Drift Creek Knotweed Eradication Project

Environmental Assessment

Siuslaw National Forest
South Zone District
Lincoln County, Oregon

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Chapter 1. Why is this project needed, and what evidence established this need?

Chapter titles are framed as questions intended to focus the writing and to alert readers to judge whether the answers provided are adequate. For readers accustomed to earlier environmental documents, chapter 1 is equivalent to the "Purpose and Need for Action" section.

The Proposed Project

Introduction - District Ranger Bill Helphinstine has proposed the Drift Creek Giant Knotweed Eradication Project (the Project) to eradicate giant knotweed (*Polygonum sachalinense*)—an invasive plant species listed by the State of Oregon as a noxious weed—located in the lower Drift Creek restoration area. To eradicate this invasive plant, the proposal would inject the herbicide glyphosate into individual plant stems. The proposed project site is located about 36 air miles southwest of Corvallis, Oregon. Injecting knotweed with glyphosate may begin as soon as September 2005. This action may be repeated in late summer or early fall of 2006. The proposed project was designed to address the problem discussed in The Problem To Be Addressed.

Relationship to the Siuslaw Forest Plan – The Siuslaw National Forest Land and Resource Management Plan (Siuslaw Forest Plan; USDA 1990), as amended by the Northwest Forest Plan (USDA, USDI 1994), establishes the management direction, desired conditions, and standards and guidelines under which lands administered by the Siuslaw National Forest are managed. These plans are intended to provide for healthy forest ecosystems, including protecting riparian areas and waters as well as providing adequate habitat to maintain viable populations of native vertebrate species. This includes providing habitat for the fresh-water phases of anadromous species, regardless of the influence that ocean conditions have on survival during the ocean phases of their life cycles. All relevant aspects of the amended Siuslaw Forest Plan – such as management area standards and guidelines apply to this project. Thus, this assessment is tiered to the Final Environmental Impact Statement for the Siuslaw National Forest Land and Resource Management Plan, as amended by the Northwest Forest Plan (the Plan).

The Planning Area

The planning area is a giant knotweed infestation on the northeast side of the oxbow meadow, along Drift Creek and extending into the meadow. The infestation covers about 0.15 acre. This land was purchased by the USDA Forest Service in 2002 for restoring aquatic and terrestrial processes in the area. The USDA Forest Service manages the entire area and adjacent land. The project area is located in Township 13 south, Range 11 west, Section 22; in Lincoln County. All proposed activities are within the riparian reserve of a late-successional reserve land use allocation as described in the Northwest Forest Plan.

The Problem To Be Addressed (Issues)

Based on available information, including direction from the Plan and the recommendations of the Lower Drift Creek Management Plan, District Ranger Bill Helphinstine identified the following need and associated problem:

- ✓ A small infestation (about 0.15 acre) of giant knotweed could quickly spread and occupy the oxbow meadow and preclude the restoration of estuarine function in the area.

Evidence Used by the District Ranger in Deciding to Address This Problem

The Record Of Decision (USDA, USDI 1994b) for the Northwest Forest Plan (The Plan) – based on physical, biological, and societal evidence provided by the Forest Ecosystem Management Assessment Team report (USDA, USDI, et al. 1993) and described in the Plan's environmental impact statement (USDA, USDI 1994a) – is intended to provide for healthy forest ecosystems, including protecting riparian areas and waters. The Lower Drift Creek Management Plan documents site-specific measures to implement these goals.

The Plan identified concern for northern spotted owls, marbled murrelets, and anadromous fish in the Oregon Coast Range Province (which includes the Siuslaw National Forest) because of its isolation and harvest history (chapters 3 and 4; p. 21). During the purchase of the Lower Drift Creek Management Area, the land was allocated into the following:

- ⇒ Late-successional reserve (pages C-9 to C-20) and
- ⇒ Riparian reserve (pages C-30 to C-38).

The Plan identified specific environmental conditions and appropriate commodities and amenities to be produced and maintain in each land allocation. It outlined the rules and limits governing possible activities for achieving desired conditions in each allocation.

The Assessment Report for Federal Lands in and adjacent to the Oregon Coast Province (USDA 1995) shows the planning area in the coastal fog zone block (block 1). The Report describes riparian habitat conditions on federal lands throughout the Province as degraded. It recommends specific action to improve riparian conditions using the aquatic conservation strategy. Objectives of this strategy include maintaining and restoring species composition and structural diversity of plant communities in riparian zones and wetlands.

The need to eradicate giant knotweed in the Lower Drift Creek Management Area

From a broad perspective, invasive plants are one of the "Four Threats" to national forest lands identified by USDA Forest Service Chief Bosworth. Recently Associate Chief Collins stated, "Nationwide, invasive species half cost our citizens billions of dollars while contributing to the decline of up to half our imperiled species, and the rate of new introductions has been growing steeply." (Collins 2005) The Invasive Species Issues

Team (ISIT) has developed a four-prong strategic implementation plan for the Forest Service aimed at early detection, prevention, control and management, rehabilitation and restoration. This response to a potentially devastating invasive plant is a result of early detection and rapid response to this threat.

The Pacific Northwest Region Invasive Plants EIS (USDA 2005b) identifies a concern for the damaging effects of invasive plant to the biological diversity and ecosystem integrity of lands within and outside the National Forests of the Pacific Northwest. The EIS cited 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 decreased water quality; and reduced soil productivity. Additionally, the EIS expressed concern for spread of invasive plants between National Forest system lands and neighboring areas and the substantial economic impact of invasive plants.

Locally, knotweed was first identified as a concern by a team preparing a management plan for Lower Drift Creek in 2004 (USDA 2004, p. 13). The Lower Drift Creek Management Area encompasses land acquired by the USDA Forest Service in 2003 for restoring aquatic processes and estuarine function in the area. Giant knotweed is a B-list noxious weed in the state of Oregon, meaning that control of this plant is possible on a case-by-case basis with prompt treatment. Giant knotweed is a concern in Lincoln County, which employs a full-time knotweed specialist to address treatment and preventing spread of this plant.

Help From Other Agencies and the Public

Local residents, through the Alsea Watershed Council and Alsea River Cable (which tapes and replays Alsea Watershed Council Meetings) have been apprised of the effects of knotweed on aquatic and terrestrial habitat and effective treatment methods, including herbicide injection. Four public meetings of the Lower Drift Creek Management Plan Advisory Group were held during the summer of 2004. Treatment of invasive species in general and knotweed in particular were items on the agenda at two of the meetings. The primary concern was effective treatment of knotweed species.

