure uncertain risks are also mitigated.

Invasive plant treatments within the range of botanical SOLI on lands outside National Forest are possible. Many species of local interest have no legal status and may be affected by activities off National Forest. On National Forest System land, viable populations are intended to be sustained. This situation is considered baseline, and none of the alternatives influence this baseline. Conditions for botanical SOLI would likely improve to the extent that treatments are effective.

Project design criteria in all action alternatives minimize or eliminate risks to non-target vegetation. No immediate conflicts between treatments and SOLI exist and monitoring and adaptive management would resolve uncertainties over time.

The spatial and temporal unintended impact of herbicide treatments to non-target vegetation is relatively small, within 100 feet of broadcast treated areas (drift zone) and much smaller (15 feet) with more selective application methods. Native plant communities are intended to be restored by the project, so habitat conditions would necessarily be improved after treatment or treatment would need to be adjusted accordingly. Treatment sites would be visited after treatment to determine re-treatment needs and adequacy of buffers to protect non-target vegetation. This approach minimizes risk of effects to appreciably accumulate.

Table 39-Alternative Comparison Risk Indicators for Botanical SOLI

Alternative	Estimated Proportion of Project with Potential Broadcast Application	Approximate Treatment Acreage Where All Options (including herbicide) are allowed	Number of Herbicides Available for Use
No Action (Alternative A)	Approximately 18 % (70 acres)	400	3
Proposed Action (Alternative B)	Approximately 35 % (940 acres)	2,710	10
Alternative C	None	940	10

3.3 Terrestrial Wildlife

3.3.1 Introduction

The potential effect of invasive plant treatment on wildlife is a primary public issue (Issue Group 4). The Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area provide diverse habitats, ranging from subalpine forest to wet meadows, and from late successional forest of Douglas-fir, to mixed conifer plantations, oak woodlands and grasslands for a diverse array of wildlife species, including amphibians and reptiles. Gifford Pinchot National Forest System lands and Columbia River Gorge National Scenic Area are located within the Pacific Flyway, which is a major migratory route for thousands of birds. Many species that are not permanent residents on the Forest may be found here during migration.

Gifford Pinchot National Forest System lands and Columbia River Gorge National Scenic Area provide important habitat for five federally listed species (four threatened and one endangered) and two species that are federal candidates, discussed in this section.

Invasive plant species have become established on Gifford Pinchot National Forest System lands and Columbia River Gorge National Scenic Area and continue to spread, causing a loss of wildlife habitat and posing a risk of injury to wildlife. Methods used to control invasive plants have the potential to have adverse effects to individual animals as well as wildlife habitat. The following wildlife analysis focuses on potential effects of invasive plants treatment on terrestrial Species of Local Interest, including Survey and Management species; Listed and Proposed Threatened and Endangered Species, Regional Forester Sensitive Species and Management Indicator Species (MIS). Effects on MIS species indicate welfare of other species using the same habitat (Thomas 1979). Birds of Conservation Concern and the Landbird Conservation Strategy are also discussed.

3.3.2 Affected Environment

Invasive Plants and Wildlife Habitat

Some wildlife species utilize invasive plants for food or cover. For example, it has been reported that elk, deer and rodents eat rosettes and seed heads of spotted knapweed; however, the few uses that an invasive plant may provide do not outweigh the adverse impacts to an entire ecosystem (Zavaleta, 2000). More detailed information on the effects of invasive plants to wildlife is reported in the R6 2005 FEIS.

Invasive plants have adversely impacted habitat for native wildlife (Washington Dept. of Fish and Wildlife, 2003). Any species of wildlife that depends upon native understory vegetation for food, shelter, or breeding, is or can be adversely affected by invasive plants.

In the case of common burdock (A*rctium minus)*, the prickly burs can trap bats and hummingbirds and cause direct mortality to individuals (Raloff, 1998; National Park Service 1999). Himalayan blackberry has created a physical barrier and blocked salmonid migration upstream in one tributary on the Columbia River Gorge National Scenic Area (Fiedler 2005).

Habitats that become dominated by invasive plants are often not used, or used much less, by native and rare wildlife species. Washington Department of Fish and Wildlife (2003) identified invasive plants, such as yellow starthistle and knapweed, as threats to upland game bird habitat. Species restricted to very specific habitats, for example pond-dwelling amphibians, are more susceptible to adverse effects of invasive plants.

Of the federally listed terrestrial wildlife species that occur on Gifford Pinchot National Forest System lands and Columbia River Gorge National Scenic Area, none are known to be adversely affected by invasive plants within the project area. Bald eagle mortality in other parts of the U.S. has been linked to a toxin produced by a *cyanobacterium* that grows on the invasive aquatic plant, *Hydrilla verticillata* (Wilde, 2005).

Some invasive species could adversely affect bald eagle foraging areas by creating dense patches of tall vegetation in and around streams or rivers, which may hinder access to salmon.

In summary, invasive plants are known or suspected of causing the following effects to wildlife:

- Embedded seeds in animal body parts (e.g. foxtails), or entrapment (e.g. common burdock) leading to injury or death.
- Scratches leading to infection.
- Alteration of habitat structure leading to habitat loss or increased chance of predation.
- Change to effective population through nutritional deficiencies or direct physical mortality.
- Poisoning due to direct or indirect ingestion of toxic compounds found on or in invasive plants.
- Altered food web, perhaps due to altered nutrient cycling.
- Source-sink population demography, with more demographic sinks than sources.
- Lack of proper forage quantity or nutritional value at critical life periods.

Threatened, Endangered, Sensitive, and Management Indicator Species

Federally Listed Species

Several species listed as "threatened," and one listed as "endangered" under the Endangered Species Act (ESA) of 1973 (as amended), are found, or are suspected to occur, on Gifford Pinchot National Forest System lands and/or Columbia River Gorge National Scenic Area (Washington side). In addition, the U.S. Fish and Wildlife Service (FWS) maintain a list of "candidate" species. Candidate species are those taxa that the FWS has on file sufficient information on biological vulnerability and threats to support issuance of a proposal to list, but issuance of a proposed rule is currently precluded by higher priority listing actions (U.S. Fish and Wildlife Service 1996). Listed and candidate species found on Gifford Pinchot National Forest System lands and National Scenic Area are included in table 40.

Table 40-Federally Listed Terrestrial Species within the Project Area

Common Name	Scientific Name	Status	Critical Habitat	Unit
Mammals				
Grizzly bear	*Ursus arctos horribilis*	Threatened	None	GP
Gray wolf	*Canis lupus*	Endangered	None	GP
Birds				
Bald eagle[24]	*Haliaeetus leucocephalus*	Sensitive (see below)	--	--
Northern spotted owl	*Strix occidentalis caurina*	Threatened	Designated	GP, NSA
Marbled murrelet	*Brachyramphus marmoratus*	Threatened	Designated	GP
Amphibian				
Oregon spotted frog	*Rana pretiosa*	Candidate	None	GP
Invertebrate				
Mardon skipper	*Polites mardon*	Candidate	None	GP

The two candidate species found on the Gifford Pinchot National Forest, Oregon spotted frog and mardon skipper, are also included in the Regional Forester's Sensitive Species List. Both species are discussed in section 3.2.2 titled "Forest Service Sensitive Species."

Brief general descriptions of the species' life history, threats, conservation measures, and their occurrence are in Appendix C. More detailed accounts can also be found in the Biological Assessment prepared for the Regional Invasive Plant Program (USDA Forest Service 2005), which is incorporated by reference.

Forest Service Sensitive Species

Terrestrial wildlife species found on Gifford Pinchot National Forest System lands and/or Columbia River Gorge National Scenic Area (Washington side) that are included in the Region's Sensitive Species Program are listed in table 41. The Sensitive Species Program and the Regional Forester's Sensitive Species List are proactive approaches for meeting the Agency's obligations under the Endangered Species Act and the National Forest Management Act (NFMA), and National Policy Direction as stated in the 2670 section of the Forest Service Manual and the U.S. Department of Agriculture Regulation 9500-4. The primary objectives of the Sensitive Species program are to ensure species viability throughout their geographic ranges and to preclude trends toward endangerment that would result in a need for federal listing. Species identified by the FWS as "candidates" for listing under the ESA, and meeting the Forest Service criteria for protection, are included on the Regional Forester's Sensitive Species Lists; the mardon skipper meets this criteria.

[24] The bald eagle was removed from the endangered species list (delisted) on June 28, 2007 (U.S. Fish and Wildlife Service 2007). Effects and PDFs would not be affected by the delisting; as per Forest Service policy, it is now included on the Region 6 Regional Forester's Sensitive Species List.

Table 41-Regional Forester Sensitive Terrestrial Wildlife Species within the Project Area

Common Name	Scientific Name	GP Occurrence*	Columbia River Gorge National Scenic Area Occurrence*
Mammals			
Townsend's big-eared bat	*Corynorhinus townsendii*	Documented	Documented
Pacific fringe-tailed bat	*Myotis thysanodes vespertinus*		Suspected
California wolverine	*Gulo gulo*	Documented	Documented
Western gray squirrel	*Sciurus griseus*	Suspected	Documented
Birds			
Bald eagle	*Haliaeetus leucocephalus*	Documented	Documented
Common loon	*Gavia immer*	Documented	Documented
Clark's grebe	*Aechmophorus clarkia*		Documented
Horned grebe (OR only)	*Podiceps auritus*		Documented
Red-necked grebe (OR on)	*Podiceps grisegena*		Documented
Eared grebe	*Podiceps nigricollis*		Documented
Ferruginous hawk	*Buteo regalis*	Documented	Suspected
American peregrine falcon	*Falco peregrinus anatum*	Documented	Documented
Great gray owl	*Strix nebulosa*	Suspected	
Gray flycatcher	*Empidonax wrightii*		Suspected
Ash-throated flycatcher	*Myiarchus cinerascens*		Documented
Green-tailed towhee	*Pipilo chlorurus*	Suspected	
Amphibians			
Oregon slender salamander	*Batrachoseps wrighti*		Documented
Larch Mountain salamander	*Plethodon larselli*	Documented	Documented
VanDyke's salamander	*Plethodon vandykei*	Documented	
Cope's giant salamander	*Dicamptodon copei*	Documented	Documented
Cascade torrent salamander	*Ryhacotriton cascadae*	Documented	Documented
Oregon spotted frog	*Rana pretiosa*	Documented	Suspected
Reptiles			
Northwestern pond turtle	*Clemmys marmorata marmorata*	Documented	Documented
Striped whipsnake	*Masticophis taeniatus*	Documented	
Sharp-tailed snake	*Contia tenuis*		Documented
California mountain kingsnake	*Lampropeltis zonata*	Documented	Documented
Terrestrial Invertebrates			
Mardon skipper	*Polites mardon*	Documented	
Puget Oregonian snail	*Cryptomastix devia*	Documented	Documented
Columbia Oregonian snail	*Cryptomastix hendersoni*		Documented
Dalles sideband snail	*Monadenia fidelis minor*	Documented	Documented
Warty jumping slug	*Hemphillia glandulosa*	Documented	
Burrington's jumping slug	*Hemphillia burringtoni*	Documented	
Malone's jumping slug	*Hemphillia malonei*	Documented	Documented
Panther jumping slug	*Hemphillia pantherina*	Suspected	
Blue-gray taildropper slug	*Prophysaon coeruleum*	Documented	Documented

* Documented – in the context of the Forest Service sensitive species program, an organism that has been verified to occur in or reside on an administrative unit.
Suspected – in the context of the Forest Service sensitive species program, an organism that is thought to occur, or that may have suitable habitat, on Forest Service land or a particular administrative unit, but presence or occupation has not been verified.
\+ all slugs and snails are species included in the Survey and Manage program.

Of the above listed sensitive species, the Gifford Pinchot National Forest does not contain suitable habitat for the green-tailed towhee and there have been no confirmed sightings. It does not occur on the Columbia River Gorge National Scenic Area. Thus, green-tailed towhees will not be discussed further in this analysis.

The panther jumping slug has never been found on either unit, despite extensive mollusk surveys, and there is considerable doubt that it is a valid taxon. It will not be discussed further in this analysis.

The Oregon slender salamander has only been documented on the Oregon side of the Columbia River Gorge National Scenic Area, which is not in the project area for this analysis, and does not occur on the Gifford Pinchot National Forest so it will not be discussed further.

Brief general descriptions of the species' life history and their occurrence on the Gifford Pinchot National Forest and/or Columbia River Gorge National Scenic Area are in Appendix C.

Survey and Manage Species

On January 9, 2006, Judge Pechman signed an Order on Plaintiffs' Motion for Injunctive Relief (Northwest Ecosystem Alliance et al. v. Mark E. Rey et al., No. 04-844P) that:

1. "The Record of Decision dated March 22, 2004, entitled "To Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl" (the "2004 ROD") is hereby set aside, and Defendants shall not rely on it or implement it."
2. "The Record of Decision dated January 2001, entitled "Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines" (the "2001 ROD") is hereby reinstated, including any amendments or modifications to the 2001 ROD that were in effect as of March 21, 2004." [e.g., including results of the 2001, 2002, and 2003 Annual Species Reviews (ASR)].
3. "Defendants shall not authorize, allow, or permit to continue any logging or other ground-disturbing activities on projects to which the 2001 ROD applied unless such activities are in compliance with the provisions of the 2001 [sic] ROD (as the 2001 ROD was amended or modified as of March 21, 2004)."
4. "No project or activity enjoined under this Order may occur unless and until this Court modifies or vacates this Order." [or the agencies bring the activities into compliance with the 2001 ROD].

Species that were covered under Survey and Manage as of March 21, 2004 (prior to the 2004 ROD) are once again included in the Survey and Manage program. The inclusion of some of these species in the Region's Special Status/Sensitive Species Program remains in effect. For the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area, all the mollusks and salamanders that are included in the Survey and Manage program are also included in the Special Status/Sensitive Species Program and are listed above, life histories are included in Appendix C, and effects are discussed in the section titled "Direct and Indirect Effects on Regional Forester Sensitive Species."

Management Indicator Species

Management Indicator Species (MIS) are selected species whose welfare is believed to be an indicator of the welfare of other species using the same habitat or a species whose condition can be used to assess the impacts of management actions on a particular area (Thomas 1979). Table 42 includes those species that were identified as MIS for the Gifford Pinchot National Forest System lands and/or Columbia River Gorge National Scenic Area (Washington side) (USDA 1990). Aquatic MIS are discussed in the aquatic species specialist's report.

Table 42-Terrestrial Wildlife Management Indicator Species within the Project Area

Common name	Scientific Name
Bald eagle	*Haliaeetus leucocephalus*
Northern Spotted owl	*Strix occendentalis caurina*
Peregrine falcon	*Falco peregrinus anatum*
Pileated woodpecker	*Dryocopus pileatus*
"Cavity excavators"	see below
Wood duck	*Aix sponsa*
Barrow's goldeneye duck	*Bucephela islandica*
Black-tailed deer	*Odocoileus hemionus columbianus*
Roosevelt elk	*Cervus canadensis roosevelti*
Mountain goat	*Oreamnos americanus*
Pine marten	*Martes martes*

Species identified as MIS for the Gifford Pinchot National Forest System lands and/or Columbia River Gorge National Scenic Area (Washington side) represents a suite of species that are dependent on a variety of habitat types, features, and conditions.

The bald eagle is sensitive to management in riparian areas. The northern spotted owl represents wildlife species associated with mature and older coniferous forests. The bald eagle and northern spotted owl are discussed under the section titled "Federally Listed Species." Peregrine falcon is discussed under the section titled "Regional Forester Sensitive Species." MIS are discussed below.

Pileated woodpecker

The Gifford Pinchot National Forest LRMP uses the pileated woodpecker as an indicator for moderate-sized areas (300 acres) of mature and old growth coniferous forest. The pileated woodpecker is the largest woodpecker species in the western United States and nests in cavities of large trees or snags. It is a denizen of mature forests, relying on dead and decaying trees for foraging and nesting. Pileated woodpeckers can act as a keystone habitat modifier by excavating large numbers of cavities that are depended upon by several other species, and by influencing ecosystem processes such as decay and nutrient cycling (Aubry and Raley 2002). Pileated woodpeckers will return to areas after timber harvesting (Ehrlich 1988), however, past management in the Pacific Northwest has lead to relatively few snags and down logs, especially of large diameters, remaining in many watersheds.

Cavity Excavators

A large number of species rely on cavities in trees for shelter and nesting. The Gifford Pinchot National Forest LRMP (USDA 1990) has designated the hairy woodpecker as the representative cavity excavator for this Management Indicator category.

Brief general descriptions of the hairy woodpecker's life history and their occurrence are in Appendix C.

Wood duck

Wood ducks represent species that require mature deciduous riparian habitat. This species is found in various locations throughout the western U.S. It breeds in most of Washington and Oregon, except southeast Oregon, and is a year-round resident along the coastal portions of the two states. Wood ducks are associated with wooded wetlands and they nest in tree cavities. Artificial nest boxes placed for them are readily accepted in lieu of tree cavities. Wood ducks feed on acorns, seeds of trees, shrubs, and aquatic plants berries, and grapes (Martinson 2003). Most feeding is done in flooded areas.

The wood duck is a common nester at many lower elevation ponds and wetlands on the Gifford Pinchot National Forest. They use nest boxes that have been placed for them at a number of ponds. This duck is particularly common in treatment blocks 35-16 and 35-18.

Some wood duck ponds are adjacent to (or in some cases at the edge of) roads proposed for treatment. Some invasive plants, such as Japanese knotweed, could adversely affect habitat for the wood duck by reducing access to foraging areas.

Barrow's goldeneye

Barrow's goldeneye represents species that require coniferous forest riparian and wetland areas. More than 90 percent of the world's population breeds west of the Rocky Mountains from central Alaska south to northern California (Scheuering 2003). The winter distribution concentration on the Pacific coast occurs from Alaska to northern Washington (Scheuering 2003). It breeds primarily on inland waters at higher elevations such as alpine and sub-alpine lakes, reservoirs, and rivers. Barrow's goldeneye normally nests in cavities of dead and dying trees in forested areas. They eat aquatic invertebrates and also some buds and tubers of aquatic plants.

Barrow's goldeneyes nest at a few high-elevation lakes and large ponds on the Gifford Pinchot National Forest (e.g. Packwood and Walupt Lakes) and it is a fairly common migrant. One known site is located within or adjacent to treatment area 33-03r3. Some invasive plants could adversely affect habitat for Barrow's goldeneye by reducing access to foraging areas.

Roosevelt Elk and Black-tailed Deer

These two species are known throughout the Gifford Pinchot National Forest and, to a lesser extent, the Columbia River Gorge National Scenic Area (Washington side). There are several established herds of Roosevelt elk that reside on the Forest as year-round residents, as well as many that are migratory. The Scenic Area is generally too fragmented, and contains too much disturbance to provide much elk habitat, but they do occur around the Wind Mountain and the North Bonneville area (C. Fiedler, personal communication, 2005). Deer occur throughout the Forest and Scenic Area, and both species use a combination of habitats comprised of cover and forage areas that are not too fragmented by road systems. Extensive winter range for these species occurs throughout the Gifford Pinchot National Forest below 2400 feet in elevation. A few elk calving areas are mainly adjacent to small ponds and wetlands below 3500 feet in elevation, and scattered widely. On the Cowlitz Valley Ranger District, hundreds of elk consume forage in private fields and pastures throughout the winter, many of which have Scotch broom (Kogut, personal observation). Invasive plants on the forest are present in important foraging areas and if infestations expanded, the quality and quantity of available forage could be reduced.

The Gifford Pinchot National Forest has a Limited Operating Period restriction for projects in winter range from December 1 to April 1. The calving area Limited Operating Period is May 15 to July 1. A portion of one road proposed for treatment (treatment area 33-12a) passes through an area of the forest that contains important foraging areas from spring through fall (Wainwright, personal communication, 2005).

Mountain goat

The mountain goat is most often found above the timberline, but will also use forested areas in winter. It feeds primarily on grasses, forbs, shrubs, and lichen. There is a restricted hunting season in Washington. Mountain goats are sensitive to habitat changes from timber or fire management and to disturbance from recreation and roads. Invasive plants threaten the quality and quantity of available forage.

The mountain goat is common on the northern portion of the Gifford Pinchot National Forest, which contains 90 percent or so of the goats on the Forest.

Mountain goats do not occur within or adjacent to any proposed treatment areas. They were present historically in Columbia River Gorge National Scenic Area (Washington side), but there is no longer a resident population there. In the 1990s a solitary goat entered the scenic area from the Mount Adams area of the Gifford Pinchot National Forest, and it remained near Lyle, Washington until it died a few years later (Fiedler 2006).

Pine Marten

The pine marten (also known as the American marten, *Martes americana*) represents species that inhabit mature coniferous forest habitats. Pine martens occur in forests containing snags and down logs, which provide suitable denning sites. The pine marten is most closely associated with heavily forested east and north-facing slopes that contain numerous windfalls (Maser 1998). They tend to avoid areas that lack overhead protection and the young are born in nests within hollow trees, stumps, or logs. Martens do not tolerate concentrated human use or habitat modification (Maser et al. 1981).

Pine martens spend a great deal of time in trees and can even leap from branch to branch between trees. They eat a variety of small mammals, particularly squirrels, as well as voles, mice, pika, and rabbits. Invasive plants are not impacting habitat for the pine marten.

The pine marten is fairly common in mature and late-successional forests on Cowlitz Valley Ranger District, Gifford Pinchot National Forest, more so in higher elevation (silver-fir zone) forests. It has been found denning in snags and down logs in campgrounds, such as Walupt Lake (treatment area 35-14r1) (Kogut, personal communication, 2005.). There are 6 recorded locations for pine marten within 5 treatment areas on the Gifford Pinchot National Forest. Pine martens may be present in some isolated areas of the Columbia River Gorge National Scenic Area (Washington side), but there are no known locations within treatment areas in the scenic area.

Washington State Sensitive Species on the Columbia River Gorge National Scenic Area

The 1992 Management Plan (revised 2006) for the Columbia River Gorge National Scenic Area requires that NEPA documents include effects to Washington State Endangered, Threatened, Sensitive, and Candidate species with historic or suspected range in the NSA. Many species on the Washington State lists were discussed previously because they are also listed as federal threatened or endangered species; Regional Forester Sensitive Species; Survey and Manage and/or Management Indicator Species. Species on the Washington State list that have been discussed previously include: Cascade torrent salamander, Larch Mountain salamander, Columbia Spotted frog, Oregon Spotted frog, Northwestern pond turtle, California mountain kingsnake, sharptail snake, striped whipsnake, bald eagle, Northern spotted owl, Ferruginous hawk, peregrine falcon, common loon, grizzly bear, gray wolf, California wolverine, Pacific fisher, Columbian white-tailed deer, Western gray squirrel, Townsend's big-eared bat, and mardon skipper butterfly.

Terrestrial wildlife species on the Washington State lists that were not previously discussed include: northern leopard frog (*Rana pipiens*), western toad (*Bufo boreas*), northern goshawk (*Accipiter gentiles*), golden eagle (*Aquila chrysaetos*), merlin (*Falco columbarius*), flammulated owl (*Otus flammeolus*), western grebe (*Aechmophorus occidentalis*), American white pelican (*Pelecanus erythrorhynchos*), sandhill crane (*Grus canadensis*), yellow-billed cuckoo (*Coccyzus americanus*), Lewis' woodpecker (*Melanerpes lewis*), white-headed woodpecker (*Picoides albolarvatus*), black-backed woodpecker (*Picoides arcticus*), sharp tailed grouse (*Tympanuchus phasianellus*), sage thrasher (*Oreoscoptes montanus*), Vaux's swift (*Chaetura vauxi*), purple martin (*Progne subis*), white-tailed jackrabbit (*Lepus townsendii*), Washington ground squirrel (*Spermophilus washingtoni*), gray tailed vole (*Microtus canicaudus*), Columbia River tiger beetle (*Cicindela columbica*), Yuma skipper butterfly, chinquapin hairstreak butterfly (*Habrodais grunus herri*), and Johnson's hairstreak butterfly (*Mitoura johnsoni*).

Several of these species would not be affected by proposed invasive plant treatments because they are not present within the National Scenic Area, or habitat for these species would not be treated as a part of the project, as shown in the table 43.

Table 43-Washington State Listed Species Not Affected By Invasive Plant Treatments on the NSA

Species	Situation
Northern leopard frog	extirpated from NSA
Sandhill crane	not present in NSA
Yellow-billed cuckoo	extirpated from NSA
White-headed woodpecker	not present in NSA
Black-backed woodpecker	not present in NSA
Sharp-tailed grouse	not present in NSA
Sage thrasher	habitat not present, no records in NSA
Washington ground squirrel	not present in NSA
White-tailed jackrabbit	not present in NSA
Johnson's hairstreak butterfly	old-growth obligate, habitat not treated
Gray-tailed vole	No habitat currently near invasive plant treatments or likely to be near new detections.

Birds of Conservation Concern

Gifford Pinchot National Forest and the Columbia River Gorge National Scenic Area (Washington side) are included in Bird Conservation Region Five (Northern Pacific Forests) and Region Nine (Great Basin). Within this region, the Forest and Scenic Area may provide habitat, based on range maps in NatureServe Explorer (NatureServe 2005, Ridgely et al. 2003) and forest survey information for several species listed by the United States Department of Interior Fish and Wildlife Service (FWS) as "Birds of Conservation Concern." Of the species on in these two Regions, only the following are likely to be present in habitats where invasive plant treatments are proposed and susceptible to disturbance or herbicide exposure: rufous hummingbird, olive-sided flycatcher, loggerhead shrike, Oregon vesper sparrow, Brewer's sparrow, and sage sparrow. Brief descriptions of these species' life history are found in Appendix C.

Landbirds

In 1999, Partners in Flight released a Conservation Strategy for landbirds in Coniferous Forests of Western Oregon and Washington (Altman 1999). The strategy identifies a select group of focal species and their associated habitat attributes that can be used to identify desired forest landscapes. Many of the focal species identified (Altman 1999) are found on the Gifford Pinchot National Forest and the Columbia River Gorge National Scenic Area (Washington side). The strategy is intended to help facilitate land management planning for healthy populations of native landbirds. The document focuses on landscape-scale forest management, with emphasis on habitat structure. Most of the conservation options recommended in the strategy are not relevant to invasive plant treatments because the treatments proposed in this FEIS do not involve modifying native forest habitat structure or age.

A conservation option listed for Vaux's swift, pileated woodpecker, and western bluebird states "avoid use of pesticides" near or in habitat, citing Washington Department of Fish and Wildlife (WDFW 1995). This citation is not included in the Literature Cited section of Altman (1999). Current management recommendations for Vaux's swift recommend avoiding use of insecticides near nest and roosts (Lewis, Morie, and Milner 2004). There is no mention of pesticide use near pileated woodpecker habitat (Lewis and Azerrad 2004). The Proposed Action does not include use of insecticides. Herbicide use would not occur on native plants that provide habitat for bluebirds.

The following conservation option is listed for Wilson's warbler and Orange-crowned warbler: "Discontinue use of herbicide for deciduous tree and shrub control in designated conservation areas for species associated with a deciduous understory." No source or reference is cited for this recommendation. The Proposed Action does not include controlling native trees or shrubs.

Therefore, the Proposed Action is consistent with all conservation options included in the landbird conservation strategy (Altman 1999).

Of the coniferous forest focal species identified in Altman (1999), the following species are most likely to forage or nest near the ground and potentially be exposed to disturbance or herbicides: varied thrush, Wilson's warbler, winter wren, black-throated gray warbler, Hutton's vireo, olive-sided flycatcher, western bluebird, orange-crowned warbler, rufous hummingbird (Source: Altman 1999, Marshall et al. 2003).

Amphibian Decline

Many species of amphibians in many parts of the world have experienced alarming population declines in the past two decades. International task forces have been formed and scientists have researched causes. A number of studies have documented declines, even in relatively undisturbed habitats (Drost and Fellers 1996, Lips 1998), while other studies have found some populations to be stable (Pechmann et al. 1991). However, detecting actual population declines in amphibian populations is difficult due to the extreme annual variation in populations caused by environmental factors, such as drought (Pechmann et al. 1991, Reed and Blaustein 1995).

Potential causes of amphibian declines investigated include ultraviolet radiation (Starnes et al. 2000, Adams et al. 2001), pesticides (Bridges and Semlitsch 2000), global warming (Blaustein et al. 2001, Crump 2005) habitat loss, non-native predators (e.g. Drost and Fellers 1996, Knapp and Matthews 2000), and disease (Muths et al. 2003, Berger et al. 1998, Berger et al. 1999), among others. Results of studies are variable and some populations are in decline while others are not. There is no "smoking gun" and all the causes are implicated to some degree (Halliday 2005).

Hayes et al. (2003, 2006) found that exposure to the herbicide atrazine caused hermaphroditism and testicular oocytes in African clawed frogs and wild leopard frogs and suggested that this could be concern in regard to amphibian declines. Population level effects to amphibians from atrazine exposure are unclear as wild leopard frogs were abundant at collection sites for the Hayes et al. study (2003).

3.3.3 Environmental Consequences

Introduction

Effects of invasive plant treatment methods to wildlife were evaluated and discussed in detail in the R6 2005 FEIS and its Appendix P, the corresponding Biological Assessment (USDA Forest Service 2005c), project files, and SERA risk assessments (2001, 2003, 2004). These documents indicate that disturbance from manual and mechanical treatment pose greater risks to terrestrial wildlife species of local interest than herbicide use.

For spotted owls and marbled murrelets, loud and sudden noises above background or ambient levels (those above 92 dB) can cause disturbance that might flush a bird off the nest or abort a feeding attempt. Vehicles used to spray roadside vegetation with herbicides do not make noise above 92 dB, based on recent field measurements, so no "injury" or "harassment" from noise will occur. Other mechanical devises proposed for use on invasive plants include brushing machines, mowers, chainsaws, and string trimmers. These tools have the potential to create noise above background levels that may disturb owls or murrelets if used close to nests during the early nesting season.

Small species that lack rapid mobility (e.g. mollusks and salamanders) are vulnerable to crushing or injury from people or equipment. Invasive plant treatments will not alter native habitat structure or composition for MIS, or bird species included in Birds of Conservation Concern or the Partners in Flight strategy for landbirds (Altman 1999).

Grazing by goats can cause some disturbance and removal of cover (e.g. Himalayan blackberries) that may be used by some birds. However, none of the species included in the Birds of Conservation Concern for the project area are reported to depend on cover provided by invasive blackberries.

Grazing is proposed on the Columbia River Gorge National Scenic Area to remove a very heavy infestation of blackberry growing in the stream channel, underneath the riparian canopy. Removal of the blackberry by goats will not affect any of the listed, sensitive, MIS, or birds discussed in this document, so the effects of grazing will not be discussed further.

Risk from herbicide exposure was determined using data and methods outlined in the SERA risk assessments. The Biological Assessment for the R6 2005 FEIS (USDA Forest Service 2005c, pp. 138-140) shows the toxicity indices used as the thresholds for potential adverse effects to mammals and birds (respectively) from each herbicide. A quantitative estimate of dose using a “worst case” scenario was compared to these toxicity indices. There is insufficient data on species-specific responses to herbicides for free-ranging wildlife, so wildlife species were placed into groups based on taxa type (e.g. bird, mammal), body size, and diet (e.g. insect eater, fish eater, herbivore).

Under “worst case” scenarios, mammals and birds that eat insects or grass may be harmed by some herbicides and surfactants. Amphibians also appear to be at higher risk of adverse effects due to their permeable skin and aquatic or semi-aquatic life history.

The SERA and Bakke risk assessments and the R6 2005 FEIS indicated that for typical application rates, triclopyr and NPE surfactants produced doses that exceeded toxicity indices for birds and mammals. NPE surfactant exceeded the toxicity index for direct spray of a small mammal, large mammal and large bird that consumed contaminated vegetation (acute), and small mammal and small bird that consume contaminated insects.

The “worst case” exposure scenarios do not account for factors such as timing and method of application, animal behavior and feeding strategies, seasonal presence or absence within a treatment area, and/or implementation of project design criteria. Therefore, risk is overestimated when compared to actual applications proposed in this EIS.

Nonetheless, caution in the design and implementation of the project is warranted. In many cases, insufficient data is available to allow quantitative risk assessment. For instance, there is no quantitative scenario for a predatory bird that eats primarily other birds, like the peregrine falcon, so the “fish-eating bird” scenario was used as a surrogate. This scenario likely overestimates the dose to the peregrine falcon because the hypothetical fish consumed are from a pond contaminated by a large spill of herbicide. These hypothetical fish likely have higher concentrations of herbicide in their bodies (and thus a higher dose to the predatory bird) than would a small bird that incidentally ingested herbicide before it was preyed upon. Also, data was insufficient to assess risk of chronic exposures for a large grass-eating bird from NPE exposure, or insect-eating birds and mammals for several herbicides. Data was also lacking on potential adverse effects of herbicides to mollusks and amphibians. Some data suggested that amphibians may be as sensitive to herbicides as fish (Berrill et al. 1994; Berrill et al. 1997; Perkins et al. 2000).

The limited spatial extent of infestations, which are limited primarily to disturbed roadsides (see Section 2.5), and the limits placed on herbicide applications will reduce exposure of wildlife to herbicides. Standards 19 and 20 adopted in the Forest Plan as amended by the R6 2005 ROD require that adverse effects to wildlife species of local interest from invasive plant treatments be minimized or eliminated through project design and implementation. In addition, Standard 16 restricts broadcast use of triclopyr, which eliminates plausible exposure scenarios. All action alternatives must be designed to comply with these standards.

To account for uncertainty, the PDC restrict broadcast herbicide treatments near perennial streams; minimize disturbance to certain habitats during certain times of the year; and limit the amount or proportion of certain habitats that may be treated in a 30-day period. These Forest Plan Standards and project design criteria ensure that no alternative adversely affects federally listed terrestrial species; results in a trend toward listing of any sensitive species; nor adversely impacts the habitat of Management Indicator Species, landbirds, or Birds of Conservation Concern.

The direct, indirect, and cumulative effects analysis applies to herbicide use under all alternatives. The differences between alternatives do not result in significant differences to impacts on wildlife, even though there are differences in the acreage treated, the methods used, and the range of herbicides permitted. This is because the PDC serve to limit the risks associated with herbicide use sufficiently to compensate for extent of exposure. The layers of caution applied to risk assessment and interpretation discussed previously reinforce the conclusion that exposures of herbicide would be below thresholds of concerns for all wildlife species, including those of local interest.

The negligible effects of non-herbicide treatments are disclosed in Appendix J of the R6 2005 FEIS, and discussed as applicable below. All alternatives would result in disturbance and some herbicide exposures, however all alternatives would follow PDC that limit disturbance and exposure to low levels.

Direct and Indirect Effects on Federally Listed Species: Grizzly Bear, Gray Wolf, Spotted Owls, Marbled Murrelets

The project design criteria listed for spotted owls, and marbled murrelets apply to all action alternatives. For marbled murrelets, which feed upon fish, adverse effects from herbicide or NPE surfactant exposure are not plausible because even if they fed on contaminated fish for a lifetime, the estimated dose for herbicide or NPE does not exceed a threshold of concern for potential effects (i.e. the toxicity index), and murrelet prey is not found on National Forest System land. For spotted owls, no herbicide or NPE dose from feeding on prey that had been directly sprayed exceeded the toxicity index for typical application rates. In addition, exposure of spotted owl prey to herbicide, and the consumption of contaminated prey by spotted owls are not plausible because of the life history and habitat of the prey. The owl’s arboreal and nocturnal prey, which does not feed upon invasive plants, has almost no opportunity to become exposed to herbicide or NPE surfactants.

Exposure scenarios used to analyze potential effects from herbicides are discussed in the 2005 R6 FEIS (Appendix P, p. 15-17).

Grizzly Bear and Gray Wolf

Grizzly bear and gray wolf do not likely occur with any regularity on the Gifford Pinchot National Forest and do not occur on the Columbia River Gorge National Scenic Area. Invasive plant treatments in suitable habitat would be rare and located primarily along roads. Because it is highly unlikely that invasive plant treatments would coincide with grizzly bear or gray wolf presence, there will be no adverse effects to them regardless of alternative chosen.

Northern Spotted Owl

Disturbance

Invasive plant treatments may disturb spotted owls during the nesting season. Direct effects from invasive plant treatment include disturbance caused by noise, people, vehicles and equipment. The potential for visual disturbance to cause harassment of spotted owls is low. Noise-generating activities above ambient could potentially cause enough disturbance to result in harassment of northern spotted owls during the breeding season.

Noise or visual stimuli may interrupt or preclude essential nesting and feeding behaviors, cause flushing from the nest or missed feedings of young (U.S. Fish and Wildlife Service, 2003).

Projects that generate noise or activity above ambient levels and occur within 35 yards (for heavy equipment), or 65 yards (for chainsaws or motorized tools), from an active spotted owl nest may cause these harassment effects (U.S. Fish and Wildlife Service, 2003). Some equipment used to treat invasive plants could create noise above ambient levels, depending upon site-specific conditions. Engines used to pump herbicide and other liquids through nozzles for roadside spraying operations, normally in the back of a pick up truck, may generate noise levels that could disturb spotted owls. Because noise levels of this type of equipment were not known, two diesel pump engines used for roadside spraying were evaluated for noise level. Two separate readings of different pump engines using different decibel meters produced readings of 72-75 decibels within 10 yards, dropping to 64-67 decibels at 35 yards (observations in the project file). The threshold for noticeable noise is 70 decibels and the threshold for disturbance causing "injury" is 92 decibels (U.S. Fish and Wildlife Service 2003). Vehicles used to spray roadside vegetation with herbicides do not make noise above 92 dB, based on the measurements taken, so no effect to the northern spotted owl from noise disturbance will occur. Within 10 yards of a nest or un-surveyed suitable habitat, roadside spraying could create a brief noise of notice to spotted owls (e.g. slightly above 70 dB), but not loud enough to create disturbance (U.S. Fish and Wildlife Service 2003, project file data). County Weed Coordinators also reported that the noise of diesel pump engines measured for this analysis was greater than the noise of gasoline-powered pump engines used by some operators (D. Sherwin, personal communication 2005, D. Durfey, personal communication 2005). The gasoline-powered pump engines will be quieter than the diesel pump engines that we measured.

There are no proposed treatment areas within 65 yards of suitable spotted owl habitat on Washington side of the Columbia River Gorge National Scenic Area. On Gifford Pinchot National Forest System lands, there are 20,112 acres of suitable habitat within 65 yards of proposed treatment areas where spotted owls could nest, however these treatment areas do not propose mowing or brushing. Mowing and brushing uses machinery that can create louder noise, so treatment areas with these methods was considered a potential disturbance effect for owls.

Treatment areas that may use brushing or mowing include 543 acres of suitable habitat for spotted owls. The mandatory PDC for spotted owls (PDC J-2) requires that these methods, or others that generate sufficient noise (greater than 92 dB), to be conducted farther away than 35 yards for heavy equipment or motorized hand tools, and 65 yards for chainsaws, or outside the breeding season. This PDC has been included in in a Programmatic Letter of Concurrence for the GPNF (U.S. Fish and Wildlife Service, 2001) to minimize the adverse effects from disturbance near nests or suitable habitat.

Therefore, noise from mechanical and manual methods to control invasive plants, including equipment used to spray roadside vegetation, "may affect, but is not likely to adversely affect" spotted owls.

Effects of Herbicides

Exposure scenarios used to analyze potential effects from herbicides are discussed in the Biological Assessment for the R6 2005 FEIS). None of the herbicides proposed for use in this EIS nor NPE surfactants, applied at typical application rates, pose a risk to northern spotted owls.

Spotted owls are not likely to be directly sprayed, or encounter vegetation that has been directly sprayed, because no aerial applications are proposed. No ground applications of herbicide would reach the upper canopies of mature trees where the owls nest and forage.

Spotted owls within Douglas-fir/Hemlock forests prey on red tree voles and flying squirrels, which are nocturnal and chiefly arboreal.

Voles feed on the needles of Douglas-fir trees and the flying squirrels feed primarily on fungi and lichen. It is not plausible for the arboreal owls or their prey to be exposed to herbicides used within their activity centers in this forest type. However, a worst-case exposure scenario for the spotted owl was conducted using consumption of prey that had been directly sprayed, and assuming 100 percent absorption of the herbicide.

The following interpretations of the exposure scenario results are made with the reservation that toxicity data was generated from laboratory animals which may not accurately represent potential effects to free-ranging wildlife.

At typical application rates, the estimated doses from the exposure scenarios are all less than the reported NOAEL (no-observable adverse effect level) for all herbicides and NPE. Therefore, there is no basis for asserting or predicting that adverse effects to spotted owls from NPE or the herbicides considered in this EIS are plausible.

Critical Habitat

Invasive plant treatments do not remove or modify any of the primary constituent elements that define critical habitat. The action alternatives will have "no effect" to critical habitat for the northern spotted owl.

Marbled Murrelet

Disturbance

Invasive plant treatments are associated with disturbance that may occur during the marbled murrelet nesting season. Direct effects from invasive plant treatment include disturbance caused by noise, people, equipment and vehicles. However, the potential for visual disturbance to cause harassment of marbled murrelet is low.

Noise-generating activities above 92 dB could potentially cause enough disturbance to result in injury during the breeding season (U.S. Fish and Wildlife Service 2003). Vehicles used to spray roadside vegetation with herbicides do not make noise above 92 dB, based on the measurements taken, so no effect to the marbled murrelet from noise disturbance will occur. Within 10 yards of a nest or un-surveyed suitable habitat, roadside spraying could create a brief noise of notice to marbled murrelets (e.g. slightly above 70 dB), but not loud enough to create disturbance resulting in "harassment" or "injury" (U.S. Fish and Wildlife Service 2003, project file data)(see section on spotted owl above).

Mowing and brushing uses machinery that can create louder noise, so treatment areas with these methods may disturb murrelets. No marbled murrelets live within the Columbia River Gorge National Scenic Area. About 613 acres of designated critical habitat and an additional 122 acres of suitable marbled murrelet habitat occur within proposed treatment areas on the Gifford Pinchot National Forest (project file GIS query), but none of these are in areas proposed for brushing or mowing.

Mechanical treatments are currently proposed (in Alternative B) as follow up to herbicide within the southern end of the forest, outside of marbled murrelet habitat found only on the northern end of the forest. Mandatory PDC (J3-a and J3-b) for marbled murrelets require that brushing or mowing, or others that generate sufficient noise, be conducted farther away than 35 yards for heavy equipment or motorized hand tools, and 45 yards for chainsaws, or outside the breeding season. These PDC have been included in a Programmatic Letter of Concurrence for the Gifford Pinchot National Forest (U.S. Fish and Wildlife Service, 2001) to minimize the adverse effects of disturbance near nests or suitable habitat.

Therefore, noise from mechanical and manual methods to control invasive plants, including equipment used to spray roadside vegetation, "may affect, but is not likely to adversely affect" marbled murrelets.

Effects of Herbicide

Exposure scenarios used to analyze potential effects from herbicides are discussed in the Biological Assessment for the R6 2005 FEIS. None of the herbicides or NPE surfactants proposed for use in this EIS and applied at typical application rates, pose a risk to marbled murrelets.

Marbled murrelets are not likely to be directly sprayed, or encounter vegetation that has been directly sprayed, because no aerial applications are proposed. No ground applications of herbicide would reach the upper canopies of mature trees where murrelets nest.

Murrelets feed on marine fish, which will not be exposed to herbicides or NPE from invasive plants treatments on lands administered by the Forest Service. However, some murrelets in some locations have been reported to feed upon some freshwater fish (Carter and Sealy 1986). Therefore, in order to investigate a worst-case scenario for exposure, a scenario involving the consumption of contaminated fish was analyzed. The potential for the herbicides included in the action alternatives to adversely affect marbled murrelets was determined using quantitative estimates of exposure from worst-case scenarios. The dose estimates for fish-eating birds were calculated using herbicide or NPE concentrations in fish that have been contaminated by an accidental spill of 200 gallons into a small pond.

Assumptions used include no dissipation of herbicide, bioconcentration is equilibrium with water, contaminant level in whole fish is used, and upper estimate assumes 15 percent of body weight eaten/day. For chronic exposures, we used a scenario where the bird consumes fish from water contaminated by an accidental spill over a lifetime. All estimated doses used in effects analysis were the upper levels reported in the Forest Service/SERA risk assessments.

The following interpretations of the exposure scenario results are made with the reservation that toxicity data was generated from laboratory animals that may not accurately represent potential effects to free-ranging wildlife. The results of the exposure scenarios indicate that no herbicide or NPE surfactant poses any plausible risk to birds from eating contaminated fish. All expected doses to fish-eating birds for all herbicides and NPE are well below any known NOAEL (see the Biological Assessment for the R6 2005 FEIS).

Even if they fed, for a lifetime, upon fresh-water fish that had been contaminated by an accidental spill of herbicide or NPE, they would not receive a dose that exceeds any known NOAEL. Therefore, marbled murrelets would not be adversely affected by herbicide use in any alternative.

Critical Habitat

Invasive plant treatments do not remove or modify any of the primary constituent elements that define critical habitat. The action alternatives will have no effect to critical habitat for the marbled murrelet.

Summary of Effects Determinations – Federally Listed Species

Table 44-Effects Determinations on Federally Listed Species (All Alternatives)

Species	Status	Effects Determinations
Grizzly Bear	Threatened	No effect
Gray wolf	Endangered	No effect
Northern spotted owl	Threatened	May Affect, Not Likely to Adversely Affect
Marbled murrelet	Threatened	May Affect, Not Likely to Adversely Affect

Direct and Indirect Effects on Regional Forester Sensitive Species

Under all alternatives, two primary effects on sensitive wildlife species are plausible: 1) disturbance and trampling from machinery or people treating invasive plants; and 2) risk from herbicide contact, particularly to species for which data is not sufficient to allow quantitative estimates of risk. Impact determination for each sensitive species is discussed in this section and displayed in table 45. Alternative C reduces the likelihood of exposure to herbicides for species that reside within riparian reserves or road segments that could deliver herbicide to streams, but it increases the likelihood of disturbance, trampling, or sedimentation effects by replacing herbicide treatment methods with non-herbicide treatment methods. When analysis was conducted by alternative, results indicated that effect determinations for each species were the same for all action alternatives.

Sensitive species' habitat would be protected in all alternatives because invasive plant treatments do not remove suitable habitat for any species, and the majority of the treatments will occur along highly disturbed roadsides which do not provide suitable habitat in most cases. Some species on the Gifford Pinchot National Forest or Columbia River Gorge National Scenic Area have suitable habitat along roads, although in small amounts relative to the amount of suitable habitat that is not within a road corridor.

Bald Eagle

Disturbance

Potential effects of invasive plant treatment methods on bald eagles are associated with disturbance that may occur during the nesting season. Direct effects from invasive plant treatment include disturbance caused by noise, people and vehicles. Human and vehicle presence can disturb bald eagles during the breeding season, causing the birds to leave nests, or stay away from the nest long enough to have detrimental effects to eggs or young (U.S. Fish and Wildlife Service, 1986). Effects from mechanical methods (e.g. tractors, bulldozers, chainsaws, or string trimmers) may be more likely to occur, and occur at greater distances from the project site, because machinery creates louder noise.

The critical period in Oregon and Washington when human activities could disturb occupied nests extends from January 1 to August 15 (U.S. Fish and Wildlife Service, 2001). Bald eagles are sensitive to human disturbance during this time, particularly within sight distance of nest sites. Invasive plant treatments will avoid conducting projects that create noise or disturbance above ambient levels in proximity to an occupied nest during the nesting season, as required by PDC J1-a. This same PDC is included in a Programmatic Letter of Concurrence for the GPNF (U.S. Fish and Wildlife Service, 2001) and will minimize effects to bald eagles because it minimizes or eliminates the source of disturbance near nests. Invasive plant treatments will not result in the removal of bald eagle nest or roost trees, or suitable habitat, because invasive plants do not provide habitat. Projects could occur within suitable habitat.

No bald eagle nests occur within 0.25 mile of proposed treatment areas. Because disturbance is a plausible occurrence, all action alternatives may affect bald eagle. However, the project design criteria (J1-a and J1-b) included in both action alternatives would minimize the likelihood that disturbance to nesting eagles would actually occur. Therefore, all alternatives "may affect, but are not likely to adversely affect" the bald eagle from disturbance.

Wintering bald eagles on the Gifford Pinchot and Columbia River Gorge NSA (Washington side) can be sensitive to disturbance from October 31 to March 31 (U.S. Fish and Wildlife Service, 2001). Disturbance near winter roost sites is not likely to occur in any alternative because invasive plant treatments generally do not occur during the winter and PDC J1b will minimize or eliminate the source of disturbance near winter roosts.

Effects of Herbicides

Herbicides and surfactants applied according to PDC, pose no risk to bald eagles. Bald eagles are not likely to be directly sprayed, or encounter vegetation that has been directly sprayed, because no aerial application is proposed. No ground applications of herbicide would reach the upper canopies of mature trees where bald eagles nest.

The potential for the herbicides to adversely affect bald eagles was determined using quantitative estimates of exposure from worst-case scenarios. The dose estimates for fish-eating birds were calculated using herbicide or NPE concentrations in fish that have been contaminated by an accidental spill of 200 gallons into a small pond. Assumptions used include no dissipation of herbicide, bioconcentration is equilibrium with water, contaminant level in whole fish is used, and upper estimate assumes 15 percent of body weight eaten/day. For chronic exposures, we used a scenario where the bird consumes fish from water contaminated by an accidental spill over a lifetime. All estimated doses used in effects analysis were the upper levels reported in the Forest Service/SERA risk assessments.

The following interpretations of the exposure scenario results are made with the reservation that toxicity data was generated from laboratory animals, which may not accurately represent potential effects to free-ranging wildlife.

The results of these exposure scenarios indicate that no herbicide or NPE surfactant poses any plausible risk to birds from eating contaminated fish. All expected doses to fish-eating birds for all herbicides and NPE are well below any known No Observable Adverse Effect Level (NOAEL - see the Biological Assessment for the R6 2005 FEIS). The weight of evidence suggests that adverse impacts to bald eagles from NPE or the herbicides included in the action alternatives are not plausible.

Townsend's big-eared and Pacific Fringe-tailed bat

Townsend's big-eared bat is known to have roosts on bridges or in lava tubes on the Gifford Pinchot National Forest. There is one sighting of Pacific fringe-tailed bat on the Columbia River Gorge National Scenic Area. No known locations are within proposed treatment areas. Roadside treatments are unlikely to disturb bats roosting under bridges, should they roost under bridges near proposed treatments in the future. Roadside treatments typically consist of a boom or nozzle spray attached to a pick-up truck, or a person with a backpack sprayer conducting spot sprays of plants. Both treatment methods have short durations, do not generate noise much beyond the background noise of the road and bridge use, and do not occur in close proximity to the bats themselves. Therefore, the likelihood of disturbing roosting bats during treatment of roadside invasive plants is remote. Invasive plant treatments in the treatment areas near bridges known to be utilized by Townsend's big-eared bats are not likely to adversely impact Townsend's big-eared bats.

The bats forage over large areas catching insects (primarily moths) in flight or by gleaning from vegetation. Bats are unlikely to forage within treatment areas on insects that have been inadvertently sprayed by herbicides and NPE surfactant given the extent and nature of the treatment. If contaminated insects were ingested, only NPE surfactants would result in a dose that exceeds the toxicity index. In order to receive this dose, the bat would have to consume nothing but contaminated insects for an entire nights feeding. Given the bats foraging habits, it is unlikely that bats would be exposed to this level of NPE. In addition, because the bats roost in crevices well above ground level during the day, it is not plausible that they could be directly exposed to spray of herbicides or NPE.

Data is lacking on risk from chronic exposure to contaminated insects. The likelihood of a chronic exposure to contaminated insects is remote, given the small acreages treated and the relatively large areas in which bats forage. The bats are not likely to forage exclusively within treated areas over a 90-day period (the chronic exposure) so there does not appear to be a plausible risk from chronic exposure.

Therefore, “no impact” to Townsend’s big-eared bats or Pacific fringe-tailed bats will occur for all action alternatives.

California Wolverine

Wolverines likely occur in remote areas of the Gifford Pinchot National Forest. Occasional transient individuals have been known to enter the Columbia River Gorge National Scenic Area. No treatment areas are located in likely wolverine habitat and short duration, low intensity invasive plant treatments are unlikely to disturb wolverines. Therefore, “no impact” to California wolverine will occur for all action alternatives.

Western Gray Squirrel

These squirrels are unlikely to occur on the Gifford Pinchot National Forest and there is no suitable habitat within or adjacent to proposed treatment areas. Western gray squirrels do occur on the Washington side of the Columbia River National Scenic Area and some proposed treatment areas are adjacent to, but not within, suitable habitat. Their primary foods are acorns, conifer seeds and fungi, neither of which is likely to be contaminated by invasive plant treatments. Disturbance from short duration and low intensity treatments would not affect gray squirrels. Therefore, there will be “no impact” to western gray squirrels for all action alternatives.

Common Loon

Common loons occur occasionally during migration at Packwood Lake on the Gifford Pinchot National Forest and during winter on the Columbia River. There are no nesting records for the Gifford Pinchot National Forest or Columbia River National Scenic Area. Invasive plant treatments occur during spring and summer when the loons are not likely to be present. Therefore, there will be “no impact” to common loons for all action alternatives.

Clark’s, horned, red-necked, and eared grebes

These species are not present during the breeding season when most invasive plant treatments would occur. No herbicide or NPE dose exceeded the toxicity indices for fish-eating birds even in a “worst case” scenario. There is “no impact” to these grebes for all action alternatives.

Great gray owl

Great gray owls do not occur on the National Scenic Area but could occur on the GP. The GP has mapped suitable habitat and several proposed treatment areas include suitable foraging habitat for the great gray owl. The “worst case” scenario analysis for herbicide exposure (R6 FEIS 2005, Appendix P), indicated that only NPE surfactants applied at the highest application rate could pose a risk of adverse effect to predatory birds in an acute exposure. Proposed herbicide treatments in suitable great gray owl habitat are roadside boom spraying and spot spraying or hand wiping within a meadow.

The worst case scenario exposure is based on the owl consuming prey that has been directly sprayed. The gopher and vole prey of great gray owls are primarily nocturnal and unlikely to be directly sprayed. Worst case scenario exposure for small mammals eating contaminated vegetation resulted in doses to the small mammal that were very close to those from being directly sprayed (project file worksheets). Therefore, if a great gray owl ate a gopher or vole that had been directly sprayed, or that had eaten contaminated vegetation, it would not receive a dose of herbicide that would cause an adverse effect. Exposure for NPE applied at the highest rate exceeded the level of concern. However, NPE would not be broadcast at the highest rate.

PDC (J4) for great gray owls also prohibits broadcast spraying of NPE in suitable foraging habitat. This will minimize the likelihood that any small mammal prey would consume the vegetation that had been treated. Chronic exposures are unlikely because gophers and voles are not known to prefer foraging on invasive plant species, reducing the likelihood of exposure.

Therefore, because the PDC will greatly reduce likelihood of their prey being exposed to NPE, gophers and voles are unlikely to consume invasive plants and the nocturnal habits of gophers and voles reduce the chances of being directly sprayed, there is “no impact” to great gray owls for all action alternatives.

American Peregrine Falcon

No current nest sites for peregrine falcon occur within 1.5 miles of any proposed treatment area, the mandatory PDC group J5, will avoid disturbance, and no herbicide or NPE dose exceeded the toxicity indices for fish-eating birds even in a “worst case” scenario, so there would be “no impact” to peregrine falcons for all action alternatives.

Gray flycatcher

Gray flycatchers are not present in the Gifford Pinchot National Forest or the Columbia River National Scenic Area, so there would be “no impact” to gray flycatchers for all action alternatives.

Ash-throated flycatcher

Ash-throated flycatchers breed on the Columbia River Gorge (Flick, personal communication). Some treatment areas overlap nesting habitat within the Klickitat River corridor, as well as portions of Catherine Creek. These treatment areas propose hand pulling and use of glyphosate, triclopyr, clopyralid imazapic, chlorsulfuron, and metsulfuron methyl applied by spot spray.

The Appendix P of the 2005 R6 FEIS assessed risk of herbicides to insectivorous birds. The exposure scenarios for insectivorous birds indicate that only NPE doses would exceed a threshold of concern in acute exposures at typical application rates.

At highest application rates, insectivorous birds are at risk of adverse effects from glyphosate, triclopyr, and NPE in acute exposures. Data are insufficient to assess risk from clopyralid, glyphosate, triclopyr, and NPE for chronic exposures at high application rates. However, the worst case scenario is based on consuming nothing but contaminated insects for an entire day. This scenario is more likely for a large broadcast spray operation that would encompass the nesting bird’s territory. Given the directed spot spray application proposed on these sites for all alternatives, it is much less likely that ash-throated flycatchers would consume only insects that had been contaminated by spot spray of targeted invasive plants. These flycatchers often eat flying insects, which are less likely to be inadvertently sprayed by a person conducting a spot spray application. Exposure to some herbicide or NPE cannot be ruled out; however, it is unlikely that ash-throated flycatchers would be exposed to enough herbicide or NPE to cause an adverse effect. Any exposure that did occur would be limited to the individual birds whose territory included the specific patches of treated plants. Therefore, for all action alternatives, the proposed treatments may impact individuals but would not lead to a trend toward federal listing.

Striped whipsnake, sharp-tailed snake, California mountain kingsnake

Striped whipsnakes are not likely to occur within treatment areas due to lack of suitable habitat or recent known locations. There is suitable habitat for sharp-tailed snakes in the Columbia River Gorge National Scenic Area. There is a known location for California mountain kingsnakes within a treatment area in the Columbia River Gorge National Scenic Area.

These snakes may be adversely affected by machinery, but are mobile and may escape in some cases. Grazing blackberries with goats will not affect these mobile snakes or their habitat. There is no data available on effects of herbicides to reptiles, but since they are often under shrubs, leaf litter, rocks or other objects, it appears that they are not likely to be exposed to direct sprays. Some indirect exposure to contaminated soil or vegetation could occur. The relatively small size of the treatment areas, compared to availability of suitable habitat, indicate that it is unlikely that proposed invasive plant treatments would have much impact on these species.

The differences between the alternatives do not reduce herbicide exposure or risk of injury from mechanical equipment, so the proposed treatments may impact individuals but would not result in a trend toward federal listing for all action alternatives.

Northwestern pond turtle

There is one known site on the Columbia River Gorge National Scenic Area and it is within a treatment area. There are no sites on the Gifford Pinchot National Forest. Invasive plants are impacting the habitat for the pond turtle in this location and the objective of the proposed treatments is to restore and maintain turtle habitat. The PDC (J8), as well as an interagency MOU, requires close coordination with Washington Department of Fish and Wildlife (WDFW) on the timing, methods, and locations of proposed treatments. Because WDFW closely monitors the turtles at this site, the PDC is expected to be effective at minimizing adverse impacts from cultural (goat grazing), herbicide exposure, manual, and/or mechanical techniques to pond turtles in this location. There are three other pond turtle locations in Washington and seven other locations on National Forests in Oregon. Due to the effectiveness of the PDC, the MOU with WDFW, and the turtle's distribution, this alternative may adversely impact individuals, but is not likely to lead to a trend toward federal listing.

Oregon slender salamander and Oregon spotted frog

These species are not present in proposed treatment areas, so there would be "no impact" for all action alternatives. If Oregon spotted frogs were to move into areas proposed for treatment, PDC (J6) would prohibit broadcast spraying of all herbicides and spot spraying of some herbicides and surfactants in or adjacent to their habitat, which would effectively minimize exposure to chemicals likely to cause harm to the frog. The salamander PDC (J7) would minimize any exposure of Oregon slender salamanders should they move into areas proposed for treatment.

Van Dyke's, Cascade torrent, and Cope's Giant Salamander

These salamanders are associated with flowing streams or moist habitats. The Cope's giant and Cascade torrent salamanders are highly aquatic and found in streams. There are 20 known sites for Cope's giant salamander documented on the Gifford Pinchot National Forest, 1 of which occurs within a treatment area. There are about 133 known sites for the Cascade torrent salamander on the Forest. Two sites are within treatment areas. Fourteen portions of 6-7 timber sale units where Cascade torrent salamanders were reported also overlap treatment areas. (Older surveys did not report locations as point data, so locations are less precise.) There are several known locations for Cascade torrent salamanders within Skamania County, but none of the locations are included in Forest Service databases, so they are likely outside of land administered by the National Scenic Area. No locations of Cascade torrent salamanders that are included in the NRIS database are on the Washington side of the Scenic Area.

Van Dyke's salamander is associated with moist areas, including streams, seeps, and springs and is active when soil moisture is high and temperatures are cool. There are 25 known sites for Van Dyke's salamander on the Gifford Pinchot National Forest, one of which is within a treatment area. There are no known sites for Van Dyke's salamander on the Washington side of the Columbia River Gorge National Scenic Area.

Suitable habitat for all three of these salamanders exists on the forest; much of it has not been surveyed. Suitable habitat has not been mapped but can be considered to be most closely associated with riparian areas. For purposes of this analysis, the aquatic influence zone (the inner half of riparian reserves) is used as an indicator of suitable salamander habitat that has not been surveyed. This will greatly overestimate the actual suitable habitat for these rare salamanders, which have quite specific habitat associations.

On the Gifford Pinchot National Forest, there are an estimated 3,483 acres within the aquatic influence zone that may be treated for invasive plants (GIS database query). This compares to an estimated 250,480 total acres of aquatic influence zone on the Gifford Pinchot National Forest. About 1.4 percent contains infested acres that may be treated contain salamander habitat. On the Columbia River Gorge National Scenic Area, there are an estimated 132 acres within the aquatic influence zone that may be treated for invasive plants (GIS database query). This compares to an estimated 27,257 total acres of aquatic influence zone on the Scenic Area. So, of the un-surveyed suitable salamander habitat in the Scenic Area, 0.5 percent are infested acres that may be treated and 99.5 percent are not likely to have invasive plant treatments.

Mechanical treatments near streams and springs can create ground disturbance that could introduce silt into salamander habitat, potentially clogging the gills of the salamanders and resulting in mortality. Little is known about the effects of herbicides other than the potential for some herbicides to cause mortality or result in malformations of amphibian larvae. Effects of herbicides to amphibians are discussed in the R6 2005 FEIS (Appendix P, pp. 28-31).

The aquatic and salamander project design criteria (H1, H1a, H6-11, J7) that limit broadcast application of herbicides and apply to all alternatives would minimize exposure of salamanders to the herbicides most likely to have adverse effects. Limiting broadcast application of herbicides within potential salamander habitat reduces the likelihood and amount of herbicide that could contaminate water, soil or rocks used by salamanders. Broadcast spray buffers apply wherever and whenever water is present, which is where and when salamanders are most likely to occur. In addition, there is little overlap between the habitat for these salamanders and locations of infestations to be treated, as suggested by the aquatic influence zone acres described above. Most invasive plants occur in more open, drier, and previously disturbed sites. Because there is minimal overlap between actual treatment sites and salamander habitat, and project design criteria minimize exposure to herbicides, this project may adversely impact individuals, but is not likely to lead to a trend toward federal listing of these salamanders.

Larch Mountain

Larch mountain salamanders are associated with talus, scree, gravelly soils and other areas of accumulated rock. According to ISMS database records, there are a total of 43 Larch Mountain salamander sites documented on the Gifford Pinchot National Forest, one of which occurs within a proposed treatment area (treatment area 33-07r4). There is also additional suitable, but un-surveyed, habitat on the forest. Some un-surveyed habitat occurs in forest blocks adjacent to roadside treatments in treatment areas 35-14, 35-18, and 35-16. There are 45 sites documented for the Washington side of the Columbia River Gorge National Scenic Area, one of which in within a proposed treatment area (treatment area 22-06). The salamander PDC (J7) would minimize exposure of this species to the herbicides most likely to have adverse effects. Limiting broadcast application of herbicides within potential salamander habitat reduces the likelihood and amount of herbicide that could contaminate water, soil or rocks used by salamanders. In addition, there is little overlap between the habitat for these salamanders and locations of infestations to be treated. Because there is minimal overlap between actual treatment sites and salamander habitat, and project design criteria minimize exposure to herbicides, this project may adversely impact individuals, but is not likely to lead to a trend toward federal listing of these salamanders.

Mardon Skipper

There are 38 known sites for mardon skipper on the Gifford Pinchot National Forest. Of these, 34 sites are within 12 treatment areas that encompass meadows, plantations, or roadsides. Invasive plants are threatening the habitat for the mardon skipper in all of these proposed treatment sites.

Invasive plants reduce the abundance and/or cover of larval food plants (fescue) as well as adult nectar plants (violet). Mechanical and manual techniques could harm eggs or larvae. Herbicide data on potential effect to butterflies is very limited. The ester formulation of triclopyr (triclopyr BEE) and NPE-based surfactants are the most likely to cause adverse effects. The PDC (J9) requires that only selective application methods (i.e. no broadcast spray) be used and prohibits NPE-based surfactants and ester formulations of herbicide in mardon skipper habitat. Data is insufficient to rule out remaining risk from herbicide exposure.

The PDC also requires coordination with the local Biologist on timing, method, and location of treatments and to use herbicides on only a portion of a mardon skipper site in any one year. It has been found that, at least in the southern Cascades populations, that in an area of suitable habitat such as a large meadow or meadow complex, the mardon skipper may use only a small portion of the area (Kerwin 2005). Since the butterfly populations fluctuate wildly among meadows and between years, the local Biologist can provide advice on where to prioritize treatments and minimize potential adverse effects. Since not all known habitat for the butterfly would be treated in any one year, there is the opportunity to refine treatments and techniques for minimizing adverse effects. This is consistent with recommendations and findings in the Draft Conservation Assessment for the mardon skipper (Kerwin 2005).

The invasive plant treatments are necessary to protect and restore the habitat for the mardon skipper (see Kerwin 2005). If the infestations are allowed to continue unchecked, it is likely that there would be a substantial reduction in suitable habitat and mardon skipper would be further restricted, or even eliminated, from current sites on the Gifford Pinchot National Forest. The proposed treatments may adversely impact some individuals, but the management is necessary to provide for the long term preservation of the mardon skipper’s habitat. Strategies (similar to those required by the PDC) on conducting habitat management on multiple sites, using multiple methods, only treating portions of habitats at a time, and managing small populations of invasive plants, are recommended for other skipper species (Schlicht and Saunders 1995, as cited in Kerwin 2005) and should be effective for the mardon skipper. The practices required in the PDC will minimize potential adverse impacts to individuals while providing for the long-term maintenance of the populations on the Gifford Pinchot National Forest. Therefore, invasive plant treatments may adversely impact individuals, but are not likely to lead to a trend toward federal listing for all action alternatives.

Blue-gray taildropper

This slug inhabits wide range of moist and mixed forests. It is found at surface only during moist seasons and is underground during the dry summer months. It is common in Oregon but very rare in Washington. The effects of herbicide or NPE to mollusks are unknown. Trampling can cause direct and immediate mortality when they are active at surface. The PDC (J10) restricts activity in known sites when soil moisture is high and these slugs are likely to be at or near the surface, which will reduce risk from herbicide exposure or trampling. The one location that occurs within a treatment area is not in a riparian reserve or along a high aquatic risk road, and the PDC applies to all alternatives, there is no difference between alternatives. There are many known sites that would not be at risk from the effects of invasive plant treatments, so there is no plausible risk to the species as whole or its distribution. Invasive plant treatments may impact individuals, but are not likely to lead to a trend toward federal listing, for all action alternatives.

Columbia Oregonian snail, Dalles sideband snail and Burrington's jumping slug

These species are not present in treatment areas, so there is would be "no impact" for all action alternatives.

Warty jumping slug, Malone's jumping slug

These mollusks occur in a variety of terrestrial and riparian habitats. The PDC (J10) for the mollusks will minimize invasive plant treatments in known sites when soil moisture is high, during the time of year these animals are active above-ground. This will minimize risk from trampling or herbicide exposure. For Malone's jumping slugs, there are 30 known sites that occur within treatment areas and there are at least 588 sites outside of proposed treatment areas. For the warty jumping slug, there are only 4 known sites within treatment areas and 130 outside any treatment areas. In addition, the majority of the proposed treatment areas are along disturbed roadsides that do not provide suitable habitat for these mollusks (Joan Ziegltrum, personal communication, 2006). Roadsides conditions are more dry and harsh than is suitable for mollusks. While occasional individuals may occur along roadsides, they would not be there but for the suitable adjacent habitat (Duncan et al. 2003). While many known site locations coincide with treatment areas, the actual invasive plant treatments would occur in microhabitats that are not suitable for mollusks.

No invasive plant treatments will remove habitat for jumping slugs nor will treatments cause large-scale microclimate changes within their suitable habitat. Habitat components for jumping slugs, such as down logs, will remain in place on treatment sites. Invasive plant treatments will not threaten the persistence of the species at any known sites.

In all action alternatives, PDC J10 requires that treatments avoid known sites or high potential habitat when soil moisture is high and these slugs are most likely to be at or near the surface. This will minimize their exposure to herbicides and reduce the risk of mortality by trampling. Although the project design criteria minimize risk to these species from manual, mechanical, and herbicide treatments, all action alternatives may adversely impact some individuals, but would not likely to lead to a trend toward federal listing.

Puget Oregonian

This snail occurs in mature to late successional moist forest and riparian zones, often under big-leaf maple leaf litter or other canopy such as ferns. For the Puget Oregonian, 15 sites are within treatment areas while there are 123 known sites outside of proposed treatment areas. The majority of known sites are outside of proposed treatment areas. Most invasive plants are not likely to grow under the canopy of large big-leaf maple trees. An exception may be where a big-leaf maple is close to a roadside and some area underneath the tree canopy is disturbed. Like other mollusks, it retreats under cover when conditions are dry. Because this snail occurs in very low densities, the presence of undisturbed suitable habitat adjacent to the roadside is less relevant than for the jumping slugs mentioned above – loss of one or two individuals may cause loss of the "site" (Kogut, personal communication, 2005). Even surveying for the species poses some risk of trampling individual snails. However, invasive plants are known to alter site conditions and are therefore undesirable within mollusk habitat.

The PDC for suitable habitat and known sites for the Puget Oregonian (J11) will minimize the likelihood that individual snails will be trampled or exposed to herbicides. Although the project design criteria minimize risk to this species from manual, mechanical, and herbicide treatments, all action alternatives may adversely impact some individuals, but would not likely to lead to a trend toward federal listing.

Table 45-Impact Determinations for Sensitive Wildlife Species

Common Name	Impact Determination
Mammals	
Townsend's big-eared bat	No Impact
Pacific fringe-tailed bat	No Impact
California wolverine	No Impact
Western gray squirrel	No Impact
Birds	
Bald eagle	May Impact Individuals, But Would Not Likely To Lead To A Trend Toward Federal Listing.
Common loon	No Impact
Clark's grebe	No Impact
Horned grebe (OR only)	No Impact
Red-necked grebe (OR on)	No Impact
Eared grebe	No Impact
Ferruginous hawk	No Impact
American peregrine falcon	No Impact
Great gray owl	No Impact
Gray flycatcher	No Impact
Ash-throated flycatcher	May Impact Individuals, But Would Not Likely To Lead To A Trend Toward Federal Listing.
Green-tailed towhee	No Impact
Amphibians	
Oregon slender salamander	No Impact
Larch Mountain salamander	May Impact Individuals, But Would Not Likely To Lead To A Trend Toward Federal Listing.
VanDyke's salamander	May Impact Individuals, But Would Not Likely To Lead To A Trend Toward Federal Listing.
Cope's giant salamander	May Impact Individuals, But Would Not Likely To Lead To A Trend Toward Federal Listing.
Cascade torrent salamander	May Impact Individuals, But Would Not Likely To Lead To A Trend Toward Federal Listing.
Oregon spotted frog	No Impact
Reptiles	
Northwestern pond turtle	May Impact Individuals, But Would Not Likely To Lead To A Trend Toward Federal Listing.
Striped whipsnake	May Impact Individuals, But Would Not Likely To Lead To A Trend Toward Federal Listing.
Sharp-tailed snake	May Impact Individuals, But Would Not Likely To Lead To A Trend Toward Federal Listing.
California mountain kingsnake	May Impact Individuals, But Would Not Likely To Lead To A Trend Toward Federal Listing.
Terrestrial Invertebrates+	
Mardon skipper	May Impact Individuals, But Would Not Likely To Lead To A Trend Toward Federal Listing.
Puget Oregonian snail	May Impact Individuals, But Would Not Likely To Lead To A Trend Toward Federal Listing.
Columbia Oregonian snail	No Impact
Dalles sideband snail	No Impact
Burrington's jumping slug	No Impact
Warty jumping slug	May Impact Individuals, But Would Not Likely To Lead To A Trend Toward Federal Listing.
Malone's jumping slug	May Impact Individuals, But Would Not Likely To Lead To A Trend Toward Federal Listing.
Panther jumping slug	No Impact
Blue-gray taildropper slug	May Impact Individuals, But Would Not Likely To Lead To A Trend Toward Federal Listing.

Direct and Indirect Effects on Survey and Manage Species

Effects to Survey and Manage Species are discussed above under Direct and Indirect Effects to Regional Forester Sensitive Species. Species that are designated as Survey and Manage for the Gifford Pinchot National Forest and Washington side of the Columbia River Gorge National Scenic Area are listed in table 46. This information is current as of the 2004 Annual Species Review and 2006 update).

Table 46-Terrestrial Survey and Manage Species with the Project Area

Common Name	Scientific Name	Administrative Unit
Larch Mountain salamander	*Plethodon larselli*	GP, NSA
Van Dyke's salamander	*Plethodon vandykei*	GP
Puget Oregonian snail	*Cryptomastix devia*	GP, NSA
Columbia Oregonian snail	*Cryptomastx hendersoni*	NSA
Dalles sideband snail	*Monadenia fidelis minor*	GP, NSA
Burrington's jumping slug	*Hemphillia burringtoni*	GP
Warty jumping slug	*Hemphillia glandulosa*	GP
Malone's jumping slug	*Hemphillia malonei*	GP, NSA
Panther jumping slug	*Hemphillia pantherina*	GP
Blue-gray taildropper slug	*Prophysaon coeruleum*	GP, NSA

The 2001 Survey and Manage ROD (USDA and USDI 2001, p. 22) states, "The line officer should seek specialists' recommendations to help determine the need for a survey based on site-specific information. In making such determination, the line officer should consider the probability of the species being present on the project site, 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." The expert opinion of the District Biologists is that pre-project surveys for Survey and Manage mollusks are not required for the proposed invasive plant treatments along roadsides, regardless of alternative, because there is a low probability of them occurring within the infestations to be treated, and the project design criteria minimize the potential for adverse effects even if they are present (Kogut and Wainwright 2006). Invasive plant treatments are similar in scope and scale to routine maintenance such as pulling ditches and removing encroaching vegetation, which are not considered habitat-disturbing activities in the 2001 ROD (p. 22). Also, the survey protocol for terrestrial mollusk species (Duncan et al. 2003) states that while mollusks may be found on roadsides, they would not be there if not for the adjacent natural habitat. Routine maintenance of currently used roads can occur without the need for surveys because populations in adjacent habitat are expected to persist.

The need for pre-project surveys for early detection/rapid response would be evaluated during the annual implementation planning process (see Section 2.5.7, Implementation Planning).

Invasive plant treatments will not alter a sites ability to support any Survey and Manage species because no long term modification of suitable or native habitat will occur.

Direct and Indirect Effects on Management Indicator Species

The invasive plant treatments proposed in all alternatives focus on treating the target non-native plants and avoid or minimize effects to non-target native vegetation. No treatments will remove native trees or alter native habitat structure. Direct and Indirect effects to bald eagle, northern spotted owl, and peregrine falcon have been discussed above. Proposed treatments will improve cover of native plants within treatment areas and could contribute to improved habitat conditions for deer and elk in some select sites. Habitat for pileated woodpecker, cavity excavators, wood duck, Barrow's goldeneye, mountain goat, and pine marten is not currently substantially affected by invasive plants, nor would it be affected by invasive plant treatments.

Pileated woodpecker and Cavity Excavators

Invasive plant treatments will not affect the pileated woodpecker or the hairy woodpecker. These birds nest in cavities in trees, usually dead, or dead limbs, and forage largely on trees or logs and perhaps some shrubs, making it unlikely for them to be exposed to herbicides or affected by manual or mechanical treatments. Invasive plant treatments will not reduce the availability of dead trees or appropriate cavity sites. The differences between alternatives do not result in any differences in effects to the hairy woodpeckers or pileated woodpeckers. There is no impact to these species for all action alternatives.

Wood duck and Barrow's goldeneye

These ducks are highly mobile and may move in and out of lakes or streams within or adjacent to treatment areas. Precise locations cannot be mapped and the number of treatment areas in which they occur cannot be counted in a meaningful way. They are restricted to streamside and lake habitat. No herbicide, applied at typical application rates and accounting for application restrictions on triclopyr, produced a dose that exceeded a toxicity index for fish-eating, insect-eating, or grass-eating birds (see the R6 2005 FEIS, Appendix P). NPE-based surfactants exceeded the toxicity indices for grass-eating and insect-eating birds in acute exposures under a "worst case" scenario. Given the varied diet of these ducks, it is unlikely that they would eat only contaminated vegetation or insects for an entire day. In addition, invasive plant infestations tend to be patchy and treatment of very large areas in which these ducks would forage exclusively is unlikely. These ducks could be exposed to herbicide in the water, but the dose to which they would be exposed is highly unlikely to cause any adverse effects, based upon available data (project file worksheets, water contamination rates). Invasive plant treatments would benefit their habitat by contributing to the overall maintenance of riparian areas and potentially preserving the structure and function of native plant species in riparian areas. No nest trees or trees suitable for cavity nests would be removed during invasive plant treatments. Invasive plant treatments are unlikely to have adverse impacts to wood ducks or Barrow's goldeneye for all action alternatives.

Roosevelt elk and Black-tailed deer

Invasive plant treatments will not reduce available habitat for deer or elk, but could contribute to improved habitat quality in the long term (see Rice et al. 1997, for example).

The grazing and browsing habits of elk and deer make it possible for them to consume vegetation that has been sprayed with herbicide. Quantitative estimates of risk using "worst-case" scenarios found that none of the herbicides considered for use, at typical application rates, would result in a dose that exceeds the toxicity indices in either acute or chronic scenarios. The dose for NPE surfactant exceeds the toxicity index only in an acute scenario. The deer or elk would have to consume an entire day's diet of contaminated grass in order to receive this dose. Deer and elk do not forage extensively on the invasive plants found on the Gifford Pinchot National Forest or the Columbia River Gorge National Scenic Area. They are not likely to forage exclusively on the patches of invasive plants that have been treated with herbicide, and the treated sites comprise a very small proportion of the available foraging area for these species. Backpack spot sprays and roadside broadcast applications would only contaminate very small amounts of forage, if any, because forage species are not the target of the applications. The "worst case" exposure scenario for NPE is not plausible for the treatments proposed in any of the alternatives. Therefore, no plausible impacts to deer or elk would result for all action alternatives.

Mountain goat

This species is not present in or near treatment areas so there will be no impact for all action alternatives.

Pine Marten

There are 6 known locations within 5 treatment areas on the Gifford Pinchot National Forest. All treatment areas are roadside treatments that are unlikely to disturb pine martens, do not alter suitable habitat, and are unlikely to expose their prey. Even if pine martens consumed for an entire day nothing but prey that had been directly sprayed, they would not receive a dose that exceeded the toxicity indices for any herbicides or NPE (see R6 2005 FEIS, Appendix P). No plausible impact would result from any action alternative. No invasive plant treatments would alter the habitat's ability to support pine marten.

Direct and Indirect Effects to Species Listed in Washington State

Distribution and presence of several Washington State species is poorly known, or the animals are quite mobile and could be absent one year and present the next. Analysis of potential effects to these species was done assuming they could be present in or near invasive plant treatment areas if they occurred within the CRGNSA and suitable habitat was present. Species that may be present in or near invasive plant treatment areas, and the animal/diet group to which they belong for herbicide analysis purposes, are listed in the following table.

Table 47-Groups of Washington State Listed Wildlife Species

Species	Animal/Diet Group
Western grebe, American white pelican	Fish-eating Bird
Northern goshawk, Golden eagle, Merlin	Predatory Bird
Flammulated owl, Lewis' woodpecker, Vaux's swift, Purple martin	Insectivorous Bird
Western toad	Amphibian
Yuma skipper butterfly, Chinquapin hairstreak butterfly, Columbia River tiger beetle	Invertebrate

Effects on Fish-eating Birds

Non-herbicide methods

Western grebes and American white pelicans are primarily present in the NSA during the winter, when no invasive plant treatments will be conducted.

At other times, only post-breeding individuals are seen within the NSA. Proposed grazing will not take place within habitat for these birds; therefore, they will not be subject to disturbance of nests or any other direct or indirect effect from invasive plant treatments in the NSA. Invasive plant treatments will not affect their food supply because no significant sedimentation would occur.

Herbicides

The results of these exposure scenarios indicate that no herbicide or NPE surfactant poses any plausible risk to birds from eating contaminated fish. Doses were estimated assuming that birds ate nothing but fish contaminated by a spill of 200 gallons into a 0.25 acre pond, over a lifetime. All expected doses to fish-eating birds for all herbicides and NPE are well below any known no-observable-adverse-effect-level (NOAEL) (see detailed discussion in Wildlife Specialist's report). The weight of evidence suggests that adverse effects to western grebes or American white pelicans from NPE or the herbicides included in the action alternatives are not plausible.

Predatory Birds

Non-herbicide methods

The NSA is a high disturbance corridor with high levels of ambient human activity, presence, and noise. No disturbance levels above ambient will occur during implementation of invasive plant treatments, so there are no likely effects to nesting, foraging, or feeding of young.

There are no known nests within the NSA for goshawk or merlin. The merlin is found in the NSA only during the winter when there will be no invasive plant treatments. The golden eagle nests on Miller Island seem accustomed to human presence and invasive plant removal techniques are unlikely to create more disturbance than ambient levels. Proposed grazing will not take place within habitat for these birds. Invasive plant treatments will not reduce the supply of prey, because they do not remove native habitat that supports prey.

Herbicides

At typical application rates, the estimated acute doses from the exposure scenarios are all less than the reported NOAELs (no-observable adverse effect level) for all herbicides and NPE. The estimated dose from an NPE-based surfactant applied at the highest rate did exceed the NOAEL. Project design criteria F4 limits use of NPE-based surfactants to less than the typical application rate analyzed, so exposures exceeding the NOAEL will not occur. Chronic doses in this scenario are highly unlikely to occur because it is very unlikely that even one prey item could be directly sprayed and then immediately consumed, let alone a long-term diet of contaminated prey. Therefore, there is no basis for asserting or predicting that adverse effects to predatory birds from NPE or the herbicides considered in this EIS are plausible.

Herbicides or NPE are not lethal to small mammals in the amounts to which they could be exposed from proposed invasive plant treatments (see USDA Forest Service 2005, Appendix P). There will be no effect to small mammal populations that serve as prey for goshawk and golden eagle.

Since there is no scenario with which to quantify potential dose to a predatory bird that eats primarily birds, like the merlin, the fish-eating bird scenario was also considered for effects to merlin. The fish eating bird scenario likely overestimates the dose to the peregrine falcon because the hypothetical fish consumed are from a pond contaminated by a large spill of herbicide. These hypothetical fish likely have higher concentrations of herbicide in their bodies (and thus a higher dose to the predatory bird) than would a small bird that incidentally ingested herbicide before it was preyed upon. Also, the small mammal in the "mammal-eating bird scenario" is directly sprayed. It would be practically impossible to directly spray a bird that a peregrine falcon would then immediately prey upon. Herbicide analysis indicates that no herbicide dose exceeded the toxicity indices for fish-eating or mammal-eating birds even at highest application rates in the "worst-case" scenarios.

Insectivorous Birds

Non-herbicide treatment methods

None of the birds in this group nest within treatment areas, so no nests will be disturbed. Invasive plants also do not provide appropriate nest sites for these birds, so no treatments in the future will disturb or destroy nests. Invasive plant treatments, including grazing of blackberries with goats, will not remove suitable native habitat for nesting or foraging. Neither the birds nor their prey will be affected by invasive plant treatment activities.

Herbicides

Risk from exposure to herbicides was analyzed assuming that a bird consumed nothing but insects contaminated by direct spray. Most of the insects consumed by Lewis' woodpecker, flammulated owl, Vaux's swift, and purple martin are unlikely to become contaminated with herbicides because invasive plants are not likely to spread to their habitats. In addition, any treated invasive plants in their habitats would intercept any herbicide applied, reducing availability to insects.

Results of the quantitative estimate of dose indicate that only glyphosate applied at a high application rate and NPE-based surfactant at high and typical rates resulted in a dose that exceeded the NOAEL.

Glyphosate is not sprayed at high application rates because it is ineffective (browns the vegetation too quickly resulting in reduced translocation) and not cost effective.

Data on effects to birds from NPE is limited, but based on available information; the following is a reasonable characterization of risk. PDC F4 limits NPE application to less than the typical application rate analyzed, so exposures of concern are less likely to occur. Substantial numbers of insect prey are not likely to be sprayed during ground spraying treatments (no aerial treatment is proposed). The birds in this group are unlikely to forage exclusively on insects contaminated with NPE or herbicides because their insect prey is not likely to be present on invasive plants, so doses of concern are unlikely. Therefore, invasive plant treatments will have "no impact" on flammulated owl, Lewis' woodpecker, Vaux's swift, or purple martin.

Amphibians

Non-herbicide methods

Western toads are quite terrestrial, inhabiting water primarily for breeding. They dig under the soil surface during the day and emerge at night to forage. Toads that are in shallow burrows or vegetative cover could be susceptible to trampling, by people or goats, during treatment of invasive plants. Western toads are not particularly associated with invasive plant communities, but neither are they likely to specifically avoid them unless microhabitat sites under invasive plants are unsuitable. The limited and specific nature of the treatment areas with the NSA, and the low likelihood that individual toads would actually be trampled or harmed during treatment, indicate that invasive plant treatments could impact some individuals, but are not likely to lead to a trend toward State or federal listing.

Herbicides

Data on herbicide effects to amphibians is limited. Appendix P of the USDA Forest Service (2005) summarized available data on the effects of herbicides to amphibians and this discussion is incorporated by reference. Information in Appendix P, and this paper, is largely taken from the corresponding Forest Service risk assessments (SERA2001, 2003, 2004). Where data was lacking, toxicity data on fish was used as a surrogate for toxicity to amphibians, based on studies comparing data available for both groups of species (Berrill et al. 1994; Berrill et al. 1997; Perkins et al. 2000). For glyphosate and sulfometuron methyl there was sufficient data to do a quantitative evaluation of exposure and risk. Quantitative estimates of dose from the exposure scenario are done assuming the amphibian is exposed to contaminated water.