For this project, the processes of scoping and the notice of availability for public comment on the preliminary analysis were done concurrently. The notice of availability for the Drift Creek Knotweed Eradication Project Preliminary Analysis (PA) was published as a legal notice in the Eugene Register-Guard on July 22, 2005, informing the public that the PA is available for a 30-day review and comment period. The preliminary analysis was also posted on the Forest's website. Copies of the PA were made available at the Siuslaw National Forest Headquarters in Corvallis, and the District offices in Waldport and Florence. Copies of the PA were mailed to those who expressed interest in the proposed project or who requested a copy of the document. The legal notice and PA cover letters indicated that scoping and the notice of availability processes were being combined and indicated the beginning and end of the comment period. The comment process was described and Forest Service contact persons were identified. The comment

period ended at the close-of-business on August 22, 2005. One supportive comment was received.

Decision Framework

The Responsible Official for this project is the District Ranger for the South Zone District of the Siuslaw National Forest. The environmental assessment for this project provides the alternatives, the environmental effects of implementation, and public comments upon which a decision will be made by the District Ranger. The District Ranger will determine through a Decision Notice:

- To what extent, if any, will activities called for in the proposed project or management alternatives be implemented?
- What management requirement and mitigation measures (project design criteria) will be applied to these activities?

The primary factor that will influence the District Ranger's decision is how well the problem is addressed. The Decision Notice will document this decision and describe what activities will be implemented to address the problem. The decision will be consistent with the Siuslaw Forest Plan, as amended by the Northwest Forest Plan, and will incorporate the associated project design criteria (Appendix A), including management requirements and mitigation measures.

Chapter 2. What alternatives were developed to meet the identified needs?

In chapter 2, the District Ranger considered alternative proposals that were not fully developed for reasons disclosed. He guided the development of alternative proposals for resolving the problem and meeting the needs identified in chapter 1. These fully developed alternatives are described in this chapter; it is equivalent to the traditional section, "Alternatives Including the Proposed Action".

We designed alternatives based in part on priorities and recommendations identified in Lower Drift Creek Management Plan. We also evaluated the project activities based on history and current conditions. For example, we evaluated stream characteristics such as tidal influence and local erosion patterns to help develop the alternatives.

The infested site extends about 165 feet along Drift Creek and up to 30 feet into the meadow, with an estimated population of 1500 stems. An additional patch of giant knotweed about 200 feet upstream from the site is about 5 feet long and 5 feet wide, with about 10 stems and is believed to have originated from the larger site. Giant knotweed is below the ordinary high water level of Drift Creek and leaves and stem extend over the stream. Knotweed has been shown to out-compete and replace native riparian vegetation (TNC 2000). It is estimated the primary infestation site has nearly doubled in size in the last year. Because the size of the infestation is relatively small, eradication of the site is a reasonable expectation if it is treated, beginning this season (2005).

To control knotweed, Dawson and Holland (1999) recommended: (1) Immediately controlling new knotweed colonies before they become well established; (2) containing plant material and treating on site; (3) treating upstream sites and proceed downstream; (4) developing a long-term management policy that includes surveying; and (5) never consider partial or incomplete control measures. The existing colony is spreading rapidly and immediate eradication is needed so that it does not become well established. This site is the furthest upstream, and eradicating this population will protect downstream and upstream riparian areas. The Siuslaw National Forest partner in this project is the Lincoln County Soil and Water Conservation District, which is engaged in surveys throughout Lincoln County to identify and treat knotweed. The goal of the project is complete eradication of giant knotweed from the site.

Alternatives were developed to meet the identified need and associated problem, and to be consistent with the standards and guidelines associated with the Siuslaw Forest Plan, as amended by the Northwest Forest Plan. "Common Control Measures for Invasive Plants of the Pacific Northwest" (Appendix N, "Pacific Northwest Region Invasive Plants Program EIS", April 2005) was used to develop alternatives. The range of alternatives considered, including the alternative considered but eliminated from detailed study, reflects the problem identified, as well as comments from other invasive plant treatment plans on the Siuslaw National Forest and the Pacific Northwest Region Invasive Plants Program EIS (USDA 2005b). Concerns are addressed in the following sections, in the Alternatives Considered in Detail section, in chapter 3, and in the project design criteria (Appendix A).

Alternatives Considered But Eliminated from Detailed Study

The use of goats to eradicate the knotweed infestation was considered but eliminated from detailed study. In a controlled environment, goats may be encouraged to graze on knotweed. As a response to grazing, knotweed can be expected to sprout vigorously from its extensive root system, requiring that the goats be on site every couple weeks throughout the growing season. Treatment would need to be repeated for a number of years until the plant's root reserves are depleted. Goats will also graze on desirable vegetation, as well as knotweed, potentially removing the grasses and forbs that will recolonize the site if knotweed is eliminated. Lastly, most of the site is located on a steep bank adjacent to a creek. Aside from the potential to lose animals to drowning, removing desirable vegetation will lead to accelerated erosion of soil into the creek. There is a low likelihood that grazing by goats will meet the objective of eradicating knotweed from the site and establishing desirable vegetative cover.

Alternatives Considered in Detail

Management requirements, mitigation measures, and monitoring – Design criteria (Appendix A) outline the practices to be used and their timing and duration when planned activities under Alternatives 2 or 3 are implemented. Measures to avoid or minimize impacts associated with implementing these alternatives have been incorporated into the design criteria. Monitoring and observations of past similar action indicate that the design criteria are effective in protecting natural resources. Monitoring for this project has been identified in Appendix A for project implementation and effectiveness of design criteria.

Alternative 1 (*no action*) – The no-action alternative is required by Council of Environmental Quality regulations (40CFR 1502.14(d)). The no-action alternative forms the basis for a comparison between meeting and **not** meeting the project needs. This alternative provides baseline information for understanding changes associated with the action alternative and expected environmental responses as a result of past management actions. Selecting this alternative would continue the following resource management actions:

- ✓ Continue to monitor the size and rate of spread of the knotweed infestation in the oxbow meadow of the Lower Drift Creek Management Area; and
- ✓ Continue to coordinate with the Lincoln County Soil and Water Conservation District with regard to methods for reducing the potential spread of knotweed in the Drift Creek Watershed.

Alternative 2 (manual and mechanical treatment, with planting) – Cut the plants every 2 to 3 weeks from April through September. Dig out rhizomes of giant knotweed infesting this site in September using heavy equipment. Collect all plant material from the site after each activity, wrap it securely, and transport it to Blodgett Quarry, the closest site where knotweed would be prevented from propagating. Allow the wrapped material to dry for 5 to 10 days, and then burn the plant material. Cover the disturbed area with

several layers of black plastic, secured with rocks. Replant around the covered area with willow cuttings or native grass seed. Monitor the site the following spring, then repeat the process as needed until giant knotweed is eradicated from the site. Up to 10 years of treatment may be required to eradicate the infestation.