Available information indicates that the following herbicides pose a low risk of mortality to amphibians: chlorsulfuron, clopyralid, imazapic, imazapyr, metsulfuron methyl, and picloram. Data is insufficient to evaluate risk of sub-lethal effects. The Poast formulation of sethoxydim is much more toxic to aquatic species than is technical grade sethoxydim. However, use of Poast is unlikely to result in concentrations in the water that would result in toxic effects to aquatic species (SERA 2001). There is a substantial limitation to this risk characterization because there are no chronic toxicity studies on aquatic animals available for either sethoxydim or Poast. However, for the types of herbicide applications proposed in this analysis, the R6 Invasive Plant BA (USDA Forest Service 2005c) demonstrated that chronic exposures of concern to aquatic species are not possible.

Formulations of glyphosate that contain POEA surfactant are much more toxic to aquatic organisms than aquatic-labeled formulations, which do not contain POEA. The concentration in water for a "worst case scenario" (see fisheries effects analysis) was compared to toxicity data on both versions of glyphosate. At typical application rate, concentrations in the water for acute and chronic exposures were well-below any reported LC50 for either version of glyphosate, with the exception of one study by Smith (2001). The Smith study is not consistent with other reported studies on glyphosate and so was not used to establish the threshold of concern for aquatic species in the Glyphosate Risk Assessment (SERA 2003 Glyphosate).

Relyea (2005) reported a synergistic effect with predatory cues and glyphosate with POEA for one of six amphibian species tested. The effect occurred in wood frogs (*Rana sylvatica)* but not leopard frogs (*R. pipiens*), green frogs (*R. clamitans*), bullfrogs (*R.catesbeiana),* American toads (*Bufo americanus)* or gray tree frogs (*Hyla versicolor)*. The stress from the presence of predatory cues caused glyphosate with POEA to be twice as lethal to wood frogs. Relyea did not report, or did not study, this effect for glyphosate without POEA and states that the POEA surfactant is the likely cause for the high toxicity. The lack of comparison with glyphosate without POEA hampers the usefulness of the study in terms of facilitating conclusions about herbicides and potential synergistic effects from environmental stressors. It cannot be demonstrated that the effect noted by Relyea was due to the herbicide at all.

At the high application rate, concentrations of glyphosate with POEA surfactant exceeded lethal levels and mortality to amphibians could occur. The version of glyphosate without POEA (i.e. the aquatic-labeled formulations) did not exceed 0.1 of the lethal dose (SERA 2003). Based on available data, this dose does not appear to pose a risk of adverse effects to amphibians.

Sufficient data are available on the toxicity of sulfometuron methyl to allow quantitative estimates of exposure and risk. Data is limited to studies on African clawed frogs (*Xenopus*), a sensitive indicator for effects to amphibians (Mann and Bidwell 2000, Perkins et al. 2000). Results from the “worst case scenario” for aquatic species indication that all estimated exposures were far below acute and chronic “no-observable-effect-concentration” (NOEC) values. Sulfometuron methyl has been reported to cause malformations in amphibians, but only at doses that far exceeded those estimated from the worst case scenario.

Triclopyr comes in two forms; triclopyr BEE and triclopyr TEA (aquatic). Triclopyr BEE is much more toxic to aquatic organisms than is triclopyr TEA. Triclopyr cannot be broadcast sprayed, regardless of alternative, because of a standard added to the LRMP by the R6 2005 ROD. At typical application rates, neither version is likely to result in adverse effects to amphibians, using a sub-lethal effect for tadpole responsiveness as a threshold of concern. At the highest application rate analyzed, tadpole responsiveness could be reduced. However, the highest application rate analyzed exceeds that which is legally permitted on the herbicide label, so this rate could not be applied.

Also, the concentrations of concern are not likely to occur from applications in the Proposed Action due to the restriction on broadcast spraying.

Triclopyr also has an environmental metabolite known as TCP (3,5,6-trichloro-2-pyridinol). TCP is about as acutely toxic to aquatic species as triclopyr BEE (SERA 2003 Triclopyr). Adverse effects to aquatic species (based on data from fish) from TCP are likely only if triclopyr is applied at the highest application rates. These rates are highly unlikely to be realized given the prohibition on broadcast spraying of triclopyr.

NPE-based surfactants are known to cause adverse effects, including estrogenic effects, to aquatic organisms. A quantitative risk assessment for NPE was conducted by Bakke (2003), which included risks to aquatic organisms. Estimated concentrations from the operational scenario analyzed (10 acres of broadcast spray immediately adjacent to water) produced exposures 15-30 times lower than the level of concern from all NPE related compounds. Bakke also analyzed a scenario in which a small pond or stagnant stream reach is directly sprayed, with no foliar interception. In this case, levels of NPE related compounds could reach those that pose a risk of toxic effect.

In summary, adverse effects to amphibians are only likely from glyphosate with POEA and triclopyr applied at high rates, or NPE sprayed directly on stagnant water. As discussed, the high application rates of triclopyr and glyphosate will not be used and triclopyr cannot be broadcast sprayed at all, so concentrations in water that pose risks to amphibians are highly unlikely.

PDC F4 limits spraying of NPE-based surfactants to that less than the typical rate analyzed, so concentrations of concern are not likely.

Western toads could also be dermally exposed to herbicides as they move through treated vegetation or soil. There is insufficient data to quantify dose received from dermal exposure to contaminated vegetation or soil, but it is likely to be much less than if the frog was submerged in contaminated water and could easily absorb the solution through its skin. Our assumption for analysis is that risk from exposure to contaminated water adequately encompasses risk from all types of herbicide exposure for amphibians.

Risk of adverse impact to individual toads cannot be ruled out due to limited data availability, but based on the nature and extent of invasive plant infestations and corresponding treatments; proposed treatments are not likely to lead to a trend toward federal listing.

Invertebrates

Non-herbicide methods

The Yuma skipper and chinquapin hairstreak butterflies are unlikely to be present within areas infested by invasive plants. Invasive plant treatment sites within the NSA are primarily previously disturbed and degraded agricultural lands that do not contain significant populations of larval food plants. Most adult butterflies will use several plants, including some invasive species, for nectar sources, but invasive plants within the NSA do not provide significant sources of nectar for these species, nor are invasive plant species identified as larval food plants. There is only one record each for these two species within the NSA due to extremely limited potential habitat and the NSA is at the very edge of the species' ranges. Due to limited presence of habitat and species, and because invasive plant treatment areas do not provide suitable larval food plants or substantial sources of nectar, invasive plant treatments will not effect the Yuma skipper or chinquapin hairstreak butterflies.

The Columbia River tiger beetle is restricted to sand bars. No sand bar habitat is included within treatment areas, so there will be no invasive plant treatments within their suitable habitat. Treatments will have no effect on the tiger beetles, if they are present within the NSA.

Herbicides

Herbicide data on potential effect to butterflies is very limited. Manufacturers are required to conduct toxicity tests on honeybees as part of the registration process and often this is the only information available for potential effects to terrestrial invertebrates. The inclusion of other terrestrial invertebrates in toxicity studies varies for each herbicide. However, even well-studied herbicides will include effects on only a small fraction of terrestrial invertebrate species potentially found in any diverse ecosystem. Risk to invertebrates can only be inferred based on the few test species for which data are available.

There have been a few field studies that looked at potential effects to butterflies from the use of herbicides. Bramble et al. (1997) investigated butterfly diversity and abundance on electric transmission right-of-ways treated with herbicides versus those treated with only mechanical methods. Herbicides used in the right-of-way treatments included a mixture of picloram and triclopyr, a mixture of triclopyr and metsulfuron methyl, a mixture of glyphosate and fosamine, a mixture of triclopyr and imazapyr, and glyphosate alone. They found no significant differences in diversity or abundance of butterflies between herbicide and no-herbicide units. In another study, Bramble et al. (1999) found significantly higher diversity and abundance of butterflies on herbicide-treated units than on hand-cutting units.

Based on available information, the ester formulation of triclopyr (triclopyr BEE) and NPE-based surfactants are the most likely to cause adverse effects (see the R6 2005 FEIS, Appendix P, for details). Restrictions on the application methods for triclopyr, the application rate for NPE and the lack of suitable habitat and species presence within the NSA indicate that proposed invasive plant treatments will not affect the Yuma skipper or chinquapin hairstreak butterflies.

The Columbia River tiger beetle is restricted to sand bars and sandy shores and its presence within the NSA has not been confirmed. No sand bar habitat is included within treatment areas, so there will be no invasive plant treatments within their suitable habitat. Most invasive plants are unlikely to colonize suitable sandbar and shoreline habitat because of frequent and irregular inundation. However, some woody invasive species are invading shoreline habitat along portions of the NSA. Invasion of sand bar or shoreline habitat by invasive plants would make the area unsuitable for tiger beetles and represent a threat to their already limited habitat (based on information on a congeneric species in Niwa et al. (2001). Restrictions on the application methods in riparian areas (e.g. no broadcast), for triclopyr, and the application rate for NPE, in addition to the lack of tiger beetle presence in heavily vegetated areas indicate that treatments will have no effect on the tiger beetles, if they are present within the NSA.

Direct and Indirect Effects to Birds of Conservation Concern

For all species included in the Birds of Conservation Concern, invasive plant treatments proposed on the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area will not remove or degrade their habitat. Removal of invasive plants will likely contribute to the integrity of habitat areas, although no specific habitat elements for these species are currently being affected by invasive plants on the Forest and Scenic Area.

The olive-sided flycatchers, loggerhead shrike, Oregon vesper sparrow, sage sparrow, Brewer’s sparrow and rufous hummingbird will all eat insects. The exposure scenarios for insectivorous birds indicate that only NPE doses would exceed a threshold of concern in acute exposures at typical application rates (see 2005 R6 FEIS, Appendix P). In order to receive this dose, the birds would have to feed exclusively on contaminated insects for an entire day’s feeding. Olive-sided flycatchers catch their flying insect prey high in the air, launching from a high perch in a snag or tree. Proposed broadcast spraying is along infested roadsides and the infestations occur in patches rather than long solid infestations. The patchy nature of proposed invasive plant treatments would make it unlikely for a single flycatcher to feed exclusively on insects from treated patches. While some of their insect prey may become contaminated by broadcast spraying, it seems unlikely that they would forage exclusively on contaminated insects. Chronic doses are even more unlikely because the birds would have to forage exclusively within treated patches for 90 days. Therefore, negative effects to olive-sided flycatchers are unlikely.

The rufous hummingbird inhabits open areas and meadows, catching insects and sipping nectar. A small amount of exposure to herbicides or NPE could amount to a dose of concern because of the very small body size of the rufous hummingbird. These hummingbirds could forage in open areas where invasive plants have been treated and possibly glean contaminated insects. It is unlikely that they would forage exclusively within a patch of invasive plants. These hummingbirds are not known to heavily utilize invasive plants for a nectar source and they prefer tubular flowers where the nectar is deep inside the corolla. Native forage plants would not be treated so the nectar is unlikely to be contaminated with herbicide. Rufous hummingbirds breed from Alaska south to Oregon. The patchy nature of the invasive plant infestations and the multi-state breeding range for this bird indicate that while adverse effects to some individual birds cannot be ruled out, there is not likely to be any population-level effect to the species from proposed invasive plant treatments on the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area.

Loggerhead shrike, Oregon vesper sparrow, Brewer's sparrow, and sage sparrow will eat insects or seeds and will forage at or near the ground.

They could be exposed to contaminated insects within some treatment areas on the east end of the Forest or Scenic Area. Insects and seeds would not be contaminated because invasive plants do not provide the primary foraging habitat for these species. The patchy nature of the invasive plant infestations and the multi-state breeding range for these birds indicate that while adverse effects to some individual birds cannot be ruled out, there is not likely to be any population-level effect to the species from proposed invasive plant treatments.

Direct and Indirect Effects to Landbirds

Invasive plant treatments proposed on the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area will not remove habitat of the focal species. No trees will be removed, forest structure will not be altered by proposed treatments, and native habitat will not be altered. Because the Proposed Action involves targeted herbicide use only on invasive plants, the action is consistent with all conservation options in the Conservation Strategy (Altman 1999). Invasive plant treatments will not alter habitat for focal species in the Partners in Flight land bird conservation strategy.

Only species that forage or nest near the ground are likely to be exposed to disturbance or herbicides from invasive plant treatments. Of the coniferous forest focal species identified in Altman (1999), the following species are most likely to forage or nest near the ground: varied thrush, Wilson's warbler, winter wren, black-throated gray warbler, Hutton's vireo, olive-sided flycatcher, western bluebird, orange-crowned warbler, rufous hummingbird (Source: Altman 1999, Marshall et al. 2003). These species are all insectivorous. Because these species are not reported to nest in invasive plant species targeted for treatment, manual and mechanical treatments are not likely to disturb nests of these species.

As discussed above for ash-throated flycatcher, analysis in Appendix P of the 2005 R6 FEIS indicated that only NPE poses a risk to insectivorous birds at typical application rates for acute exposures. For chronic exposures or high application rates, several herbicides may pose a risk of adverse effects. However, exposures resulting in a dose of concern do not appear plausible for the proposed treatments, because focal species are unlikely to forage exclusively on treated invasive plants and encounter contaminated insects, although risk to some individual birds cannot be ruled out. In conclusion, invasive plant treatments will not alter habitat for focal species in the Partner's In Flight land bird conservation strategy. Manual and mechanical treatments are not likely to disturb nests of focal species. Some individuals of focal species could be exposed to NPE by foraging on contaminated insects, but the likelihood of any dose of concern is remote.

Herbicide Use and Amphibian Decline

Information on the effect of pesticides on amphibian populations is limited, and the studies that are available often focus on the most toxic compounds like insecticides (e.g. Taylor et al. 1999, Bridges and Semlitsch 2000, Boone and Semlitsch 2001, Relyea and Mills 2001). Some herbicides are known to have adverse effects on amphibians (e.g. Hayes 2002, Wojtaszek et al 2005).

To date, atrazine is the only herbicide active ingredient that has been implicated in overall amphibian declines (Hayes 2002). This herbicide is not proposed for use in this project.

Relyea (2005) implicate the glyphosate formulation Roundup in amphibian decline, but the formulation studied contains a toxic surfactant. Numerous previous studies have attributed the toxicity of this formulation to the surfactant and not the glyphosate active ingredient (e.g. Mann and Bidwell 1999; Perkins et al. 2000).

The pesticides investigated (e.g. carbaryl, PCB's, atrazine) all have much higher propensity to accumulate in the fatty tissues than the herbicides proposed in this document. For example, Atrazine has an octanol/water partition coefficient (Kow) of 481 while the highest Kow for any herbicide proposed is 45.1 for sethoxydim, and all the other herbicides have Kow ranging from 2.1 to much less than 1. There is a substantial data gap regarding effects of the herbicides included in this analysis and the potential for effects to amphibian populations, but current data on these herbicides do not suggest a risk to amphibian populations because they do not accumulate in animal tissues and are less persistent, less mobile, and less widely used than pesticides that have been implicated in amphibian declines.

Project design criteria have been proposed that respond to uncertainty about effects to amphibians from herbicide exposure. These project design criteria (e.g. PDC H1, H1a, H6-11, and J7) include buffers that prohibit broadcast spraying, specify selective application methods, and limit the herbicides that can be used within certain distances of amphibian habitat.

Cumulative Effects Analysis for All Alternatives

The project design criteria common to all action alternatives would limit the risk of adverse effects to terrestrial wildlife because they minimize or eliminate disturbance and herbicide exposure scenarios of concern. The types of exposures that are plausible would not reach acute or chronic levels of concern. The invasive plant treatments are likely to have an overall beneficial impact to wildlife to the extent that invasive plants are replaced with native vegetation. All of the environmental standards, policies and laws related to wildlife would be met in all alternatives. The types of treatments that are proposed, implemented according to project design criteria, would thus have a low likelihood of contributing to adverse cumulative effects from other projects on and off the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area. See discussion about Cumulative Effects in Chapter 3.1.

Effects Early Detection and Rapid Response

The project design criteria common to all action alternatives are likely to limit the risk of adverse effects to terrestrial wildlife sufficiently even if new infestations are found outside treatment areas, or if extent is greater than anticipated within treatment areas. The potential adverse effects of treatment are minimized by the PDC, and as long as they are followed, similar treatments in similar sites would have similar effects, regardless of actual location.

3.4 Soils and Water

3.4.1 Introduction

The effect of invasive plant treatment on soils and water is a primary public issue (Issue Group 5). Federal and state laws, policies and regulations control the use of herbicides on National Forest System lands, including the Clean Water Act and the Federal Water Pollution Control Act. Section 208 of the 1972 amendments to the Federal Water Pollution Control Act (Public Law 92-500) specifically mandated identification and control of non-point source pollution. Clean Water Act Section 303(d) directed the State of Washington to list Water Quality Limited Waterbodies (303(d) listed streams) and develop Total Maximum Daily Loads (TMDL) to control the non-point source pollutant causing loss of beneficial uses. Wind River Watershed is covered by a TMDL for temperature.

On the Columbia River Gorge National Scenic Area, Campen Creek is part of a TMDL for fecal coliform and many segments of the Columbia are part of the 2002 Columbia River TMDL for dioxin, and total dissolved gas.

The Gifford Pinchot National Forest Plan (USDA, 1990, amended by the 1994 Northwest Forest Plan ROD and by the R6 2005 ROD for invasive plants) provides direction to protect and manage resources. The Forest Plan Goal for soils is to “Protect, conserve, and enhance the long-term productivity of forest soils for the multiple uses of the Forest”.

Forest Plan Goals for water resources are to “provide water quality needs for municipal and domestic supply, and to protect rivers, streams, shorelines, lakes, wetlands, flood plains, and other riparian areas during implementation of management activities”.

Forest Management Objectives for soil, riparian areas and water resources:

- The primary goal for water quality is to provide high quality water by minimizing soil erosion and the introduction of chemicals and bacteria (IV-12).
- To reduce sediment output and control erosion by following BMPs listed in FEIS Appendix J and integrating mitigation as project design (IV-12).
- All riparian areas are to be managed to protect and maintain their unique values as they relate to wildlife, fish habitat and water quality. (IV-18)

This project would comply with all Washington State water quality standards and requirements detailed in Water Quality Standards for the State of Washington, Chapter 173-201A WAC 1997 & 2003, and Forest Chemicals Chapter 222-38 WAC.

Waters on the Gifford Pinchot National Forest and the Columbia Gorge Scenic Area are considered AA (extraordinary) under State of Washington 173-201A120 list. Beneficial uses for these waters include:

- Water Supply (Domestic, Industrial, Agricultural)
- Stock Watering
- Commerce and Navigation
- Wildlife habitat
- Recreation
- Salmonid migration, rearing, spawning, and harvesting.

3.4.2 Affected Environment

Geology and Soils

Geologically, the Forest is part of the Cascade Mountains and includes Mount Saint Helens, the most active volcano in the United States. Vegetation has been removed by eruptions occurring since the 1980s. The bedrock is primarily volcanic, and includes basalts, andesites, rhyolites and ash. The valleys were eroded by glaciation and runoff, leaving deep glacial deposits in the larger valleys. The geology of the Columbia Gorge is primarily Columbia River basalts eroded by the Columbia River and the Missoula Floods. Where fractured basalts are exposed they can have high permeability, which may serve to transfer contaminants from the surface to groundwater. Fractured basalts surface in a road cut may add to surface flow in the winter or spring when water levels are high.

Soils in the project area vary from ash soils with high permeability to clay with lower permeability. The soil depth ranges from 0 on rock outcrops to greater than 40 inches in other sites.

Many soils are listed as low fertility in the Forest Soil Resource Inventory (SRI) layer with bottom lands and some ashy soils having higher fertility.

Maintenance of soil productivity is essential to sustaining ecosystems and is mandated by every act of Congress directing national forest management. Region 6 Forest Service Manual (2550.3-1, R6 Supplemental # 50) and the Gifford Pinchot National Forest Plan require a minimum of 80 percent of an activity area to have unimpaired soil productivity.

Soils of concern for this project include soils formed in wet meadows and floodplains because these tend to have a high water table which is susceptible to contamination from herbicides. Soils with high water permeability are also of concern because, without proper project design criteria, herbicides that do not attach well to soils and are water soluble may be carried through these soils into ground water. Approximately 30 acres of these soils have been identified on the Forest and 11 acres on the Columbia Gorge as infested with invasives.

Invasive plants can affect soils in many ways. They can cause changes in soil properties such as pH, nutrient cycling, and changes in composition or activity of soil microbes. For example, 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.

Plants and mycorrhizal fungi are strongly dependent on each other, and species of fungi are associated with specific plants. Presence of non-native plants also leads to changes in the mycorrhizal fungus community (ibid). These changes could increase the difficulty of reestablishing native vegetation after the invasive plants are removed.

Municipal Watersheds and Domestic Water Supplies

Four municipal watersheds lie at least partially on Gifford Pinchot National Forest. The Carson Municipal Watershed (on Bear Creek) will continue to be the major water source for residents in the area of Carson, Washington, and will be managed under terms of the "Management Policy Statement for Bear Creek Watershed." This agreement with the Public Utility District of Skamania County was signed by the Forest Supervisor May 1, 1967 (1990, Gifford Pinchot Forest Plan). Herbicide use within all municipal watersheds would be coordinated with watershed managers. The Gifford Pinchot Forest Plan states-"Activities involving sources of domestic and municipal water, especially those in which pesticides and fertilizer are used, will be given monitoring priority."

Approximately 22 acres are currently infested with invasive plants within municipal watersheds, primarily along roads and within other disturbed areas (quarries, campsites). None of the treatment areas are within 1000 feet of any water intake.

In addition to the municipal watersheds, special use permits for approximately 30 surface water intakes are on file for individual homes. Surface water is used in one campground and the other campgrounds use wells as water sources. A map showing the municipal watersheds and other surface water sources is in the project record.

Table 48-Acres of Invasive Plants in Municipal Watersheds

Municipal Watershed Name	Acres of Infestation	Water Source
White Salmon	0	South Fork Buck Creek
Morton	0	Connolly Creek
Carson	18	Bear Creek
GMS - Summer Homes	4	Maidenhair Creek and unnamed Creek
Total	**22**	

Clean Water Act

Approximately 11,160 miles of streams flow on the Forest. Approximately 25 percent are perennial and 75 percent are intermittent. Many of the Scenic Area sites are near the Columbia River or along streams that flow into the Columbia. The Washington State 303(d) list of water quality limited streams lists segments of 21 streams on the Forest, along with segments on Major Creek and the Columbia River within the NSA. These streams within the project area are listed for temperature (table 49). None of the streams are listed due to chemical contaminants.

Table 49-Streams Listed under 303(d) Clean Water Act

Streams Listed for Temperature Under the 303(d) Clean Water Act – Gifford Pinchot NF	
1918 Creek	Muddy River
Lake Creek	Clear Creek
Cispus River	Clearwater Creek
East Creek	Copper Creek
Little Nisqually River	Lynx Creek
East Canyon Creek	Iron Creek
Quartz Creek	Pumice Creek
Little White Salmon River	Lewis River
Little Nisqually River, W.F.	Lewis River, E.F.
Lewis River	Greenhorn Creek
Silver Creek	
Streams Listed for Temperature Under the 303(d) Clean Water Act – Columbia River Gorge NSA	
Major Creek	Columbia River

Aquatic Conservation Strategy

The Aquatic Conservation Strategy (ACS) is an integral part of the 1994 Northwest Forest Plan. The ACS was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems within public lands. The ACS is intended to meet several objectives toward meeting the goal of healthy ecosystems and watersheds. Aquatic Conservation Strategy Objectives are applied over time at watershed and broader scales. A report was prepared to consider whether the project maintains or restores aquatic ecosystem components as part of the ACS. Effects from invasive plants were considered along with effects from treatment. Key aspects of the report are summarized in this section, and the full report is available on request.

Key Watersheds

The Aquatic Conservation Strategy also established a system of Key Watersheds to protect areas of high water quality and habitat for wild fish populations.

Key Watersheds are intended to serve as refugia for at risk stocks of native and anadromous fish. Activities to protect and restore aquatic habitat in Key Watersheds are higher priority than similar activities in other watersheds.

The key watersheds on the National Forest are listed below in table 50. About 44 percent of the invasive plant sites are within Key Watersheds.

Table 50-Key Watersheds

Key Watersheds	Number	Total Acres	Number of Inventoried Invasive Plant Sites
Wind River	WF-1	125,329	15
Clear Fork Cowlitz River	WF-10	62,962	12
E. Fork Lewis River	WF-2	20,619	5
Little White Salmon River	WF-3	28,858	7
Siouxon Creek	WF-4	22,487	4
White Salmon River	WF-5	37,221	7
Lewis River	WF-6	228,860	31
Upper Cispus Creek	WF-7	11,678	15
N. Fork Cispus River	WF-8	27,494	3
Packwood Lake And Streams	WF-9	16,880	4
Total		**582,388**	**103**

5th Field Watershed Analysis

Watershed analysis conducted between 1995 and 1998 for all 5th field watersheds on the forest (pg 2-16 Amendment 11) were reviewed, and recommendations regarding invasive plants were considered in the design of this project. Table 51 shows each 5th field watershed, the estimated infested acres within that watershed, and the estimated infested acres within aquatic influence zones. The aquatic influence zone is roughly approximated by half the distance of a riparian reserve (defined in the Northwest Forest Plan). An estimated 30 percent of the infested acreage lies within riparian reserves.

Table 51-Estimated Infested Acres in Fifth Field Watersheds

Fifth Field Watershed Number and Location	No. of Sixth Fields Containing Treatment Areas	Estimated Infested Acres	Estimated Infested Acres Within Aquatic Influence Zones
1707010501 Middle Columbia – Hell's Gate Canyon	1	97	9
1707010504 Middle Columbia River	2	22	6
1707010510 White Salmon River-Gilmer Creek	1	2	1
1707010512 Major, Rowena, Grays Creeks	3	45	7
1707010604 Mouth of Klickitat River	1	83	5
1708000107 Tanner, Hamilton, Viento and Latourell Creeks	4	110	16
1707010510 **White Salmon**	8	718	90

Fifth Field Watershed Number and Location	No. of Sixth Fields Containing Treatment Areas	Estimated Infested Acres	Estimated Infested Acres Within Aquatic Influence Zones
1707010511 Little White Salmon	5	189	41
1707010512 Wind River	8	86	16
170701051 Col Gorge E. Frontal	1	1	1
1708000108 Washougal River	1	3	1
1708000201 Upper Lewis	13	122	30
1708000202 Muddy River	5	25	2
1708000203 Swift Res. Lewis River	5	115	3
1708000204 Yale Res.Lewis River	4	32	1
1708000205 EF Lewis River	4	7	2
1708000206 Lewis River	2	105	15
1708000301 Kalama River	1	6	1
1708000401 Clearfork Cowlitz	4	163	33
1708000402 Upper Cowlitz	6	258	43
1708000403 Middle Cowlitz	6	21	4
1708000404 Upper Cispus	9	305	59
1708000405 Lower Cispus	8	137	24
1708000501 Riffe Res. Cowlitz	1	3	2
1708000502 Tilton River	2	1	1
1708000504 NF Toutle River	2	23	5
1708000505 Green River	1	2	1
1708000506 SF Toutle River	1	10	2
1711001403 Puyallup	1	1	1
1711001501 Upper Nisqually	6	18	3
Totals		**2,710**	**425**

Riparian Reserves in Treatment Areas

Table 52 displays the estimated infested acres by treatment area. Total treatment areas range from fewer then ten acres (distinct invasive plant population) to more than 6,000 acres (roadsides). The average treatment area size is about 300 acres. Riparian reserves are estimated to average 33 percent of treatment area acreage. The distribution of infested sites within the treatment areas and riparian reserves is scattered. An average of nine percent of each treatment area is estimated to currently have invasive plants. These populations are small and scattered and are not concentrated in any contiguous riparian reserve. Maps of treatment areas are in Appendix A.

Table 52-Estimated Infested Acres by Treatment Area and in Riparian Reserves

Treatment Area id	Total Treatment Area Acres	Treatment Area Acres in Riparian Reserves	Estimated Infested Acres	Estimated Infested Acres in Riparian Reserves
31-01a	1,485	441	114	34
31-01q	24	8	2	1
31-01r2	35	22	3	2
31-08q	9	6	1	0
31-08qa	1	1	0	0
31-08r2	1	0	0	0
31-08r3	29	4	2	0
31-08r4	1	0	0	0
31-09q	14	8	1	1
31-09qa	2	2	0	0
31-09r1	21	1	2	0
31-09r2	8	3	1	0
31-10q	11	4	1	0
31-10qa	2	2	0	0
31-10r1	13	12	1	1
31-10r3	8	4	1	0
31-10r4	48	9	4	1
31-19q	8	5	1	0
31-19qa	2	1	0	0
31-19r2	1	0	0	0
33-03q	7	2	1	0
33-03qa	2	1	0	0
33-03r0	48	46	4	4
33-03r1	25	17	2	1
33-03r2	3	2	0	0
33-03r3	14	8	1	1
33-04	3,388	616	261	47
33-04m1	35	16	3	1
33-04p1	189	32	15	2
33-04q	12	2	1	0
33-04r1	36	17	3	1
33-04r3	33	5	3	0
33-04r4	2	0	0	0
33-05	6,215	1,857	479	143
33-05a	1,542	484	119	37
33-05m1	90	72	7	6
33-05m3	150	10	12	1
33-05m4	32	22	2	2
33-05p1	6	3	0	0
33-05p2	434	162	33	12
33-05q	34	7	3	1
33-05qa	5	1	0	0
33-05r0	19	5	1	0
33-05r1	326	283	25	22
33-05r2	2	1	0	0
33-05r3	49	18	4	1
33-05r4	3	0	0	0

Treatment Area id	Total Treatment Area Acres	Treatment Area Acres in Riparian Reserves	Estimated Infested Acres	Estimated Infested Acres in Riparian Reserves
33-06q	6	1	1	0
33-06qa	2	1	0	0
33-06r1	44	27	3	2
33-06r2	4	2	0	0
33-06r3	19	5	1	0
33-07m	359	200	28	15
33-07q	7	3	1	0
33-07r0	34	7	3	1
33-07r2	8	2	1	0
33-07r3	58	23	5	2
33-07r4	176	69	14	5
33-11	2,023	741	156	57
33-11a	608	363	47	28
33-11m1	4	4	0	0
33-11q	9	3	1	0
33-11qa	2	2	0	0
33-11r1	144	102	11	8
33-11r2	1	0	0	0
33-11r3	35	16	3	1
33-12a	2,641	904	203	70
33-12q	34	13	3	1
33-12qa	5	0	0	0
33-12r1	303	163	23	13
33-12r2	7	3	1	0
33-12r3	30	6	2	0
33-12r4	17	0	1	0
35-13q	28	12	2	1
35-14	2,768	722	213	56
35-14a	1,780	514	137	40
35-14m	575	509	44	39
35-14m1	40	37	3	3
35-14m2	52	52	4	4
35-14m3	7	7	1	1
35-14p	36	5	3	0
35-14q	26	6	2	0
35-14qa	3	3	0	0
35-14r1	47	33	4	3
35-14r3	80	35	6	3
35-14r4	5	1	0	0
35-16a	2,537	964	195	74
35-16q	50	20	4	2
35-16qa	12	4	1	0
35-16r0	50	4	4	0
35-16r1	146	80	11	6
35-16r3	33	21	3	2
35-16r4	18	1	1	0
35-17q	36	15	3	1
35-17qa	2	0	0	0

Treatment Area id	Total Treatment Area Acres	Treatment Area Acres in Riparian Reserves	Estimated Infested Acres	Estimated Infested Acres in Riparian Reserves
35-17r1	16	10	1	1
35-17r3	10	5	1	0
35-18	949	277	73	21
35-18q	15	6	1	0
35-18qa	2	2	0	0
35-18r1	143	94	11	7
35-18r3	2	1	0	0
22-02	107	17	51	8
22-03	65	28	55	24
22-04	5	3	4	2
22-06	296	132	13	6
22-09	88	25	21	6
22-10	67	18	67	18
22-13	349	175	100	50
22-14	19	12	19	12
22-15	18	0	2	0
22-16	101	13	27	3
Total	**31,587**	**10,745**	**2,710**	**918**

Aquatic Emergent Invasive Plants

Approximately 14 acres are estimated to be infested with knotweed; 12 acres on the Gifford Pinchot National Forest and 2 acres on the Columbia River Gorge National Scenic Area (Washington Side). Japanese knotweed has poor bank holding capacity, which leads to more bank erosion and sedimentation of streams in high winter flows (R6 2005 FEIS). While knotweed may provide shade, native streamside hardwoods and conifers are much taller, so knotweed dominated areas may be associated with higher water temperatures than areas with native forest communities. While the known extent of knotweed on the forest is small at this time, knotweed spreads rapidly in flood prone areas such as the Pacific Northwest. Knotweeds tolerate a wide variety of substrates from cobbles to fine soils (Tu and Sol, 2004).

While knotweed has only been recognized as a major problem for the last five years in the Pacific Northwest, it is documented as a major invasive plant in the British Isle and many other areas in the U.S. For example, in the eastern United States, Japanese knotweed has been found along the banks of the Ohio and Allegheny Rivers, and in islands of these rivers where it occupies hundreds of acres of wetlands, stream banks and hillsides (http://www.invasive.org).

Approximately 10 acres infested with reed canarygrass are mapped along streams and wetlands on the Forest and three acres have been mapped within the Scenic Area. Reed canarygrass is extremely aggressive and often forms persistent, monocultures in wetlands and riparian areas. Infestations threaten the diversity of these areas, since the plant chokes out native plants and grows too densely to provide adequate cover for small mammals and waterfowl. Where the reed canarygrass grows in water, it can slow the movement of water carrying sediment and lead to increased siltation along drainage ditches and streams, thus reducing the area of habitat available for fish. Once established, reed canarygrass is difficult to control because it spreads rapidly by rhizomes (http://www.ecy.wa.gov/programs/wq/plants/weeds/aqua011.html).

Purple loosestrife, nicknamed the “purple plague”, is another aggressive riparian invasive species that out competes native vegetation and forms a monoculture. It grows quickly and spreads by roots, stem fragments or seeds. Like reed canary grass, purple loosestrife can increase fine sediment deposition and decrease channel capacity. Purple loosestrife has been found near or within streams and wetlands in the project area.

Without effective treatment, invasive plants can reduce streambank stability, which can lead to increased sediment delivery and subsequent changes in pool frequency and quality. If invasive plants replace riparian conifers and hardwood trees, large woody material inputs could be reduced, affecting stream stability, morphology and fish habitat. Himalayan blackberry and knotweed can act as a sediment trap and fish barrier. For instance, dense thickets of blackberries are presently catching sediment causing excessive aggradation of the streambed. This causes the stream to widen and downcut around the aggraded areas. In some areas the berry vines are thick enough to be a physical barrier to fish on a stream near the Columbia River in the Columbia Gorge Scenic Area (Dobson, personal communication, July, 2005).

Wetlands can be inundated with water year-round, and others are wet only seasonally. The areas that are wet only seasonally can be infested with upland invasive species, as well as invasive plants specifically adapted to wetlands. Five acres of wetlands are identified as infested with invasives on the Scenic Area. Approximately 104 acres of invasive plants on the Forest are within treatment areas classified as meadows (does not distinguish between wet and dry meadows). The Forest SRI (soils information) lists 373 acres within treatment areas as soils associated with floodplains or wet meadows. A portion (about 30 acres) of soils associated with floodplains or wet meadows within treatment areas are infested at this time.

Roads Having High Potential for Herbicide Delivery

Roads are the primary conduit for invasive plants to enter the forest. On the Gifford Pinchot approximately 85 percent of the identified invasives are along roads or in disturbed areas near roads, such as recreation sites, administrative sites, and skid trails in second growth forest. For the Columbia Gorge Scenic Area the treatment areas are often reclaimed farm land, orchards and railroad beds.

The R6 2005 FEIS describes roadside ditches as an herbicide delivery mechanism; potentially posing a high risk of herbicides reaching concentrations of concern for listed aquatic species (see Chapter 3.5 below). Ditches may function as an intermittent or perennial stream, extending the stream network. Roadside ditches can act as delivery routes or intermittent streams during high rainfalls, or as settling ponds following rainfall events.

The 2002 Gifford Pinchot National Forest Roads Analysis was used to identify roads that pose a high risk to aquatic resources, specifically streams. Aquatic risk factors used to identify high risk roads in the Roads Analysis were: geologic hazard, proximity (delivery) to fish habitat, stream crossing density, stream proximity, and upslope hazard. Of the five categories used to identify “high aquatic risk” roads, three relate directly to processes that contribute to the potential delivery of herbicides to streams: proximity (delivery) to fish habitat, stream crossing density, and stream proximity.

These three categories were used to identify roads with high potential for herbicide delivery. In this case, sediment delivery was used as a surrogate for herbicide delivery.

Roadside treatment areas include compacted ditch lines, disturbed soil and thin soils near exposed bedrock. Due to the extensive reworking of properties of soils along roads, the SRI may be misleading for roadside treatment areas. As roads and ditchlines are compacted, roadside soils are assumed to function with a high runoff rate and PDC were developed accordingly.

Tables 53 and 54 display the acreage within various types of treatment areas mapped on the Forest and Scenic Area. Approximately 943 acres of the 2,000 roadside treatment areas on the Forest are on roads with high potential to deliver herbicides to streams.

Table 53-Infested Acres by Treatment Area Description Gifford Pinchot National Forest

Gifford Pinchot National Forest Treatment Area Description	Estimated Infested Acres	Estimated Infested Acres Within Riparian Reserves	Estimated Infested Acres Along Roads With High Potential to Deliver Herbicide to Streams
Roadside	2,000	552	943
Quarries	27	11	0
Meadow	104	72	0
Administrative Site	11	5	0
Dispersed and Developed Campgrounds	105	68	0
Managed Timber Stand	51	16	0
Parking Areas and Viewpoints	52	18	0
Total Acres	**2,350**	**742**	**943**

Table 54-Infested Acres by Treatment Area Description Columbia River Gorge National Scenic Area

Columbia Gorge Scenic Area Treatment Area Description	Estimated Infested Acres	Estimated Infested Acres Within Riparian Reserves	Estimated Infested Acres Along Roads With High Potential to Deliver Herbicide to Streams
Clearing	135	39	0
Forest	220	42	0
Wetland	5	2	0
Total Acres	**360**	**83**	**0**

3.4.3 Environmental Consequences

Effects on Soils

Effects of Manual and Mechanical Treatment

Manual and mechanical treatments are approved in all alternatives. Effects of manual and mechanical treatments were analyzed in the R6 2005 FEIS (Appendix M) and are summarized in this section. Public scoping issues about these treatments were not raised. Manual treatments, such as lopping or shearing, can cause an input of organic material (dead roots) into the soil. Resulting high nutrient levels combined with disturbed soil provide ideal conditions for the establishment of many invasive species. Removal of plant roots will 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) increases the nutrient uptake of the subsequent crop (Evans and Miller, 1990). Establishment of native plants may be more successful on undisturbed soil.

Manual and mechanical treatments may slightly increase the potential for delivery of fine sediment to streams. Scotch Broom occupies up to 781 acres on the Forest and approximately 55 acres on the Scenic Area. Weed wrenching of scotch broom may loosen soil and cause negligible amounts of erosion for approximately one season until vegetation was reestablished. Passive and active restoration would occur to reestablish native vegetation. The intent is to re-establish competitive local, native vegetation post-treatment in areas of bare ground.

Mechanical treatments using heavy equipment have the potential to compact soil, eliminate soil pores and reduce water infiltration, aeration, and the ability of plants to root effectively. While the relative amounts of manual and mechanical treatments may vary, little substantive differences in terms of the context or intensity of effects are predicted regardless of alternative. Other mechanical treatments, such as the use of motorized hand tools, are expected to have effects similar to manual treatments.

Cultural (Grazing)

Grazing is proposed on the Columbia River Gorge National Scenic Area within treatment areas 22-03 and 22-06 (see Appendix A). Small amounts of manure could get in the stream, but PDC would ensure close control of goats to avoid adverse impacts to water quality.

Goats could be used to reduce the infestation and weaken the plants before hand treatment with herbicides. This would minimize the amount of herbicide used within the aquatic influence zone. By treating the invasives with grazing first, impacts on the site from other treatments would be reduced. In addition, grazing would minimize the need for mechanical treatment.

Herbicide Characteristics in Soils

Soil impacts vary depending on characteristics of the chemical used, how it is applied, and the physical, chemical and biological condition of the soil itself. PDC minimize adverse effects from the use of herbicides on soil organisms and erosion from removal of ground cover, which are the most important factors that affect soil.

General characteristics for the proposed herbicides are displayed below; these were compiled from the R6 2005 FEIS, label information and SERA Risk Assessments and compiled for the *Mount Hood National Forest and Columbia River Gorge National Scenic Area (Oregon side) Site-Specific Invasive Plant Treatment* FEIS and are used by permission here.

Half-lives in the soil vary depending on many factors including climate and soil texture. The PDC consider herbicide characteristics applied to local conditions.

Chlorsulfuron

Studies on the effects of chlorsulfuron on soil biota include lab and field studies on nematodes; fungi; populations of actinomycetes, bacteria, and fungi; and soil microorganisms.

- No effects of chlorsulfuron were found for soil biota at recommended application rates, with the exception of transient decreases in soil nitrification.
- The ‘no observable effects concentration’ for soil is 10 mg/kg, based on cellulose and protein degradation.
- Chlorsulfuron degrades in aerobic soil.
- Non-microbial hydrolysis plays an important role in chlorsulfuron breakdown, and hydrolysis rates increase as pH increases.
- Adsorption to soil particles, which affects the runoff potential of chlorsulfuron, is strongly related to the amount of organic material in the soil.
- Chlorsulfuron adsorption to clay is low.
- Chlorsulfuron is moderately mobile at high pH.
- Leaching is reduced when pH is less than six.
- Modeling results indicate that runoff would be negligible in sandy or loamy soils.

- In clay soils, off-site loss could be substantial (up to about 55 percent of the applied amount) in regions with annual rainfall rates of 15 to 250 inches.

Clopyralid

Studies of clopyralid effects on soil invertebrates have been conducted, including field studies on the effects to microorganisms.

- Soil concentrations from USDA Forest Service applications are expected to be 1,000 less than concentrations that would cause toxic effects. Therefore, no effects to soil invertebrates or microorganisms are expected from use of clopyralid.
- Clopyralid is degraded by soil microbes, with an estimated half-life of 14 to 29 days.
- Increased soil moisture decreases degradation time.
- Clopyralid is weakly adsorbed and has a moderate leaching potential overall but high leaching potential in sandy soils.
- Modeling results indicate clopyralid runoff is highest in clay soils with peaks after rainfall events.
- Clopyralid percolation is highest in sandy loam soils.

Glyphosate

Numerous soil bacteria, fungi, invertebrates, and other microorganisms have been studied for effects of glyphosate application.