Alternative 3 (glyphosate treatment, with planting) – Inject individual knotweed plants with up to 5 ml of AquaMaster®, a formulation of glyphosate registered by the Environmental Protection Agency for use in aquatic environments. Up to 2 gallons of AquaMaster® could be used on the site. The first application would be in late summer or early fall 2005, followed by replanting the treated area with willow cuttings or native grass seed. Monitor the site the following spring for effectiveness of the treatment. If any giant knotweed is found, a second glyphosate injection treatment is warranted, followed by additional planting. Up to four years of treatment may be required to eradicate the infestation.

Individual knotweed stems will be injected with glyphosate by a licensed herbicide applicator. Stems are counted to ensure that the amount of glyphosate applied does not exceed the prescribed amount. Other actions to minimize the risk of improper introduction of glyphosate to the environment include cleaning the application tool in a hardened location and recovering and properly disposing of water used to clean the equipment.

The use of glyphosate is allowed under Mediated Agreement to the 1988 Vegetation Management EIS (USDA 1988). However, analysis of this alternative considers updated information developed during analysis of the Pacific Northwest Region Invasive Plants EIS (USDA 2005b). This action will follow the standards analyzed in the Invasive Plants EIS as well as the Mediated Agreement.

Chapter 3. What environmental effects are predicted for each alternative?

In chapter 3, we predict the likely effect of each action under each alternative; it is equivalent to the traditional section "Environmental Consequences". The Northwest Forest Plan, LSR Assessment, Drift Creek (Alsea) Watershed Analysis, and Lower Drift Creek Management Plan provide evidence for baseline environmental conditions from which direct, indirect, and cumulative effects are analyzed in chapter 3. These assessments provide a cumulative view of environmental conditions at different landscape scales and consider past, present, and reasonably foreseeable future actions.

One advantage to the partnership with the Lincoln County Soil and Water Conservation District in treating this knotweed infestation is an improved analysis of indirect and cumulative effects. Knowing the identified locations of knotweed infestations in the watershed and downstream allows us to predict effects with more certainty than if projects were analyzed separately. Cumulative effects are disclosed under the section titled "Other Predicted Effects" and describe how all actions, including those expected from other landowner, affect each resource.

In this chapter, we predict the likely environmental effects of the proposed alternative, the outcomes of which are based on the assumption that the Forest standard and guidelines, the project design criteria (Appendix A), and terms and conditions of the biological opinions associated with this project have been followed. Biological Opinion 2003/00261, issued by the NOAA-Fisheries for knotweed eradication in Lincoln County, Oregon, includes terms and conditions that are incorporated in the project design criteria (Appendix A). Biological evaluations have been completed for plants and wildlife.

Based on scientific literature and our collective experience, we are confident in the accuracy of the analysis of the **current** conditions discussed in chapter 1. In chapter 3, when we describe the environmental effects of each alternative, we are **predicting** those effects based also in the literature and out collective experience; however, we recognize that predictions are inherently uncertain, some just a little and some highly.

When the District Ranger chose members of the interdisciplinary team, he considered possible scenarios for this environmental assessment and determined what disciplines would illuminate decisions about them. Relying on his professional judgment and expertise, he chose the disciplines and formed the team of Forest experts in those disciplines. Team members reviewed the site of the proposed action.

The Pacific Northwest Region Invasive Plants Program EIS (USDA 2005b) was used as a basis for the analysis of this project. This analysis reviewed relevant refereed literature, and consulted disciplinary colleagues in the Forest Service, other agencies, universities, and elsewhere. Often, literature reviewed by team members was deemed incomplete and, though studies of similar environments and similar scenarios were reviewed, the expert's professional judgment was required to determine what information can be appropriately used here – and how strongly it supports predictions about what the environmental effects of the proposed actions will be. Refereed literature about herbicide effects is plentiful and technical. The USDA Forest Service risk assessment for glyphosate (SERA 2003) reviewed and synthesized available literature and data, and helps assure that the literature review did not miss a valuable resource. Consequently, the risk assessment for glyphosate was used as a basis for predicting effects in the Lower Drift Creek Management Area. Consultation with other experts provides opportunity to debate and strengthen the team expert's conclusions about how proposed actions are likely to affect the environment. Although local team members benefit from the array of research information and the insights of colleagues, they are valued most for their experience in and knowledge about the Lower Drift Creek Management Area.

Vegetation

Forest Service Sensitive plants, lichens, and fungi—At the time of project initiation, there were no documented Sensitive plant, lichen, or fungi sites within or adjacent to the project area. A pre-field review of the project area determined that there was potential habitat for 4 Forest Service Sensitive plants and lichens. A field survey conducted on June 24, 2005 did not find any Sensitive species or their habitat.

Under alternative 1 (no action), current conditions at the site will be maintained. Since there are no Sensitive plant, lichen, or fungi species at the site, selection of the alternative will result in no impact to these species.

Under alternatives 2 an 3, implementation of a knotweed eradication project will have no impact on Sensitive plant, lichen, and fungi species because no habitat is present within or adjacent to the project area.

Riparian vegetation—The infestation in the Lower Drift Creek Management Area is the only known population in the Drift Creek drainage (M. Savage, personal communication), and the Alsea River watershed may be the least infested basin in Lincoln County (NOAA 2003). The Lower Drift Creek infestation is spreading along the stream bank and into the meadow, threatening remnant populations of native willow and tufted hairgrass. Giant knotweed spreads along riverbanks and grows in wetlands and disturbed areas. It is found primarily in open sites (Beerling 1990, 1991). As such, the entire oxbow meadow, about 60 acres, is suitable habitat for giant knotweed. Other restoration planned actions are intended to return native species to the area, so protecting these populations of native species is crucial to the overall recovery effort.

Alternative 1 (no action)--Alternative 1 would not treat the giant knotweed infestation. Giant knotweed infestations reproduce through rhizomes, which can reach up to 20 meters from the plant. The knotweed infestation is estimated to be expanding about 50% to 100% per year at this site. The knotweed is excluding other plants beneath its canopy, and could result in a monoculture in the area, as has happened in other sites around Lincoln County.

Pieces of rhizome, less than one inch long can also start new infestations. Dispersal can occur when rhizome or stem fragments break off and move by water (TNC 2004). Drift Creek is influenced by the tide at this site, so rhizome fragments broken off during a flood or windstorm can move both upstream and downstream from this site, infesting both private and public lands in lower Drift Creek and the lower Alsea River. This has already occurred in the Yaquina River basin, just north of the Alsea River basin. Delaying treatment increases the risk of a storm or other disturbance resulting in plant fragments spreading from this site.

Alternative 2 (manual and mechanical treatment, with planting) – The infestation would be cut by hand, since the infestation site on the steep bank of Drift Creek will not allow the use of a mower. Mechanical removal of the rhizomes would also remove adjacent vegetation, including remnant native plant populations. Planting and seeding would be done by hand. This disturbance would continue until the population is eradicated in five to ten years. Meanwhile, rhizomes would continue to be exposed to storms or other disturbances that could create new infestations in the Lower Drift Creek basin. In addition, rhizome fragments, resulting from this type of treatment, could increase the risk of spreading from this site.