- Studies suggest glyphosate does not adversely affect soil organisms.
- Glyphosate is readily metabolized by soil microorganisms and some species can use glyphosate as a sole source of carbon.
- It is degraded by microbial action in both soil and water.
- Sylvia and Jarstfer (1997) found that after 3 years, pine trees in plots with grassy invasive plants had 75 percent fewer mycorrhizal root tips than plots that had been treated 3 times per year with a mixture of glyphosate and metsulfuron methyl to remove invasive plants.
- Glyphosate degrades in soil, with an estimated half-life of 30 days.
- Glyphosate is highly soluble, but adsorbs rapidly and binds tightly to soil.
- Glyphosate has low leaching potential because it binds so tightly to soil.
- Modeling results indicate glyphosate runoff is highest in loam soils with peaks after the first rainfall.

Imazapic

Imazapic is a relatively new herbicide, and there are no studies on the effects of imazapic on either soil invertebrates or soil microorganisms.

- If imazapic was extremely toxic to soil microorganisms, it is reasonable to assume that secondary signs of injury to microbial populations would have been reported.
- Imazapic degrades in soil, with a half-life of about 113 days.
- Half-life is decreased by the presence of microflora.
- Imazapic is primarily degraded by microbes and it does not degrade appreciably under anaerobic conditions.

- Imazapic is weakly adsorbed in high soil pH, but adsorption increases with lower pH (acidic soils) and increasing clay and organic matter content.
- Field studies indicate that imazapic remains in the top 12 to 18 inches of soil and do not indicate any potential for imazapic to move with surface water.
- Modeling results indicate imazapic runoff is highest in clay and loam soils with peaks after the first rainfall.
- Imazapic percolation is highest in sandy soils.

Imazapyr

There are no studies on the effects of imazapyr on soil invertebrates, and incomplete information on the effects on soil microorganisms.

- One study indicates cellulose decomposition, a function of soil microorganisms, can be decreased by soil concentrations higher than concentrations expected from USDA Forest Service applications.
- There is no basis for asserting adverse effects to soil microorganisms.
- Imazapyr degrades in soil, with a half-life of 25 to 180 days.
- Degradation rates are highly dependent on microbial action.
- Anaerobic conditions slow degradation.
- Adsorption increases with time as soil dries and is reversible.
- Field studies indicate that imazapyr remains in the top 20 inches of soil and do not indicate any potential for imazapyr to move with surface water.
- In forest field studies, imazapyr did not run off and there was no evidence of lateral movement.
- Modeling results indicate imazapyr runoff is highest in clay and loam soils with peaks after the first rainfall.
- Imazapyr percolation is highest in sandy soils

Metsulfuron methyl

Studies on the effects of metsulfuron methyl on soil biota are limited to *Pseudomonas* species, though there are a few studies of insects that live in soil. The lowest observed effect concentration is 5 mg/kg, based on the Psuedomonas study. At recommended use rates, no effects are expected for insects.

- Effects to soil microorganisms appear to be transient
- Metsulfuron methyl degrades in soil, with a variable half-life up to 120 days.
- Half-life is decreased by the presence of organic matter though microbial degradation of metsulfuron methyl is slow.
- Non-microbial hydrolysis is slow at high pH but rapid at lower pH.
- Adsorption to soil particles, which affects the runoff potential of metsulfuron methyl, increased with increased pH and organic matter.
- Metsulfuron methyl has low adsorption to clay.
- Modeling results indicate that off-site movement due to runoff could be significant in clay soils.
- Metsulfuron methyl percolates in sandy soils.

Picloram

Picloram is a restricted use pesticide in the state of Washington, meaning it may only be used by a certified applicator (this is also a standard for all herbicide use on the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area). The persistence of picloram increases with soil concentration, thus increasing the likelihood that it becomes toxic to soil microorganisms in the short-term.

- Since picloram is toxic to microorganisms at low levels, toxic effects can last for some time after application.
- Persistence in soils could affect soil microorganisms by decreasing nitrification.
- Long-term effects to soil microorganisms are unknown.
- Picloram applied at a typical application rate is likely to change microbial metabolism, though detectable effects to soil productivity are not expected.
- Field studies have not noted substantial adverse effects associated with the normal application of picloram that might be expected if soil microbial activity were substantially damaged.
- Substantial effects to soil productivity from the use of picloram over the last 40 years have not been noted.
- Picloram has been studied on a number of soil invertebrates.
- Metabolites may increase toxicity for some soil microorganisms.
- Picloram has a typical half-life of 90 days.
- However, picloram soil degradation rates vary in soil, depending on application rate and soil depth.
- Picloram is water soluble, poorly bound to soils that are low in clays or organics, has a high leaching potential, and is most toxic in acidic soil.
- Picloram should not be used on coarse-textured soils with a shallow water table, where groundwater contamination is most likely to occur.
- Picloram percolation is highest in loam and sandy soils. However, modeling results indicate picloram runoff (not percolation) is highest in clay soils.

Sethoxydim

Sethoxydim has not been studied on soil invertebrates.

- Assays of soil microorganisms noted transient shifts in species composition at soil concentration levels far exceeding concentrations expected from Forest Service applications.
- No adverse effects to soil organisms are expected.
- Sethoxydim is degraded by soil microbes, with an estimated half-life of 1 to 60 days. Adsorption of sethoxydim varies with organic material content.
- Modeling results indicate sethoxydim runoff is highest in clay and loam soils with peaks after the first rainfall.

Sulfometuron methyl

There are no studies on the effects of sulfometuron methyl on soil invertebrates. However, it is toxic to soil microorganisms. Microbial inhibition is likely to occur at typical application rates and could be substantial. Soil residues may alter composition of soil microorganisms.

- Sulfometuron methyl mobility is generally greater at higher soil pH and lower organic matter content.
- 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.
- Modeling results indicate sulfometuron methyl runoff is highest in clay and loam soils with peaks after the first rainfall. Sulfometuron methyl percolation is highest in sandy soils. Monitoring results generally support modeling results.
- Sulfometuron methyl applied to vegetation at typical application rates would probably be accompanied by secondary changes to vegetation that affect the soil microbial community more certainly than direct toxic action of sulfometuron methyl on soil microorganisms.

Triclopyr

The five commercial formulations of triclopyr contain one of two forms of triclopyr, BEE (butoxyethyl ester) or TEA (triethylamine). Triclopyr 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. 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.

Summary of Soils Concerns and Project Design Criteria

Table 55 shows the project design criteria related to use of clopyralid, chlorsulfuron, picloram and sulfometuron methyl so that adverse effects on soil productivity and/or groundwater are avoided or minimized.

Table 55-Soil Property and Project Design Criteria

Soil Properties of Concern	Special Project Design Criteria in All Action Alternatives
Chlorsulfuron does not adhere to clay and therefore is available to leach or run off.	H-7 Avoid use of chlorsulfuron on soils with high clay content (finer than loam).
Clopyralid has high potential mobility in sandy soils. It can be persistent in groundwater.	H-6 Avoid use of clopyralid on high-porosity soils (coarser than a loamy sand).
Picloram is persistent in soil and water, and has high potential mobility in sandy soils.	H-8 Avoid use on shallow or coarse soils (coarser than loam.) No more than one application of picloram would be made within a two-year period, except to treat areas missed during initial application.
Sulfometuron methyl is persistent in soil and water, and has high potential mobility in sandy soils.	H-9 Avoid use on shallow or coarse soils (coarser than loam.) No more than one application within a one-year period, except to treat areas missed during initial application.

Effects on Water Quality

Non-herbicide

Treating invasive plants would improve riparian stability where invasive plants such as knotweeds have colonized along stream channels and out-competed native species. All invasive plant treatments carry some risk that removing invasive plants could exacerbate stream instability; however mulching, competitive seeding and planting would be implemented as needed to revegetate riparian and other treated areas (see Appendix F).

Treatments within the aquatic influence zone could result in negligible amounts of sediment due to erosion related to the minor ground disturbance associated with manual, mechanical and to a lesser extent, herbicide and cultural treatments. While modification of surface ground cover can also change the timing of run-off, treatment areas comprise such a small portion of any watershed that effects to stream flows are implausible.

Cultural treatments are small scale and would be managed to avoid damaging water quality.

Herbicide

Herbicide Delivery Mechanisms

The routes for herbicide to contaminate water are; direct application, drift into streams from spraying, runoff from a large rain storm soon after application, and leaching through soil into shallow ground water or into a stream. No direct application of herbicide to water is intended in any alternative; however, invasive plant treatments in wetlands or stream channels may result in some herbicide entering surface waters. NMFS 2008 BO (page 83) identified three exposure mechanisms from herbicide due to 1) runoff from riparian application, 2) application within perennial streams (i.e. emergent invasive plants), and 3) runoff from treated [roadside] ditches and dry intermittent streams.

Drift, including inadvertent overspray, is the most likely vector for herbicides coming in contact with water from riparian area or emergent vegetation treatment sites. The potential for drift varies with the herbicide application method. Spot and hand/selective application methods substantially reduce the potential for drift. Drift is most associated with broadcast treatments and can be mitigated to some extent by the applicator (see 3.2 above for more information about drift).

Label restrictions; restrictions on application rate, type of herbicide, and application method; buffers; and the use of adjuvants all factor in to limiting the potential amount of drift. In addition, roads that have a high potential for herbicide delivery have been identified and have added restrictions, such as no broadcasting. Although there will be no herbicide applied directly to the water column for purposes of treating submerged vegetation, there may be some fine droplets from spot applications coming in contact with water as a result of treating emergent vegetation.

Herbicide can move from the treatment location into adjacent areas through runoff. Some runoff can enter streams either through road or slope drainage. Roadside ditches can act as herbicide delivery routes to streams during high rainfalls or as settling ponds following rainfall events.

Herbicides affect lakes and wetlands differently than streams. Dilution by flow or tributary inflow is generally less effective in lakes. Dilution is partially a function of lake size, but dilution could be rapid in small lakes with large water contributing areas. Decreases in herbicide concentration in lakes, ponds, and other lentic water bodies are largely a function of chemical and biological degradation processes rather than of dilution. Evaporation of water from a lake's surface can concentrate chemical constituents. As vegetation emerging from water dies the oxygen level within a lake or wetland can decrease.

Previous Monitoring Results

Berg (2004) compiled monitoring results for broadcast herbicide treatments given various buffers along waterbodies. The results showed that any buffer helps lower the concentration of herbicide in streams adjacent to treatment areas. In California, when buffers between 25 and 200 feet were used, herbicides were not detected in monitored streams (detection limits of 1to 3 mg/m3) (ibid).

In South Carolina, buffers of 30 meters (comparable to 100 feet) during ground applications of the herbicides imazapyr, picloram and triclopyr resulted in no detectable concentrations of herbicide in monitored streams (ibid). No detection limits were given.

Even smaller buffers have successfully protected water quality. For example, where imazapyr was aerial sprayed without a buffer, the stream concentration was 680 mg/ml. With a 15-meter buffer, the concentration was below detectable limits (ibid.). No detection limits were given.

Berg also reported that herbicide applied in or along dry ephemeral or intermittent stream channels may enter streams through run-off if a large rainstorm occurred soon after treatment. This risk is minimized if intermittent and ephemeral channels are buffered (ibid.). Risk may also be minimized by limitations on herbicide selection and application method. If a large rainstorm occurs sediment contaminated by herbicide could be carried into streams. As most ditch lines on the National Forest and Scenic Area are heavily vegetated, this is less likely to occur than in a drier environment.

The United States Geological Service, in partnership with the Oregon Department of Transportation, studied runoff of herbicides along roads (Wood, 2001). The study was conducted on runoff associated with sulfometuron methyl and glyphosate along a road in western Oregon. Water (simulated rainfall) was applied at 1/3 inches an hour at 1, 7 and 14 days after treatment. Samples were collected at the shoulder of the road and found concentrations of several hundred ppb of sulfometuron-methyl and nearly 1,000 ppb of glyphosate that could potentially leave the road shoulder.

In the fall, the road was again sprayed and the ditch line of the road was checked during natural rainstorms for three months. Sulfometuron-methyl was found in concentrations of 0.1 to 1 parts per billion (ppb) along the shoulder and from 0.3 to 0.1 ppb in the ditch line, but below detectable limits in the stream. Glyphosate was not found at the shoulder, ditch line or stream. This study indicates that the greatest risk of herbicides moving off site is from large storms soon after herbicide application. In addition, this study also indicates that sulfometuron methyl may persist in the environment as it was detectable along the shoulder of the road (but not in the stream) the entire duration (three months) of the study.

The Washington State Department of Agriculture (WSDOA 2004, 2005 and 2006) monitored residual concentrations of aquatic labeled herbicides for treatment of emergent noxious and quarantine weeds. Ten out of the sixteen sites sampled between the years 2003 and 2005 showed residual herbicide levels that were below a level of concern for drinking water. The rest showed no detectable level of herbicide.

Effects from Riparian Treatment at the Site Scale

The potential for run off to result in herbicide contamination to water (associated with treatments within Riparian Reserves) was analyzed at the site scale using the SERA Worksheets (SERA 2007). The worksheet model is sensitive to the behavior of each herbicide in soil and water. Potential concentrations from emergent vegetation treatments were also calculated (see Chapter 3.5 below for more information). The model and calculation were used to indicate whether treatments near streams and wetlands could enter water in concentrations above a level of concern for beneficial uses, including drinking water and fish. More information on the methodology used is in SERA 2007, the Biological Assessment for this project (available on our website or hard copy by request), and Chapter 3.5 below.

The Cave Creek Meadow (treatment area #33-05ml) on Gifford Pinchot National Forest, and the Hot Springs site (treatment area #22-04) on the Columbia River Gorge National Scenic Area have the greatest likelihood of herbicides coming in contact with water as a result of treatment within Riparian Reserves, including treatment of emergent wetland vegetation under the Proposed Action, because invasive plants may be growing immediately along the water line (in some cases emergent) in these areas or growing in seasonally or perennially saturated soils.

The worst-case analysis indicated a relatively low risk of adverse effects from herbicide delivery at the site scale. While some herbicide is predicted to contact water at these sites despite cautious practices, the amount would be much smaller than the amount that could cause concern to water quality, watershed processes or aquatic organisms. In the analysis, all invasive plants within these treatment areas were assumed to lie near or within a stream, floodplain or wetland. In reality, treatment areas contain upland and riparian target species.

The PDC and buffers and implementation planning process ensure that potential for harm to the aquatic ecosystem remains low for future treatments under the Early Detection Rapid Response approach (see Chapter 2.5).

Roadside Ditches

The primary determinants of exposure include herbicide properties, application rate, extent of application, application timing, and precipitation amount and timing, and proximity to stream crossings. The highest concentration of herbicides resulting from application to ditches and intermittent channels is likely to occur early in storm runoff (NMFS BO 2008). The most significant exposure locations are at or near confluences with perennial streams (ibid.).

The mechanism of herbicide delivery through roadside ditches was recognized in the design of the Proposed Action and Alternative C. No broadcast of herbicide would occur on any roadside with high potential to deliver herbicide to streams. In addition, PDC limit the type of herbicide that could be used near any wet roadside ditch. Herbicide use is either eliminated near stream crossings (no herbicide use in riparian reserves in Alternative C) or restricted by buffers developed where roads cross wet or dry streams and/or wetlands (see Chapter 2.5).

An analysis of juxtaposition of invasive plants along roads did not reveal contiguous ditchline concentrations that would result in significant herbicide delivery.

Accidental Spill

Concentrations of herbicides in the water as a result of an accidental spill depend on the amount and concentration of herbicide spilled and the size and volume of the water body. The persistence of the herbicide in water depends on the length of stream where the accidental spill took place, velocity of stream flow, and hydrologic characteristics of the stream channel. The concentration of herbicides would decrease rapidly down-stream because of dilution and interactions with physical and biological properties of the stream system (Norris et. al.1991).

Accidental spills are not considered within the scope of this project. PDC would reduce the potential for spills to occur, and if an accident were to occur, minimizes the magnitude and intensity of impacts. An herbicide transportation and handling plan is a project requirement. This plan would address spill prevention and containment (See Table 15, PDC G).

Municipal Watersheds and Domestic Water Supplies

Coordination with water boards and users would occur and herbicide use within 1000 feet (slope distance) upstream of known water intakes would be coordinated with the water manager or owner. In all alternatives, existing municipal watershed agreements would be followed.

Most of the infestations in municipal watersheds are along roads. Some of these roads are currently proposed for broadcast treatment, assuming density of invasive plants warrant this method. Herbicide use may be excluded or limited to spot and/or hand treatments according to a memorandum of understanding.

Under all alternatives water quality would not be adversely affected for municipal watershed or other domestic water supplies, because:

- All alternatives protect drinking water supplies. None of the treatment areas are within 1,000 feet of any water intake. There are no plausible scenarios that could lead to drinking water contamination sufficient to affect public health, given the types of herbicide proposed and the manner they will be used. Concentrations of herbicides that may reach groundwater or streams are low and below levels of concern for people (see Appendix Q and Chapter 4.5 of the R6 2005 FEIS, and Section 3.6 later in this chapter.)
- About 57 acres are proposed for treatment within municipal watersheds, about half of which are estimated to be within the aquatic influence zone. Only a small portion of any municipal watershed would be treated.
- Herbicide would not be applied within 100 feet of wells and/or 200 feet of springs as are required by Washington State WAC 246-290-315.

Aquatic Conservation Strategy

Treatment of invasive plants is consistent with recommendations in watershed analysis done for key watersheds on the Gifford Pinchot National Forest. None of the invasive plant treatments in the scope of this document would retard achievement of ACS objectives in these, or other watersheds, because the PDC minimize potential for harm at the site scale and less than one percent of the aquatic influence zone of any 5th field watershed would be affected (about 0.15 percent of the acreage within aquatic influence zones in 5th field watersheds is currently estimated to be infested, ranging from less than 0.1 percent up to about 0.4 percent). An analysis of each alternative relative to ACS objectives is in the following section. A report detailing compliance with the ACS is available in the project record.

Direct and Indirect Effects of the Alternatives

Alternative A (No Action)

On the Gifford Pinchot National Forest, a previous decision approved about 100 acres of glyphosate spot treatments within administrative sites. Fewer than 50 acres, limited to selective methods, would occur within riparian reserves in administrative sites.

An additional 2,300 acres manual treatment (mainly on roadsides) was also previously approved and could continue to occur under No Action. On the Columbia River Gorge National Scenic Area, most of the known infestations would be treated (300 of 360 acres).

No broadcast treatments would occur on the Gifford Pinchot National Forest. Broadcast treatments would continue to occur on a small scale on the Columbia River Gorge according to existing plans. The range of herbicides that may be used on the Scenic Area are among those with greater persistence (picloram) and higher risks to aquatic organisms (picloram, glyphosate, triclopyr) compared to the ten considered for the Proposed Action.

Chapter 3.2 describes the relative effectiveness of each alternative; No Action would not result in control of invasive plants for many years, even with an unlimited budget. Adverse watershed effects from the infestations would likely continue or worsen. Knotweeds and other invasive plants could continue to destabilize stream banks.

Invasive plant treatments under Alternative A would continue to result in small areas of localized erosion and sedimentation until vegetation became re-established. Most invasive plants provide little shade; therefore removing them would not lead to a measurable change in temperature.

Measurable chemical contamination is unlikely. No herbicide would be applied directly to water, nor would measurable amounts likely be transported by runoff, leaching or drift, given the small scale of herbicide use across the area. The treatments proposed are unlikely to result in large amounts of decaying plants or nutrients entering a stream at one time, and therefore no change to oxygen levels is anticipated. Effects would be similar to baseline conditions, since the No Action alternative has been partially implemented already and is ongoing. While herbicides may drift or run off away from the application site, the distance they may move is small and offsite effects are unlikely.

Cumulative Effects

The spatial scale for cumulative effects analysis for soils and water is the 6th field watershed level. Most 6th field watersheds vary from 9,000 and 25,000 acres. Some of the watersheds are primarily Forest Service land and others are mostly private; averages for all the 6th fields in the Project Area are 60 percent National Forest System lands and 40 percent other public lands, tribal lands, and private properties.

Land management activities including treatment of invasive plants would occur on other ownerships within 6th field watershed. Counties commonly treat roadsides with mowing or herbicides. Herbicides are also used on private farmland, golf courses, and private timberlands. The extent and type of herbicide use on private lands was estimated in Chapter 4.1 of the R6 2005 FEIS.

None of the streams in the project area are currently 303d listed for chemical contamination. The No Action Alternative would not contribute to chemical contamination. The minor amount of sediment associated with No Action would be negligible at the watershed scale.

Aquatic Conservation Objectives

The following discussion is focused on the existing condition relative to invasive plants in the treatment area and their impact on meeting ACS objectives.

No Action assumes ongoing treatment; however, the effects of treatments approved under No Action are minor, short-lived and insignificant relative to ACS objectives.

1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

The diversity of watershed scale features may be impacted over time by the spread of invasive plants. Invasive plants found growing adjacent to or within aquatic influence areas can invade, occupy, and dominate riparian areas and indirectly impact aquatic ecosystems and fish habitat. About 33% of the currently infested sites are found within Riparian Reserves. About 44 percent of the invasive plant sites are within Key Watersheds.

2. Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

No action would not likely affect chemical or physical routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species. Small obstructions are possible from emergent target species (reed canary grass, knotweed, purple loosestrife).

3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.

Knotweed has poor bank holding capacity, which can result in bank erosion and sedimentation of streams in high winter flows. This species threatens the physical integrity of stream banks. Purple loosestrife and reed canarygrass are other wetland loving species that are having adverse effects on the physical integrity of the aquatic system (see species by treatment area in Appendix A of the EIS for locations of these species, they are scattered in small patches throughout the project area).

4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

Invasive plants do not currently affect water quality. The range and extent of target species in aquatic influence zones is relatively small (about 0.15 percent of the acreage within aquatic influence zones in 5th field watersheds is currently estimated to be infested, ranging from less than 0.1 percent up to about 0.4 percent). No streams on the Forest are water quality listed (303d) for chemical contamination.

5. Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

Target species such as knotweed, blackberry, purple loosestrife and reed canarygrass can choke streams, become sediment traps and cause stream aggradation, and/or block fish access. Spawning gravels locked up in the root masses are unavailable for fish, and the stream areas around the root masses have such accelerated flows that gravels aren't retained, resulting in a net loss of fish habitat. Banks could become less stable, leading to changes in suspended sediment and substrate character and embeddedness. Potentially this could lead to changes in pool frequency and quality.

6. Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.

Invasive plants can change stand structure and alter future inputs of wood and leaves that provide the basic foundation of the aquatic ecosystem food webs.

7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.

Reed canary grass, purple loosestrife, or knotweed emerging from wetland can alter water table elevation.

8. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.

Riparian vegetation stabilizes stream banks, and acts as a filter to prevent the run-off of soil into streams. Riparian vegetation also provides large and small wood to streams, adding to habitat complexity and providing cover and food sourced for aquatic organisms. Aquatic ecosystems have evolved with certain vegetation types; invasive plants do not necessarily provide similar habitat.

While knotweed may provide shade, native streamside hardwoods and conifers are much taller, so knotweed dominated areas may be associated with higher water temperatures than areas with native forest communities.

Approximately 13 acres of reed canary grass are mapped along streams and wetlands on the Forest. Reed canarygrass is extremely aggressive and often forms persistent, monocultures in wetlands and riparian areas.

9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species.

Native vegetation growth may change as a result of infestation, and the type and quality of litter fall, and quality of organic matter may decline, which can alter or degrade habitat for aquatic organisms. For example, native vegetation regeneration was reduced as a result of knotweed infestations (Lauren Urgenson, personal communication). The amount of nitrogen to aquatic ecosystems through riparian litter fall may be compromised because knotweed retains more nitrogen than native species. The availability of nitrogen to aquatic biota and native vegetation may be significantly reduced because knotweed can uptake or hold on to 75 percent of leaf nitrogen in the root system (ibid). Primary and secondary consumers that form the basic food source for fish and other aquatic organisms may be indirectly affected.

Reed canarygrass infestations threaten the diversity of these areas, since the plant chokes out native plants and grows too densely to provide adequate cover for small mammals and waterfowl.

Alternative B (Proposed Action)

Under this alternative, land managers would have the option of using herbicide on the estimated 2,350 infested acres on the Gifford Pinchot National Forest and 360 infested acres on the Columbia River Gorge National Scenic Area. Herbicides would be a part of the prescription on most acreage, particularly the first few years of treatment. Approximately 85 percent of the treatments on Forest occur along roads. None of the Columbia River Gorge National Scenic Area treatments are classified as roadside treatments, although they would occur in accessible areas near roads and other developed areas.

On the Columbia River Gorge National Scenic Area (Washington side, the amount of estimated herbicide use would increase overall from 300 to 360 acres. Of these, about 70 acres of broadcast spraying is currently approved. This amount would increase to about 100 acres in this alternative. The range of herbicides that may be used on the Scenic Area currently are among those with greater persistence (picloram) and higher risks to aquatic organisms (picloram, glyphosate, triclopyr) – less persistent, mobile and/or toxic herbicides would become available under the Proposed Action, which would likely decrease the risks compared to No Action. Currently, for instance, triclopyr may be broadcast on the Scenic Area, this method would not be approved under the Proposed Action due to new R6 standards.

The Proposed Action would substantially increase the use of herbicides on the Gifford Pinchot National Forest. Herbicides could be used on 2,350 acres compared to 100 under No Action. This increases possible soil and water exposure to herbicides. Approximately 35 percent of the project area would be subject to broadcast treatment.

Most of the ten herbicides used under this alternative do not negatively affect soil organisms at typical application rates and would not affect soil productivity. Picloram and sulfometuron methyl are two of the ten herbicides thought to potentially affect soil organisms at typical application rates and are therefore the only herbicides of concern to soil resources (R6 2005 FEIS Soils Report). These two herbicides have half-lives that range up to100 days depending on soil conditions.

To protect soil organisms and therefore soil productivity within each treated site and avoid residual soil impacts, sulfometuron methyl would only be used once a year and picloram could only be used once every two years. This would reduce the potential for cumulative impacts to soil organisms from these herbicides in any one location. The other herbicides have a small to no effect on soil microorganisms at typical application rates (see Herbicide Characteristics in Soils above) and could potentially be used three times on the same area in one year. Subsequent treatments would consist of spot spraying to treat missed areas, to treat areas where seeds have germinated since the last spraying, or to treat the small areas where invasives were damaged but are resprouting.

A minor, localized increase in fine sediments could result from invasive plant removal along streams, particularly if vegetation is removed from stream banks. This increase would last one season until vegetation became re-established. Many treatment sites are small and would reseed naturally with existing native vegetation. Restoration would occur on approximately 65 percent of the sites to ensure revegetation occurs and erosion is controlled.

The biggest risk to soils and water is from broadcast spraying that would become an option on about 35 percent of the infested acres. Broadcast spraying has the most potential to kill patches of vegetation and expose soil and increase erosion rates. Passive and active restoration is part of the prescription; an estimated two-thirds of treated areas would include some type of restoration such as mulching, competitive seeding or planting replace soil cover and allow native vegetation to re-colonize a site (passive restoration is expected to be successful over about one-third of the area).

Broadcast treatments within aquatic influence zones would be limited to herbicides posing low levels of concern for aquatic organisms. Herbicides considered high risk to aquatic organisms would not be applied using any method within 15 feet of ditches that feed streams, or 50 to 100 feet from intermittent streams, even when ditches or intermittent streams are dry. These buffers are considered adequate to minimize herbicide concentrations in water because, buffer studies in forested areas (Berg, 2004) show that buffers greater than 25 feet commonly lower herbicide concentrations below detectable limits.

This project takes into account the delivery mechanism of road side ditches. By buffering the ditches with high potential to deliver herbicides through the ditchline to streams from broadcast treatments, and eliminating the use of herbicides considered high risk to aquatic organism, adverse effects from treating these areas is minimized. In addition, no broadcast would occur on the estimated 940 acres of infestation on roads with a high potential to deliver herbicide, and no picloram or triclopyr BEE (most mobile and/or persistent and highest risk to aquatic organisms) would be used on these areas. These PDC resolve concerns about herbicides affecting water quality.

Given the buffers for broadcast applications on both perennial and intermittent streams, if rain occurred soon after application, herbicide would be filtered before entering water. As spot and hand treatments use small amounts of herbicide and sites are scattered, even if a large rain event occurs soon after treatment, it is unlikely that substantial amounts of herbicide would enter water bodies.

The PDC were developed considering herbicide and soil properties and are expected to control movement of herbicides off-site. Treatments would occur during times of the year when soils are driest. If herbicide treatment is necessary when soils are wet, aquatic-labeled herbicides or those that pose low risk to aquatic organisms would be used according to label directions.

Wetlands would be treated using non-herbicide methods where such treatments are likely to be effective. Non-herbicide treatments are not effective for treating of knotweed, so some hand application of herbicide would occur in or near stream channels. Where invasive plants are emergent from water, herbicide would be applied through hand and selective methods. Effective treatment of knotweed and replacement with native vegetation would lead to increased bank and channel stability in these sites.

Cumulative Effects

The spatial scale for cumulative effects analysis for soils and water is the 6th field watershed level. This scale was chosen because it allows for consideration of whether herbicide use in all alternatives, when added to other actions in the watershed, may result in adverse effects beyond those disclosed in the direct and indirect effects analysis.

Most 6th field watersheds vary from 9,000 and 25,000 acres. Some of the watersheds are primarily Forest Service land and others are mostly private; averages for all the 6th fields in the Project Area are 60 percent National Forest System lands and 40 percent other public lands, tribal lands, and private properties.

Land management activities including treatment of invasive plants would occur on other ownerships within 6th field watershed. Counties commonly treat roadsides with mowing or herbicides. Herbicides are also used on private farmland, golf courses, and private timberlands. The extent and type of herbicide use on private lands was estimated in Chapter 4.1 of the R6 2005 FEIS. The Proposed Action was designed assuming that herbicide use on other ownerships need not be reported and would therefore be unknown.

The PDC and buffers limit the potential for this project to contribute to cumulative effects at the watershed scale by minimizing the amount of herbicide used; restricting use of more mobile, persistent or toxic chemicals; and applying buffers to reduce the distance which herbicides may run off or drift.

The PDC were developed considering herbicide properties and to minimize the potential for soil and water contamination. While some herbicide delivery to water is possible, the amount of herbicide would not exceed any threshold of concern relative to water quality and beneficial uses. The herbicides selected for use under this alternative minimize adverse effects while still giving a range of treatment options. Approximately 0.1 percent of the total land base is proposed for treatment with this project, which is about 0.2 percent of the National Forest System land. PDC minimize potential for harm at the site scale and less than one percent of the aquatic influence zone of any 5th field watershed would be affected (about 0.15 percent of the acreage within aquatic influence zones in 5th field watersheds is currently estimated to be infested, ranging from less than 0.1 percent up to about 0.4 percent). This small scale of treatment compared with the watershed size is one reason that effects to water quality are unlikely.

An analysis was also conducted for 6th field watersheds to make sure that herbicide use would not be concentrated in a smaller portion of any watershed. Table 55 lists the site-specific conditions within 6th field watersheds that have more than 10 estimated acres of infestation within aquatic influence zones. All other watersheds have fewer than 10 estimated acres of infestation within aquatic influence zones. No long contiguous infestations occur along roadside ditches.

PDC were developed considering the watershed conditions listed in the following table. The PDC ensure that treatments would not adversely affect watershed quality or function, even if invasive plants were to spread further into aquatic influence zones in these or other watersheds, or further along roads with high potential to deliver herbicide to surface waters.

This action would not result in chemical contamination that would lead to degradation of water quality.

Table 56-Conditions of Sixth Field Watersheds Having the Greatest Extent of Infested Acres

Sixth Field Watershed	Est. Infested Acres/ Percent of Watershed Area	Est. Infested Acres in Aquatic Influence Zone	Miles of Road with High Potential For Herbicide Delivery Within Treatment Areas	Site-specific Considerations	PDC that Minimize Impacts In All Watersheds (these PDC apply to all watersheds)
Cave/Bear Creek Watershed	309/ 1%	45	39	Cave Creek meadow (wetland) complex.	Streams and wetlands, along with road crossings and ditches, would be buffered to minimize herbicide drift and runoff. Buffers are largest for herbicides that are mobile, persistent, and/or potentially toxic to fish. With the exception of hand/select methods, herbicides would be applied at typical (or lower) rates within Aquatic influence zones. Wetland vegetation would be treated when soils are driest. If herbicide treatment is necessary for emergent target plants when soils are wet, use aquatic labeled herbicides. Favor hand/selective treatment methods where effective and
Upper Trout Lake Creek Watershed	139/ 0.5%	20	27	Treatments are primarily along roads with treatments in parking areas, campgrounds and quarries also proposed. One campground is in a wetland.	
East Canyon Creek	89/ 0.5%	21	30	Roadside treatment areas.	
Middle Little White Salmon River	87/ 0.8%	20	15	Wetlands along the roads proposed for treatment.	
Clear Fork of the Cowlitz River	98/ 0.3%	18	16	Most of the treatment areas are roads following streams. Treatments are also proposed in quarries, meadows and La Wis Wis Campground.	

Sixth Field Watershed	Est. Infested Acres/ Percent of Watershed Area	Est. Infested Acres in Aquatic Influence Zone	Miles of Road with High Potential For Herbicide Delivery Within Treatment Areas	Site-specific Considerations	PDC that Minimize Impacts In All Watersheds (these PDC apply to all watersheds)
Upper White Salmon River	76/ 0.3%	7	2	Roadside treatment areas and landings in managed stands.	practical. Treatments above bankfull would not exceed 10 acres along any 1.5 mile of stream reach within a 6th field subwatershed in any given year. Treatments below bankfull would not exceed 7 acres total within a 6th field sub-watershed in any given year. No use of picloram or triclopyr BEE and no broadcast of any herbicide on roadside treatment areas that have a high risk of herbicide delivery to surface waters.

Aquatic Conservation Strategy Objectives – Alternative B

1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

Alternative B would restore the diversity of watershed scale features by removing invasive plants found growing adjacent to or within aquatic influence areas. Invasive plant treatment under Alternative B would follow recommendations in watershed analysis.

2. Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

Alternative B would not likely affect chemical or physical routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species. The amount of treatment in any given watershed is small. Less than six percent of National Forest Service System lands within any single 6th field watershed are currently infested. These infestations cover less than three percent of any single 6th field watershed when other ownership acreage is added.

3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.

Alternative B would restore the physical integrity of shorelines and streambanks by replacing invasive plants with native plant communities. The types of treatments proposed could result in minor streambank erosion, but since no heavy equipment would be used, impacts would be localized and short-lived.

4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

The extent and range of infestations currently found in aquatic influence zones is relatively small (about 0.15 percent of the acreage within aquatic influence zones in 5th field watersheds is currently estimated to be infested, ranging from less than 0.1 percent up to about 0.4 percent). No more than ten acres would be treated within any 1.5 miles of stream. The amount of treatment that could occur annually in aquatic influence zones is limited by PDC so that future treatments under EDRR would not result in greater potential effects. Some herbicide may enter water bodies, but not in quantities sufficient to reduce water quality at any scale.

5. Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

Removal of invasive plants and replacement with native plant communities would restore sediment regime affected by knotweed and other target species. Projects may result in small amounts of sediment, especially related to manual and mechanical treatments, but the limited overall extent would not result in watershed-scale impacts. No heavy equipment would be used off roads in riparian reserves.

6. Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.

Removal of invasive plants and replacement with native plant communities would restore future inputs of wood and leaves that provide the basic foundation of the aquatic ecosystem food webs.

7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.

Removal of invasive plants and replacement with native plant communities would restore floodplain habitat and water table elevation in meadows and wetlands.

8. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.

Removal of invasive plants and replacement with native plant communities would restore species composition and structural diversity in riparian areas and wetlands.

9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species.

Removal of invasive plants and replacement with native plant communities would restore habitat for species dependant on riparian and aquatic habitats.

Alternative C

Alternative C would reduce the risks to soils and water associated with herbicide use on the Columbia River Gorge National Scenic Area compared to both Alternatives A and B because 1) it would eliminate broadcast treatments and 2) it would eliminate herbicide application within riparian reserves.

On the Gifford Pinchot National Forest, Alternative C would increase the level of herbicide use compared to Alternative A, but to a smaller degree than Alternative B. This alternative includes no broadcast spray and no herbicide use in riparian reserves or along roads associated with high potential for herbicide delivery. Thus, there would be very low risk of runoff, drift or leaching herbicide to streams and other water bodies.

Alternative C is associated with less risk of herbicide delivery to surface waters compared to Alternative B; however, the most ambitious conceivable treatment scenario has more potential to result in erosion and sedimentation because so much manual and mechanical treatment, including weed-wrenching of scotch broom, would occur. Up to 1,770 acres of non-herbicide treatment could occur under this alternative including treatment within the aquatic influence zone and on roads that are associated with a high risk of sediment delivery. With more treatment by non-herbicide methods, Alternative C has the greatest potential for erosion and sediment delivery to streams.

Approximately 836 acres of scotch broom would be treated under the most ambitious treatment scenario (781 acres on the Forest and 55 acres on the Columbia River Gorge National Scenic Area), about half of which is likely to lie within aquatic influence zones or along roads with high risk for sediment delivery to streams. The potential for ground disturbance is greater if herbicides are not an option in combination with manual and mechanical treatments, including weed wrenching.[25] However, the erosion at these sites would be small compared to ongoing activities and last only until vegetation became reestablished. Active restoration would occur if there were not an available seedbank for reestablishing native vegetation.

Cumulative Effects

Cumulative effects of Alternative C to soils and water would be similar to No Action. No herbicide use across the majority (65%) of the project area would eliminate potential for cumulative herbicide delivery to streams. The potential for sediment delivery would likely be greatest under this alternative, because more ground disturbance is likely where herbicides are not part of the treatment combination. However, the types of manual and mechanical treatment proposed would result in a negligible amount of sediment delivered to streams when compared to natural levels at any scale. The amount of ground disturbance at any one site would be minimal and would not contribute to significant cumulative effects.

Aquatic Conservation Strategy Objectives – Alternative C

1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

Alternative C would restore he diversity of watershed scale features by removing invasive plants found growing adjacent to or within aquatic influence areas. Invasive plant treatment under Alternative C would follow recommendations in watershed analysis. Alternative C is less cost-effective than Alternative B in restoring native plant communities so it would take longer and cost more to restore desired conditions.

2. Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

[25] Weed-wrenching pulls the plant out by the root creating a very small amount of bare ground where each plant is removed.

Alternative C would not likely affect chemical or physical routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species. The amount of treatment in any given watershed is small. Less than six percent of National Forest Service System lands within any single 6th field watershed are currently infested. These infestations cover less than three percent of any single 6th field watershed when other ownership acreage is added.

3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.

Alternative C would restore the physical integrity of shorelines and streambanks by replacing invasive plants with native plant communities. The types of treatments proposed could result in minor streambank erosion, but since no heavy equipment would be used, impacts would be localized and short-lived. Alternative C is less cost-effective than Alternative B in restoring native plant communities so it would take longer and cost more to restore desired conditions. In addition, because no herbicide would be used on shorelines or streambanks, greater reliance on manual and mechanical treatments could lead to increased erosion compared to Alternative B.

4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

The extent and range of infestations currently found in aquatic influence zones is relatively small (about 600 acres over the National Forest as a whole, no more than 74 acres in any 6th field watershed). No more than ten acres would be treated within any 1.5 miles of stream. The amount of treatment that could occur annually in aquatic influence zones is limited by PDC, so that future treatments under EDRR would not result in greater potential effects. No herbicide would enter water bodies so no chemical contamination would be possible.

5. Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

Removal of invasive plants and replacement with native plant communities would restore sediment regime affected by knotweed and other target species. Projects may result in small amounts of sediment, especially related to manual and mechanical treatments, but the limited overall extent would not result in watershed-scale impacts. No heavy equipment would be used off roads in riparian reserves. Alternative C is less cost-effective than Alternative B in restoring native plant communities so it would take longer and cost more to restore desired conditions. In addition, because no herbicide would be used on shorelines or streambanks, greater reliance on manual and mechanical treatments could lead to increased erosion compared to Alternative B.

6. Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.

Removal of invasive plants and replacement with native plant communities would restore future inputs of wood and leaves that provide the basic foundation of the aquatic ecosystem food webs. Alternative C is less cost-effective than Alternative B in restoring native plant communities so it would take longer and cost more to restore desired conditions.

7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.

Removal of invasive plants and replacement with native plant communities would restore floodplain habitat and water table elevation in meadows and wetlands. Alternative C is less cost-effective than Alternative B in restoring native plant communities so it would take longer and cost more to restore desired conditions.

8. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.

Removal of invasive plants and replacement with native plant communities would restore species composition and structural diversity in riparian areas and wetlands. Alternative C is less cost-effective than Alternative B in restoring native plant communities so it would take longer and cost more to restore desired conditions.

9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species.

Removal of invasive plants and replacement with native plant communities would restore habitat for species dependant on riparian and aquatic habitats. Alternative C is less cost-effective than Alternative B in restoring native plant communities so it would take longer and cost more to restore desired conditions.

Alternative Comparison – Soil and Water

Table 57-Comparison of Herbicide Use within Aquatic Influence Zones

Alternative	Acreage and Character of Herbicide Use Within Aquatic Influence Zones	Estimated Proportion of Herbicide Use Subject to Broadcast	Estimated acreage of project where herbicide treatment may occur on roads with high potential to deliver herbicides
No Action (Alternative A)	Fewer than 50 acres, limited to selective methods within administrative sites.	18%	0
Proposed Action (Alternative B)	Approximately 405 acres – limited to spot and selective methods, lower risk formulations, all sites.	35%	909
Alternative C	Same as A	0%	0

3.5 Aquatic Organisms and Habitat

3.5.1 Introduction

The following section discusses effects from non-herbicide and herbicide methods occurring near streams that provide habitat for fish. A Biological Assessment (BA) was prepared for this project and submitted to the FWS and NMFS as a part of ESA Consultation (January 2007). The BA is summarized in this chapter. FWS responded to the BA with a letter of concurrence (LOC, October 2007) and formal Biological Opinions (NMFS 2007 BO). NMFS responded to the BA with a Biological Opinion (NMFS 2008 BO, January 2008). The BOs authorize incidental take for known sites and the EDRR program. Consultation documents are available by request or at http://www.fs.fed.us/gpnf/04projects/pinchotprojects.

Several lengthy documents are incorporated by reference including the R6 2005 FEIS and accompanying Fisheries Biological Assessment, Biological Opinions, and SERA Risk Assessments (1997a, 1997b, 1999a, 1999b, 2001a, 2001c, 2003a, 2003b, 2003c, 2003d, 2003e, 2003f). Details about the risk assessment methodologies, toxicity indices for fish and other aquatic organisms, and Hazard Quotient values are not repeated in the project level FEIS. The SERA Risk Assessment scenarios were used as indicators of situations where PDC and buffers would be necessary to minimize adverse effects on the aquatic ecosystem.

The impacts of invasive plants on the environment can last decades, while the impacts of treatment tend to be short term (one year or less). Passive and active restoration would accelerate native vegetative recovery in treated sites.

3.5.2 Affected Environment

Effects of Invasive Plants on Aquatic Ecosystems

As described previously, invasive plants found growing adjacent to or within aquatic influence areas can invade, occupy, and dominate riparian areas and indirectly impact aquatic ecosystems and fish habitat. Target species such as knotweed and blackberry can choke streams, become sediment traps, degrade habitat, and block fish access. For example, invasive blackberries may dominate small streams or spread their thick root systems within and across streams, blocking fish access.