Alternative 3 (glyphosate treatment, with planting) – Glyphosate injection, planting and seeding the site would be done by hand. Herbicide injection eliminates the possibility of contacting other plant species with herbicide, so no herbicide effects to vegetation are expected. Trampling would disturb existing vegetation, including remnant native plant populations. This disturbance would continue until the giant knotweed population was eradicated in two to four years. The risk of rhizomes spreading to other sites would be at current levels. Disturbance to desirable vegetation would occur, but less than that associated with Alternative 2 because no mechanical methods would be used and the number of treatments would be less.

Treatment effectiveness—Alternative 1 (no action) allows this giant knotweed infestation to spread. Rate of spread at this location is about 100% per year. Spread is primarily due to the rhizomes growing out from the infestation. It is predicted that the entire oxbow meadow could be covered in less than forty years. Further, broken rhizomes carried downstream or upstream could start new infestations, making eradication in the Drift Creek and Alsea River basins impossible, and control difficult and expensive.

Alternative 2 (manual and mechanical treatment, with planting) would require diligence over a number of years to be effective. While giant knotweed plants remain, rhizomes would be subject to floods and extreme high tides, causing breakage that could allow new infestations downstream or upstream of the site. The treatment itself carries risk of spread, since plant material—including rhizomes—would likely be transported off site, exposing the route to infestations of giant knotweed. To illustrate this point, Yachats River landowners attempted to eliminate knotweed from their properties by cutting plants and dropping the remains into the river. This resulted in a monoculture of knotweed that spread into the lower portion of the river basin. Knotweed has also sprouted from mats of stems in the river, even on large wood that trapped knotweed debris. This points to the risks associated with manual or mechanical treatment of this species and the importance of treating knotweed effectively.

If eradication were unsuccessful, herbicide use would be re-evaluated. Since spread of the infestation would be the indicator of lack of success, more herbicide would be needed to treat the infestation than is needed while the infestation is relatively small.

Alternative 3 (glyphosate treatment, with planting) includes the most effective known method of eradicating giant knotweed. Prompt action with herbicide injection shortens the time upstream and downstream sites would be exposed to the risk of infestation from rhizomes broken off during floods or extreme high tides.

Soil and Water Resources

Sediment production and soil productivity – The infested area is on an outside corner of a shallow meander of Drift Creek, and as such is subject to bank erosion. At low flow, when the tide is out, a log extending into the stream slows the flow and creates a backwater below the infested area. At higher flows or high tide, the bank is exposed to erosion. Stems are below the highest high tide level. Although giant knotweed can form

a monoculture, this infestation has not yet completely excluded other vegetation. A few other sparsely located plants are found below the giant knotweed plants, with bare soil between the stems of the various plants. When the knotweed dies back for the winter, the soil on the bank is exposed to wind and rain.

Alternative 1 (no action) - The infested site is exposed to high flows and tides, winds and rain. Giant knotweed dies back to the ground after the first hard frost, then grows back rapidly in the spring (TNC 2004). Under monoculture conditions, this leaves bare soil exposed to surface erosion during the season of highest rainfall. Coupled with rapid expansion of the infestation, could result in sediment production and concurrent loss of soil productivity in the oxbow meadow, expanding with the infestation.

Alternative 2 (manual and mechanical treatment, with planting) – Some trampling and soil displacement from planting and cutting would be expected. In the fall, heavy equipment would be used to dig up the rhizomes, and some soil would be lost with the plant material. Some bare soil would be exposed to wind and rain until new vegetation effectively controls erosion. Sediment production and delivery to Drift Creek is expected from the exposed soil, though subsequent planting and covering the disturbed area with plastic would ensure this effect was short-term. Loss of soil productivity due to soil removal from the site and erosion is expected. Placing several layers of black plastic over the site would delay restoration of soil productivity to the site but productivity would be returned as soon as the plastic was removed. This effort would need to be repeated for a number of years, perhaps using hand crews to dig up the rhizomes after the initial effort. Repeated treatment perpetuates soil loss and sediment production until the giant knotweed was eradicated.

Alternative 3 (glyphosate treatment, with planting) – Glyphosate injection, planting and seeding the site would be done by hand. Some trampling and displacement of soil from these activities would be expected, though the plants growing sparsely under the giant knotweed and the thatch would remain after treatment and provide some protection from erosion. Disturbance to soil would be less than that associated with Alternative 2 because no mechanical methods would be used and the number of treatments would be less.

Glyphosate is the active ingredient in AquaMaster®. Risk assessments locate, evaluate, and synthesize refereed research and other data. The following information summarizes the effects to sediment production and soil productivity from the use of glyphosate from the USDA Forest Service risk assessment, then applies this information to the Lower Drift Creek site:

- Glyphosate is not extensively metabolized or detoxified by plants. Soil strongly adsorbs glyphosate and it does not retain herbicidal properties following contact with soil. Some glyphosate may be translocated from the rhizomes to the soil, but it is not expected to affect other vegetation on site. Remaining vegetation, while preventing erosion, also protects soil productivity on the site.
- Glyphosate is readily metabolized by soil organisms and many species of soil microorganisms can use glyphosate as a sole carbon source. There is very little information suggesting that glyphosate will be harmful to soil microorganisms under

field conditions and a substantial body of information indicating glyphosate is likely to enhance or have no effect on soil microorganisms. Soil productivity is not likely to be affected and may be enhanced for a short time following application of glyphosate.

- The half-life of glyphosate in soil can range from 2 to 50 days. Glyphosate degradation in soil is expected to be relatively slow at this site since the soil is dominated by fine particle soils.

Water quality: solar radiation and temperature – Drift Creek discharge is high at this site, with a relatively wide, deep channel. The knotweed infestation is on the south side of Drift Creek, which means vegetation would need to be 20 to 30 feet tall to block substantial amounts of solar radiation relative to discharge. Giant knotweed only grows to a height of 10 to 12 feet. Conifer is the preferred species for providing shade at this site because it has the most shading capability of all native species. Knotweed will preclude conifer establishment, reducing the potential to provide adequate shading.

Alternatives 1 (no action) – Existing willows adjacent to the infested area are 15 to 20 feet tall, providing some shade to Drift Creek. This shade does not measurably affect water temperature because of the relatively high discharge at this point. Giant knotweed colonizes open, disturbed areas and prevents the establishment of native plants such as willow. If the current infestation continues to spread, potential shade from native vegetation would be lost, and the opportunity to moderate stream temperatures through vegetative restoration would be lost.

Alternatives 2 (manual and mechanical treatment, with planting) and 3 (glyphosate treatment, with planting) - Removal of vegetation may result in short-term increases in direct solar radiation at the treatment site. Because giant knotweed is not blocking solar radiation relative to Drift Creek, no measurable effect to water temperature is expected from either action alternative.

Water quality: turbidity, habitat modification, and biological criteria – Turbidity, habitat modification, and biological criteria (diversity of macroinvertebrates in water) are Oregon DEQ water quality parameters (DEQ 2005). Drift Creek is not listed for failure to meet standards for these criteria.

Alternative 1 (no action) – Giant knotweed is likely to spread aggressively from this site, particularly along the banks of Drift Creek and into the oxbow meadow and slough. Surface erosion during the winter could increase turbidity locally, and this effect could spread upstream and downstream from the site, as the infestation spreads. Giant knotweed prevents the establishment of native vegetation, including trees, resulting in a lack of input of large wood to Drift Creek and the oxbow meadow slough. A monoculture of giant knotweed would change the quality and timing of the input of nutrients to Drift Creek and the slough, resulting in a reduced diversity of macroinvertebrates.

Alternative 2 (manual and mechanical treatment, with planting) – Manual and mechanical treatment would result in localized introduction of fine sediment to Drift Creek during

treatment. Daily turbidity pulses occur naturally when the direction of the tide changes in areas near the transition between salt water and fresh water, which is within the project area. Changes in turbidity are expected to be within the range of natural variability at this site. This effect is expected to be minor and short term and largely mitigated by the project design criteria (Appendix A). Effective treatment is expected to result in improved habitat over time. A diversity of native plant species supports a diversity of aquatic macroinvertebrates.

Alternative 3 (glyphosate treatment, with planting) – Glyphosate injection and planting would result in minor localized introduction of fine sediment to Drift Creek during treatment. This effect is expected to be minor and short term. Effective treatment is expected to result in improved habitat over time.

The preponderance of evidence in the relevant scientific literature indicates that the use of glyphosate near the water poses a minimal risk of long-term adverse effects on the prey base of salmonids (Morgan et al. 1991, Norris et al. 1991, Anton et al. 1994, Gardner and Grue 1996, Simenstad et al. 1996, Kilbride and Paveglio 2001, SERA 2003). Any effects to estuarine invertebrates would likely be of limited temporal and spatial extent as well (NOAA 2003).

Water quality: herbicide concentration
Alternatives 1 (no action) and 2 (manual and mechanical treatment, with planting) – Herbicide treatment would not be used under alternatives 1 and 2, so these alternatives would not introduce glyphosate to water.

Alternative 3 (glyphosate treatment, with planting) – Glyphosate is a commonly used herbicide. The majority of the Drift Creek watershed is in federal ownership, with no use of herbicides (including glyphosate) on these lands. The adjacent landowners are engaged in forestry and cattle ranching, and they may use glyphosate as part of these operations. Glyphosate is not listed as a state water quality parameter in Oregon.

The product label for AquaMaster®, the formulation that would be used to inject the stems, is 53.8% glyphosate salt and 46.2% inert ingredients. The exact composition of the other ingredients is Confidential Business Information and is therefore unknown. However, the risk assessment (SERA 2003) states that AquaMaster® appears to be glyphosate and water. The NOAA-Fisheries Biological Opinion also asserts that the AquaMaster® is composed of glyphosate and water. Thus, it is unlikely inert ingredients are of concern to water quality.

Glyphosate dissolves easily on water (Norris et al. 1991, SERA 2003). Because glyphosate is strongly adsorbed by soil particles, it is not easily released back into water moving through soil. Herbicide injection, the recommended herbicide treatment method for giant knotweed, eliminates accidental introduction of glyphosate into Drift Creek through overspray or wind during application. Glyphosate released when the plant dies and rots would bind tightly to soil.

The most likely source of measurable concentrations of glyphosate in the stream is rotting plants in water. Glyphosate entering the water may quickly be bound to sediment and suspended particulates (Solomon and Thompson 2003). The half-life of glyphosate in water is 3 to 70 days. Given the propensity for glyphosate to bind to fine sediment and the abundance of fine sediment in Drift Creek, it is unlikely that measurable amounts of glyphosate can be found in Drift Creek.

Aquatic Species

Many aquatic species are found in Drift Creek, including a number of anadromous fish, invertebrates, and plants. Seals occasionally visit the area, and amphibians are found in local sloughs and wetlands, though not generally in the main stem of Drift Creek. Drift Creek is Essential Fish Habitat under the Magnuson-Stevens Act.

Alternative 1 (no action) – The presence of giant knotweed on the banks of Drift Creek indirectly affects aquatic species. Effects to turbidity, shade, stream temperature, cover, and nutrients over a large area are described earlier. These factors could affect many aspects of life cycles of aquatic species.

Alternative 2 (manual and mechanical treatment, with planting) – No direct effects to aquatic species are expected from this alternative. As described under water quality, this alternative will result in short-term indirect effects to habitat factors at the project site. The site is small relative to the rest of the stream, and habitat conditions in the willow patch just upstream of the site are of superior quality and will not be affected by treatment.

Changes in turbidity and other habitat factors are unlikely to be sustained, and effects to aquatic species due to treatment are expected to be negligible.

Alternative 3 (glyphosate treatment, with planting) – As with alternative 2, no direct effects to aquatic species are expected from this alternative. As described under water quality, this alternative will result in short-term indirect effects to habitat factors at the project site. The site is small relative to the rest of the stream, and habitat conditions in the willow patch just upstream of the site are of superior quality and will not be affected by treatment.

Glyphosate injection avoids direct contamination from drift or indirect contamination from runoff since the herbicide would remain contained in the plant itself. Glyphosate binds quickly and strongly to soil, so glyphosate translocated to the soil from the plant is unlikely to contaminate Drift Creek with glyphosate.

The injection method increases the risk of spills since a concentrated formulation of glyphosate would be used (NOAA 2003). The project design criteria (Appendix A) include measures to prevent spills, limit the amount of herbicide that can be spilled, and support effective response to spills. These measures minimize both the likelihood of a spill and the effects should one occur. Up to two gallons of the AquaMaster®

formulation will be used on this site, and this amount spilled into Drift Creek could reach concentrations that could affect aquatic organisms. Contaminates in flowing water are likely to move downstream and concentrations would decline rapidly as mixing occurs and glyphosate binds to particulates (Solomon and Thompson 2003), although elevated concentrations may persist in near-bank areas with slow velocities (NOAA 2003). This site has low velocities during low tides, when the embedded tree slows water, but once the water level rises above the tree, velocities rise. Effects from an unlikely spill of the entire amount of glyphosate applied would be of short duration due to dilution in Drift Creek. Preventing the spread of knotweed will maintain existing riparian habitats, resulting in long-term benefits to aquatic species (USDA 2005a).

A biological opinion from NOAA Fisheries (2003/00261) provides terms and conditions for application of glyphosate to knotweed in Lincoln County. These terms and conditions are included in the project design criteria (Appendix A).

Terrestrial Species

Federally listed species – The project area is outside the range or contains no suitable habitat for the Oregon silverspot butterfly, brown pelican, Nelson' sidalcea (checker mallow), western lily, or western snowy plover, thus none of the alternatives affect these species.