Invasive plants can change stand structure and alter future inputs of wood and leaves that provide the basic foundation of the aquatic ecosystem food web. Native vegetation growth may change as a result of infestation, and the type and quality of litter fall, and quality of organic matter may decline, which can alter or degrade habitat for aquatic organisms. For example, native vegetation regeneration was reduced as a result of knotweed infestations. The amount of nitrogen to aquatic ecosystems through riparian litter fall may be compromised because knotweed retains more nitrogen than native species. The availability of nitrogen to aquatic biota and native vegetation may be substantially reduced because knotweed can uptake or hold on to 75 percent of leaf nitrogen in the root system (ibid). Primary and secondary consumers that form the basic food source for fish and other aquatic organisms may be indirectly affected.

Aquatic Species of Local Interest

The Gifford Pinchot National Forest (Forest) and the Columbia River Gorge National Scenic Area, Washington side (Scenic Area) have a total of 23 Aquatic Species of Local Interest and 11 critical habitat designations. Four of these are on the July 2004 Regional Forester's Sensitive Species list (see Regional Forester's Sensitive Species section below) and 12 are either federally listed as Threatened or Endangered fish species (table 58). Seven are Washington State Endangered, Threatened, Sensitive, and Candidate species with historic or suspected range in the Scenic Area. No fish species or habitats on Gifford Pinchot National Forest or National Scenic Area are *proposed* for federal listing.

Federally Listed Fish Species

Approximately 55 percent of the total 5th field watersheds on Gifford Pinchot National Forest provide habitat for federally listed fish species. The Columbia River Gorge National Scenic Area has streams that are captured in seven 5th fields along the Washington side: Columbia Gorge Tributaries, Mid-Columbia-Grays Ck, Mid-Columbia-Eagle Ck, Wind River, Little White Salmon, White Salmon, and

Lower Klickitat River. Fish habitat on Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area includes migration, presence, rearing, spawning, refugia, cover, and historical use.

Appendix C displays brief summaries regarding the life history and other information for aquatic species of local interest, compiled from a variety of sources. Additional information related to life history and status of populations at the Evolutionary Significant Unit (ESU) or Distinct Population Segment (DPS) scale can be found in the following sources:

- R6 2005 FEIS and programmatic Fisheries Biological Assessment (BA),
- NMFS and USFWS Federal Register documents (http://www.nwr.noaa.gov/ESA-Salmon-Listings/Salmon-Populations/Index.cfm), (http://www.fws.gov/pacific/bulltrout/),
- Lower Columbia Salmon Recovery and Fish and Wildlife Plan (http://www.nwcouncil.org/fw/subbasinplanning/lowerColumbia/plan/
- Draft Columbia River and Puget Sound Bull Trout Recovery Plans (http://www.fws.gov/pacific/bulltrout/recovery.html)

Table 58-Aquatic Species of Local Interest and their Critical Habitat within the Project Area

Species	DPS or Critical Habitat	Status	Federal Register	5th Field Watersheds on Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area
Steelhead	Lower Columbia	Threatened	63 FR 13347 3/19/98	Wind River, Columbia Gorge Tributaries, Washougal, EF Lewis River, Clearfork Cowlitz River, Upper Cowlitz River, Middle Cowlitz River, Upper Cispus River, Lower Cispus River, Tilton River, NF Toutle River, Green River
	Middle Columbia River	Threatened	64 FR 14517 3/25/99	Columbia River Gorge National Scenic Area: Lower Klickitat River, intermittent use in the lower ½-1 mile of Catherine and Major Creeks, Lower White Salmon River.
	Upper Columbia River	Endangered	62 FR 43937	Columbia River Gorge National Scenic Area – mainstem Columbia River migration only
	Critical Habitat for Lower Columbia Steelhead	Designated	70 FR 52629 09/02/05	Wind River, Columbia Gorge Tributaries, Washougal, EF Lewis River, Clearfork Cowlitz River, Upper Cowlitz River, Middle Cowlitz River, Upper Cispus River, Lower Cispus River, Tilton River, NF Toutle River, Green River
	Critical Habitat for Middle Columbia Steelhead	Designated	70 FR 52629 09/02/05	Columbia River Gorge National Scenic Area: Lower Klickitat River, intermittent use in the lower ½-1 mile of Catherine and Major Creeks, Lower White Salmon River.
	Critical Habitat for Upper Columbia Steelhead	Designated	70 FR 52629 09/02/05	Columbia River Gorge National Scenic Area – mainstem Columbia River migration only
Chinook Salmon	Snake River Spring/Summer-run	Threatened	57 FR 14653 4/22/92	Columbia River Gorge National Scenic Area - mainstem Columbia River migration only
	Snake River Fall-run	Threatened	57 FR 14653 4/22/92	Columbia River Gorge National Scenic Area - mainstem Columbia River migration only
	Upper Columbia River Spring-run	Endangered	64 FR 14308 3/24/99	Columbia River Gorge National Scenic Area - mainstem Columbia River migration only
	Lower Columbia River	Threatened	64 FR 14308 3/24/99	Wind River, Columbia Gorge Tributaries, Clearfork Cowlitz River, Upper Cowlitz River, Middle Cowlitz River, Upper Cispus River, Lower Cispus River, Green River

Species	DPS or Critical Habitat	Status	Federal Register	5th Field Watersheds on Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area
	Critical Habitat for Snake River Spring/Summer Chinook salmon	Designated	58 FR 68543 12/28/93	Columbia River Gorge National Scenic Area - mainstem Columbia River migration only
	Critical habitat for Snake River Fall Chinook salmon	Designated	58 FR 68543 12/28/93	Columbia River Gorge National Scenic Area - mainstem Columbia River migration only
	Critical Habitat for Lower Columbia River Chinook	Designated	70 FR 52629 09/02/05	Columbia River Gorge Tributaries, Wind River,
	Critical Habitat for Upper Columbia River Spring-run Chinook	Designated	70 FR 52629 09/02/05	Columbia River Gorge National Scenic Area - mainstem Columbia River migration only
Coho Salmon	Lower Columbia River	Threatened	70 FR 37160 6/28/05	Columbia Gorge Tributaries, Clearfork Cowlitz River, Upper Cowlitz River, Middle Cowlitz River, Upper Cispus River, Lower Cispus River, Tilton River, Green River
Chum Salmon	Columbia River	Threatened	70 FR 37160 6/28/05	Columbia Gorge Tributaries, Lower White Salmon River
	Critical Habitat for Columbia River Chum	Designated	70 FR 52630 09/02/05	Same as Threatened
Bull Trout	Columbia River	Threatened	64 FR 58910 11/01/99	Columbia River Gorge National Scenic Area, Muddy River, Swift Reservoir-Lewis River, Yale Reservoir-Lewis River, Upper Lewis River and tributaries below lower falls on mainstem,
	Coastal Puget Sound	Threatened	64 FR 58910 11/01/99	Puyallup River (presumed)
	Critical Habitat for Columbia River Bull Trout	Designated	70 FR 56212 09/26/05	Does not include NF lands
	Critical Habitat for Puget Sound Bull Trout	Designated	70 FR 56212 09/26/05	Does not include NF lands
Sockeye Salmon	Snake River	Endangered	56 FR 58619 11/20/91	Columbia River Gorge National Scenic Area - mainstem Columbia River migration only
	Critical Habitat for Snake River Sockeye Salmon	Designated	58 FR 68543 12/28/93	Columbia River Gorge National Scenic Area - mainstem Columbia River migration only

Subbasin plans have been completed for areas within the Lower Columbia River region, Washington side. These subbasin plans are amendments to the Fish and Wildlife Program for the Northwest Power Planning Council. Under the Northwest Power Act, Congress charged the Northwest Power and Conservation Council with developing and periodically amending a fish and wildlife program for the Columbia River Basin to protect, mitigate and enhance fish and wildlife affected by the development and operation of hydroelectric facilities while assuring the Pacific Northwest an adequate, efficient, economical and reliable power supply.

Subbasin plans that cover watersheds on Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area, Washington side, are: Cowlitz, Kalama, Lewis, Washougal, Wind River, Little White Salmon, and Columbia Gorge Tributaries. Extensive information on individual stocks of fish species and limiting factors can be found at: (http://www.nwcouncil.org/fw/subbasinplanning/lowerColumbia/plan/). Salmon and/or steelhead populations have plummeted in many watersheds due to a variety of factors including fish passage barriers (Cowlitz Creek, Toutle Creek, Kalama Creek, Lewis Creek, Wind River, Little White Salmon

River, and Columbia River). A summary of watershed conditions relative to fish habitat and populations is in the analysis files.

All anadromous salmonid life stages occur within the Columbia River and its tributaries within the Columbia River Gorge National Scenic Area. Adult salmonids migrate in the main channel of the Columbia River, generally in mid-channel and in the upper 25 feet (range 1-50 feet) of the water column. Juveniles (less than1 year age class) generally use near shore and off-channel habitats and occur throughout the water column, at depths ranging from 1 to 20 feet.

Older juveniles, in the 1-plus age class, tend to use near shore and off-channel habitat, but will also use mid-channel and deeper water habitats where the velocity is greater. Migration behavior varies greatly depending on species, age, season, photoperiod and habitat availability. Downstream migration times for various species of salmonid stocks past Bonneville dam are summarized below. Data for chum salmon (of which most populations are below Bonneville dam) are from seining data at various locations below Bonneville Dam.

Table 59 displays invasive plant treatment areas (see Appendix A for maps) that are within 100 feet of streams with federally listed fish species. Treatment areas that are not included in the table below are further than 100 feet from streams with federally listed fish or are in a subwatershed that does not have federally listed fish. See Appendix A for a complete list of treatment areas.

Table 59-Invasive Plant Treatment Areas within 100 feet of Streams with Federally Listed Fish

5th Field Watershed	Stream Name	Treatment Area Identification	Listed Fish Species and Life Stages found within Stream (data from WDFW)
Clearfork Cowlitz River	*Clear Fork Cowlitz River*	35-14a Road-related	LCS = Presence/Migration, Known Spawning LCCo, LCC = Presence/Migration
		35-18r1 Campground	LCS = Presence/Migration, Known Spawning LCCo, LCC = Presence/Migration
	Cowlitz River	35-18 Road-related	LCS , LCCo, LCC = Presence/Migration
		35-18qa Quarry	LCS , LCCo, LCC = Presence/Migration
		35-18r1 Campground	LCS , LCCo, LCC = Presence/Migration
	Muddy Fork Cowlitz River	35-18 Road-related	LCS , LCCo, LCC = Presence/Migration
	Ohanapecosh River	35-18r1 Campground	LCS , LCCo, LCC = Presence/Migration
	Purcell Creek	35-18r1 Campground	LCS , LCCo = Presence/Migration
East Fork Lewis River	Unnamed Streams	31-01a Road-related	LCS = Presence/Migration
		31-01r2 Dispersed Campsite	LCS = Presence/Migration
	East Fork Lewis River	31-01a Road-related	LCS = Presence/Migration, Known Juvenile Rearing, Known Spawning
		31-01r2 Dispersed Campsite	LCS = Presence/Migration, Known Juvenile Rearing, Known Spawning
	Green Fork	31-01a Road-related	LCS = Presence/Migration, Known Juvenile Rearing, Known Spawning
		31-01r2 Dispersed Campsite	LCS = Presence/Migration, Known Juvenile Rearing, Known Spawning
	Little Creek	31-01a Road-related	LCS = Presence/Migration, Known Juvenile Rearing, Known Spawning
		31-01r2 Dispersed Campsite	LCS = Presence/Migration, Known Juvenile Rearing, Known Spawning

5th Field Watershed	Stream Name	Treatment Area Identification	Listed Fish Species and Life Stages found within Stream (data from WDFW)
	Slide Creek	31-01a Road-related	LCS = Presence/Migration, Known Juvenile Rearing
		31-01r2 Dispersed Campsite	LCS = Presence/Migration, Known Juvenile Rearing
Lower Cispus River	Unnamed Streams	35-16a Road-related	LCS , LCCo, LCC = Presence/Migration
	Camp Creek	35-16a Road-related	LCS , LCCo = Presence/Migration
	Cispus River	35-16a Road-related	LCS , LCCo, LCC = Presence/Migration
		35-16r1 Campground	LCS , LCCo, LCC = Presence/Migration
	Covell Creek	35-16a Road-related	LCS , LCCo = Presence/Migration
		35-16r0 Admin	LCS , LCCo = Presence/Migration
	Dry Creek	35-16a Road-related	LCCo = Presence/Migration
	Greenhorn Creek	35-16a Road-related	LCS = Presence/Migration
	Iron Creek	35-16a Road-related	LCS , LCCo = Presence/Migration
		35-16r1 Campground	LCS , LCCo = Presence/Migration
		35-16r3 Parking	LCS , LCCo = Presence/Migration
	Woods Creek	35-16a Road-related	LCS , LCCo = Presence/Migration
	Yellowjacket Creek	35-16a Road-related	LCS , LCCo, LCC = Presence/Migration
Muddy River	Unnamed Streams	33-12a Road-related	LCS = Presence/Migration
	Clear Creek	33-12a Road-related	LCS = Presence/Migration
		33-12r2 Dispersed Campsite	LCS = Presence/Migration
	Muddy River	33-12a Road-related	LCS = Presence/Migration CRBT = Presence/Migration
		33-12r2 Dispersed Campsite	LCS = Presence/Migration CRBT = Presence/Migration
Swift Reservoir - Lewis River	Unnamed Streams	33-12a Road-related	LCS = Presence/Migration
Upper Cispus River	*Cispus River*	33-11a Road-related	LCS , LCCo, LCC = Presence/Migration
		35-16a Road-related	LCS , LCCo, LCC = Presence/Migration
		35-16q Quarry	LCS , LCCo, LCC = Presence/Migration
	North Fork Cispus River	35-16a Road-related	LCS , LCCo, LCC = Presence/Migration
		35-16r1 Campground	LCS , LCCo, LCC = Presence/Migration
	Yozoo Creek	35-16a Road-related	LCS = Presence/Migration
Upper Cowlitz River	*Coal Creek*	35-18 Road-related	LCS , LCCo, LCC = Presence/Migration
		35-14a Road-related	LCS , LCCo = Presence/Migration
	Johnson Creek	35-14 Road-related	LCS , LCCo, LCC = Presence/Migration
	Skate Creek	35-17r3 Parking	LCS , LCCo, LCC = Presence/Migration

5th Field Watershed	Stream Name	Treatment Area Identification	Listed Fish Species and Life Stages found within Stream (data from WDFW)
		35-18 Road-related	LCS , LCCo, LCC = Presence/Migration
Upper Lewis River	*Crab Creek*	33-12a Road-related	LCS = Presence/Migration
	Lewis River	33-12a Road-related	LCS, CRBT = Presence/Migration
	Little Creek	33-12a Road-related	LCS = Presence/Migration
	Rush Creek	33-12a Road-related	LCS = Presence/Migration CRBT = Presence/Migration, Known Juvenile Rearing, Known Spawning
Wind River	Unnamed stream	33-05a Road-related	LCS , LCCo = Presence/Migration
	Cedar Creek	33-05a Road-related	LCS = Presence/Migration
	Dry Creek	33-03r2 Dispersed Campsite	LCS = Presence/Migration, Known Juvenile Rearing, Known Spawning LCC = Presence/Migration
	Falls Creek	33-06r3 Parking	LCS = Presence/Migration, Known Juvenile Rearing, Known Spawning LCC = Presence/Migration
	Layout Creek	33-03r2 Dispersed Campsite	LCS = Presence/Migration, Known Juvenile Rearing, Known Spawning
	Mouse Creek	33-05a Road-related	LCS = Presence/Migration, Known Juvenile Rearing
	Panther Creek	33-06r1 Campground	LCS = Presence/Migration, Known Juvenile Rearing, Known Spawning
		33-06r2 Dispersed Campsite	LCS = Presence/Migration, Known Juvenile Rearing, Known Spawning
	Paradise Creek	33-06r1 Campground	LCS = Presence/Migration, Known Juvenile Rearing, Known Spawning LCC = Presence/Migration
		33-03r0 Admin	LCS = Presence/Migration, Known Juvenile Rearing, Known Spawning LCC = Presence/Migration
		33-03r2 Dispersed Campsite	LCS = Presence/Migration
	Trout Creek	33-03r2 Dispersed Campsite	LCS = Presence/Migration, Known Juvenile Rearing, Known Spawning LCC = Presence/Migration
		33-03r3 Parking	LCS = Presence/Migration, Known Juvenile Rearing, Known Spawning LCC = Presence/Migration
	Wind River	33-03r0 Admin	LCS, LCC = Presence/Migration, Known Juvenile Rearing, Known Spawning
		33-03r1 Campground	LCS, LCC = Presence/Migration, Known Juvenile Rearing, Known Spawning
		33-06r1 Campground	LCS = Presence/Migration, Known Juvenile Rearing, Known Spawning LCC = Presence/Migration
	Trapper Creek	33-03r0 Admin	LCS = Presence/Migration, Known Juvenile Rearing, Known Spawning LCC = Presence/Migration
Columbia Gorge Tributaries	*Duncan Creek*	22-03 St. Cloud/Sam Walker	LCCo, CRC = Presence/Migration LCS = Presence/Migration, Known Spawning

5th Field Watershed	Stream Name	Treatment Area Identification	Listed Fish Species and Life Stages found within Stream (data from WDFW)
	Greenleaf Creek	22-04 Hot Springs site	LCCo = Presence/Migration, Known Spawning LCS = Presence/Migration, Known Juvenile Rearing, Known Spawning
	Unnamed streams (referred to as Goodbear and Archer Creeks – Refer to Appendix H)	22-03 St. Cloud/Sam Walker	LCCo, LCC, CRC = Presence/Migration
Lower Klickitat River	*Klickitat River*	22-10 Balfour	MCS, CRBT = Presence/Migration
		22-16 Klickitat Rails to Trails	MCS = Presence/Migration, Known Juvenile Rearing, Known Spawning CRBT = Presence/Migration
	Logging Camp Canyon	22-16 Klickitat Rails to Trails	MCS = Presence/Migration
	Knight Canyon	22-16 Klickitat Rails to Trails	CRBT = Presence/Migration
	Wide Sky Canyon	22-16 Klickitat Rails to Trails	CRBT = Presence/Migration
	Unnamed stream	22-10 Balfour	MCS, CRBT = Presumed
Middle Columbia/Grays Creek	*Unnamed stream*	22-06 Collin's Slide	LCS, LCCo = Presence/Migration below fish barrier at Hwy 14 and Railroad (Treatment located above barrier)
	Collin's Creek	22-06 Collin's Slide	LCS, LCCo = Presence/Migration below fish barrier at Hwy 14 and Railroad (Treatment located above barrier)
	Major Creek	22-09 Burdoin/Catherine/Major Creeks (furthest east site only)	LCCo = Presence/Migration, Known Juvenile Rearing MCS = Presence/Migration, Known Juvenile Rearing, Known Spawning
	Catherine Creek	22-09 Burdoin/Catherine/Major Creeks (east site only)	LCCo = Presence/Migration MCS = Presence/Migration, Known Juvenile Rearing, Known Spawning
White Salmon River	*Lower White Salmon River*	22-15 South BZ (less than 0.10 acre Within 100 feet)-	MCS = Presence/Migration up to Condit Dam, located below treatment area CRBT = Presumed
Mainstem of Columbia River within CRGNSA	*Columbia River*	22-13 Miller Island	Upper Columbia River, Middle Columbia River, and Snake River migrating fish
		22-03 St. Cloud/Sam Walker	Upper Columbia River, Middle Columbia River, and Snake River migrating fish

*LCS = Lower Columbia River Steelhead, MCS = Middle Columbia River Steelhead, LCCo = Lower Columbia River Coho, LCC = Lower Columbia River Chinook, CRC = Columbia River Chum, CRBT = Columbia River Bull Trout

Designated Critical Habitat for Pacific Salmon

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). Table 60 displays the river basins on the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area that serve as migration corridors and rearing habitat for adult and juvenile salmonids.

The three freshwater primary constituent elements of critical habitat are:

- 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 with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival

Recent designated critical habitat on the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area includes the stream channels in each designated reach, and a lateral extent as defined by the ordinary high water line (Sept. 2, 2005; 70 FR 52629). The primary constituent elements essential for conservation of listed ESUs are those sites and habitat components that support one or more fish life stages, including freshwater spawning sites, freshwater rearing sites, and freshwater migration corridors. Nearly all 5th field watersheds on the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area contain designated critical habitat (see Table 58).

Designated Critical Habitat for Coastal Puget Sound and Columbia River Bull Trout

Critical habitat for the Coastal Puget Sound and Columbia River bull trout does not incorporate National Forest System lands but is located adjacent to or in relatively close proximity to the project area. Herbicide may be transported onto adjacent critical habitat through drift or runoff.

The primary constituent elements (PCE) of bull trout habitat are: (1) permanent water having low levels of contaminates such that normal reproduction, growth and survival are not inhibited; (2) water temperatures ranging from 2 to 15 degrees C (36 to 59 degrees 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; (3) 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; (4) substrates of sufficient amount, size, and decomposition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine substrate less than 0.63 cm (0.25 in) in diameter and minimal substrate embeddedness are characteristic of these conditions; (5) 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; (6) springs, seeps, groundwater sources, and subsurface connectivity to contribute to water quality and quantity; (7) migratory corridors with minimal physical, biological, or chemical barriers between spawning, rearing, overwintering, and foraging habitats, including intermittent or seasonal barriers induced by high water temperatures or low flows; (8) an abundant food base including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish; and (9) few or no predatory, interbreeding or competitive non-native species present.

Essential Fish Habitat (Magnuson-Stevens Act)

The Sustainable Fisheries Act of 1996 (Public Law 104-267) amended the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) to require Federal action agencies to consult with the Secretary of Commerce regarding any action or proposed action authorized, funded, or undertaken by the agency that may adversely affect essential fish habitat (EFH) identified under the Magnuson-Stevens Act for Chinook, coho and pink salmon. There is no pink salmon on Gifford

Pinchot National Forest or Columbia River Gorge National Scenic Area. The EFH regulations at CFR section 600.920(e)(l)(i) enable Federal agencies to use existing consultation/environmental review procedures to satisfy EFH consultation requirements if they meet the following criteria: 1) The existing process must provide the NOAA Fisheries (NOAA Fisheries) with timely notification (60-90 days) of actions that may adversely affect EFH; 2) Notification must include an assessment of impacts of the proposed action as discussed in section 600.920(g): and 3) NOAA Fisheries must have made a "finding" pursuant to section (e)(3) that the existing process satisfies the requirements of section 305 (b)(2) of the Magnuson-Stevens Act.

Essential Fish Habitat is defined in the Act as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Essential Fish Habitat includes all freshwater streams accessible to anadromous fish (Chinook and coho), marine waters, and inter-tidal habitats.

Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area, Washington side, has incorporated an EFH assessment into this EIS pursuant to 40 CFR Section 1500. NEPA and ESA documents prepared by the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area should contain sufficient information to satisfy the requirements in 50 CFR 600.920(g) for EFH assessments and must clearly be identified as an EFH assessment.

The geographic extent of EFH is specifically defined as all currently viable waters and most of the habitat historically accessible to Chinook and coho within the watersheds identified in table 57. Salmon EFH excludes areas upstream of longstanding naturally impassible barriers (i.e., natural waterfalls in existence for several hundred years). Salmon EFH includes aquatic areas above all artificial barriers.

Regional Forester Sensitive Aquatic Species

The Regional Forester's Sensitive Species list is a proactive approach for meeting Forest Service obligations under ESA and the National Forest Management Act (NFMA) and the U.S. Department of Agriculture Regulation 9500-4. Federally proposed and listed species, proposed and designated critical habitat, federal candidate species, and sensitive species for which population viability is a concern are included in the Regional Forester's Sensitive Species list. Federally listed species were discussed in the sections above.

Interior Redband trout, Puget Sound coastal cutthroat trout, pygmy whitefish and Columbia duskysnail are on the Regional Forester's Sensitive Aquatic Species list. With the exception of the Columbia duskysnail, none of these species or their habitat is found within the project area.

The Columbia duskysnail is an aquatic mollusk with a very sporadic distribution in the central and eastern part of the Columbia River Gorge portion of the project area, where six duskysnail sites are known (no sites are known on Gifford Pinchot National Forest). This species occurs in cold, well oxygenated springs and spring outflows on soft substrates in shallow, slow-flowing areas where it appears to feed on decaying organic particles. It prefers areas without macrophytes (macroscopic emergent and submerged aquatic plants), but may also occur in areas with watercress and water hemlock. It occurs with *Pristinicola hemphilli* and *Juga* (*Oreobasis*) *spp*., which are typically found in small, cold, pristine springs.

Washington State Listed Aquatic Species on the Columbia River Gorge National Scenic Area

The 1992 Management Plan (revised 2006) for the Columbia River Gorge National Scenic Area requires that NEPA documents include effects to Washington State Endangered, Threatened, Sensitive, and Candidate species with historic or suspected range in the NSA. Bull trout and anadromous salmonids are discussed in the section on federally listed species.

Additional species not mentioned previously that are on the Washington State list include: river lamprey, eulachon, leopard dace, mountain sucker, California floater mussel, great Columbia River spire snail and giant Columbia River limpet. Habitat and species occurrence for the snail and limpet is not present on the National Scenic Area.

Table 60-Habitats for Aquatic Species on Washington State Lists Present in the National Scenic Area

Common Name	Scientific Name	River Basins Potentially Containing Habitat	Habitat and Life Requirements*
River lamprey	*Lampetra ayresi*	Salmon, Washougal, Wind River, White Salmon, Klickitat	River lampreys are primarily concentrated in medium and large sized low-gradient Pacific coast streams from California to Alaska. This species has not been reported in the Columbia River system for over 20 years. Detailed distribution records are not available for Washington; occupy fine silt substrates in backwaters of cold-water streams; larvae (ammocoetes) are filter feeders in mud substrates of cold-water streams; juveniles believed to migrate to Pacific Ocean several years after hatching; adults spend May to September in ocean before migrating to fresh water; adults attach to and feed on fish
Eulachon	*Thaleichthys pacificus*	Mouths of Wind River, White Salmon, Klickitat	Eulachon occur from northern California to southwestern Alaska; annually ascend the Columbia River to spawn in the mainstem and its tributaries downstream of Bonneville Dam; occur in offshore marine waters and spawn in tidal portions of rivers; spawn in variety of substrates but sand most common; juveniles rear in nearshore marine areas; plankton-feeders eating crustaceans such as copepods and euphausiids; larvae and post-larvae eat phytoplankton, copepods; important prey species for fishes, marine mammals, and birds. The fish typically enter the Columbia River in early to mid-January, followed by tributary entry in mid to late January. Within the Scenic Area, eulachon are presently known to spawn in the mainstem Columbia River as well as the Sandy River from December to May, with peak spawning from February to March. Historically this species spawning distribution was to the Hood River, prior to the construction of Bonneville Dam.
Leopard dace	*Rhinichthys falcatus*	Salmon, Washougal, Wind River, White Salmon, Klickitat	Leopard Dace are a small cyprinid fish that have a distribution restricted to the Fraser and Columbia River systems east of the Cascade Mountains. Much of the original habitat of these fishes in the Columbia River is now dammed. Within Washington, Leopard dace currently inhabit the lower, mid, and upper sections of the Columbia, Snake, Yakima and Similikameen Rivers; utilize habitat on or near the bottom of streams and small to mid-sized rivers with velocities less than 1.6 feet/sec (0.5 m/second); prefers gravel and small cobble substrate covered by fine sediment with summer water temperatures ranging between 59 and 64 degrees F (15 and 18 degrees C); juveniles feed primarily on aquatic insects; adult leopard dace consume terrestrial insects; breeding occurs during the summer, where adhesive eggs are broadcasted over gravel beds.
Mountain sucker	*Catostomus platyrhynchus*	Salmon, Washougal, Wind River, White Salmon, Klickitat, Columbia River	Distribution restricted to Columbia River system, could potentially be in lower Klickitat River; found in clear, cold mountain streams less than 40 feet wide and in some lakes; prefer deep pools in summer with moderate current; juveniles prefer slower side channels or weedy backwaters; diet consists largely of diatoms and algae scraped from rocky substrates

Common Name	Scientific Name	River Basins Potentially Containing Habitat	Habitat and Life Requirements*
California floater (mussel)	*Anadonta californiensis*	Klickitat	Freshwater filter feeder requiring clean, well-oxygenated water; declining through much of historical range; known to occur in Columbia and Okanogan Rivers and several lakes; Known sites within the NSA include impounded ponds adjacent to the Columbia River;.intolerant of habitats with shifting substrates, excessive water flow fluctuations, or seasonal hypoxia; fertilization takes place within the brood chambers of the female mussel; the fertilized eggs develop into a parasitic stage called glochidia; released glochidia attach to species-specific host fish; juvenile and adult mussels attach to gravel and rocks; More sites are being documented as surveys are ramping up for all native mussel species.
*Information on Habitat and Life Requirements taken from WDFW, 2006.			

3.5.3 Environmental Consequences

The potential effect of invasive plant treatments on aquatic organisms is a primary public issue (Issue Group 5). Many people have expressed concern about the effects of herbicide use on fish and the aquatic ecosystem. Many laws, policies, standards and guidelines relate to aquatic ecosystems and activities near streams. The discussion below focuses on the likelihood of potential effects on aquatic organisms and their habitat should any alternative result in herbicides coming in contact with water. The analysis complements Chapter 3.4.

All alternatives (including No Action) "May Impact" some sensitive aquatic species, but none will affect the viability of any species or cause any species to be listed under the Endangered Species Act. All alternatives "May Affect" some aquatic species listed or proposed for listing under the Endangered Species Act, but none will jeopardize the continued existence of any species. Because the proposed action will ultimately result in the restoration of degraded habitat, long-term adverse alteration of habitat is not anticipated to occur (NMFS 2008 BO).

Consultation with the Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS, also referred to as NOAA Fisheries) has been completed for this project. The Forest Service worked with these agencies from project inception throughout the planning process. Over the course of 2006 and into early 2007, there were a series of meetings and negotiations between the Forest Service, FWS and NMFS staff to develop the project description and finalize the Biological Assessment (FWS 2007 BO.). The Biological Assessment was submitted in January 2007, covering proposed actions that were considered both "not likely" and "likely" to adversely affect aquatic species listed or proposed for listing under the Endangered Species Act. Each agency (FWS and NMFS) prepared its own documents in response to the BA. FWS and NMFS have authorized incidental take on the known sites as well as the EDRR approach for future detections. "Reasonable and Prudent Measures" necessary to minimize the taking of federally listed fish are documented in the BO's. The consultation record is available hard copy on request or via the Forest Service website: http://www.fs.fed.us/gpnf/04projects/pinchotprojects.

Effects of Non-Herbicide Treatments

All invasive plant treatments occurring near streams and wetlands pose risk of disturbing the aquatic ecosystem. Crews using hand tools may accidentally step on fish redds, for instance, or trigger behavioral changes in aquatic fauna. Erosion may be slightly accelerated for short periods of time from manual or mechanical treatments (see effects of non-herbicide methods in Chapter 3.4), which may indirectly add sediment to fish bearing waters. All alternatives, including No Action, allow hand pulling and other treatments that may result in minor, short term disturbances to fish and other aquatic organisms.

The effects of non-herbicide treatments to fish are addressed in detail in Appendix J of the R6 2005 FEIS. Project specific impacts of non-herbicide treatments are addressed in the Biological Assessment submitted to the regulatory agencies (available electronically on our website – http://www.fs.fed.us/gpnf/04projects/pinchotprojects or in the project record). These effects were not addressed by the public, who expressed specific concerns to the proposed increase in use of herbicides near streams.

All invasive plant treatments can result in increased erosion, stream sedimentation, and disturbance to aquatic organisms if carried out over a large enough area. Sedimentation can cover eggs or spawning gravels, reduce prey availability, and harm fish gills. Soil can also become compacted and prevent the establishment of native vegetative cover. All invasive plant treatments can reduce insect biomass, which would result in a decrease in the supply of food for fish and other aquatic organism.

The presence of people or crews with hand-held tools along streambanks could lead to localized, short-term adverse effects to fish habitat because of trampling, and soil sloughing due to stepping on banks and removal of invasive plant roots. However, the invasive plant populations on the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area are not extensive enough for this to be a plausible result on any alternative.

Effective invasive plant treatment and restoration of treated sites would improve the function of riparian areas and lead to improved fish habitat conditions.

Restoration of native plant communities in riparian habitats would benefit aquatic species. The impacts of invasive plants on riparian habitats can last decades, while the impacts of treatment tend to be short term. Passive and active restoration would accelerate native vegetative recovery in treated sites.

Effects from Grazing

Grazing is currently proposed for approximately 23 acres of blackberry treatments on the Columbia River, at the St. Cloud (22-03) and Collins Slide (22-06) sites. The majority of these infestations in these areas are within the aquatic influence zone. Grazing would reduce the amount of herbicide used in these areas and eliminate the need for mechanical treatment. Goats could adversely impact fish or habitat if allowed to wallow or eliminate waste in streams. PDC have been established to prevent these adverse impacts.

Herbicides in Aquatic Ecosystems

As discussed in Chapter 3.4, herbicide treatments along streams and roadside ditches may result in herbicide reaching water bodies through drift, runoff, and/or leaching. The movement, persistence, and fate of an herbicide in the environment determine the likelihood and the nature of the exposure fish and other aquatic organisms may receive. The primary determinants of exposure of herbicide to fish are herbicide properties, application rate, extent of application, application timing, precipitation amount and timing, and proximity to habitat (NMFS 2007 BO). Herbicides coming in contact with water would be infrequent and limited in extent (small, scattered infestations) and duration (minutes to hours). Even if toxicity indices for fish are temporarily exceeded at a treatment site, exposure is unlikely to occur due to high base flows and the limited duration and extent of effects associated with invasive plant treatments (FWS 2007 BO).

Herbicides can alter the structure and biological processes of both terrestrial and aquatic ecosystems; these effects of herbicides may have more profound influences on communities of fish and other aquatic organisms than direct lethal or sublethal toxic effects (Norris et al. 1991). Stream and lake sediments may be contaminated with herbicides by deposition of soils carrying adsorbed herbicides from the land or by adsorption of herbicides from the water (ibid).

Residues in food from direct spraying are likely to occur during and shortly after application. Drift from herbicides considered for use may affect aquatic vegetation at low concentrations, however it shows little tendency to bioaccumulate and is likely to be rapidly excreted by organisms as exposure decreases (ibid.).

The application rate and method, along with the behavior of the herbicide in the environment, influence the amount and length of time an herbicide persists in water, sediment, or food sources. Once in contact, the herbicide must be taken up by the organism and moved to the site of biochemical action where the chemical must be present in an active form at a concentration high enough to cause a biological effect (ibid.).

Herbicides have been shown to affect aquatic ecosystem components, however concentration of herbicides coming in contact with water following land-base treatments are unlikely to be great enough to cause such changes (ibid). While the herbicides considered for use in this project kill aquatic plants, aquatic habitats and the food chain would not be adversely impacted because:

- The amount of herbicide that could be delivered is relatively low in comparison with levels of concern
- The duration to which any non-target organism (including aquatic plants) would be exposed is very short-lived and impacts to aquatic plants would be localized.

Herbicide Ingredients

Some herbicide ingredients pose little risk to elements of the aquatic ecosystem. Other ingredients, particularly in certain formulations of glyphosate, triclopyr, sethoxydim, and picloram, have the potential to harm fish even when used according to label directions. Aquatic labeled glyphosate and aquatic labeled triclopyr reduce risk to fish when compared to their terrestrial formulations. Both aquatic and terrestrial imazapyr pose a lower risk to fish than aquatic glyphosate or triclopyr.

Inert ingredients, including adjuvants, impurities and surfactants, were studied as a part of SERA risk assessment for all herbicides (see Chapter 3.1 above). Some inerts are not publicly disclosed, but were considered in risk assessments. Any inerts that are not publicly disclosed are considered non-toxic by the Environmental Protection Agency (EPA).

Surfactants are added to certain herbicide formulations. POEA surfactant is toxic to aquatic species (SERA, 2003-Glyphosate, p. 4-14). In the SERA risk assessment, the toxicity of non-aquatic glyphosate is considered together with this surfactant, either in the formulation or added as an adjuvant in a tank mixture (SERA, 2003- Glyphosate, p. 4-14). NPE based surfactants were classified as a low risk to aquatic organisms because predicted concentrations were less than the estimated or measured “no observable effect concentration.” FS/SERA Risk Assessments analyzed herbicide ingredients using the process described below:

- Compared acute toxicity data between the formulated products (includes inert ingredients) and their active ingredients alone
- Disclosed whether or not the formulated products have undergone chronic toxicity testing
- Identified (with the help of EPA and the herbicide registrants) ingredients of known toxicological concern in the formulated products and assess the risks of those ingredients

Table 61 compares the sensitivity of elements of the aquatic ecosystem to herbicide impacts, based on SERA risk assessments. The PDC and buffers were developed to minimize the risk that exposures of these herbicides would have adverse effects on the aquatic environment.

Table 61-Summary of Herbicide Aquatic Risk Assessment

Herbicide	Toxicity of Active Ingredients	Toxicity of Inert Ingredients
Chlorsulfuron (Telar, Glean, Corsair)	Exposure to fish and aquatic invertebrates far below levels of concern (no effects to egg and fry); peak exposures could damage aquatic plants at typical application rates; algae may be damaged at high rates.	SERA reviewed confidential ingredients for the risk assessment EPA has not classified any of the inerts as toxic.
Clopyralid (Transline)	Exposures very far below levels of concern for fish and aquatic invertebrates; aquatic plants and algae are not susceptible.	Identified inerts include approved food additives. These inert ingredients do not affect the assessment of risk.
Glyphosate (Accord XRT, Rodeo, Roundup, Roundup Pro, Aquamaster, etc, including 35 formulations)	Aquatic formulation exceeds level of concern for fish at typical and highest application rate; exposures below level of concern for aquatic invertebrates, algae, and plants;	At least 35 glyphosate formulations are registered for forestry applications (with a variety of inert ingredients). Surfactants (tallow amine or POEA) in some non-aquatic use formulations are very toxic to aquatic organisms and may cause fish mortality at high application rates.
Imazapic (Plateau)	Exposures far below level of concern for fish (no effects to egg & fry); potential risk to aquatic plants at highest application rate only; no risk to algae.	None of the inerts are classified by EPA as toxic.
Imazapyr (Arsenal, Arsenal AC, Chopper, Stalker, Habitat)	Exposure to fish and invertebrates very far below levels of concern; potential risk to aquatic plants at typical application rate, no risk to algae.	The toxicity of the inert ingredient isopropanolamine is uncertain (it is on EPA List 3, which means it is not known to be toxic, but is also not proven non-toxic).
Metsulfuron Methyl (Escort XP)	Exposures to fish very far below level of concern (no effects to egg & fry); can damage aquatic plants in acute exposures at typical application rates, no risk to algae.	None of the inerts are classified by EPA as toxic.
Picloram (Tordon K, Tordon 22K)	Exposures exceed level of concern for fish at typical and highest application rate; salmonids appear to be marginally more sensitive to technical grade picloram (acid) than other fish species. Picloram may adversely affect aquatic plants at high application rates.	Tordon K and Tordon 22K may contain the surfactant polyglycol 26-2, which is on EPA's List 3: Inerts of Unknown Toxicity.
Sethoxydim (Poast, Poast Plus)	Highly toxic to fish due to petroleum inert (see column right); exposure exceeds level of concern for fish at typical rate and maximum exposure assumptions). Poast is much more toxic to fish than sethoxydim. Sethoxydim poses low risk to other aquatic organisms besides fish.	The formulation Poast contains 74 percent petroleum solvent that includes naphthalene. The EPA has placed this naphthalene on List 2 ("agents that are potentially toxic and a high priority for testing").
Sulfometuron methyl (Oust, Oust XP)	Exposures below level of concern to fish (highly toxic to embryo hatch). Aquatic plants may be adversely affected at typical application rates.	None of the inerts are classified by EPA as toxic.
Triclopyr (Garlon 3A, Garlon IV, Forestry Garlon IV, Pathfinder II, Remedy, Remedy RTU, Redeem R&P)	Ester formulation (Garlon 4) and metabolite TCP is toxic to fish and aquatic invertebrates at typical rates; salt/acid formulation (Garlon 3A) exceeds level of concern for federally listed fish at typical rate and aquatic plants at high application rates. TCP exposures do not exceed level of concern.	Formulations contain ethanol (Garlon 3A) or kerosene (Garlon 4), which are known to be neurotoxic.

The PDC and buffers were developed based on the relative risk of each herbicide to the aquatic environment. The PDC minimize or eliminate potential for herbicides to enter water at concentrations of concern by limiting the rate, extent, or herbicide application method. For instance, PDC H14 limits extent of annual treatment to about 18 percent of any aquatic influence zone, which would result in at least a five-fold reduction in herbicide exposure compared to the worst case modeled scenarios. In addition, limitations on broadcasting would result in much spottier coverage compared to the modeled assumptions. Broadcasting is greatly restricted near streams in all alternatives and would never exceed the typical application rate.

No methodology is available to quantify the effect of PDC and site-specific restricted herbicide use buffers in reducing predicted HQ values under SERA risk assessment scenarios. SERA worksheets are available to refine some site-specific parameters; however the effect of the PDC in restricting the timing, extent, location, herbicide selection, and application rate cannot be precisely modeled.

SERA Worksheets and the Emergent Vegetation Analysis

SERA has developed Risk Assessment Worksheets (SERA 2004c) to refine worst-case herbicide delivery analysis from riparian treatments, using site-specific information. The worksheets incorporate the behavior of the various herbicides in the environment, along with local soil and weather information, to estimate herbicide concentration in a stream. The results can be compared to toxicity indices for fish, invertebrates and aquatic plants to indicate degree of hazard associated with herbicide predicted to enter water. As discussed previously, hazard quotients less than one would indicate a low potential for impact to aquatic organisms.

SERA Worksheets were run for two representative areas, the Cave Creek watershed and the Hot Springs site on the Columbia River. The SERA Worksheets were run for the Proposed Action (Alternative B). None of the other alternatives propose enough riparian treatment to warrant the SERA worksheet analysis. Results are shown in the discussion under Alternative B, below.

The SERA Worksheets are likely to overestimate herbicide concentrations because they do not consider vegetation interception or absorption and they do not consider herbicide degradation before the first rainfall, and they assume a solid 10 acres of broadcast spray (which would not occur in any alternative given PDC and buffers). The SERA risk assessment scenario assumes an even broadcast spray of 10 acres along a 2 meter wide stream, with a constant flow of 1.8 cfs along 4.3 miles of stream below the 10 acre block (fixed flow velocity).

Actual proposed treatments contain buffers; distances within which only spot spray or hand application is allowed. The established buffers in the Proposed Action are believed to reduce the amount of herbicide potentially coming in contact with water. The potential amount of herbicide coming in contact with water even after application of buffers is believed to be greatly minimized to almost non-detectable levels. Photodegradation, hydrolosis, adsorption to particles in the water column and along the channel side and bottom, dilution resulting from influx of additional water (either subsurface or surface), and accretion of volume as the stream flows down can and do occur very rapidly. These factors result in a much less likelihood of certain herbicides achieving concentrations that were calculated above. Therefore, it is believed that herbicides coming in contact with water, if any, would either be below levels of concern or non-detectable under the Proposed Action.

In addition, the model assumes a constant 1.8 cfs base flow for 4.3 miles. Nearly all streams in the project area contain tributaries adding to flow and mixing. Herbicide concentration would not remain constant for a distance of 4.3 miles long in a 1.8 cfs stream. There are many factors in addition to dilution and mixing that add to reducing herbicide amount in water over distance, including interception by aquatic plants or soils.