Disturbance – Alternative 1 (no action) would not disturb any wildlife species. Alternative 2 (manual and mechanical treatment, with planting) would include noise from heavy equipment and generalized human disturbance during the operating period. Alternative 3 (glyphosate treatment, with planting) would include generalized human disturbance while workers were on site. The treatment period does not coincide with the critical breeding periods of any designated species. Therefore, under both action alternatives, project activities will have no effect on listed species.

Habitat— Although it appears that grazing animals have tasted the knotweed, in general there is no indication that they find it palatable. Some insects may eat giant knotweed leaves, though few leaves have signs of insect holes. In general, knotweed infestations are poor habitat for native wildlife species. For instance, on a recent field visit, songbirds were abundant in the willow patch adjacent to the infested site, while no songbirds were seen in the giant knotweed. Giant knotweed can form monocultures, excluding other plants from the site. Native plant exclusion can be seen in Lincoln County, and is a source of concern for native plant species.

Under alternative 1 (no action)—In the next 1 to 2 years, small changes in wildlife habitat are expected, but not enough to affect use and distribution. In the long-term, the giant knotweed infestation would spread and form a monoculture, replacing palatable food and suitable habitat with unpalatable food and poor habitat for wildlife. Desirable native plant species would be replaced by giant knotweed, perhaps over the entire Lower Drift Creek Management area, or in satellite locations downstream in Alsea Bay.

Under alternatives 2 (manual and mechanical treatment, with planting) and 3 (glyphosate treatment, with planting), no existing habitat would be lost, and effective treatment would lead to restoration of suitable habitat and palatable food for wildlife species. Native and non-native plant species currently growing under the canopy of the infestation would be removed with the knotweed. Planting after treatment would reestablish native or non-native non-invasive vegetation after treatment.

Effects from herbicide formulations – Under alternatives 1 (no action) and 2 (manual and mechanical treatment, with planting), no herbicides would be used, so wildlife would not be exposed to herbicides from treatment of this infestation.

Under alternative 3 (glyphosate treatment, with planting), AquaMaster® would be injected into individual giant knotweed stems. For an herbicide to affect individual wildlife, an animal must be exposed to the herbicide, and the amount it is exposed to must be sufficient to cause an effect.

Glyphosate and this particular formulation is the subject of a USDA Forest Service risk assessment. Risk assessment includes identifying the hazards associated with glyphosate, assessment of potential exposure to this compound, assessment of the dose response relationships, and characterization of the risks associated with plausible exposure to this compound (SERA 2003).

Glyphosate in sufficient quantities can harm wildlife. Injecting glyphosate limits plausible exposure scenarios to eating treated vegetation. To get the full dose of applied glyphosate, the animal would need to eat the injected stem before the glyphosate is translocated throughout the plant. Eating four plant stems immediately after treatment would expose a 70 kg mammal to a dose sufficient to exceed the “no observable adverse effect level” of glyphosate. An animal ingesting this amount may become ill until its body eliminated the glyphosate, but is unlikely to die from the herbicide dose. Bird and insect species are less sensitive to glyphosate than mammals. The stems show no signs of palatability to any species.

The most plausible scenario for exposure is an animal drinking spilled AquaMaster®. If the herbicide were spilled into Drift Creek, dilution would decrease the dose below the “no observable adverse effect level”, and again could become ill. However, an animal could ingest enough glyphosate to exceed this level if it were left on the surface. Project design criteria (Appendix A) and lack of herbicide palatability limit the likelihood of an effect to wildlife species under this scenario.

Effects to plants growing under the canopy of the infestation include trampling during treatment. Injection of stems prevents indirect herbicide effects to adjacent plants.

Human Uses and Influences

Lincoln County is significantly concerned about the effects knotweed species could have on agricultural lands, water quality, and fish habitat. Through the Lincoln County Soil

and Water Conservation District and the USDA Natural Resources Conservation Service, a local board has devoted resources to hire a knotweed specialist for the county, as well as at least two crews to identify and treat infestations throughout the county. Alternative 1 (no action) would not meet the needs of the local community in terms of preventing the spread of this giant knotweed infestation onto private lands in the basin. The action alternatives (2 and 3) would meet this need, although the most effective treatment (integrated approach, using glyphosate injection) would meet this need more responsively.

Effects to workers and the public – Under Alternative 1 (no action), workers and the public would not be exposed to potential safety hazards.

Alternative 2 (manual and mechanical treatment, with planting) would expose workers to injuries, such as sprains, cuts and bruises, particularly because access to the site is steep and slippery. Use of heavy equipment exposes workers to noise and hearing damage. Transporting workers, equipment, and plant material exposes workers to harm from vehicle accidents. This exposure would continue over a number of years since repeated treatment would be necessary. Members of the public would be exposed to a slight increase in traffic under this alternative, but otherwise would not be exposed to hazards.

Alternative 3 (glyphosate treatment, with planting) would expose workers to injuries such as sprains, cuts and bruises, particularly because access to the site is steep and slippery. None of the scenarios for workers assessed in the USDA Forest Service risk assessments, even at the highest application rate, exceeded the dose of glyphosate that would cause observable adverse effects to humans (USDA 2005b). Project design criteria (appendix A) would help minimize risk to workers. Transporting workers and equipment material exposes workers to harm from vehicle accidents. This exposure would be repeated for two years while treatment continued.

Members of the public would be exposed to a slight increase in traffic under this alternative. Knotweed is not desirable for human consumption and does not produce edible fruit. One scenario for exposure to the public assessed in the USDA Forest Service risk assessments exceeded the dose of glyphosate that would cause observable adverse effects to humans (USDA 2005b). In this scenario, more glyphosate than will be applied at this site was spilled into a small pond, and the water was ingested by a small child. None of these conditions exists on the site. There is no known drinking water source downstream of the site, and the brackish nature of Drift Creek here precludes ingestion of water from Drift Creek. None of the other scenarios for the public assessed in the USDA Forest Service risk assessments, even at the highest application rate, exceeded the dose of glyphosate that would cause observable adverse effects to humans (USDA 2005b). Project design criteria (Appendix A) require informing the public of ongoing treatment.

Summary of Project Costs

Table 1 summarizes project costs. Calculations for these estimated costs are in the analysis files. The estimates assume that workers would receive the same wage, regardless of the task. The estimates are based on 2005 costs, which may increase in later years. The table is provided to allow economic comparison of the alternatives only.

Table 1. Summary of project costs by alternative

Year	Activity	***Alternative 1*** No Action	***Alternative 2*** Manual and Mechanical Treatment	***Alternative 3*** Glyphosate Treatment
1	Cut plants every 2 to 3 weeks for 6 months	$0	$1,000	$0
	Dig out rhizomes with heavy equipment	$0	$1,000	$0
	Destroy plant material	$0	$500	$0
	Cover with plastic	$0	$200	$0
	Replant	$0	$100	$100
	Inject with glyphosate	$0	$0	$1,000
Year 1 total costs:		$0	$2,800	$1,100
2	Cut plants every 2 to 3 weeks for 6 months	$0	$1,000	$0
	Grub out rhizomes by hand	$0	$1,000	$0
	Destroy plant material	$0	$500	$0
	Cover with plastic	$0	$200	$0
	Replant	$0	$100	$100
	Inject with glyphosate	$0	$0	$1,000
Year 2 total costs:		$0	$2,800	$1,100
3 to 5	Cut plants every 2 to 3 weeks for 6 months	$0	$1,000 x 3	$0
	Grub out rhizomes by hand	$0	$500 x 3	$0
	Destroy plant material	$0	$250 x 3	$0
	Cover with plastic	$0	$100 x 3	$0
	Replant	$0	$100 x 3	$100 x 2
	Inject with glyphosate	$0	$0	$1,000 x 2
Year 3 to 5 total costs:		$0	$5,850	$2,200*
Year 5 to 10 total costs		$0	$6,450	$0
Total project costs:		$0	$17,900	$4,400

*Glyphosate treatment is not expected to exceed 4 years.

In evaluating project costs, it should be noted that the No Action alternative has no direct costs but has enormous indirect costs. The infestation will spread off-site, shifting treatment costs and responsibilities to downstream landowners. Further, it will not be possible to eradicate giant knotweed from the site within the next five years, given the rate of spread and ability to exclude other species. Costs to the ecosystem of this possibility are incalculable.

Other Predicted Effects

Cumulative Effects

Alternative 1 (no action) - Giant knotweed will continue to spread quickly. Giant knotweed can grow on moist and upland sites, and the low salinity found in Drift Creek and the Alsea Bay does not prevent infestation. At this time, it is spreading into the oxbow meadow, downstream and upstream from the infested site. Loss of habitat for aquatic and terrestrial species, effects to the food chain, increased solar radiation to Drift Creek and sloughs with increased stream temperature, and erosion with loss of soil productivity are expected to ensue. With no treatment, the potential for future infestations in Forest Service and other ownerships will increase substantially, based on the spread seen in other parts of Lincoln County. This, in turn, increases the potential for the use of herbicides on Forest Service and other ownerships in the future.

Alternative 2 (manual and mechanical treatment, with planting) will require several years of treatment and diligence to eradicate giant knotweed from the site. In the meantime, live stems and rhizomes will be available to be broken off and transported, increasing the risk of spreading new infestations downstream or upstream during that time. New infestations carry the risk of creating cumulative effects as described in the no action alternative.

Alternative 3 (glyphosate treatment, with planting) requires two years of treatment to effectively eradicate giant knotweed from the site. Any stems or rhizomes that are transported are likely to be dead, though the risk of new infestations is not eliminated after the first treatment. Glyphosate has a relatively short half-life in water and soil. It does not accumulate in the bodies of animals that ingest it, and it is used as a sole carbon source for some soil microorganisms (SERA 2003). Further, prompt treatment of the existing infestation prevents the need for herbicide use to treat other infestation sites caused by the current site.

Aquatic Conservation Strategy

On March 22, 2004, the USDA Under Secretary for Natural Resources and the Environment signed a Record of Decision (ROD) amending the Northwest Forest Plan. The decision clarifies provisions relating to the application of the Aquatic Conservation Strategy (ACS). Specifically, the amendment removes the need for deciding officials to certify that individual projects meet ACS objectives at the site-specific level and short time frames. Instead, the ROD requires individual projects to meet ACS standards and guides and that ACS objectives be met at watershed of larger scales (5^{th} field hydrologic fields or greater) and over longer time periods of decades or more. Project records must also demonstrate how the decision maker used relevant information from watershed analysis to provide context for project planning.

The 5^{th}-field Drift Creek (Alsea) Watershed Analysis and the Lower Drift Creek Management Plan describe existing conditions in the watershed, including those that are

having adverse effects on watershed health. The Drift Creek Giant Knotweed Eradication Project is designed to maintain, restore, and protect watershed health by eradicating a plant that threatens the watershed health locally and could spread and threaten watershed health both upstream and downstream of the treatment area. By improving and protecting watershed health, the project meets ACS objectives, standards, and guidelines in the short term and long term at the watershed scale.

Short-Term Uses and Long-Term Productivity

The use or protection of natural resources for long-term, sustained yield is the legislated basis of management and direction for the Forest Service (USDA, USDI 1994a, p. 32). The design criteria were developed to incorporate the standards and guides of the Siuslaw National Forest Plans, as amended by the Northwest Forest Plan. We expect that applying them to the proposed management actions will reduce the potential for long-term loss in productivity of soils that may result from short-term uses. They will also allow for the long-term restoration of aquatic ecosystems.

Unavoidable Adverse Effects

Implementing any alternative, including the no-action alternative, would result in some adverse environmental effects that cannot be avoided. The design criteria, along with Forest standards and guides, are intended to keep the extent and duration of these effects within acceptable rates, but adverse effects cannot be completely eliminated. The following adverse consequences would be associated to some extent with the no-action alternative:

- Spread of giant knotweed will continue, resulting in loss of habitat for native riparian vegetation.

The following adverse environmental consequences would be associated to some extent with alternatives 2 and 3:

- Management actions result in short-term, localized reductions in air quality from dust and vehicle emissions.
- During management actions, there will be a temporary increase in large vehicle traffic (Alternative 2) and passenger vehicle traffic (both action alternatives).

Irreversible Resource Commitments

Irreversible commitments of resources are actions that disturb either a non-renewable resource (for example, heritage resources) or other resources to the point that they can only be renewed over 100 years or not at all. No irreversible resource commitments are expected with this project.

Irretrievable Commitment of Resources

An irretrievable commitment is the loss of opportunities for producing or using a renewable resource for a period of time. Almost all activities produce varying degrees of irretrievable resource commitments. They parallel the effects for each resource discussed

earlier in this chapter. They are not irreversible because they could be reversed by changing management direction. There is no example of irretrievable commitment of resources for this project.

Environmental Justice

Based on local knowledge, low-income people live within easy traveling distance of the site, and some may augment their diet or recreate by hunting elk or fishing. Proposed activities are not expected to affect hunting or fishing opportunities, and long term opportunities for these activities would remain. The effects of the alternatives on the human environment (including minority and low-income populations) are expected to be similar for all human populations regardless of nationality, gender, race, or income. No disproportionately high and adverse human health or environmental effects on minority populations and low-income populations are expected as a result of implementing actions described for alternatives 2 and 3.