SERA Worksheets do not explicitly address treatments of emergent vegetation below bankfull of a stream or wetland. Slower backwater areas may not dilute herbicides as quickly, and herbicide may remain in lentic water bodies (i.e. ponds) longer than predicted. These factors lead to some uncertainty about whether the SERA Worksheets adequately estimate the risk associated with emergent vegetation treatments.

The Forest Service also conducted an “emergent vegetation analysis” developed by NMFS to estimate peak concentrations from treatments below bankfull of a small stream or wetland. However, the Forest Service does not believe this analysis is more accurate than the SERA Worksheets to indicate degree of risk to the aquatic ecosystem. In the emergent vegetation analysis, herbicide concentrations in streams are calculated based on a typical rate of an herbicide applied directly to one cubic foot of water (one square foot, one foot deep). An applicator would have to pour herbicide directly into a foot of water to approach the calculated concentration levels (direct application to water is not proposed for this project). The calculation does not incorporate local soil or weather information, nor does it integrate the behavior of the different herbicides in the environment. Unlike the SERA Worksheets, the emergent vegetation analysis has not been peer-reviewed.

Results for both the SERA Worksheets and emergent vegetation analysis are described under Alternative B below.

Ditches and Intermittent Channels

NMFS 2008 BO reported that herbicides applied within ditches and intermittent stream channels may be delivered to places where fish or their food might be exposed by leaching into soil, dissolving directly into ditch or stream channel flow (when present), and erosion of exposed soil. The primary determinants of exposure risk from ditch or intermittent channel treatments are herbicide properties, application rate, extent of application, application timing, precipitation amount and timing, and proximity to habitat.

NMFS 2008 BO also reported that glyphosate, sethoxydim, and triclopyr use modeled for this project exceeded the fish HQ threshold level of 1, causing likely adverse effects on listed salmonids and their habitat from rain within 24 hours after application at ditch and intermittent channel confluences with perennial streams. NMFS assumed that this would occur for complete treatment of up to 660 feet of a ditch or dry channel that discharges to a perennial stream containing listed fish. NMFS also reported that several herbicides delivered through application near dry streams and/or roadside ditches would adversely affect aquatic macrophytes, invertebrates and plants (NMFS 2008 BO).

NMFS findings do not consider that glyphosate would be bound to soil present in the dry stream or ditch and therefore would not be plausibly delivered to a stream 660 feet away from the site of application. These findings assume "complete treatment" of a long stretch of dry stream or roadside ditch, which does not account for the patchy distribution of known infestations, topography of Forest Service roads, nor the presence of ditch relief pipes. NMFS findings also do not account for the mitigating effects of PDC and buffers specific to dry streams and roadside ditch networks. Finally, NMFS findings do not consider the short period of time that fish could possibly be exposed to herbicides at the concentrations predicted in their analysis. The threshold of concern for fish in the SERA Risk Assessments assumed that fish would be exposed to a given herbicide concentration for 96 hours. Any herbicide delivered from roadside ditches would be diluted in a matter of minutes.

In the FWS 2007 BO, the agency found that under the right conditions (extensive spot spray applications, immediately followed by a rain event) roadside treatments in this area could result in bull trout exposure to herbicide, therefore it is reasonable to expect that individual bull trout may suffer short-term impairments associated with herbicide applications in ditches and intermittent streams under these conditions."

Direct and Indirect Effects by Alternative

Alternative A (No Action)

The No Action Alternative A would continue the currently approved use of herbicides on 100 acres of the Gifford Pinchot National Forest, and 300 acres on Columbia River Gorge National Scenic Area. Aquatic-labeled glyphosate has been approved for streamside knotweed adjacent to recreation sites as part of the existing program. Otherwise, treatments with herbicide would be unlikely to occur near fish habitat. Little potential exists for herbicides to enter water in concentrations above any levels of concern that could adversely affect aquatic organisms or ecosystems. Treatments have been previously subject to appropriate NEPA and ESA analysis.

Non-herbicide treatments (mainly hand pulling) could continue to occur on an additional 2,100 acres. The use of non-herbicide treatment methods may result in some sediment delivery at the site, however, the likelihood of substantial amounts of sediment being delivered to fish-bearing streams is extremely low and unlikely.

SERA Worksheets and Emergent Vegetation Calculation

The SERA Worksheet and Emergent Vegetation Analysis was not conducted for Alternative A because the herbicide use currently approved is unlikely to result in herbicide delivery to streams.

Effects on Species Proposed or Listed under the Endangered Species Act, Designated Critical Habitat and Essential Fish Habitat Assessment

Alternative A may affect (but is not likely to adversely affect) some fish species listed under the Federal Endangered Species Act. Herbicide delivery to streams is unlikely. Minor ground disturbance or disturbance to an individual fish is possible from treatments within aquatic influence zones. However, adverse effects from to Designated Critical or Essential Fish Habitat are not likely to occur under Alternative A because the type of treatments currently approved are unlikely to result in meaningful erosion or habitat disturbance. Table 65 compares Endangered Species Act determinations for listed species under all alternatives, including Alternative A. Due to the minor ground disturbance and potential to disturb an individual fish, Alternative A is associated with an Endangered Species Act determination of "may affect, not likely to adversely affect" some federally listed species or their designated critical habitat for species listed (see Table 65). The quality and/or quantity of Essential Fish Habitat would not be reduced or degraded by this alternative.

Effects on Regional Forester Sensitive Species

Minor ground disturbance associated with Alternative A may impact individual Columbia duskysnail, but would not likely contribute to a trend towards federal listing or loss of viability to their population or species. Existing treatments are not extensive enough to alter duskysnail habitat nor would the species likely be present during the time of treatment. Alternative A will have no impact on Interior Redband trout, Puget Sound coastal cutthroat trout, and pygmy whitefish because none of these species or their habitat is found within the project area.

Effects on Washington State Listed Species

Alternative A may impact individual Columbia eulachon, leopard dace, and mountain sucker, but would not likely contribute to a trend towards federal listing or loss of viability to populations of these species. Existing treatments are not extensive enough to alter their habitat nor would individuals from any of these species likely be present during the time of treatment.

Alternative A would have no impact on the interior redband trout, pygmy whitefish, giant Columbia River limpet, and great Columbia River spire snail because none of these species nor their habitat is present in the project area.

Alternative A would have no impact on river lamprey or California floater mussel because there are no treatments within their habitat.

Alternative B (Proposed Action)

Alternative B allows limited use of herbicides within aquatic influence zones and along roads that have a high potential to deliver herbicides to surface waters. Alternative B is the Preferred Alternative, thus effects to federally listed fish species from this alternative have been detailed in a Biological

Assessment (BA) submitted to the regulatory agencies and available electronically on our website or hard copy by request. The BA is summarized and incorporated by reference to the FEIS.

Under Alternative B, PDC and buffers minimize the risk of herbicide delivery to the aquatic environment by limiting the rate, extent, or herbicide application method. Monitoring results and other studies (see discussion in Chapter 3.4) indicate buffers are effective in eliminating or substantially reducing potential for herbicides to enter water bodies at levels of concern for fish and invertebrates (Berg, 2005). However some herbicide delivery to surface water bodies is possible. Herbicide use on roads that have high potential to deliver herbicides to surface waters and within the aquatic influence zone is likely to result in small amounts of herbicide contacting aquatic environments.

With the exception of aquatic labeled herbicides, broadcast applications of all herbicides would not occur within 100 feet of perennial and intermittent streams or on roads that have a high potential for herbicide delivery. The majority of herbicides have 50-foot buffers for spot treatments, except for low risk and aquatic labeled herbicides. Spot applications of aquatic labeled formulations of glyphosate and imazapyr may be used up to the water's edge or within 15 feet of water present in roadside ditches that are outside the stream buffer. Spot applications of aquatic labeled triclopyr may not be used within 15 feet of perennial and wet intermittent streams or other waterbodies.

The probability that fish would be exposed to non aquatic formulations of herbicide is very low due to PDC and buffers that require aquatic formulations for spot applications near perennial streams and wetlands. The probability of hand-select methods, such as foliar painting a knotweed leaf, resulting in herbicides coming in contact with water is low. Localized effects to individual aquatic plants are possible as a result of treatments that occur within the bankfull channel. These localized effects would not disrupt aquatic ecosystem function of the aquatic food web because of the low potential to reach toxicity levels for each trophic level under spot and hand/select applications with glyphosate and imazapyr. Spot applications of aquatic formulations of glyphosate and imazapyr are not likely to result in harmful amounts coming in contact with water and harming fish, invertebrates, and algae. However, some aquatic plants would be damaged at the immediate spot spray locations if enough herbicide comes in contact with the aquatic plant. It is believed that there will not be enough herbicide coming in contact with water to result in extensive aquatic plant mortality. For example, the use of glyphosate will not be applied directly to water for weed control, but if it does enter the water it is bound tightly to dissolved and suspended particles and to bottom sediments, and quickly becomes inactive.

In general, juvenile and adult fish will avoid the presence of human beings and will more than likely swim away from predator like shadows overcasting waterbodies. The possibility of a fish being present in the immediate water column where spot spray applications may be taking place up to the water's edge is low. However, fry avoid faster flows and tend to rear along the shoreline or around large substrate/wood where flow is slower. Fry tend to avoid overcastting shadows as well but can return to their previous location after being disturbed if a human stands still enough near the stream margin. It is unlikely that an applicator will stand still for a period of time when treating emergent vegetation.

Fish may be exposed to aquatic formulations of glyphosate and imazapyr where there is emergent vegetation treatment in smaller streams where they are present. Fish in the mainstem of rivers and streams may not be exposed because of the river's large flow and density of fish during time of treatment. Smaller streams however, do not have as much flow and may not dilute herbicides as quickly. Fish in smaller streams tend to be juveniles and fry, and are also lower in density, thus lowering the potential for exposure. Although there will be no herbicide applied directly to the water column for purposes of treating submerged vegetation, there may be some fine droplets from spot applications coming in contact with water as a result of treating emergent vegetation. Of all of the methods within the scope of this project, treatment of emergent vegetation below the bankfull portion of a small stream or wetland has the greatest potential to result in herbicide exposure to aquatic organisms. Treating emergent invasive vegetation during spawning and/or when redds are present could result in disturbance and/or herbicide exposure to fish. Although activities would be planned and scheduled to avoid disturbance of spawning fish or damage to redds, a worker may accidentally displace a spawning fish or step on a redd.

A few sites in the Wind River (upper Trout Creek), Lower Cispus River (mainstem corridor), and Muddy River (lower reaches of Clear Creek) watersheds contain emergent reed canarygrass, however these areas are dry part of the year, thus treatment would be during low flow periods where there is less probability of herbicide coming in contact with water due to application methods and timing. Knotweed may grow along stream corridors within or outside the high water level. For example, the Collins Slide Area (22-06) on the National Scenic Area contains a discontinuous streamside population of knotweed. Streamside knotweed would be treated with stem injection of aquatic formulations (glyphosate and imazapyr). These treatments have a low potential for herbicides to enter water at levels of concern.

Alternative B may result in removal of some emergent vegetation that may be providing cover for juvenile fish and invertebrates. Juvenile fish may use emergent vegetation, specifically reed canary grass, as cover. However, other cover vegetation currently grows in combination with reed canarygrass in mapped treatment areas so adverse effects from removal of reed canarygrass are unlikely.

Under the proposed action, spot-spray applications of aquatic glyphosate can occur directly within ditches and dry stream channels. Hand/select applications of clopyralid, imazapic, imazapyr (aquatic formulation), metsulfuron methyl, and triclopyr (aquatic formulation) is also proposed within ditches and dry intermittent channels…It is reasonable to assume that … aquatic organisms may be briefly exposed to toxic levels of glyphosate or other herbicide compounds if a rainfall event occurs shortly after an application. To be exposed, individual bull trout would need to be in close proximity to the confluence where a ditch or intermittent stream channel is located when the “first flush” event occurs (FWS 2007 BO).

SERA Worksheets

The potential effects from herbicide exposure to fish was analyzed using the SERA worksheets, considering site-specific conditions within the Cave Creek Meadow (33-05ml) and Hot Springs (22-04) treatment areas. Aquatic formulations were modeled since they would be used for emergent vegetation treatments.

The Cave Creek Meadow is located in the Cave/Bear Creek sub-watershed (White Salmon River fifth field watershed) and is adjacent to Cave Creek, which provides habitat for resident fish. Resident fish are not present in the meadow during high rainfall because it does not provide any type of habitat. The Hot Springs site is located adjacent to Greenleaf Creek, a tributary to the Columbia River, which is known to contain steelhead and coho. While treatments would be preferred during dry times of the year, when herbicide is least likely to contact water, these areas may remain wet year round.

In this case, HQ values below 1 indicate that the modeled concentration of herbicide in water would not likely adversely affect federally listed fish. The worst case assumptions for the scenario are not possible on the ground under the Proposed Action because there will be no broadcasting within at least 50 feet of streams. No broadcasting would occur on roads that have high risk of herbicide delivery through their ditch networks. In addition, triclopyr would not be broadcast under any conditions. These design criteria greatly reduce the potential for herbicide delivery compared to the modeled predictions (see monitoring results Berg 2004, ODOT 2003-2005).

If the herbicide concentration under the worst-case scenario is less than the toxicity index for a given species, the potential for harm is low. In all worksheet calculations, the concentrations estimated in water are less than the toxicity indices, thus the Hazard Quotient is below 1. This indicates a low level of risk to fish from herbicide use in aquatic influence zones as proposed in Alternative B. Table 62 shows the results of the SERA Worksheet.

Table 62-SERA Worksheet Results

Herbicide and Application Rate	Treatment Area	Range of Concentrations in water (dose in mg/L)	Toxicity Index for Fish (mg/L)	Range of Hazard Quotients
Glyphosate (2 lbs/acre)	Cave Creek Meadow	0.0382 - 0.197	0.5	0.08 - 0.4
	Hot Springs	0.0561 - 0.154	0.5	0.1 - 0.3
Imazapyr (0.45 lbs/acre)	Cave Creek Meadow	0.000069 – 0.0001	5.0	0.000006 – 0.00002
	Hot Springs	0.00000135 – 0.000036	5.0	0.0000003 – 0.000007
Triclopyr TEA (1 lbs/acre)	Cave Creek Meadow	0.0309 – 0.0713	0.26	0.1 – 0.3
	Hot Springs	0.0939 – 0.168	0.26	0.4 – 0.6

New information has come to light since the release of the DEIS. Tierney et al. (2006) studied the effects of five herbicides, including aquatic glyphosate, on coho salmon olfaction (i.e. smell). Coho salmon olfaction ability was reduced within 10 minutes of exposure to 1.0 mg/L of aquatic glyphosate, and more rapidly to higher concentrations. There was no effect to olfaction ability when the aquatic glyphosate concentration was reduced to 0.1 mg/L. No concentrations were tested between 1.0 and 0.1 mg/L, which means that the true NOEC value may have been anywhere between 1.0 and 0.1 mg/L. Since Tierney et al. (2006) only studied the effects of aquatic glyphosate on fish; the results of the study are not applicable to algae, aquatic plants, and aquatic invertebrates.

Given this new information, hazard quotients from the SERA risk assessment worksheets for glyphosate were recalculated using 0.1 mg/L as the NOEC value with the understanding that the true NOEC value is somewhere between 1.0 and 0.1 mg/L. Hazard quotient values using the upper range of concentrations in water from the table above for the Cave Creek Meadows and Hot Springs are 1.9 and 1.5, respectively. This is a worst-case scenario that overestimates herbicide delivery and does not consider PDC and buffers. However, this new information confirms that potential non-lethal impacts to fish cannot be entirely discounted. Given the ground conditions and application methods, the use of a the potential for harm to the aquatic ecosystem is low.

NMFS 2008 BO reported that within aquatic influence zones, triclopyr used at maximum application rates by hand or selective methods (in locations with rainfall rates between 50 to 100 inches per year), and glyphosate applied at both typical and maximum rates, are likely to cause effects on listed salmonids. NMFS also reported potential HQ exceedences to aquatic macrophytes, invertebrates and/or algae for riparian application of chlorsulfuron and metsulfuron methyl. Development of the proposed action included PDC and buffers using results of the SERA risk assessment information to minimize the potential for herbicides to reach streams in concentrations high enough to cause these effects. NMFS results are based on models that assume 100 percent broadcast coverage within a riparian area and maximum runoff.

Emergent Vegetation Calculation

The following table shows the results of the emergent vegetation analysis developed by NMFS. Results indicate a higher degree of risk than the SERA Worksheets. The emergent vegetation calculation indicated that aquatic labeled glyphosate and triclopyr could exceed the toxicity indices for fish, and imazapyr could exceed the toxicity indices for aquatic plants (algae and macrophytes). Given the new information from Tierney et al. (2006), glyphosate would have an estimated Hazard Quotient of 7.

These estimated peak concentrations are unlikely to represent real life situations under Alternative B. An applicator would have to pour herbicide directly into a foot of water to approach the calculated concentration levels (direct application to water is not proposed for this project). The calculation does not incorporate local soil or weather information, nor does it integrate the behavior of the different herbicides in the environment. The emergent vegetation analysis has not been peer-reviewed and represents an extreme scenario compared to actual conditions.

However, the potential for aquatic imazapyr to kill individual aquatic plants, or for aquatic glyphosate to potentially result in sub-lethal adverse effects to fish, cannot be entirely discounted.

Table 63-Estimated Peak Concentrations in One Cubic Foot of Water for Three Aquatic Labeled Herbicides

Aquatic formulations at typical application rate	Estimated Peak concentration on 1 ft3 of water	Acute toxicity indices			
		Fish	Invertebrates	Algae	Macrophytes
Glyphosate	0.735 Mg/L	**0.5 Mg/L Tierney 2006 0.1 Mg/L**	78 Mg/L (1/10th of LC50)	3 Mg/L (NOEC)	3 Mg/L (NOEC)
Imazapyr	0.552 Mg/L	5 Mg/L (1/20th of LC50)	100 Mg/L (NOEC)	**0.02 Mg/L (1/10th of EC50)**	**0.013 Mg/L (EC25)**
Triclopyr	0.368 Mg/L	**0.26 Mg/L (1/20th of LC50)**	13.3 Mg/L (1/10th of LC50)	4.2 Mg/L (NOEC)	0.42 Mg/L (1/10th of EC50)

In their 2008 BO, NMFS displayed potential HQ values associated with emergent vegetation treatment, referred to as "Exposure from Applications within Perennial Streams." NMFS reported that "glyphosate exhibits HQ exceedances at both typical and maximum application rates…and triclopyr exhibits HQ exceedences at typical and maximum application rates." NFMS also reported "instream and gravel bar application of imazapyr can have direct lethal effects on aquatic macrophytes at both typical and maximum application rates…"

The estimated peak concentrations leading to adverse effects reported by NMFS are unlikely to actually occur under Alternative B. An applicator would have to pour herbicide directly into a foot of water to approach the calculated concentration levels (direct application to water is not proposed for this project). The calculation does not incorporate local soil or weather information, nor does it integrate the behavior of the different herbicides in the environment. The emergent vegetation analysis has not been peer-reviewed and represents an extreme, unrealistic worst case scenario compared to expected field conditions.

Effects on Species Proposed or Listed under the Endangered Species Act, Designated Critical Habitat

Alternative B has a low potential to adversely affect federally listed aquatic species within the project area. Treatments are not likely to adversely affect listed fish or critical habitat because it is unlikely that herbicides would come in contact with water at amounts calculated above or of concern at treatment sites listed in Appendix A. However, the effects of herbicide treatment of aquatic emergent vegetation under EDRR cannot be entirely discounted.

Table 65 displays effects determinations for listed species and their critical habitat. As discussed above, treatments of emergent vegetation in small streams have the greatest potential for disturbance to fish, and/or exposure to herbicides. There remains uncertainty about whether fish may be present during treatments under EDRR.

Primary Constituent Elements (PCE) were analyzed for critical freshwater habitats include spawning sites, rearing sites, and migration corridors. In 1996, NMFS developed a methodology for making ESA determinations for individual or grouped activities at the watershed scale, termed the "Habitat Approach". A Matrix of Pathways and Indicators (MPI) was also recommended under the Habitat Approach to assist with analyzing effects to listed species.

When using the MPI, project effects to the "Pathways and Indicators" (numeric ratings or narrative descriptors for each Pathway) are used to determine whether proposed actions would damage habitat or retard the progress of habitat recovering towards properly functioning condition. The Habitat Approach's MPI has numerous habitat-associated Indicators that closely "cross-walk" with the PCE's associated with designated critical habitat (Sept. 2002 designation letter).

Table 64 displays the PCE – MPI Crosswalk.

Table 64-Crosswalk of PCE Elements and MPI Indicators

Primary Constituent Elements	Matrix of Pathways and Indicators
Spawning Habitat, as defined by water quality, water quantity, substrate	Water Quality: Temperature, Suspended Sediment, Substrate, Chemical Contaminants and Nutrients Flow/Hydrology: Change in Peak/Base flows Habitat Elements: Substrate/Embeddedness
Rearing as defined by adequate water quantity and floodplain connectivity	Channel Conditions and Dynamics: Floodplain connectivity Flow/Hydrology: Change in Peak/Base flow
Rearing as defined by adequate water quality and forage	Water Quality: Temperature, Substrate Habitat Elements: Large Woody Debris, Pool Frequency and Quality, Off-channel Habitat
Rearing as defined by adequate natural cover	Habitat Elements: Large Woody Debris, Pool Frequency and Quality, Large Pools, Off-channel Habitat
Migration as defined by habitat free of artificial obstructions, and adequate water quality, water quantity, and natural cover	Habitat Access: Physical Barriers Water Quality: Temperature Flow/Hydrology: Change in Peak/Base flow Habitat Elements: Large Woody Debris, Pool Frequency and Quality, Large Pools

All of these aquatic ecosystem components were evaluated in detail in the BA. The results of the detailed analysis indicate that there would be no detectable changes to temperature, floodplain connectivity, stream flow, pool frequency and quality, wood routing, or substrate from the treatments proposed. Invasive plant treatments may result in minor ground disturbance and localized sedimentation (see Chapter 3.4), but the amount of sediment is expected to be negligible and within the range of natural variability. Herbicide treatments may result in herbicide drift, run-off or leaching to streams, but the potential amount is very low given the PDC and buffers. The PDC and buffers minimize the risk of herbicide delivery to streams and limit the extent, intensity and frequency of treatment to reduce the likelihood of adverse effects actually occurring.

Invasive plants have some negative impacts on these aquatic ecosystem components (see discussion under Affected Environment). However, invasive plant treatments would have many beneficial effects on critical habitat for federally listed fish species by increasing native vegetation growth, cover and food. Invasive plant treatments conducted in riparian areas would help restore or maintain the native riparian vegetation that is essential in maintaining the PCE of critical habitat in the long-term.

Essential Fish Habitat

The Magnuson-Stevens defines adverse effects as any impact, which reduces the quality and/or quantity of Essential Fish Habitat (EFH). Non-herbicide and herbicide treatment methods would not impact those waters necessary for spawning, breeding, feeding, or growth to maturity because there is no treatment of submerged invasive plants and the predicted amount of herbicide coming in contact with water is expected to be below levels of concern or non-detectable. The quantity of EFH would not be reduced and the quality of EFH would be maintained (not degraded), thus Alternative B is associated with a determination of No Effect.

Effects on Regional Forester Sensitive Species

Alternative B may impact individual Columbia duskysnail but would not likely contribute to a trend towards federal listing or loss of viability to their population or species because treatments are not extensive enough to alter habitat nor would the species be present during the time of treatment. Since the duskysnail prefers habitat without macrophytes, loss of individual plants as a result of emergent vegetation treatments would not impact habitat availability. Alternative B will have no impact on Interior Redband trout, Puget Sound coastal cutthroat trout, and pygmy whitefish because none of these species or their habitat is found within the project area.

Effects on Washington State Listed Species

Minor ground disturbance and herbicide use under Alternative B may impact individual Eulachon, Leopard dace, Mountain sucker, but will not likely contribute to a trend towards federal listing or loss of viability to their population or species. Treatments are not extensive enough to alter their habitat or species would not be present during the time of treatment.

Lamprey and floater mussel are not present in the treatment areas, thus impacts are unlikely to occur. Habitat for these species is present within the National Scenic Area, but PDC that apply under EDRR would likely eliminate any potential for adverse effects. Habitat in the mainstem of the Columbia River is difficult to impact should treatments take place on the shoreline or above bankfull in a different watershed. The mainstem flow and width of the Columbia River is significant that sediment as a result of disturbance from invasive plant treatments would be within the range of natural variability. Herbicides would quickly be diluted before ever reaching the mainstem or as soon as any herbicide would come in contact with the mainstem. Therefore, alternative B will have no impact on the River lamprey or California floater mussel.

Impacts to individual eulachon eggs may result from disturbance and accidental trampling from treating emergent vegetation along tidal areas in the mainstem of the Columbia River. Herbicide exposure is not expected to be above a level of concern because the amount of herbicide potentially coming in contact with water would be diluted to non-detectable levels in the mainstem of the Columbia River.

Impacts to individual leopard dace may result from disturbance and accidental trampling during treatments of emergent vegetation. Herbicide exposure is expected to be below levels of concern because of PDC and buffers restrict the herbicide type, rate, extent, and application methods allowed in aquatic influence zones.

Juvenile mountain suckers are susceptible to habitat disturbance and herbicide exposure because they prefer slower side channels or weedy backwaters. Treatments of emergent vegetation may reduce available cover and food source for juvenile suckers. Non-herbicide treatment methods may generate enough sedimentation at the local project scale to impact an individual sucker. Slower backwater areas may not dilute herbicides as quickly. Impacts would not be extensive enough to adversely impact the food chain for suckers and herbicide exposure would not exceed a level of concern.

Early Detection and Rapid Response

The SERA Worksheet Analysis indicates a low level of concern for fish or other aquatic organisms from the existing project. However, uncertainty about the applicability of the worksheet results to treatments below bankfull remains. PDC and buffers compensate for uncertainty about the potential level of exposure and location and extent of treatment.

As discussed above, the emergent vegetation calculation was developed by NMFS to address this uncertainty. The emergent vegetation calculation assumes an extreme (unrealistic) treatment scenario that indicates potential exposure over a threshold of concern for fish. Such exposures are implausible, especially, given that fish are unlikely to be present during or soon after emergent vegetation treatments.

Treatment of emergent invasive vegetation during spawning and/or when redds are present could result in disturbance and/or minimal herbicide exposure to fish in small streams. Although activities would be planned and scheduled to avoid disturbance of spawning fish or damage to redds, a worker may accidentally displace a spawning fish or step on a redd.

PDC and buffers compensate for uncertainty about the potential level of exposure and location and extent of treatment. Treatment of emergent vegetation would be submitted as candidates for monitoring under the R6 2005 ROD Monitoring Framework to identify any unpredicted impacts. Changes would be made to prescriptions (different herbicides or methods used based on monitoring results).

Alternative C

Alternative C eliminates most use of herbicides in riparian reserves (twice the size of the aquatic influence zone); eliminates use of herbicides within roadside treatment areas having high potential for herbicide delivery, and does not allow any broadcast of any herbicide in any situation. Thus, no direct or indirect effects on fish and other aquatic organisms from herbicide use would be anticipated; effects from herbicide use would be similar to No Action.

Even though herbicide effects to aquatic ecosystems are largely eliminated, non-herbicide treatments within riparian areas under Alternative C "may affect" listed fish species. Effects on aquatic organisms from non-herbicide treatments would be similar to the Proposed Action.

SERA Worksheets and Emergent Vegetation Calculation

The SERA Worksheet and Emergent Vegetation Analysis was not conducted for Alternative C because the herbicide use currently approved does not result in herbicide delivery to streams.

Effects on Species Proposed or Listed under the Endangered Species Act, Designated Critical Habitat and Essential Fish Habitat Assessment

Alternative C may affect (but is not likely to adversely affect) some fish species listed under the Federal Endangered Species Act. Although herbicide delivery to streams would not occur, minor ground disturbance or disturbance to an individual fish would be possible from non-herbicide treatments within aquatic influence zones. However, adverse effects to Designated Critical or Essential Fish Habitat are not likely to occur under Alternative C because significant erosion or habitat disturbance is unlikely. See discussion on PCEs under Alternative B for more information about non-herbicide impacts.

Table 65 compares Endangered Species Act determinations for listed species under all alternatives, including Alternative C. Due to potential for negligible amounts of sediment and the potential to disturb an individual fish, Alternative C is associated with an Endangered Species Act determination of "may affect, not likely to adversely affect" some federally listed species or their designated critical habitat for species listed (see Table 65).

Non-herbicide treatments under Alternative C would have localized effects to habitat indicators for EFH at the project scale but the quantity of EFH would not be reduced and the quality of EFH would be maintained (not degraded). Therefore, alternative C would have no effect on EFH.

Effects on Regional Forester Sensitive Species

Minor ground disturbance under Alternative C may impact individual Columbia duskysnail but would not likely contribute to a trend towards federal listing or loss of viability to their population or species.

Existing treatments are not extensive enough to alter duskysnail habitat nor would the species likely be present during the time of treatment. Alternative C would have no impact on Interior Redband trout, Puget Sound coastal cutthroat trout, and pygmy whitefish because none of these species or their habitat is found within the project area.

Effects on Washington State Listed Species

Alternative C may impact individual Columbia eulachon, leopard dace and/or mountain sucker, but would not likely contribute to a trend towards federal listing or loss of viability to populations of these species. Existing treatments are not extensive enough to alter their habitat nor would individuals from any of these species likely be present during the time of treatment.

Impacts to individual eulachon eggs, leopard dace, and juvenile suckers may result from disturbance and accidental trampling from treating emergent vegetation along tidal areas in the mainstem of the Columbia River. Non-herbicide treatment methods may generate enough sedimentation at the local project scale to impact individuals from these species. Elimination of herbicide would tend to increase the likelihood of impacts from non-herbicide methods, but the extent and intensity of the treatment would remain relatively small compared to the existing habitats for these species.

Lamprey and floater mussel are not present in the treatment areas, thus impacts are unlikely to occur. Habitat for these species is present within the National Scenic Area, but PDC that apply under EDRR would likely eliminate any potential for adverse effects. Habitat in the mainstem of the Columbia River is difficult to impact should manual/mechanical/cultural treatments take place on the shoreline or above bankfull in a different watershed. The mainstem flow and width of the Columbia River is significant that sediment as a result of disturbance from invasive plant treatments would be within the range of natural variability. Therefore, Alternative C would have no impact on the River lamprey or California floater mussel.

Early Detection and Rapid Response

The effects to the aquatic environment from treating unknown future populations would be similar to the effects of treating the known inventory. PDC would be applied and treatments would be limited non-herbicide methods within Riparian Reserves and along road segments with a high potential for herbicide delivery to streams. Treatments of aquatic emergent vegetation could result in short-lived, localized disturbance to redds. Such disturbances may be more frequent in Alternative C than the Proposed Action due to the lack of treatment effectiveness and presumable increased need for repeated treatments.

Cumulative Effects Analysis (All Alternatives) for Fish and Aquatic Organisms

As discussed above, for all alternatives, there is a low to very low risk of harmful herbicide exposures to fish. Alternatives A and C virtually avoids herbicide use near streams, and Alternative B includes PDC and buffers that minimize the amount of herbicide exposure possible, thus reducing uncertainty and risk of harmful exposures. This is true for all existing inventory sites and for future treatments within the scope of this project.

While some commonly used herbicides are associated with hazards to aquatic organisms, harmful amounts of herbicides coming in contact with water as a result of Forest Service applications are not likely to occur for all existing inventory sites and for future treatments within the scope of this project. The limitation on extent of treatment for emergent vegetation at the 6th field watershed per year further reduces the potential for effects at a watershed scale. Herbicides coming in contact with water via drift or runoff at the immediate application site would dissipate rapidly and become non-detectable or below levels of concern. State monitoring data for emergent vegetation has either resulted in no detections or below State drinking water standards, which is more restrictive than the levels of concern used for this analysis.

Individual aquatic non-target plants may be inadvertently killed, especially during spot-spray of emergent vegetation treatments with glyphosate or imazapyr; however effects would not be extensive enough to impact a fish population or aquatic ecosystem. The PDC and buffers minimize the potential for herbicides to reach a level of concern should they come in contact with water and reduce the amount of herbicide exposure to the aquatic food web as a whole.

Herbicide use on the National Forest and Scenic Area would be limited to invasive plant treatments according to PDC. Direct and indirect impacts would be limited in extent and duration, and would not contribute to significant cumulative effects. Herbicide application off National Forest would be done according to state law. The Washington State Department of Agriculture monitors herbicide application that occurs near or in streams on private and other lands. Such monitoring has not indicated a concern for cumulative effects at any scale (see Chapter 3.4). More information on the basis for cumulative effects analysis is in Chapter 3.1.

Alternative Comparison

Table 65-Issue Indicator and ESA Findings and Determinations for Fish Species of Local Interest A

Issue Indicator	No Action (A)	Proposed Action (B)	Alternative C
Potential for fish to be exposed to harmful concentrations of herbicide	Very Low	Low	Very low
Findings and Determinations for Listed Species and Critical Habitat			
Species			
Columbia River Bull Trout	NLAA Negligible sediment and disturbance	LAA Uncertainty related to herbicide use under EDRR for emergent vegetation. Sediment and disturbance same as other alternatives	NLAA Negligible sediment and disturbance
Critical Habitat for Columbia River Bull Trout	No Effect	No Effect	No Effect
Coastal Puget Sound Bull Trout	No Effect (Species not found on National Forest System lands)	No Effect	No Effect
Critical Habitat for Coastal Puget Sound Bull Trout	No Effect	No Effect	No Effect
Lower Columbia River Steelhead Trout	NLAA Negligible sediment and disturbance	LAA Uncertainty related to herbicide use under EDRR for emergent vegetation. Sediment and disturbance same as other alternatives	NLAA Negligible sediment and disturbance
Critical Habitat for Lower Columbia River Steelhead Trout	NLAA Negligible sediment and disturbance	NLAA Negligible sediment and disturbance; low potential for individual aquatic plants to die as a result of herbicide .	NLAA Negligible sediment and disturbance
Middle Columbia River Steelhead Trout	NLAA Negligible sediment and disturbance	NLAA Negligible sediment and disturbance; herbicide exposure highly unlikely due to migration only in NSA	NLAA Negligible sediment and disturbance
Critical Habitat for Middle Columbia River Steelhead Trout	NLAA Negligible sediment and disturbance	NLAA Negligible sediment; low potential for impacting aquatic plants along mainstem of Columbia River during migration.	NLAA Negligible sediment and disturbance
Upper Columbia River	NLAA	NLAA	NLAA

Issue Indicator	No Action (A)	Proposed Action (B)	Alternative C
Potential for fish to be exposed to harmful concentrations of herbicide	Very Low	Low	Very low
Findings and Determinations for Listed Species and Critical Habitat			
Species			
Steelhead Trout	Negligible sediment and disturbance	Negligible sediment and disturbance; herbicide exposure highly unlikely due to migration only in NSA	Negligible sediment and disturbance
Critical Habitat for Upper Columbia River Steelhead Trout	No Effect Sediment and disturbance within range of natural variability	No Effect Sediment and disturbance within range of natural variability; no herbicide exposure from GP or NSA treatments during migration	No Effect Sediment and disturbance within range of natural variability; no herbicide exposure from GP or NSA treatments during migration
Lower Columbia River Chinook Salmon	NLAA Negligible sediment and disturbance	LAA Uncertainty related to herbicide use under EDRR for emergent vegetation. Sediment and disturbance same as other alternatives	NLAA Negligible sediment and disturbance
Critical Habitat for Lower Columbia River Chinook Salmon	NLAA Negligible sediment and disturbance	NLAA Negligible sediment and disturbance; low potential for individual aquatic plants to die as a result of herbicide.	NLAA Negligible sediment and disturbance
Snake River Spring/ Summer-run Chinook Salmon	NLAA Negligible sediment and disturbance	NLAA Negligible sediment and disturbance; herbicide exposure highly unlikely due to migration only in NSA	NLAA Negligible sediment and disturbance
Critical Habitat for Snake River Spring/Summer-run Chinook Salmon	No Effect Sediment and disturbance within range of natural variability	No Effect Sediment and disturbance within range of natural variability; no herbicide exposure from GP or NSA treatments during migration	No Effect Sediment and disturbance within range of natural variability
Snake River Fall-run Chinook Salmon	NLAA Negligible sediment and disturbance	NLAA Negligible sediment and disturbance; herbicide exposure highly unlikely due to migration only in NSA	NLAA Negligible sediment and disturbance
Critical Habitat for Snake River Fall-run Chinook Salmon	No Effect Sediment and disturbance within range of natural variability	No Effect Sediment and disturbance within range of natural variability; no herbicide exposure from GP or NSA treatments during migration	No Effect Sediment and disturbance within range of natural variability
Upper Columbia River Spring-run Chinook Salmon	NLAA Negligible sediment and disturbance	NLAA Negligible sediment and disturbance; herbicide exposure highly unlikely due to migration only in NSA	NLAA Negligible sediment and disturbance
Critical Habitat for Upper Columbia River Spring-run Chinook Salmon	No Effect Sediment and disturbance within range of natural variability	No Effect Sediment and disturbance within range of natural variability; no herbicide exposure from GP or NSA treatments during migration	No Effect Sediment and disturbance within range of natural variability
Lower Columbia River Coho Salmon	NLAA Negligible sediment and disturbance	LAA Uncertainty related to herbicide use under EDRR for emergent vegetation. Sediment and disturbance same as other alternatives	NLAA Negligible sediment and disturbance
Columbia River Chum Salmon	NLAA Negligible sediment and disturbance	LAA Uncertainty related to herbicide use under EDRR for emergent vegetation. Sediment and disturbance same as other alternatives	NLAA Negligible sediment and disturbance
Critical Habitat for Columbia River Chum	NLAA Negligible sediment and	NLAA Negligible sediment and disturbance;	NLAA Negligible sediment and

Issue Indicator	No Action (A)	Proposed Action (B)	Alternative C
Potential for fish to be exposed to harmful concentrations of herbicide	Very Low	Low	Very low
Findings and Determinations for Listed Species and Critical Habitat			
Species			
	disturbance	herbicide exposure from GP or NSA treatments highly unlikely in mainstem of Columbia River	disturbance
Snake River Sockeye Salmon	NLAA Negligible sediment and disturbance	NLAA Negligible sediment and disturbance; herbicide exposure from GP or NSA treatments highly unlikely in Columbia River during migration	NLAA Negligible sediment and disturbance
Critical Habitat for Snake River Sockeye Salmon	No Effect Sediment and disturbance within range of natural variability	No Effect Sediment and disturbance within range of natural variability; no herbicide exposure from GP or NSA treatments during migration	No Effect Sediment and disturbance within range of natural variability
Essential Fish Habitat for Coho and Chinook Salmon	No Effect Quality of habitat maintained; quantity will not be reduced	No Effect Quality of habitat maintained; quantity will not be reduced	No Effect Quality of habitat maintained; quantity will not be reduced

NLAA = Not Likely to Adversely Affect

LAA = Likely to Adversely Affect

3.6 Effects of Herbicide Use on Workers and The Public_

3.6.1 Introduction

The effect of herbicides on human health is a primary public issue (Issue Group 1). This section focuses on plausible effects to workers and the public from herbicide exposure. The R6 2005 FEIS evaluated human health risks from herbicide and non-herbicide invasive plant treatment methods. Hazards normally encountered while working in the woods (strains, sprains, falls, etc) are possible during herbicide and non-herbicide invasive plant treatment operations. Such hazards are mitigated through worker compliance with occupational health and safety standards and are not a key issue for this project-level analysis.

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.

The R6 2005 FEIS considered potential hazards to human health from herbicide active ingredients, metabolites, inert ingredients, and adjuvants. As a result, the R6 2005 ROD standards were adopted to minimize herbicide exposures of concern to workers and the public. Site-specific project design criteria (PDC) was 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 R6 2005 FEIS relied on professional risk assessments completed Syracuse Environmental Research Associates, Inc (SERA) using peer-reviewed articles from the open scientific literature and current EPA documents, including Confidential Business Information. The SERA Risk Assessment full citations are listed in Chapter 3.1.5. Appendix Q of the R6 2005 FEIS provides detailed information about the human health hazards associated with the herbicides considered for invasive plant treatments.

3.6.2 Affected Environment

Many people live near, spend time, work in, drink water from, or depend on forest products from the Gifford Pinchot National Forest and Columbia River Gorge National Scenic Area. Several municipal watersheds lie on the Forest (see Chapter 3.4). Public concern for drinking water quality in these watersheds is high.

These people may be inadvertently exposed to chemicals from invasive plant management projects on the National Forest. 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.

Special forest products such as blackberries, huckleberries, salal, bear grass, mushrooms and herbs are gathered for personal use and commercial sale. Some of these products are target species (blackberries, St. John's wort) but most are not. People who harvest special forest product may have more contact with sprayed vegetation than other Forest visitors.

People who gather special forest products tend to be ethnically diverse. A recent unpublished study of commercial permit holders demonstrated that the largest ethnic groups involved with forest product gathering were Hispanics and Southeast Asians (Khmer, Khmer Krom, Laotian and Vietnamese).

Infested sites are scattered and occupy less than one percent of National Forest System lands in the project area. Invasive plant treatments are implemented in partnership with the local counties. Crews most often come from the communities in and around the National Forest boundary. Herbicide applicators are well-trained in safe herbicide handling and transportation practices (Lucero presentation, May 2005).

3.6.3 Environmental Consequences

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 R6 2005 FEIS displayed risks for typical and maximum label rates under a range of conditions. Four potential exposure levels were evaluated for workers, ranging from predicted average exposure (typical application rate-typical exposure variables) to a worst-case predicted exposure (maximum application rate-maximum exposure variables).

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 the action alternatives, used at rates and methods consistent with PDC, have little potential to harm a human being. Appendix Q of the R6 2005 FEIS 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 R6 2005 ROD Standard 16. However, 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. Project design criteria 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 Standard 16), and non-NPE surfactants would always be favored where effective.

Chronic (daily over 90 days) worker exposure was also considered in SERA Risk Assessments; chronic exposures also 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).

Public Herbicide Exposure Analysis

The general public would not be exposed to substantial levels of any herbicides used in the implementation of this project. R6 2005 FEIS Appendix Q 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). However, such contact is implausible because no broadcast spraying with triclopyr would occur under any alternative. The R6 2005 ROD added Standard 16 to the Gifford Pinchot National Forest Plan to only allow spot or hand/selective treatment if triclopyr is used. 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 Fish, Berries or Mushrooms

The public may also be exposed to herbicide if they eat contaminated fish, berries, or mushrooms (etc). Several exposure scenarios for recreational and subsistence fish consumption were considered in the SERA Risk Assessments; none are near any herbicide exposure level of concern. Fish contamination is unlikely given the project design criteria that reduce potential herbicide delivery to water.

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.

The R6 2005 FEIS 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 below a very conservative threshold of concern (Hazard Quotient greater than one).

Appendix Q 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. To respond to this concern, PDC limit the application methods and rate of application for triclopyr (especially Garlon 4). In addition, under worst-case scenarios and maximum label rates, exposure to NPE surfactant may also 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, 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 R6 2005 FEIS. 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 tank truck involved in an herbicide operation could spill into a body of water; however, this risk would be mitigated by the requirement for an Herbicide Transportation and Handling Safety Plan with detailed spill prevention and clean-up measures.

Endocrine Disruption

In 2007, the Environmental Protection Agency released a draft list of 73 pesticides, based on the high potential for human exposure, which will be tested for potential to cause endocrine disruption. Glyphosate is the only herbicide considered for use within the project area included in the EPA testing. Endocrine disruption and glyphosate was studied by SERA in 2002 (SERA 2002) and considered in the R6 2005 FEIS and Appendix Q.

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.

Environmental Justice and Disproportionate Effects

The R6 2005 FEIS found that some minority groups may be disproportionately exposed to herbicides, either because they are disproportionately represented in the pool of likely forest workers, or they are disproportionately represented in the pool of special forest product or subsistence gatherers.

The R6 2005 FEIS suggested that Hispanic forest workers and American Indians may be minority groups that could be disproportionately affected by herbicide use.

Hispanic and non-Hispanic herbicide applicators would be more likely to be exposed to herbicides than other people. Contractors for the Forest and/or County would likely implement herbicide treatments. County invasive plant control departments do not indicate that they employ any specific population group that could be disproportionately affected during invasive plant treatments. Regardless, effects to all County or contract employees engaged in invasive plant control would be negligible due to project design criteria and compliance with occupational health and safety standards.

People of Hispanic and Southeast Asian (Khmer, Khmer Krom, Laotian and Vietnamese) descent are minority groups that tend to gather mushrooms. However, no mushrooms are target species and project design criteria are in place to protect fungi. Whenever herbicide treatment is going to happen, the Forest will notify tribes, plant collectors and the general public with media postings, handouts attached to permits, annual tribal contacts and on-the-ground signing. Information about invasive plant treatments would be added to existing multi-lingual mushroom gathering permit material to eliminate inadvertent exposures if appropriate. Some areas may be closed to gathering following treatment to avoid exposures. Even given plausible inadvertent exposures, the HQ values would not exceed the threshold of concern.

Direct and Indirect Effects of the Alternatives

No Action

The herbicide applications approved in No Action were previously analyzed in the 1998 EA and found to pose no significant potential risks to health for workers or the public.

Action Alternatives

All alternatives similarly resolve issues related to human health. No individual worker or public exposures of concern are predicted for any alternative. Alternative C has the least risk of adverse effects from herbicide use of all action alternatives because it eliminates or severely restricts herbicide on an estimated two-thirds of the project acreage. However, the project design criteria, particularly the perennial stream buffers, limitations on application rate of some herbicides also eliminate plausible exposures of concern in Alternative B. No adverse effects to public drinking water supplies or health and safety are predicted in any alternative. Exposures of concern would be minimized on inventoried and currently unknown sites because the project design criteria would be applied to all situations.

Table 66-How Human Health Concerns are Addressed

Concerns	Project Design Criteria to Minimize Exposures of Concern
Workers	Reduced application rates of some herbicides; limitations on broadcast of triclopyr as per Standard 16.
Public	Reduced application rates of some herbicides; limitations on broadcast of triclopyr as per Standard 16. These limitations reduce risks to the general public, even considering multiple exposures.
Special Forest Products	Reduced application rates of some herbicides; posting areas, supplying info to permittees; Using flagging to mark treated areas; Ensuring some areas are available that will not be treated. Detectable impacts are implausible except in the event of an unpredictable exposure. Even multiple exposures (eating contaminated fish, drinking contaminated water, skin irritation) would not result in exposure levels of concern.
Drinking Water	Detectable impacts are implausible except in the event of a spill. Transportation and Handling Safety Plan and Spill Plan.

Early Detection and Rapid Response

Workers and public exposure herbicide would be managed through herbicide selection, limitations on rate and method of application and other PDC that ensure no detectable human health impacts. This would be true for new or currently undetected infestations, and would be true even if rates of spread were greater than predicted. The herbicide properties were considered in development of PDC.

Cumulative Effects of All Alternatives

The proposed use of herbicides in all alternatives could result in cumulative doses of the same or different herbicides to workers or the general public. Cumulative doses are possible within the context of this project, or when combined with herbicide use on adjacent private lands or home use by a worker or member of the general public.

A person could be exposed to herbicide repeatedly over the course of their lifetime where and whenever herbicides are used. Appendix Q of the R6 2005 FEIS 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 were below one.

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), 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 less than one).

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 in the human body.

Risk assessments indicated a cause for concern about the health effects from exposure to triclopyr; project design criteria avoid broadcast with this herbicide and severely restrict the use of its more toxic formulation (Garlon 4). In addition, risk assessments indicate a concern regarding use of NPE surfactant. NPE surfactant use is also restricted by the project design criteria, which would ensure that no thresholds of concern would be exceeded, even if the most ambitious treatment scenario was implemented. All alternatives comply with standards, policies and laws aimed at protecting worker safety and public health.

3.7 Project Costs and Financial Efficiency

3.7.1 Introduction

The treatments proposed by the Forest Service are likely to be funded through a variety of mechanisms and partnerships including county, state, federal and private sources. The economic efficiency analysis compares the relative total and average costs of implementing each alternative.

The following project cost and financial efficiency analysis covers the most ambitious conceivable program discussed throughout this chapter. Many variables affect the cost of treatment, including: method (for instance: mechanical, manual, herbicide); herbicide method of application (for instance: broadcast vs. selective); the treatment objective (for instance: eradicate vs. contain). The treatments proposed are likely to need repeated entries; the phenology of individual invasive species and the effectiveness of a given treatment influence the number of entries that may be required, which in turn influences cost. None of these factors can be precisely predicted, however, the following assumptions were used in economic modeling to characterize these influences.

- Eradicate acres will be harder to treat and will cost 1.5 times as much as contain/control acres to effectively treat each year.
- More options equates to greater potential effectiveness (see Chapter 3.2). Each year's treatment is expected to reduce populations by 80 percent if herbicides are in the range of available methods, and 50 percent if herbicide use is severely restricted as in No Action (see Chapter 3.2 for further rationale for these percentages). No hard data exists to derive these estimates; rather they are based on the professional judgment of the IDT, and are a fair representation of the treatment effectiveness concepts discussed in the R6 2005 FEIS.
- Alternative B has 34 percent of its herbicide treatment acres modeled for broadcast treatment. This estimate likely includes more broadcasting than would actually occur, because many of the current infestations are small and scattered and broadcast is not necessary in such cases. The assumption of broadcasting on all acres where it would not be restricted due to environmental conditions allows for a consistent analytical basis across resource areas and provides the maximum differentiation between the impacts of herbicide use in the alternatives.
- Non-herbicide treatments that are combined with herbicide treatments are modeled to begin occurring in the second year of treatment. The first year is assumed to be 100% herbicide, even though the final prescriptions may include some manual and mechanical treatment during or before herbicide application. This assumption allows for the maximum differentiation between the impacts of herbicide use in the alternatives.
- Over time, the proportion of herbicide use compared to non-herbicide methods is expected to decrease.

Table 67-Pattern of Herbicide to Non-Herbicide over Time

Year	Percent Herbicide Use	Percent Non-Herbicide Use
2007[26]	100%	0%
2008	75%	25%
2009	50%	50%
2010	0%	100%

3.7.2 Treatment Costs by Method

The following costs were used in the analysis. These costs are based on financial data from the R6 2005 FEIS economic analysis and the Mount Hood/Columbia River Gorge National Scenic Area (Oregon side), refined by invasive plant specialists on the IDT for local conditions:

- Base cost for broadcast is $100 per acre per year. The cost per year is increased for eradicate strategy acres by 1.5 to $150.
- Base cost for Spot/Hand is $250 per acre per year, increased for eradicate strategy acres by 1.5 to $375
- Base cost for Manual/mechanical is $340 per acre per year, increased for eradicate strategy acres by 1.5 to $460
- Nominal cost of goat grazing was not modeled.
- Annual inventory and monitoring was estimated to cost $20,000 per year.
- Active restoration was estimated to cost about $500 per acre, applied to two-thirds of the project acreage, spread out over three years.

3.7.3 Treatment Scenarios

No Action (Alternative A) Most Ambitious Treatment Scenario

Under No Action, about 2,500 acres could be treated under existing NEPA decisions (2,200 on the Gifford Pinchot National Forest, 300 on the Washington side of the Columbia River Gorge National Scenic Area). Of the 2,200 acres on the National Forest, about 100 have herbicide use approved. All 300 Scenic Area acres are currently approved for use of three herbicides, along with non-herbicide methods.

Under Alternative A, about 2,100 acres would be treated in year one using hand methods. About 330 acres would be treated using selective herbicide treatments and 70 acres using broadcast, based on the most ambitious scenario available given current NEPA decisions.

These treatments are assumed to reduce infestation size by 50 percent (see Chapter 3.2.3). This estimate is intended to reflect the concepts that some infestations cannot be effectively treated without herbicide and manual treatment tends to be less cost effective and require more labor than when herbicide is available in combination with non-herbicide treatments. Need for re-treatment is likely to be greater if herbicides are not available as part of the integrated prescription. It also reflects the reduced range of herbicide options available on the Columbia River Gorge, specifically 3 versus 10 chemicals available.

[26] This analysis assumed implementation would begin in 2007. Due to delays associated with consultation under the Endangered Species Act, implementation is now scheduled to begin in 2008. All dates associated with the life of the project would be advanced by one year.

About 210 acres estimated to need treatment would not be treated under No Action. Otherwise, nearly all the existing infestations could be reduced via treatments already approved, albeit at a great expense.

Table 68-Basis for Cost-Effectiveness Analysis – Alternative A

Acres	Year 1	Year 2	Year 3	Year 4
Total Treated	**2,500**	**1,313**	**657**	**345**
Total Herbicide	400	210	110	58
Broadcast	70	38	20	0
Spot/Hand	330	172	90	58
Non-Herbicide Treatments	2,100	1103	547	287
Percentage of treatments that are non-herbicide	84%	84%	84%	84%
Acres Restored Passive or Active (mulch, seed, plant)	NA	NA	NA	NA

Alternative B Most Ambitious Treatment Scenario

Under Alternatives B, all 2,710 estimated infested acres are assumed be treated in year one, which would be assumed to reduce infestation size by 80 percent (see Botany and Effectiveness section later in this Chapter). Each year, a portion of each treated area would need to be retreated until Year 5, when desired conditions for all known infestations would be assumed to be achieved. For the purposes of analysis, under Alternatives B, the current infestations would be controlled within 5 years, assuming the most ambitious treatment scenario. In reality, some infestations may still need to be treated after five years if there is a persistent seed bank.

As invasive plant populations get smaller, non-herbicide methods would become more cost-effective. Thus, the proportion of non-herbicide compared to herbicide methods would increase over time.

Table 69-Basis for Cost-Effectiveness Analysis – Alternative B

Acres	Year 1	Year 2	Year 3	Year 4
Total Acres Treated	**2,710**	**569**	**119**	**24**
Acres Treated with Herbicide	2,710	427	60	0
Broadcast	950	149	20	0
Spot/Hand	1,760	278	40	0
Acres Treated With Non-Herbicide	0	142	59	24
Percentage of treatments that are non-herbicide	0%	25%	50%	100%
Acres Restored Passive or Active (mulch, seed, plant)	0	903	903	903

Alternative C Most Ambitious Treatment Scenario

Under Alternative C, non-herbicide methods only would be approved within 65 percent of the analysis area (riparian reserves and roads associated with high risk of delivering herbicide to streams).[27] The remaining 35 percent (approximately 940 acres of the current inventory) would be treated similarly to Alternative B. As in Alternative B, all 940 was modeled for herbicide treatment in year one and non-herbicide treatments in increasing proportion thereafter, and target populations would be reduced by 80 percent each year of treatment. Effectiveness of these treatments would be similar to Alternative B.

The other 65 percent of the acreage (estimated infestations in riparian reserves and along roads that have high potential to deliver herbicide to streams) would not be treated with herbicide; manual and mechanical treatments would occur instead. Effectiveness of these treatments would be reduced to about 50 percent per year, similar to No Action.

[27] Small acreage of stem injection with aquatic glyphosate would likely continue where already approved under No Action.

Table 70-Basis for Cost Effectiveness Analysis - Alternative C

Acres	Year 1	Year 2	Year 3	Year 4
Total Acres Treated	**2,710**	**1,134**	**476**	**200**
Acres Treated with Herbicide (All Spot/Hand – no Broadcast)	940	200	21	0
Acres Treated With Non-Herbicide	1,770	934	455	200
Percentage of treatments that are non-herbicide	65%	93%	96%	100%
Acres Restored Passive or Active (mulch, seed, plant)	0	812	812	812

3.7.4 Relationship of Analysis Scenarios to Early Detection-Rapid Response

All action alternatives include the ability for Forest Service land managers to approve treatments on currently unknown invasive plant sites assuming project design criteria would be followed. The premise of early detection-rapid response analysis approach is that treatments of new infestations according to methods and design criteria defined in this project-level EIS will have similar effects to treatments of existing sites.

Assuming the most ambitious conceivable treatment scenario under the Proposed Action, early detection/rapid response would be expected to be a very small part of the program, because so much of the current inventory would be treated in year one.

If the most ambitious treatment scenarios were not implemented, over time, early detection-rapid response would tend to become a larger part of the program. The acreage treated in any one year would not likely exceed the most ambitious treatment scenario analyzed because the most ambitious scenario would require about twice the current budget.

3.7.5 Cost Effectiveness

Table 71 displays the results financial efficiency analysis for the three alternatives, using the scenarios and assumptions previously discussed.[28] Given an unlimited budget, and most ambitious conceivable treatment scenario, Alternative A (No Action) would cost nearly $1.8 million total from 2007 to 2011 (an average of $499,000 per year, at an average of $780 per acre total). This would include herbicide treatment in combination with non-herbicide treatments on approximately 400 acres, and non-herbicide treatment only on 2,100 acres. Even with an unlimited budget, of the existing 2,710 acres of invasives estimated, about 15 percent (400 acres) would still require treatment. Given a constant, realistic budget of $250,000 per year, approximately 1,160 acres may be controlled under No Action. This does not include active restoration, which would tend to increase average cost per acre by at least $300.

Alternative B would cost about 3 percent less than No Action ($1.76 million) and restore far more acreage, due to efficiency gained by more the option of herbicides becoming more widespread and the emphasis on restoration. The cost includes active restoration ($500 per acre averaged across 65 percent of the acreage). Given an unlimited budget, the most ambitious conceivable treatment scenario is modeled to contain, control or eradicate nearly all existing invasive plant infestations by 2011 at an average cost of $656 per acre. Given a constant, realistic budget of $250,000 per year, approximately 1,160 acres may be controlled under the Proposed Action (Alternative B).

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[28] This analysis assumed implementation would begin in 2007. Due to delays associated with consultation under the Endangered Species Act, implementation is now scheduled to begin in 2008. All dates associated with the life of the project would be advanced by one year.

Alternative C would restore fewer acres than Alternative B, at more than 1.5 times the cost. Given a constant, realistic budget of $250,000 per year, fewer acres (772 as compared to 1,365) would likely be restored. This is due to the loss of effectiveness and greater expense imposed by restrictions on herbicide use.

While the cost of Alternative C appears to be higher than No Action, it includes active restoration on two-thirds of the acreage. Thus, Alternative C is likely more cost effective than No Action and would effectively restore more acreage at a similar cost.

Table 71-Cost Effectiveness Analysis – Alternative Comparison

Alternatives	A	B	C
Average Cost per year (Unlimited Budget)	$499,000	$486,000	$788,000
Total Cost 2007-2011 (Unlimited Budget)	$1,810,000	$1,763,000	$2,859,000
Acres Restored by 2011 (Unlimited Budget)	2,320	2,686	2,436
Average Cost Per Acre	$780[29]	$656	$1,117
Acres of Invasives 2011 (Unlimited Budget)	407	6	84
Acres Controlled By 2011 (Realistic Budget – $250,000 per year)	1,160	1,365	772

[29] Does not include restoration cost (approximately $300 per acre) that has been included in economic models for Alternatives B and C.

3.8 Additional Environmental Effects

Additional environmental effects include required analysis for heritage (cultural resources); environmental justice and civil rights; tribal consultation and treaty rights, scenic and recreation resources; congressionally designated areas such as Wilderness and Wild and Scenic Rivers;

3.8.1 Heritage (Cultural) Resources

Introduction

The USDA, Forest Service, Advisory Council on Historic Preservation and the Washington State Historic Preservation Office (Office of Archaeology and Historic Preservation), have a programmatic agreement addressing the management of cultural resources on National Forests in the state of Washington (Agreement Number 97-06-59-10). There are several actions that were determined to have little or no potential to affect historic properties (Appendix A). Examples of these actions include fence construction, planting on disturbed areas, aerial seeding, pre-commercial thinning, encroachment thinning using hand methods to lop branches and cut small trees, and reforestation planting by hand.

While invasive weed eradication is not specifically itemized in the Programmatic Agreement between the Forest Service and the Washington SHPO, the techniques, methods and effects appear similar. Consultation with the Washington SHPO and affected Tribes in a letter dated February 10, 2006 proposed to classify the following actions with those that have little or no potential to affect cultural resources:

- Herbicide Application Methods (selective/hand, spot and broadcast spray)
- Cultural Methods limited to goat grazing in this proposal
- Manual/Mechanical Methods (mowing, weed whipping, and hand pulling)
- Manual/Mechanical Methods (grubbing and wrenching) in areas that occur on landslides, flood deposits, previously surveyed areas where no archaeological sites have been found, skid trails, landings and road cuts and fills

Affected Environment

Effects to cultural resources were assessed for each treatment method; manual, mechanical, cultural and herbicide. The Gifford Pinchot National Forest and the Columbia River Gorge National Scenic Area (NSA) rest between the Northwest Coast and the Columbia Plateau Culture Areas and has been used by Indian people for thousands of years and archaeological resources are found throughout both areas. Site specific information is not presented in this document.

The environments affected by the Proposed Action are most commonly restricted to areas disturbed by road construction and use (shoulders, cuts and fills). Archaeological sites are sometimes bisected by roads and could be within the areas of potential affect. Other geographic areas proposed for treatment include quarries, administrative sites, campgrounds, parking areas, artificial clearings, meadows, forested areas, etc. Archaeological resources could possibly occur in all of these locations although they may not be affected by the Proposed Action, depending on the ground-disturbing potential of the action.

Environmental Consequences

Direct and Indirect Effects Alternative A (No Action)

This alternative continues 400 acres of herbicide treatment approved under previous NEPA documentation (300 acres on the Scenic Area and 100 acres on the Gifford Pinchot National Forest), and manual treatment along 2,000 additional roadside acres on the Forest. This alternative would have no discernable new effect on archaeological sites that has not already been considered in previous NEPA documents.

Direct, Indirect and Cumulative Effects of Action Alternatives

Most of the treatment methods proposed are not ground disturbing and therefore would have no direct or indirect effect on cultural or heritage resources. The exception may be weed wrenching and grubbing, manual techniques that have minor potential to disturb heritage resources. Project design criteria (PDC) would minimize or eliminate potential impacts from weed wrenching and grubbing. PDC M2 applies to minor ground disturbing actions such as weed wrenching and grubbing with a shovel in areas that are outside landslides, flood deposits, previously surveyed areas, skid trails, landings, road shoulders, cuts and fills, etc. Weed wrenching and grubbing areas will be assessed annually and the Forest Archaeologist will have an opportunity to review project locations to determine if any cultural resources could be affected. Weed wrenching and grubbing techniques will not be used in known archaeological sites. Alternative treatment methods will be selected from those that would have low potential to affect cultural resources. With application of the PDC, no important direct or indirect adverse effects to cultural resources are predicted, and no contribution to cumulative adverse effects would occur.

Early Detection Rapid Response

PDC would adequately protect cultural resources where new detections are identified for similar treatments.

3.8.2 Tribal Consultation and Treaty Rights

Introduction

The Forest Service communicated by letter with eight affected tribes; the Nez Perce Tribe, the Yakama Nation, the Confederated Tribes of the Warm Springs, the Confederated Tribes of the Umatilla Indian Reservation, the Nisqually Indian Tribe, the Puyallup Tribe, the Squaxin Island Tribe and the Cowlitz Indian Tribe. The Forest Service outlined the project details and potential effects to cultural resources. No comments were received by any of these Tribes. In addition, face to face meetings were held to discuss the project and ensure that tribal concerns were addressed.

The Nez Perce, Umatilla, Warm Springs, and Yakima Indian tribes signed treaties with Congress in 1855. The Nisqually, Puyallip, and Squaxin Island Tribes signed the Treaty of Medicine Creek on December 26, 1854. These treaties ceded to the United States legal title to millions of acres of land, and reserved and guaranteed certain rights exercised by Indian people to fishing, hunting, gathering roots and berries, and other activities. The Cowlitz Tribe declined to sign treaties.

Executive Order 12898 directs federal agencies to consider patterns of subsistence hunting and fishing if an action will affect fish and wildlife. No adverse effects to treaty fishing sites, traditional cultural plant gathering areas, traditional plants, or subsistence lifestyles would occur.

Affected Environment

An important Yakama Nation traditional fishing site on the Klickitat River known as Fisher Hill is located in the proximity of Treatment Area 22-16 (Klickitat Trail). Fisher Hill is the site of the annual First Foods Ceremony in May, and has been determined to meet the National Register of Historic Places criteria of eligibility as a Traditional Cultural Property. A modern Yakama cemetery is also nearby. The treatment area is confined to an existing right-of-way for the Klickitat Trail. Treatment is not proposed at the fishing site or the cemetery. This right-of way is typically over 100 ft from the Klickitat River, and is visually buffered from both the fishing platforms and the cemetery.

Several other treatment sites are adjacent to the Columbia River and its fish bearing tributaries. Treatment areas 22-03 (St. Cloud and Sams-Walker) and 22-13 (Miller Island) are adjacent to the Columbia River. Treatment area 22-10 (Balfour) and 22-16 (Klickitat Trail) are adjacent to the Klickitat River. Treatment area 22-15 (BZ) is adjacent to the White Salmon River. None of these sites are known to be traditional tribal fishing sites.

Traditional cultural plants such as bitterroot, camas and huckleberry are found in the project area. Culturally important plants are collected and used as food, medicine, or ceremonies. An incomplete list of these plants is shown in table 72.

Treatments are proposed in the Sawtooth Berryfields. A designated area within the Sawtooth Berry Fields (east of Road 24) was reserved in 1932 by a handshake agreement between Yakama Indian Chief William Yallup and Gifford Pinchot Forest Supervisor K. P. Cecil for the members of the Yakama Nation to gather huckleberries.

Table 72-Culturally Significant Plants Suspected to be in 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 virginiana*
Blue Huckleberry	*Vaccinium species*
Black Lichen	*Alectoria species*
Bear Grass	*Xerophyllum tenax*

Environmental Consequences

Effects of Alternative A (No Action)

This alternative continues 400 acres of treatment approved under previous NEPA documentation (300-acres on the Scenic Area and 100-acres on the Gifford Pinchot National Forest). This alternative would have no new effect on treaty rights that result from treatment actions that have not already been approved, and therefore, would not contribute to cumulative effects. Invasive plants would likely continue to compete with traditional cultural plants, and continued spread of invasive plants could reduce the extent and abundance of traditional cultural plants.

Effects of Action Alternatives

No adverse effects are expected from invasive plant treatment in either action alternative to fish and wildlife populations on which the Indian tribes rely. For more discussion, see Section 3.3, Terrestrial Wildlife and Section 3.5, Aquatic Organisms.

The activity (machinery, personnel) involved with invasive plant treatment near the Fisher Hill fishery (Treatment Area 22-16) could potentially conflict with tribal use in the vicinity at certain times of year. PDC M3 requires coordination with the Yakama Nation of the timing of treatment at the Fisher Hill fishery to avoid potential conflicts with tribal use of the fishery and surrounding area.

Invasive plant treatment at the other proposed treatment sites adjacent to the Columbia or Klickitat Rivers would not affect access to, use of, or fishing in these rivers.

The mechanical and manual treatment methods are not likely to affect traditional cultural plants. Manual methods such as weed pulling allow a great deal of plant specificity and reduce the likelihood to impact non-target plants. Proposed herbicides have the potential to effect broadleaf varieties and grasses, including cultural plants. Project design criteria listed in Chapter 2 would adequately protect non-target vegetation, including fungi, vascular and non-vascular plants (see Section 3.2.4 – Environmental Consequences of Invasive Plant Treatments on Non-Target Plants).

PDC M1 requires annual consultation with American Indian tribes as treatments are scheduled so that tribal members may provide input and/or be notified prior to gathering cultural plants. Individual cultural plants identified by tribes would be buffered as described for botanical species of local interest (project design criteria I-1 through I-5).

The risk associated with direct herbicide contact and with ingesting contaminated fish, berries, mushroom, etc, is discussed in Section 3.6. – Effects of Herbicide Use on Workers and the Public. PDC L1 would limit triclopyr and NPE use in areas of wild food collection. Exposure is unlikely to exceed a level of concern.

Given the types of treatments considered and the PDC, no direct, indirect or cumulative adverse effects on tribal and treaty rights would occur.

3.8.3 Environmental Justice and Civil Rights

Executive Order 12898 directs federal agencies to identify and address the problem of adverse environmental effects by agency programs on minority and low income populations. Low income and minority groups would see no change to their use of the Forest under any alternative. There currently are no disparate effects on low income or minority people by forest management activities, and no evidence exists that this project would result in disparate effects. The R6 2005 FEIS noted that Hispanic people, subsistence gatherers (American Indians), and special forest product gatherers (sometimes people of Asian descent) may be disproportionately affected by herbicide exposure. The PDC associated with this project would minimize potential exposure to all people, including workers. Outreach during scoping did not indicate that any one race or group of people would receive disproportionate exposure.

Contractors for the Forest and/or County would likely implement herbicide treatments. County invasive plant control departments do not indicate that they employ any specific population group that could be disproportionately affected during invasive plant treatments. Regardless, effects to all county or contract employees engaged in invasive plant control would be negligible given the counties are licensed herbicide applicators that follow label precautions. See Section 3.6 for further information on herbicides and worker safety.

3.8.4 Scenery

Introduction

This analysis assesses the alternatives in terms of achieving Forest and Scenic Area visual quality objectives.

Affected Environment

Treatment areas on the Gifford Pinchot National Forest are included in areas with visual quality objectives (VQO) of Modification, Partial Retention, Retention and Preservation. Most of the treatments within the Gifford Pinchot National Forest are along roadsides (about 2,035 acres of the 2,350 treatment acres proposed for treatment in Alternative B), and many of the roadsides have a VQO of Modification.

Areas with a Partial Retention VQO include, among others, the middle ground along Roads 90, 25, and US Hwy 12, and some treatment sites along the Wind River.

Areas with a Retention VQO include, among others, the Mt St. Helens National Volcanic Monument, Roads 90, 25, and US Hwy 12, and other treatment sites along the Wind River.

The Gifford Pinchot applies the Preservation VQO to Wilderness Areas and Research Natural Areas. The preservation VQO applies to eighteen treatment sites located in Wilderness areas and Road 90 in the Cedar Flats NRA.

In areas with a VQO of Retention in the foreground or middleground, or a VQO of Partial Retention in the foreground, a Forest wide Standard and Guideline requires that:

> "Ground disturbance by any activity should be rehabilitated within one year to natural appearance"

Late Successional Reserves, Managed Late Successional Reserves and Matrix allocations have Visual Emphasis areas defined by Management Category V.

The goal of the Visual Emphasis areas is to "provide a visually natural or near-natural landscape as viewed from the designated travel route or use area."

Management Category V includes VL and VM. The VQO in Management Category VL is Retention. Treatment areas within Management Category VL include U.S. Highway 12, Road 25, and portions Road 90 among other areas. The VQO in Management Category VM is Partial Retention. Treatment areas within Management Category VM include Road 23 and portions Road 90 among other areas.

Most of the treatment areas on the Gifford Pinchot National Forest are along roadsides and in recreation sites. Therefore, the existing scenic condition for most of the National Forest treatment areas is of a developed setting in the immediate foreground. The exception is in the wilderness areas and in meadows, which appear undeveloped.

A primary purpose of the Columbia River Gorge National Scenic Area is to protect the scenic resources of the Columbia River Gorge area. The Scenic Area Management Plan identifies Key Viewing Areas, Landscape Settings and scenic standards (visual quality objectives) to protect these resources.

The Scenic Area Management Plan established 26 "key viewing areas" (KVAs) from which the scenic impacts of land management actions are evaluated. KVAs are portions important public roads, parks or other vantage points from which the public views Scenic Area landscapes.

Table 73-Scenic Area Key Viewing Areas

Oregon	Washington
▪ Sandy River	▪ Columbia River
▪ Highway I-84, including rest stops	▪ Washington State Route 14
▪ Historic Columbia River Highway	▪ Cape Horn
▪ Larch Mountain Road (SMA only)	▪ Beacon Rock
▪ Larch Mountain	▪ Dog Mountain Trail
▪ Sherrard Point on Larch Mountain (SMA only)	▪ Pacific Crest Trail
▪ Portland Women's Forum State Park	▪ Cook-Underwood Road
▪ Crown Point	▪ Washington State Route 141
▪ Rooster Rock State Park	▪ Washington State Route 142
▪ Bridal Veil State Park	▪ Old SR 14 (County Road 1230)
▪ Multnomah Falls	
▪ Bonneville Dam Visitor Centers	
▪ Wyeth Bench Road (SMA only)	
▪ Oregon Highway 35	
▪ Panorama Point Park	
▪ Rowena Plateau and Nature Conservancy Viewpoint	

Treatment areas in the Scenic Area are topographically visible from most of these KVAs, with exceptions such as Oregon Highway 35, Panorama Point Park and Cook-Underwood Road. The EDRR process may allow treatment in areas seen from all KVAs.

The landscape is mapped into "Landscape Settings", which were derived from the combination of land use, landform, and vegetation pattern that distinguish an area in appearance and character from other portions of the Scenic Area.

Table 74-Scenic Area Landscape Settings

Special and General Management Areas	General Management Area Only
▪ Pastoral *	▪ Grassland *
▪ Coniferous Woodland *	▪ Village
▪ Oak-Pine Woodland *	▪ Residential
▪ Residential	▪ Rural Residential
▪ Gorge Walls, Canyonlands and Wildlands	▪ Rural Residential in Pastoral/Coniferous Woodland/Oak-Pine Woodland
▪ River Bottomlands *	

Treatment areas in the Scenic Area are located in the Landscape Settings marked in table 74 with an asterisk. The EDRR process may allow treatment in areas within all of the Landscape Settings.

Two scenic standards apply in the Scenic Area, "not visually evident" (equivalent to retention) and "visually subordinate" (equivalent to partial retention). The treatment areas are largely undeveloped, except for trails, parking areas and restrooms in the recreation sites.

Invasive plants have the potential to reduce scenic quality and integrity. 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. Native grass species may not be maintained and conditions necessary for continued regeneration of oak species may be altered (Carey, 2002). In the long run, plant species diversity could be reduced. The continued spread of invasive species would increase the risk of large scale wildfires of great intensity, reducing scenic stability. Japanese knotweed may overtake riparian vegetation and river banks altering the scenic pattern, form and texture of open areas and the forest understory.

Environmental Consequences

Scenic quality and integrity increases with invasive plant control. To some extent, all alternatives, including No Action, would help restore scenic quality and integrity. However, all invasive plant treatment may have minor, short term scenic impacts resulting from visible dead vegetation and/or the change in vegetation color. Larger scale treatment methods such as broadcast spraying or mowing have greater potential to create the larger areas of browned vegetation. Little such treatment is anticipated.

Due to the short term nature of scenic impacts, all alternatives would meet all of the existing visual quality objectives. All alternatives would be beneficial to the scenic character of the landscape by reducing risks of altered plant species composition and related effects. The scenic integrity and scenic stability would be maintained.

Based on monitoring experience on forests that utilize selective herbicide applications, the casual observer driving forest roads typically would not be offended by scattered limp or brown plants while driving through a forest. Therefore, the following standard could be eliminated from the Gifford Pinchot National Forest Plan.

> "Vegetation adjacent to the designated travel route or recreation site should be controlled in a visually inconspicuous manner, primarily by hand or machine methods. Any use of chemicals should be timed to avoid vegetative brownout (i.e., a dormant spray used in the fall)".

This EIS proposes a Forest Plan amendment that would eliminate this guideline because 1) it is very unlikely that the forest would ever broadcast spray to the extent that nearly every roadside plant was killed and; 2) even if a roadside were heavily treated and dead plants were evident, the need to eliminate the invasive plants far outweighs the temporary visual impact of brown plants.

Acreage of broadcast herbicide use is a measure of relative risk of brown vegetation. The more roadside broadcasting, the more likely brown target plants would be evident.

Broadcast spray would only occur where there is dense invasive plant cover, or where the dominant plant community is non-native. Smaller, less dense patchy infestations would be spot sprayed. The three herbicides used to treat knapweeds and Canada thistle found on roads (clopyralid, picloram and chlorsulfuron) target broadleaf plants and would have little effect on most perennial grasses and conifers.

As depicted in table 75 below, nine roadside treatment areas propose to treat over 100 acres; all contain knapweeds and/or thistles and are proposed for broadcast spray. Treatment area #31-01a is the only treatment area of the nine areas to be mowed. All of these treatment areas except #31-01a includes some acreage with a Visual Emphasis Area VL or VM allocation.

Table 75-Highest Acreage Roadside Treatment Areas; Alternative B

Roadside Treatment Area	Treatment Acres	VL or VM Allocation
31-01a	114	None
33-04	261	VM/VL
33-05	478	VM
33-05a	119	VM
33-11	156	VM
33-12a	203	VL
35-14	213	VL
35-14a	137	VL
35-16a	195	VL

Broadcast applications have the greatest potential to leave dead patches of vegetation. However, even herbicides may selectively leave non-target plants alive, particularly grasses and conifers. The scenic impact of dead plants is scattered and temporary.

Patches of dead vegetation for a 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. Many treatment areas stretch for miles along the sides of roads. Such treatments would be more noticeable; however the effect would be short-term through the end of that growing season

Native vegetation would be planted to restore the treated areas. Direct beneficial effects would include the limitation of non-native 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 of mosaic of forested canopy and grassland openings. The control or eradication of invasive species would help sustain the landscape character with some short term effects to scenic integrity.

The Proposed Action is consistent with the landscape settings guidelines and scenic standards of the Columbia River Gorge National Scenic Area (consistency determination is in Appendix D).

No significant adverse direct, indirect and cumulative effects to scenic integrity would occur in any alternative. All actions contemplated in all alternatives would contribute to restoration of native plant communities and improve scenic quality.

3.8.5 Recreation

Introduction

Invasive plants are often found where people like to congregate on National Forests, in fact, people are one of the main vectors of invasive plant seeds – spreading seed with automobiles, Off Highway Vehicles (OHV), clothing or even planted intentionally as garden plants. On the Gifford Pinchot National Forest and Columbia River Gorge Scenic Area, invasive plants may be found at recreation sites, visitor centers, trailheads and along roadsides. The analysis assesses the impacts of 1) treatment methods on the recreation experience, and 2) the impacts of invasive species on the recreation experience.

Affected Environment

Over 500 individual recreation sites are included in the Gifford Pinchot National Forest treatment inventory (table 76). Seven public recreation sites are in the Columbia River Gorge National Scenic area treatment inventory (table 77).

Table 76-Recreation Sites in Treatment Inventory; Gifford Pinchot National Forest

Type of Recreation Site	Number of Recreation Sites in Treatment Inventory
Campgrounds and Horse Camps	48
Sno-Parks	9
Picnic Areas and Day Use Sites	8
Parking Areas and Trailheads	73
Interpretive Sites/Trails	14
Viewpoints (primarily at Mt St Helens)	10
Administrative Sites	4
Dispersed campsites	Over 350

Table 77-Recreation Sites in Treatment Inventory; Columbia River Gorge NSA

Columbia River Gorge NSA Recreation Sites
St Cloud Day Use Site (22-03)
Sams Walker Day Use Site (22-03)
Catherine Creek Trail (22-09)
Coyote Wall/Burdoin Trails (22-09)
Balfour Day Use Site (22-10)
BZ River Launch Site (22-15)
Klickitat Trail (22-16)

Most treatments are along roadsides. For instance, of the 2,350 acres of identified treatment on the Gifford Pinchot National Forest, about 2,100 acres are along roadsides (including the parking areas and viewpoints identified in Table 76). Additional areas could be treated with any of the approved methods, subject to the Implementation Planning Process described in Chapter 2.

Environmental Consequences

About 6 percent (166 acres) of the infested land base is in public areas where there are high concentrations of visitors. In all alternatives (including No Action) recreation visitors may be temporarily affected at the time of treatment. Portions of recreation sites may be closed to public use during treatment.

Some forest visitors may object to using areas where chemicals have been used. Some forest visitors may feel they must go elsewhere to avoid chemicals in their favorite spots. These effects are temporary.

For action alternatives, PDC K1 and K2 require public notification in local newspapers before treatment in high use recreation areas; this measure affords the public the opportunity to avoid places where herbicides are used.

If forest visitors use recreation sites just before, during or right after treatment, the risk of an adverse impact to visitors from treated plants is very low (see Section 3.6. – Effects of Herbicide Use on Workers and the Public).

Cumulative effects for some types of recreation users, such as campers, are minimal. Campers use one campground for at least one night. These users would not be affected by treatments occurring in the same time period at other campgrounds.

For other users, cumulative effects are more strongly related to how many areas are treated at any given time. For instance, if multiple sites are treated at the same time along access roads into the Mt. St. Helens National Monument, the recreation user could be inconvenienced at a number of viewpoints and interpretive sites on a single trip. Again, public notification of treatment at high use sites gives the forest visitor the opportunity to avoid treatment areas at specific times.

The direct and indirect effects on recreation users are minor and temporary and there are no long term cumulative effects to recreation users.

3.8.6 Congressionally Designated Areas

Introduction

Wilderness, Wild and Scenic Rivers, Mt St Helens National Volcanic Monument, and National Scenic Area are all examples of Congressionally designated areas. Such areas on the Gifford Pinchot National Forest include the Mount St Helens Volcanic Monument; the Upper White Salmon Wild and Scenic

River, and the William O. Douglas, Goat Rocks, Trapper Creek, Indian Heaven and Mt. Adams Wilderness Areas.

The entire Columbia River Gorge National Scenic Area is a Congressionally designated area. In addition, 10.8 miles of the lower Klickitat River, and 7.7 miles of the Lower White Salmon River are designated as Wild and Scenic Rivers.

The analysis assesses impacts of treatment on the resource values to be protected by the Congressional designation. Effects on the Columbia River Gorge National Scenic Area, which itself is a congressionally designated area, are discussed throughout this document and are not repeated here.

Affected Environment

Wilderness Areas

The Wilderness Act (1964) 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 Regional Forester is responsible for vegetation manipulation in wilderness. In the ROD for the R6 2005 Invasive Plant FEIS, the Regional Forester approved pesticide use for consideration in designated wilderness (FSM 2323.04c), wilderness study areas, and designated or candidate research areas.
In Region 6, NEPA decisions for wilderness herbicide use that are tiered to the R6 2005 FEIS may be signed by Forest Supervisors.

The wilderness areas are generally weed-free at this time. Small areas of treatments are proposed within the William O. Douglas, Goat Rocks, Indian Heaven and Trapper Creek Wilderness areas, and on the very edges of Glacier View, Tatoosh, and Mt Adams Wilderness.

Eighteen treatment sites are in Wilderness (see table 74 below). Most of the wilderness treatment acreage consists of eight meadows in the William O. Douglas and Goat Rocks Wildernesses. A few dispersed campsites and a previously disturbed quarry are proposed for treatment in the Indian Heaven and Trapper Creek Wilderness Areas. In total, 60 acres of target species are estimated to need treatment in or near these areas.

Unknown, undetected, and unpredictable infestations are also possible within the wilderness areas on the Gifford Pinchot National Forest. Treating these acres would have short term adverse effects by introducing human manipulation, but would result in long term beneficial effects to wilderness values by restoring natural conditions and the enduring resource of wilderness. The need for treatment is not driven by convenience or cost of administration.

Invasive plants have adverse effects wilderness values since they disrupt natural processes. Invasive plants may alter natural plant communities, interact in unknown ways with native wildlife species, and alter ecological processes such as plant community dynamics and disturbance processes such as fire.

Table 78-Wilderness Areas with Proposed Treatments

Wilderness Area	Treatment Area	Type Of Treatment Site
William O Douglas	35-14m	3 Meadows
Goat Rocks	35-14m	5 Meadows
Indian Heaven	33-12r2	7 Dispersed Campsites
Trapper Creek	33-03r2	2 Dispersed Campsites
Trapper Creek	33-03q	1 Quarry

Wild and Scenic Rivers

The intent of the Wild and Scenic Rivers Act (1968) is to maintain the free-flowing character of the designated river and to protect its “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. Typically, a Wild and Scenic River corridor is determined for one-quarter mile each side of a designated river.

Three Wild and Scenic River segments are included in the project area. The upper 20 miles of the upper White Salmon River and Cascade Creek were added to the Wild and Scenic River system in 2005, and are managed by the Gifford Pinchot National Forest. The Lower Klickitat and the Lower White Salmon Wild and Scenic Rivers are managed by the Columbia River Gorge National Scenic Area.

Table 79 displays the Wild and Scenic River segments, outstandingly remarkable values and where treatment is proposed within ¼ mile of the designated rivers. Additional treatment in Wild and Scenic River corridors may occur subject to the Implementation Planning Process described in Chapter 2.

Table 79-Proposed Treatments near Wild and Scenic Rivers

River	WSR Classification	Outstandingly Remarkable Resource Values	Treatment within ¼ mile
Upper White Salmon River			
1.6 miles headwaters to Mt Adams Wilderness Boundary.	Wild	▪ Scenery ▪ Hydrology ▪ Listed/Monitored Animal Species/Habitat	None
11.8 miles from Mt Adams Wilderness Boundary to National Forest Boundary.	Scenic	▪ Scenery ▪ Hydrology ▪ Listed/Monitored Animal Species/Habitat	Roadside Treatment
Cascade Creek: 5.1 miles headwaters to Mt Adams Wilderness Boundary.	Wild	▪ Scenery ▪ Hydrology ▪ Listed/Monitored Animal Species/Habitat	None
Cascade Creek: 1.5 miles Mt Adams Wilderness Boundary to White Salmon River confluence.	Scenic	▪ Scenery ▪ Hydrology ▪ Listed/Monitored Animal Species/Habitat	Roadside Treatment
Lower White Salmon River			
7.7 miles from Northwestern Lake to BZ Corners.	Scenic	▪ White water boating ▪ White Salmon River Gorge ▪ Hydrology ▪ Native American Indian Longhouse Site and Cemetery ▪ Resident Fish	BZ Launch Site (#22-15)
Lower Klickitat River			
10.8 miles from Columbia River to Wheeler Canyon.	Recreation	▪ Native American Dip-Net Fishery ▪ Geology ▪ Hydrology ▪ Anadromous and Resident Fish	Klickitat Trail (22-16).Balfour (22-10)

Mt. St Helens National Volcanic Monument

In 1980, Mt. St. Helens erupted. The 110,000-acre Mt. St. Helens National Volcanic Monument was created in 1982 for research, recreation, and education. Inside the Monument, the environment is left to respond naturally to the disturbance.

Treatment areas 31-01a through 31-19r2 are proposed in the Monument (see Appendix A). The full suite of treatment methods are proposed along roadsides, at recreation sites, and at quarries.