Other Disclosures

Based on the Team's evaluation of effects, we concluded:

- ⇒ None of the alternatives would affect minority groups, women, and consumers differently from other groups. These groups may benefit from the restored habitat for fish and other species; the no-action alternative may adversely affect fish habitat. None of the alternatives adversely affects civil rights.
- ⇒ None of the proposed activities will affect known prehistoric or historic sites. The site was disturbed through cultivation prior to infestation. Under the Programmatic Agreement with the State Historic Preservation Officer, invasive plant species eradication—through the application of herbicides and hand removal (including hand tools such as shovels to dig up roots)—has no potential to cause effects to cultural resources. Machine excavation under alternative 2 would require testing or monitoring during treatment. As outlined in the American Indian Religious Freedom Act, no effects are anticipated on American Indian social, economic, subsistence rights, or sacred sites.
- ⇒ No adverse effects on wetlands and floodplains are anticipated. No farmland, parkland, rangeland, wilderness, or wild and scenic rivers will be affected.
- ⇒ This environmental assessment is tiered to the Siuslaw Forest Plan FEIS, as amended by the Northwest Forest Plan, and is consistent with those plans and their requirements.
- ⇒ Proposed activities are not in or adjacent to an inventoried roadless area.
- ⇒ Proposed activities are consistent with the Coastal Zone Management Program.
- ⇒ None of the proposed activities are expected to substantially affect human health and safety.
- ⇒ Proposed activities are consistent with the Clean Air Act because effects from the use of passenger vehicles and heavy equipment that can generate dust and exhaust are localized and short-term.
- ⇒ Because of the design criteria (Appendix A) to be applied, this project is expected to be consistent with the Clean Water Act.

⇒ The proposed activities are not expected to measurably affect global warming. The USDA Forest Service will continue an active leadership role in agriculture and forestry regarding the reduction of greenhouse gas emissions.
⇒ These actions do not set a precedent for future actions because they are similar to actions implemented in the past.

List of Agencies and Organizations Consulted

Agencies—Lincoln Soil and Water Conservation District; NOAA Fisheries, Portland, OR.

Organizations—Confederated Tribes of Siletz, Mid-Coast Watershed Council, Alsea Watershed Council, Oregon Watershed Enhancement Board.

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Appendix A

Project Design Criteria

The following project design criteria were developed from the standards in the "Pacific Northwest Region Invasive Plant Program EIS", April (USDA 2005b). The first 10 standards apply to prevention activities and do not apply directly to this project. The statements below describe how this project meets the standards in the EIS.

11) This project was prioritized in cooperation with the Lincoln Soils and Water Conservation District, which works with multiple land owners in Lincoln County, and who have prioritized knotweed treatment very highly in the county.

12) Long-term treatment plans are included in the alternatives.

13) Native willow and grasses will be used for revegetation at this site.

14) Not applicable.

15) This standard applies to alternative 3 only. 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 a herbicide transportation and handling safety plan. The Lincoln County knotweed specialist provides the supervising applicator and has safety plans on file.

16) This standard applies to alternative 3 only. This project uses an herbicide and application methods allowed by this standard. The US Environmental Protection Agency permits this formulation and application method as well.

17) Not applicable. The rationale for the use of herbicides, if alternative 3 is selected, will be included in the Decision Notice for this project.

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. AquaMaster® is specifically evaluated in the glyphosate risk assessment.

19) This standard applies to alternative 3 only. Apply herbicide during low tide. Injection is probably the least likely application method to expose other species to herbicides. AquaMaster® is registered for aquatic use.

20) The Biological Opinion from NOAA-Fisheries provides design criteria to protect species and critical habitats listed under the Endangered Species Act.

21) Not applicable.

22) Not applicable.

23) Prior to implementation of treatment projects, each Forest will develop a public information plan. The plan will ensure (at a minimum) that timely (normally 15 days) public notification will occur. Warning and information signs will be placed at appropriate locations (defined in the public information plan) to inform the public and forest workers of herbicide application dates and the herbicide used. If requested, individuals may be notified in advance of application dates and times.

The following project design criteria were adapted from the NOAA-Fisheries Biological Opinion and apply only to alternative 3:

1. Trained individuals under direction of a licensed applicator would apply herbicides using only low-pressure spot spray or injection application methods in accordance with label instructions.
2. Herbicide is limited to AquaMaster®. Injection application will use undiluted AquaMaster® without surfactant.
3. Not applicable
4. Not applicable
5. All herbicide application would occur from May through October, and would stop at the onset of the rainy season in October.
6. No herbicides would be applied to open water (surface water) or applied to plants in standing water.
7. Only the quantity of herbicides needed for a day's use would be transported to the project site.
8. Areas used for mixing herbicides would be located where an accidental spill would not run into surface waters or result in groundwater contamination. Impervious material would be placed beneath mixing areas in such a manner as to contain any spills associated with mixing or refilling.
9. A spill kit would be on site during all herbicide application.
10. Equipment cleaning, storage, and disposal of rinsates and containers would follow all applicable state and federal laws.

Other design criteria applicable to Alternatives 2 and 3:

1. Follow Siuslaw Plan standards and guides (FW-114 through FW-118) to meet water-quality standards outlined in the Clean Water Act for protecting Oregon waters, and apply practices as described in General Water Quality Best Management Practices, Pacific Northwest Region, November 1988. Design criteria, including these practices, are incorporated throughout the project, such as in project location, design, contract language, implementation, and monitoring. The State has agreed that compliance with these practices will ensure compliance with State Water Quality Standards (Forest Service Manual 1561.5, R-6 Supplement 1500-90-12).

2. The literature was searched for possible heritage resources (historical or archaeological sites) in the project planning area. No known sites were identified that could be affected by this project. All actions will be on previously disturbed ground and will not require field inventories. To avoid impacts to unknown sites, a certified cultural resource technician will monitor riparian planting areas. Should heritage resources be discovered as a result of any project activities, cease work in that area and consult with the Forest Archaeologist. Protect, preserve, and treat sites in accordance with the National Historic Preservation Act.

3. Follow the Vegetation Management Analysis to guide the managing of competing and unwanted vegetation. The plan was developed in compliance with the Record of Decision for the "Managing Competing and Unwanted Vegetation" FEIS (November 1988) and the subsequent Mediated Agreement.

4. To prevent spread of noxious and undesirable weeds, all heavy equipment shall be clean and free of soil, vegetative matter, or other debris that may contain or hold weed seeds prior to entering National Forest System lands or leaving the worksite.

5. Use compressed air, high-pressure water, or other specified cleaning method to assure equipment is free of soil, vegetative matter, or other material that could contain or hold weed seeds. Prohibit the use of chemicals such as solvents and detergents to clean equipment on National Forest System lands. The Forest Service will specify cleaning areas, either on site or at a facility with a catch basin.

6. Forest Service direction, regulations, and standards and guides for resource protection may change over time. Should changes occur prior to completion of any actions under this project, complete an addendum to the project EA and modify contract(s) to reflect mandatory changes.