Environmental Consequences

Wilderness Areas

No wilderness area treatment is included in the current 2,500 acres of treatment planned to continue under Alternative A. Continued spread of the existing invasive plants within and adjacent to Wilderness would be expected. Changes to native plant populations and native ecosystems may result. No Action avoids manipulation of the wilderness, but does not protect natural conditions.

Actions outside the wilderness, such as prevention of future infestations by controlling feed brought into the area would occur, and may influence the rate of spread or conditions that contribute to spread of invasive plants. However, without treatment, the Canada thistle currently inventoried would likely remain a key source for additional infestation.

Action to prevent invasive plants from becoming established, to contain infestations, or to eradicate invasive plants are recognized as active human manipulations of wilderness. However, it is not possible to both preserve natural conditions and to also maintain freedom from human manipulation.

Under both action alternatives, treatment would be proposed in and adjacent to wilderness, as needed according to PDC. Alternative C would eliminate herbicide treatment in one meadow and a portion of second meadow in the William O. Douglas Wilderness, all seven dispersed campsites in the Indian Heaven Wilderness, and both dispersed campsites in the Trapper Creek Wilderness. These sites are in riparian reserves, and thus treatment would be limited to manual, which may take more time, and increase the duration of human intervention in that area. Negative effects of treating invasive plants include trammeling or modern human interference with ecological dynamics between the natural plant communities and the introduced invasives that can affect the sense that the wilderness is free from human control or manipulation. Manual control methods, use of herbicides, and related activities have adverse effects to the experience of wilderness.

PDC D1 and D2 prohibit mechanical treatments, cultural treatments or motorized treatment in the Wilderness Areas. Treatment methods are limited to manual and non-motorized herbicide application. One treatment side in the William O. Douglas Wilderness is along a trail (Trail 57). Evidence of treatment activity would be short term, and may include the presence of crews and unnatural concentrations of dead and dying vegetation. This evidence of treatment activities would slightly reduce the sense of solitude, and the sense that the wilderness areas are free from human intervention. These effects would be short term. Since the direct and indirect effects are minimal and short term, there are no long term cumulative effects associated with this alternative.

Wild and Scenic Rivers

None of the alternatives would adversely affect Wild and Scenic Rivers. Restoration of native plant communities would benefit meeting Wild and Scenic River objectives.

Under No Action, treatment on the Lower Klickitat River at Balfour Day Use Site (22-10) and along the Klickitat Trail (22-16), and on the Lower White Salmon River at the BZ launch site (22-15), would continue, but with less effective herbicides than the Proposed Action. No treatment would take place along the Upper White Salmon Wild and Scenic River. No new treatment impacts would be associated with treatment methods. However, continued spread of invasive plants could alter the outstandingly remarkable scenic condition and/or habitat conditions of the Upper White Salmon River.

The Proposed Action (Alternative B) would allow more effective herbicides to be used on the treatment sites on the Lower Klickitat and Lower White Salmon Rivers, and allow new infestations to be treated with the EDRR process. Infested roadsides along the Upper White Salmon River would be treated. Treatment methods may have short term impacts, such as visible dead and dying plants. Potential impacts to aquatic organisms and habitats are low (see Section 3.5,), so potential impacts to the outstandingly remarkable fisheries values of the Klickitat and White Salmon Rivers are low. In the long term, treatment of invasive plants will help protect the Rivers' outstandingly remarkable values.

Alternative C would not utilize herbicide treatment in the riparian reserves of the Lower Klickitat River at Balfour Day Use Site (22-10) and on the Lower White Salmon River at the BZ launch site. This alternative would also not utilize herbicide treatment in riparian reserve areas and along high risk roadsides adjacent to the Upper White Salmon River.

Potential impacts to aquatic organisms and habitats are very low (see Section 3.5,), so potential impacts to the outstandingly remarkable fisheries values of the Klickitat and White Salmon Rivers are very low.

Manual treatments may be less effective than herbicide treatments, and therefore chances would be higher of continued spread of invasive plants and concurrent impacts to outstandingly remarkable values.

For all alternatives, the direct and indirect effects are minimal and short term and would not contribute to significant cumulative effects.

Mount St Helens National Volcanic Monument

Roadsides within the Mount St Helens National Volcanic Monument would be treated in all alternatives; however, No Action and Alternative C would have a greater proportion of manual treatments. However, no adverse effects to the monument were identified from treatment. Adverse effects will continue to occur from invasive plants unless treatments are effective.

3.8.7 Irreversible or Irretrievable Use of Resources

No irreversible or irretrievable uses of resources are associated with this project. This project restores native vegetation in areas where non-native plants have been introduced. Herbicide treatments in accordance with the alternatives would have relatively short-lived impacts; effects on non-target species would be minimized; such effects would not be permanent. No adverse impacts on roadless areas or degradation of roadless area quality would occur.

3.8.8 Effects on Long-term Productivity

Positive effects on site productivity would be expected as native vegetation is restored. Some herbicides have potential to reduce soil productivity; project design criteria are intended to avoid use of such herbicides where soil productivity is already low.

3.8.9 Consistency with Forest Service Policies and Plans

The proposed project is consistent with all Forest Service policies and existing plans. No conflicts with existing plans have been noted. A recent lawsuit Washington Toxics Coalition et al. v EPA, regarding the lack of Endangered Species Act consultation on use of certain herbicides, was resolved by requiring certain buffers near streams. Herbicide use on federal land was exempt from the buffer zone requirement because such use already “implements safeguards routinely required” by the regulatory agencies.

The conclusions and findings in this analysis are supported by the best scientific information available. The FEIS (and the broader scale R6 2005 FEIS to which it is tiered) identifies methods used, discusses responsible opposing views, and discloses incomplete or unavailable information, scientific uncertainty, and risk (See 40 CFR, 1502.9 (b), 1502.22, 1502.24).

Invasive plant treatments are no longer subject to the requirements of the 1989 Mediated Agreement that affected removal of unwanted vegetation in Region Six. The R6 2005 ROD vacated the mediated agreement; replacing it with management direction for invasive plant prevention, treatment, restoration and monitoring. In April 2007, Northwest Coalition for Alternatives to Pesticides, the lead signer in the 1989 Mediated Agreement, agreed it was willing to dissolve the Mediated Agreement for purposes of controlling invasive plants in Region 6. The Portland Audubon Society (July 2, 2007) and the Oregon Environmental Council (October 15, 2007) have also agreed in writing to dissolve the Mediated Agreement for invasive plant control.

3.8.11 Energy Requirements and Conservation Potential

No unusual energy requirements are associated with this project. No unusual equipment would be used. Fossil fuels would be used in a prudent manner.

3.8.12 Adverse Effects That Cannot Be Avoided

Most of the important issues are resolved through adherence to project design criteria that minimize or eliminate the potential for adverse effects. However, some adverse effects are inherent to invasive plant treatments and cannot be avoided. These include:

- Taxpayers will likely be responsible for the costs of some if not all the treatments.
- Herbicide toxicity exceeding thresholds of concern are unlikely but possible given an herbicide spill or unpredictable weather event.
- Minor to moderate physical injuries due to forestry work are possible.
- Some common non-target plants are likely to be killed by treatments in close proximity. This is most likely with broadcast herbicide treatments and less likely (but possible) for all other treatment methods. The adverse effects of the invasive plants themselves far outweigh the potential for adverse effects of treatment.

CHAPTER 4. List of Preparers, Consultation and Coordination with Others (Tribes, Agencies)

4.1 List of Preparers

The following people were the primary authors of this EIS.

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4.2 Consultation with Regulatory Agencies

The Forest Service has initiated consultation with the US Fish and Wildlife Service and NOAA Fisheries regarding potential adverse effects on Endangered Species. The consultation is tiered to programmatic consultation at the Regional Scale. A Biological Assessment has been prepared for the Preferred Alternative (excerpt in Appendix C). Results of consultation will be addressed in the Record of Decision.

4.3 Consultation with Tribal Governments

Government to government consultation is ongoing with several tribes including: Yakama Nation, Confederated Tribes of the Umatilla Indian Reservation, Confederated Tribes of the Warm Springs, Nez Perce Tribe, Confederated Tribes of the Grand Ronde, Cowlitz Indian Tribe, Nisqually Tribe, Puyallup Tribe, Squaxin Island Tribe, Steilacoom Tribe of Indian, Confederated Tribes of the Warm Springs, and the Confederated Tribes of the Umatilla Indian Reservation. Letters have been sent to all tribal chairs, and follow up presentations and meetings have occurred at the request of the tribes. A courtesy copy of the DEIS was presented to the tribes before it was available to the public.

No tribal members (who have identified themselves as such) have expressed disapproval of the project. Informally, tribal representatives have stated they believe the long-term benefits of treating and controlling invasive plants outweigh the short-term risks to localized populations of culturally significant plants.

4.4 Consultation with Counties

The Forest Service has worked closely with the County Weed Boards. County staff have presented information to the Forest Service, participated in field trips, and commented on the DEIS (see Appendix G).

4.5 Consultation with Others

Many people within and outside the Forest Service helped the team develop and analyze the project. Managers and specialists from the National Forest and Scenic Area reviewed analysis documentation and suggested changes.

Public scoping has occurred on this project since 2004. The public has been apprised of project progress through the newspaper, direct mailings, Notices of Intent published in the Federal Register in 2004 and again in 2005, the Forest Schedule of Proposed Actions, informal meetings and discussions, and other media.

Many organizations and individuals have expressed interest in the project; everyone who expressed interest was offered a hard copy or CD containing the FEIS and Appendices.

The full FEIS and Appendices are also available electronically by website: http://www.fs.fed.us/gpnf/04projects/ or on request (see cover page for more information or to request a CD or hard copy).

Hard copies are available for review at Forest Service offices throughout the area. The FEIS has been sent to the Environmental Protection Agency (who commented during scoping) and other federal and state agencies. The following is a list of individuals, organizations, agencies and tribal governments and groups to whom this FEIS was sent:

Individuals

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Felix Capoeman
Betty Captein
F.Stuart Chapin
Carolee Colter
James Crudele
Ted Davenport
Jean Day
Jean Dunlop
John Edmundson
Stan Fouts
Michelle Franz
Enid Griffin
C.J. Guthrie
Donald and Alice Hack
Emery Ingham
John Irwin
Richard Johnson
Pam Kenyon
Kurt Kessler
Irene Kocher
Jack Konner
M.A. Kruse
Russell Kysar
Leroy Layton
Eugene Lynch
Ned Marshall
C.J. McClellan
Moyers
Lewis Nickerson
Pellissier
Charlotte Portner
Tim Plein
Nancy Russell
Michael Ryan
Michael Rysavy
A.L. Schwiesow
Greg Short
Sandra Smith
C.G. Spies
Phyllis Stuart
Nita Sullivan
Aubrey Taylor
Cheryl Thoen
Chris Thompson
Ray Triplett
Jim and Barbara Scott
Trusky
Roberta Vandehey
Kathryn Venator
Carol Volk
Jennifer Vollmer
Mitchell Williams

Organizations

German Shorthair Pointer Club
Strategic Analysis
Freres Lumber Co. Inc.
Columbia Helicopters Inc.
Black Butte Ranch
Nelson Tree Farm
Mt. Hood Study Group
Env & Nat Resource Law Dept,
Lewis and Clark College
Olympic Forest Coalition
Ochoco Lumber Co.
Longevity Herb Company
Greenworks PC Landscape Architecture
Western Society of Weed Science
American Forest Resource Council
Washington Native Plant Society
The Ptarmigans
Glacier View Enterprises
Portland General Electric
BARK
NCAP
Gifford Pinchot Task Force
Columbia River Keepers
Friends of the Columbia River
Physicians for Social Responsibility
Pacific NW Four Wheel Drive Assoc
Kettle Range Group
NW Ecosystem Alliance

Agencies

National Marine Fisheries Service
Washington State Department of Ecology
Bonneville Power Administration
Environmental Protection Agency Region 10
Washington Dept of Natural Resources
Washington Noxious Weed Board
Wash. Dept. of Transportation
Speros K. Doulos
City of Stevenson
USDA, National Agricultural Library
USDI, Office of Environmental Policy and
Compliance
Klickitat County Weed Coordinator
Skamania County Weed Coordinator
Cowlitz County Weed Coordinator
Lewis County Weed Coordinator

Tribal Governments and Groups

Yakama Nation
Confederated Tribes of the Umatilla Indian
Reservation
Confederated Tribes of the Warm Springs
Nez Perce Tribe
Confederated Tribes of the Grand Ronde
Cowlitz Indian Tribe
Nisqually Tribe
Puyallup Tribal Council
Squaxin Island Tribe
Steilacoom Tribe of Indians
Confederated Tribes of the Warm Springs
Confederated Tribes of the Umatilla Indian
Reservation

CHAPTER 5. REFERENCES, INDEX, ACRONYMS AND GLOSSARY

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5.2 Index

5.3 Acronyms

a.i. – Active ingredient
ACHP – Advisory Council on Historic Preservation
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
BCF – Bioconcentration factor
BEE – Butoxyethyl Ester
BIA – US Department of the Interior, Bureau of Indian Affairs
BLM – US Department of the Interior, Bureau of Land Management
BMP – Best Management Practices
BPA – Bonneville Power Administration
CAS – Chemical Abstract Service
CBI – Confidential Business Information
CE – Cumulative Effect
CFR – Code of Federal Regulations
CHU – Critical Habitat Unit
National Scenic Area – Columbia River Gorge National Scenic Area
CTWS – Confederate Tribes of Warm Springs
CWA – Clean Water Act
DEIS – Draft Environmental Impact Statement
DEQ – Department of Environmental Quality
DPS – Distinct Population Segment
EDRR – Early Detection/ Rapid Response
EA – Environmental Assessment
EFH – Essential Fish Habitat
EIS – Environmental Impact Statement
ESU – Evolutionary Significant Unit
EO – Executive Order
EPA – Environmental Protection Agency
ESA – Endangered Species Act
FDA – US Food and Drug Administration
FEIS – Final Environmental Impact Statement
FEMAT – Forest Ecosystem Management Assessment Team
FHP – Forest Health Protection
FIRFA – Federal Insecticide, Fungicide, and Rodenticide Act
FSH – USDA Forest Service Handbook
FSM – Forest Service Manual
FWS – Fish and Wildlife Service
FY – Fiscal Year
GP or GIF – Gifford Pinchot National Forest
GIS – Geographic Information Systems
GLEAMS – Groundwater Loading Effects of Agricultural Management
GMA – General Management Area
HQ – Hazard Quotient
ICBEMP – Interior Columbia Basin Ecosystem Management Project
IDT – Interdisciplinary Team
IWM – Integrated Weed Management
LFL – Likely to Cause a Trend to Federal Listing or Loss of Viability
LOAEL – Lowest-Observed-Adverse-Effect Level
LOC – Level of Concern

LSR – Late-Successional Reserve
MA-LAA – May Affect, Likely to Adversely Affect
MA-NLAA – May Affect, Not Likely to Adversely Affect
MI-NLFL – May Impact Individual, but Not Likely to Cause a Trend to Federal Listing or Loss of Viability
MIS – Management Indicator Species
MSDS – Materials Safety Data Sheet
NAA – Not Adversely Affected
NC – Nature Conservancy
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 – Not Likely to Adversely Affect
NMFS – National Marine Fisheries Service
NOAA – National Oceanic and Atmospheric Administration, US Department of Commerce
NOEC – No Observable Effects Concentration
NOAEL – No-Observed-Adverse-Effect Level
NOEL – No-Observed-Effect-Level
NOI – Notice of Intent
NPE – Nonylphenol Polyethoxylate
NRF – Nesting, Roosting and Foraging Habitat
NRIS – National Resource Information System
NVUM – National Visitor Use Monitoring
NWFP – Northwest Forest Plan
ORV – Outstandingly Remarkable Values
OSHA – Occupational Safety and Health Administration
OSS – Oregon Slender salamander
PAYCO – Payments to Counties
PCE – Primary Constituent Elements
PDC – Project Design Criteria
PIF – Partners in Flight
POEA – Polyethoxylated Tallow Amine
PPE – Personal Protective Equipment
PVT – Potential Vegetation Type
RfD – Reference Dose
R6 – USDA Forest Service, Pacific Northwest Region (Washington and Oregon)
ROD – Record of Decision
SERA – Syracuse Environmental Research Associates, Inc.
SHPO – State Historic Preservation Office
SMA – Special Management Area
SRI – Soil Resource Inventory
TCP – 3,5,6-Thrichloro-2-Pyridinol
TEA – Triethylamine
TES – Threatened, Endangered and Sensitive species
USDA Forest Service – United States Department of Agriculture Forest Service
USDI – United States Department of the Interior

5.4 Glossary

Active ingredient (a.i.) - In any pesticide product, the component (a chemical or biological substance) that kills or otherwise controls the target pests. Pesticides are regulated primarily on the basis of active ingredients. The remaining ingredients are called “inerts.”
Acute effect - An adverse effect on any living organism in which severe symptoms develop rapidly and often subside after the exposure stops.
Acute exposure - A single exposure or multiple brief exposures occurring within a short time (e.g., 24 hours or less in humans). The classification of multiple brief exposures as “acute” is 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.
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.
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.
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, *invasive*, *noxious*, and *weed species*.)
Allelopathy - The suppression of growth of one plant species due to the release of toxic substances by another plant.
Alluvial - Relating to clay, silt, sand, gravel, or similar detrital material deposited by flowing water. Alluvial deposits may occur after a heavy rain storm.
Ambient - Usual or surrounding conditions.
Amphibian - Any of a class of cold-blooded vertebrates (including frogs, toads, or salamanders) intermediate in many characteristics between fishes and reptiles and having gilled aquatic larvae and air-breathing adults.

Anadromous - Fish that spend their adult life in the sea but swim upriver to fresh water spawning grounds to reproduce.
Anaerobic - Life or process that occurs in, or is not destroyed by, the absence of oxygen. (See also, *aerobic*.)
Anions - Negatively charged ions in solution e.g., hydroxyl or OH- ion. (See also, *cations*.)
Annual - A plant that endures for not more than a year. A plant which completes its entire life cycle from germinating seedling to seed production and death within a year.
Annuity - Payment or receipt of a series of equal amounts at stated intervals for a specified number of time periods. An "annuity due" is a series of equal value outputs or inputs occurring for N equal time periods with "payments" made at the beginning of each period.
Anoxia - Literally, "without oxygen." A deficiency of oxygen reaching the tissues of the body especially of such severity as to result in permanent damage.
Aquatic Influence Zone – The inner half of a Riparian Reserve.
Aqueous - Describes a water-based solution or suspension.
Aquifer - An underground geological formation, or group of formations, containing usable amounts of groundwater that can supply wells and springs.
Arid - A terrestrial region lacking moisture, or a climate in which the rainfall is not sufficient to support the growth of most vegetation.
Background level - In pollution, the level of pollutants commonly present in ambient media (air, water, soil.)
Bacteria - Microscopic living organisms that metabolize organic matter in soil, water, or other environmental media. Some bacteria can also cause human, animal and plant health problems.
Basal application - In pesticides, the spreading of a chemical on stems or trunks of plants just above the soil line.
Base - Substances that (usually) liberate hydroxyl (OH-) anions when dissolved in water and weaken a strong acid.
Benchmark - A dose associated with a defined effect level or designated as a no effect level.
Benthic region - The bottom layer of a body of water.
Benthos - The plants and animals that inhabit the bottom layer of a water body.
Best Management Practices (BMP) - A practice or combination of practices determined by a state or an agency to be the most effective and practical means (technological, economic, and institutional) of controlling point and non-point source pollutants at levels compatible with environmental quality.
Bioaccumulation - The increase in concentration of a substance in living organisms as they take in contaminated air, water, or food because the substance is very slowly metabolized or excreted (often concentrating in the body fat.)
Bioassay - (1) To measure the effect of a substance, factor, or condition using living organisms. (2) A test to determine the toxicity of an agent to an organism.
Bioconcentration - The accumulation of a chemical in tissues of a fish or other organism to levels greater than in the surrounding water or environment.
Bioconcentration Factor (BCF) - The concentration of a compound in an aquatic organism divided by the concentration in the ambient water of the organism.
Biodegradability - Susceptibility of a substance to decomposition by microorganisms; specifically, the rate at which compounds may be chemically broken down by bacteria and/or natural environmental factors.
Biodiversity or biological diversity - The diversity of living things (species) and of life patterns and processes (ecosystem structures and functions). Includes genetic diversity, ecosystem diversity, landscape and regional diversity, and biosphere diversity.
Biological control - The use of natural enemies, including invertebrate parasites and predators (usually insects, mites, and nematodes,) and plant pathogens to reduce populations of nonnative, invasive plants.

Biological magnification - The process whereby certain substances such as pesticides or heavy metals increase in concentration as they move up the food chain.
Biologically sensitive - A term used to identify a group of individuals who, because of their developmental stage or some other biological condition, are more susceptible than the general population to a chemical or biological agent in the environment.
Biomass - The amount of living matter.
Biota or Biome - All living organisms of a region or system.
Body Burden - The amount of a chemical stored in the body at a given time, especially a potential toxin in the body as the result of exposure.
Broadcast application - Herbicide treatment method generally used along roads; boom truck spray is directed at target species. Broadcast methods are used for larger infestations where spot treatments would not be effective.
Bryophytes - Plants of the phylum *Bryophyta*, including mosses, liverworts, and hornworts; characterized by the lack of true roots, stems, and leaves.
Buffer Zone - A strip of untreated land that separates a waterway or other environmentally sensitive area from an area being treated with pesticides.
Candidate species - Those plant and animal species that, in the opinion of the Fish and Wildlife Service (FWS) or National Oceanic and Atmospheric Administration (NOAA) Fisheries, may qualify for listing as “endangered” or “threatened.” The FWS recognizes two categories of candidates. Category 1 candidates are taxa for which the FWS has on file sufficient information to support proposals for listing. Category 2 candidates are taxa for which information available to the FWS indicates that proposing to list is possibly appropriate, but for which sufficient data are not currently available to support proposed rules.
Capillary fringe - The zone above the water table within which the soil or rock is saturated by water under less than atmospheric pressure.
Carcinogen - A chemical capable of inducing cancer.
Carrier – An inert substance added to a commercial pesticide formulation to make it easier to handle or apply.
Chemical Abstracts Service (CAS) Registry Number - An assigned number used to identify a chemical. Chemical Abstracts Service is an organization that indexes information published in Chemical Abstracts by the American Chemical Society and that provides index guides to help locate information about particular substances in the abstracts. Sequentially assigned CAS numbers identify specific chemicals. The numbers have no chemical significance. The CAS number is a concise, unique means of chemical identification.
Cations - Positively charged ions in a solution. (See also, *anion*.)
Characteristic Landscape - The naturally established landscape within a scene or scenes being viewed.
Chemical Control - The use of naturally derived or synthetic chemicals called herbicides to eliminate or control the growth of invasive plants.
Chronic exposure - Exposures that extend over the average lifetime or for a significant fraction of the lifetime of the species (for a rat, chronic exposure is typically about two years). Chronic exposure studies are used to evaluate the carcinogenic potential of chemicals and other long-term health effects. (See also, *acute* and *cumulative exposure*.)
Chronic Reference Dose (RfD) - An estimate of a lifetime daily exposure level (in mg/kg/day) for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of deleterious effects. Chronic RfDs are specifically developed to be protective for long-term exposure to a compound (seven years to lifetime.)
Chronic toxicity - The ability of a substance or mixture of substances to cause harmful effects over an extended period, usually upon repeated or continuous exposure sometimes lasting for the entire life of

the exposed organism.
Code of Federal Regulations (CFR) - Document that codifies all rules of the executive departments and agencies of the federal government. It is divided into fifty volumes, known as titles. Title 40 of the CFR (referenced as 40 CFR) lists all environmental regulations, including regulations for EPA pesticide programs (40 CFR Parts 150-189).
Competitive seeding - Restoration 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.
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 control - The establishment or maintenance of competitive vegetation, use of fertilizing, mulching, prescribed burning, or grazing animals to control or eliminate invasive plants.
Cumulative Effect (CE) - The impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions—regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time (40 CFR 1508.7).
Cumulative exposure - Exposure resulting from one or more activities that are repeated over a period of time. (See also, *acute* and *chronic exposure*.)
Detritus - Loose fragments, particles, or grains formed by the disintegration of organic matter or rocks.
Discount - In economics, discounting is the process of carrying an end value backward in time at compound interest.
Distance Zones - Landscape areas denoted by specified distances from the observer. Used as a frame of reference in which to discuss landscape attributes or the scenic effect of human activities in a landscape.
Disturbance - An effect of a planned human management activity, or unplanned native or exotic agent or event that changes the state of a landscape element, landscape pattern, or regional composition.
Dosage/Dose - (1) The actual quantity of a chemical administered to an organism or to which it is exposed. (2) The amount of a substance that reaches a specific tissue (e.g. the liver). (3) The amount of a substance available for interaction with metabolic processes after crossing the outer boundary of an organism.
Dose Rate - In exposure assessment, dose per time unit (e.g. mg/day); also called dosage.
Dose Response - Changes in toxicological responses of an individual (such as alterations in severity of symptoms) or populations (such as alterations in incidence) that are related to changes in the dose of any given substance.
Drift - The portion of a sprayed chemical that is moved by wind off of a target site.

Emergent Vegetation - Plants growing out of or standing in water, in contrast to "submerged aquatic vegetation (SAV)," which grows entirely underneath the waters' surface.
Endangered Species - Any species listed in the *Federal Register* as being in danger of extinction throughout all, or a significant portion, of its range.
Endangered Species Act (ESA) - A law passed in 1973 to conserve species of wildlife and plants, determined by the Director of the U.S. Fish and Wildlife Service or the NOAA Fisheries to be endangered or threatened with extinction in all or a significant portion of its range. Among other measures, ESA requires all federal agencies to conserve these species and consult with the Fish and Wildlife Service or NOAA Fisheries on federal actions that may affect these species or their designated critical habitat.
Endemic - A species or other taxonomic group that is restricted to a particular geographic region due to factors such as isolation or response to soil or climatic conditions. (Compare to "*Indigenous*" and "*Native*.")
Environmental justice - Executive Order 12898 of February 11, 1994 requires federal agencies, to the greatest extent practicable and permitted by law, to make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions, the District of Columbia, the Commonwealth of Puerto Rico, and the commonwealth of the Mariana Islands.
Exposure assessment - The process of estimating the amount of contact with a chemical or biological agent that an individual or a population of organisms will receive from a pesticide application conducted under specific, stated circumstances.
Exotic – Non-native species; introduced from elsewhere, but not completely naturalized. (See also *alien* and *introduced species*.)
Extirpate - To destroy completely; wipe out.
Extrapolation - The use of a model to make estimates of values of a variable in an unobserved interval from values within an already observed interval.
Fauna - The animals of a specified region or time.
Federally listed species - Formally listed as a threatened or endangered species under the Endangered Species Act. Designations are made by the Fish and Wildlife Service or the National Marine Fisheries Service.
Federal Insecticide and Rodenticide Act (FIFRA) Pesticide Ingredient - An ingredient of a pesticide that must be registered with EPA under the Federal Insecticide, Fungicide, and Rodenticide Act. Products making pesticide claims must submit required information to EPA to register under FIFRA and may be subject to labeling and use requirements.
Fertilization - Treatment method involving adding of nutrients, which could improve the success of desirable species; may be limited, depending on species/soil characteristics.
Flora - Plant life, especially all the plants found in a particular country, region, or time regarded as a group. Also, a systematic set of descriptions of all the plants of a particular place or time.
Foaming - Hot foam is a mechanical method that is effective on seedlings and annuals and can be applied under certain weather conditions, including wind and light rain.
Food chain - A hierarchical sequence of organisms, each of which feeds on the next, lower member of the sequence.
Forage - Food for animals. In this document, term applies to both availability of plant material for wildlife and domestic livestock.
Formulation - A commercial preparation of a chemical including any inerts and/or contaminants.
Fungi - Molds, mildews, yeasts, mushrooms, and puffballs, a group of organisms that lack chlorophyll and therefore are not photosynthetic. They are usually non-mobile, filamentous, and multi-cellular.

Game fish - Species like trout, salmon, or bass, caught for sport. Many of them show more sensitivity to environmental change than non-game fish.
Grazing animals - Treatment method which requires matching the invasive species with the appropriate grazer for best success.
Groundwater Loading Effects of Agricultural Management Systems (GLEAMS) – A model which displays herbicide concentrations in streams under a variety of conditions.
Groundwater - The supply of fresh water found beneath the Earth's surface, usually in aquifers, which often supply wells and springs.
Habitat - The place where a population (e.g., human, animal, plant, microorganism) lives and its surroundings, both living and non-living.
Halftime or half-life - The time required for the concentration of the chemical to decrease by one-half.
Hand/Selective application- Herbicide treatment of individual plants through wicking, wiping, injecting stems, etc., with low likelihood of drift or delivery of herbicides away from treatment sites. This method ensures no herbicide directly contacts soil.
Hand-pulling/Grubbing - Treatment method which is labor-intensive but effective on single plants or on small, low-density infestations.
Hazard Quotient (HQ) - The ratio of the estimated level of exposure to a substance from a specific pesticide application to the RfD for that substance, or to some other index of acceptable exposure or toxicity. A HQ less than or equal to one is presumed to indicate an acceptably low level of risk for that specific application.
Hazard identification - The process of identifying the array of potential effects that an agent may induce in an exposed of humans or other organisms.
Herbaceous - A plant that does not develop persistent woody tissue above the ground (annual, biennial, or perennial.) Herbaceous vegetation includes grasses and grass-like vegetation, and broadleaved forbs.
Herbicide - A chemical preparation designed to kill plants, especially weeds, or to otherwise inhibit their growth.
Humus - Organic portion of the soil remaining after prolonged microbial decomposition.
Tribal and Treaty Rights - Native American treaty and other rights or interests recognized by treaties, statutes, laws, executive orders, or other government action, or federal court decisions.
Indian Tribe - Any American Indian or Alaska Native tribe, band, nation, pueblo, community, rancheria, colony, or group meeting the provisions of the Code of Federal Regulations Title 25, Section 83.7 (25 FR 83.7), or those recognized in statutes or treaties with the United States.
Indigenous - An indigenous species is any which were or are native or inherent to an area. (See also, *native*.)
Inerts - Anything other than the active ingredient in a pesticide product; not having pesticide properties.
Infested area - A contiguous area of land occupied by, in this case, invasive plant species. An infested area of land is defined by drawing a line around the actual perimeter of the infestation as defined by the canopy cover of the plants, excluding areas not infested. Generally, the smallest area of infestation mapped will be 1/10th (0.10) of an acre or 0.04 hectares.
Integrated Weed Management (IWM) - An interdisciplinary weed management approach for selecting methods for preventing, containing, and controlling noxious weeds in coordination with other resource management activities to achieve optimum management goals and objectives.
Interdisciplinary Team (IDT) - A group of individuals with varying areas of specialty assembled to solve a problem or perform a task. The team is assembled out of recognition that no one scientific discipline is sufficiently broad enough to adequately analyze the problem and propose action.
Introduced species - An alien or exotic species that has been intentionally or unintentionally released into an area as a result of human activity. (See also *exotic, invasive, and noxious*.)
Introduction - "The intentional or unintentional escape, release, dissemination, or placement of a

species into an ecosystem as a result of human activity" (Executive Order 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* and *introduced species*.)
Irreversible effect - Effect characterized by the inability of the body to partially or fully repair injury caused by a toxic agent.
Irritant - Non-corrosive material that causes a reversible inflammatory effect on living tissue by chemical action at the site of contact as a function of concentration or duration of exposure.
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 is determined by interacting ecosystems.
Landscape Character - Particular attributes, qualities, and traits of a landscape that give it an image and make it identifiable or unique.
Landscape Setting - The context and environment in which a landscape is set; a landscape backdrop. It is the combination of land use, landform, and vegetation patterns that distinguish an area in appearance and character from other areas.
Leachate - Water that collects chemicals as it trickles through soil or other porous media containing the chemicals.
Leaching - The process by which chemicals on or in soil or other porous media are dissolved and carried away by water, or are moved into a lower layer of soil.
Level of Concern (LOC) - The concentration in media or some other estimate of exposure above which there may be effects.
Lichens - Complex thallophytic plants comprised of an alga and a fungus growing in symbiotic association on a solid surface (such as a rock.)
Littoral zone - (1) That portion of a body of fresh water extending from the shoreline lakeward to the limit of occupancy of rooted plants. (2) The strip of land along the shoreline between the high and low water levels.
Lowest-Observed-Adverse-Effect Level (LOAEL) - The lowest dose of a chemical in a study, or group of studies, that produces statistically or biologically significant increases in frequency or severity of adverse effects between the exposed and control populations.
Manual Control - The use of any non-mechanized approach to control or eliminate invasive plants (i.e. hand-pulling, grubbing.)
Material Safety Data Sheet (MSDS) - A compilation of information required under the OSHA Communication Standard on the identity of hazardous chemicals, health and physical hazards, exposure limits, and precautions.
Mechanical Control - The use of any mechanized approach to control or eliminate invasive plants (i.e. mowing, weed whipping, hot foam.)
Microorganisms - A generic term for all organisms consisting only of a single cell, such as bacteria,

viruses, protozoa and some fungi.
Minimum tool - Use of a weed treatment alternative that would accomplish management objectives and have the least impact on resources.
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-Level (NOEL) - Exposure level at which there are no statistically or biological significant differences in the frequency or severity of any effect in the exposed or control populations.

Not Likely to Adversely Affect (NLAA) - Determinations are applied to those species that had very little habitat on National Forests in Region Six, were not in habitats susceptible to invasive plants, or were known to tolerate herbicide treatments without effects.

Noxious weed - "Any living stage (including but not limited to, seeds and reproductive parts) of any parasitic or other plant of a kind, or subdivision of a kind, which is of foreign origin, is new to or not widely prevalent in the United States, and can directly or indirectly injure crops, other useful plants, livestock, or poultry or other interests of agriculture, including irrigation, or navigation or the fish and wildlife resources of the United States or the public health" (Public Law 93-629, January 3, 1975, Federal Noxious Weed Act of 1974).

Outstandingly Remarkable Value (ORV) - A characteristic of rivers or sections of rivers in the national Wild and Scenic River System. In order for a river to be included in the system, it must possess at least one "outstandingly remarkable" value, such as scenic, recreational, geologic, fish, wildlife, historic, cultural, or other similar features. ORV's are values or opportunities in a river corridor which are directly related to the river and which are rare, unique, or exemplary from a regional or national perspective.

Partial Retention - A visual quality objective which in general means human activities may be evident but must remain subordinate to the characteristic landscape.

Pathogen - A living organism, typically a bacteria or virus, that causes adverse effects in another organism.

Percolation - Downward flow or filtering of water through pores or spaces in rock or soil.

Perennial - A plant species having a life span of more than two years.

Periphyton - Microscopic plants and animals that are firmly attached to solid surfaces under water such as rocks, logs, pilings and other structures.

Persistence - Refers to the length of time a compound, once introduced into the environment, stays there.

Personal Protective Equipment (PPE) - Clothing and equipment worn by pesticide mixers, loaders and applicators and re-entry workers, hazmat emergency responders, workers cleaning up Superfund sites, et. al., which is worn to reduce their exposure to potentially hazardous chemicals and other pollutants.

Pest - An insect, rodent, nematode, fungus, weed or other form of terrestrial or aquatic plant or animal life that is classified as undesirable because it is injurious to health or the environment.

Pesticide - Any substance used for controlling, preventing, destroying, repelling, or mitigating any pest. Includes fungicides, herbicides, fumigants, insecticides, nematicides, rodenticides, desiccants, defoliants, plant growth regulators, etc.
Pesticide tolerance - The amount of pesticide residue allowed by law to remain in or on a harvested crop.
pH - The negative log of the hydrogen ion concentration. A high pH (greater than seven) is alkaline or basic and a low pH (less than seven) is acidic.
Population - A group of individuals of the same species in an area.
Population at Risk - A population subgroup that is more likely to be exposed to a chemical, or is more sensitive to the chemical, than is the general population.
Porosity - Degree to which soil, gravel, sediment, or rock is permeated with pores or cavities through which water or air can move.
Potable Water - Water that is considered safe for drinking and cooking.
Project Design Criteria/Features (PDC, PDF) - A set of implementation Design Criteria/features applied to projects to ensure that the project is done according to environmental standards and adverse effects are within the scope of those predicted in this Environmental Impact Statement.
Proposed species - Any plant or animal species that is proposed by the Fish and Wildlife Service or NOAA Fisheries in a *Federal Register* notice to be listed as threatened or endangered.
Potential Vegetation Type (PVT) - The term Potential Vegetation Type is used to represent the combination of species that could occupy the site in the absence of disturbance.
Protozoa - Single-celled, microorganisms without cell walls containing visibly evident nuclei and organelles. Most protozoa are free-living although many are parasitic.
Recreational Rivers - A classification within the national Wild and Scenic River System. Recreational rivers are those rivers, or sections of rivers, that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.
Reference Dose (RfD) - The RfD is a numerical estimate of a daily exposure to the human population, including sensitive subgroups such as children, that is not likely to cause harmful effects during a lifetime. RfDs are generally used for health effects that are thought to have a threshold or minimum dose for producing effects.
Registered Pesticides - Pesticide products which have been approved for the uses listed on the label.
Registration - Formal licensing with EPA of a new pesticide before it can be sold or distributed. Under the Federal Insecticide, Fungicide, and Rodenticide Act, EPA is responsible for registration (pre-market licensing) of pesticides on the basis of data demonstrating no unreasonable adverse effects on human health or the environment when applied according to approved label directions.
Restoration - Ecological restoration is the process of assisting the recovery and management of ecological integrity. Ecological integrity includes a critical range of variability in biodiversity, ecological processes and structures, regional and historical context, and sustainable cultural practices.
Retention - A visual quality objective which in general means human activities are not evident to the casual forest visitor.
Revegetation - The re-establishment of plants on a site. The term does not imply native or nonnative; does not imply that the site can ever support any other types of plants or species and is not at all concerned with how the site ‘functions’ as an ecosystem.
Riparian Area - A geographic area containing an aquatic ecosystem and adjacent upland areas that directly affect it.
Riparian 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 Assessment - An analytic process that is firmly based on scientific considerations, but also requires judgments to be made when the available information is incomplete. These judgments inevitably draw on both scientific and policy considerations.
Risk - The chance of an adverse or undesirable effect, often measured as a percentage.
Risk assessment - The qualitative and quantitative evaluation performed in an effort to estimate the risk posed to human health and/or the environment by the presence or potential presence and/or use of specific chemical or biological agents.
Saturated zone - A subsurface area in which all pores and cracks are filled with water under pressure equal to or greater than that of the atmosphere.
Scenery Management - The art and science of arranging, planning, and designing landscape attributes relative to the appearance of places and expanses in outdoor settings.
Scenic - Of or relating to landscape scenery; pertaining to natural or natural-appearing scenery; constituting or affording pleasant views of natural landscape attributes or positive cultural elements.
Scenic 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.
Species of Local Interest (SOLI) - Threatened, endangered and proposed species; Regional Forester's Sensitive species, management indicator species, and other rare or endemic species of concern.
Species - "A group of organisms, all of which have a high degree of physical and genetic similarity, generally interbreed only among themselves, and show persistent differences from members of allied groups of organisms." (Executive Order 13122, 2/3/99).
Spot application - Herbicide treatment involving use of a backpack sprayer or other means. Application is aimed at specific target species, with methods of prevention (such as barriers,) to control damage to non-target species.
Standards and guidelines - The rules and limits governing actions, as well as the principles specifying the environmental conditions or levels to be achieved and maintained.
Sub-chronic exposure - An exposure duration that can last for different periods of time (5 to 90 days), with 90 days being the most common test duration for mammals. The sub-chronic study is usually performed in two species (rat and dog) by the route of intended use or exposure.
Sub-chronic toxicity - The ability of one or more substances to cause effects over periods from about 90 days but substantially less than the lifetime of the exposed organism. Sub-chronic toxicity only applies to relatively long-lived organisms such as mammals.

Submerged Aquatic Vegetation (SAV) - Vegetation that lives at or below the water surface; an important habitat for young fish and other aquatic organisms. In contrast to "emergent vegetation," which is growing out of or standing in water.
Substrate - With reference to enzymes, the chemical that the enzyme acts upon.
Surface water - All water naturally open to the atmosphere (rivers, lakes, reservoirs, streams, impoundments, seas, estuaries, etc.) and all springs, wells, or other collectors which are directly influenced by surface water.
Surfactant - A surface active agent; usually an organic compound whose molecules contain a hydrophilic group at one end and a lipophilic group at the other. Promotes solubility of a chemical, or lathering, or reduces surface tension of a solution.
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)
Threatened species - Plant or animal species likely to become endangered throughout all, or a significant portion of, its range within the foreseeable future. A plant or animal identified and defined in accordance with the 1973 Endangered Species Act and published in the Federal Register.
Threshold - The maximum dose or concentration level of a chemical or biological agent that will not cause an effect in the organism.
Tolerances - Permissible residue levels for pesticides in raw agricultural produce and processed foods. Whenever a pesticide is registered for use on a food or a feed crop, a tolerance (or exemption from the tolerance requirement) must be established. EPA establishes the tolerance levels, which are enforced by the Food and Drug Administration and the Department of Agriculture.
Toxicity - The inherent ability of an agent to affect living organisms adversely. Toxicity is the degree to which a substance or mixture of substances can harm humans or animals.
Toxicology - The study of the nature, effects, and detection of poisons in living organisms. Also, substances that are otherwise harmless but prove toxic under particular conditions. The basic assumption of toxicology is that there is a relationship among the dose (amount), the concentration at the affected site, and the resulting effects.
Treatment Area - An infested area where weeds have been treated or retreated by an acceptable method for the specific objective of controlling their spread or reducing their density.
U.S. Fish and Wildlife Service (US FWS) - The federal agency that is the listing authority for species other than marine mammals and anadromous fish under the ESA.
U.S. Forest Service (USDA FS or USFS) - The federal agency responsible for management of the nation's National Forest 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.
Well-distributed - Distribution sufficient to permit normal biological function and species interactions, considering life history characteristics of the species and the habitats for which it is specifically adapted.
Wetland - An area that is regularly saturated by surface or ground water and subsequently is characterized by a prevalence of vegetation that is adapted for life in saturated soil conditions. Examples include swamps, bogs, fens, marshes, and estuaries.
Wild and Scenic River System - The Wild and Scenic Rivers Act of 1968 established a system of selected rivers in the United States, which possess outstandingly remarkable values, to be preserved in free-flowing condition. Within the national system of rivers, three classifications define the general character of designated rivers: Wild, Scenic, and Recreational. Classifications reflect levels of development and natural conditions along a stretch of river. Classifications are used to help develop management goals for the river.
Wilderness - Areas designated by Congressional action under the 1964 Wilderness Act. Wilderness is defined as undeveloped federal land retaining its primeval character and influence without permanent improvements or human habitation. Wilderness areas are protected and managed to preserve their natural conditions, which generally appear to have been affected primarily by the forces of nature with the imprint of human activity substantially unnoticeable; have outstanding opportunities for solitude or for a primitive and confined type of recreation; include at least 5,000 acres, or are of sufficient size to make practical their preservation, enjoyment, and use in an unimpaired condition; and may contain features of scientific, educational, scenic, or historical value as well as ecological and geologic interest.
Wild Rivers - A classification within the national Wild and Scenic River System. Wild rivers are those rivers, or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted.