Chapter 3 – Affected Environment and Environmental Consequences

Changes between the DEIS and FEIS for Section 3.1

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

Section 3.1.2 Basis for Cumulative Effects - This section is reworded to describe the incremental impacts of the proposed action and alternatives when added to other past, present, and reasonably foreseeable actions, both on National Forest System lands and other adjacent federal, state, or private lands.

3.1 Introduction

This chapter describes both the existing conditions of the project area, and the environmental effects of implementing the alternatives described in Chapter 2. Effects are defined as:

- Adverse and/or beneficial direct effects occur at the same time and in the same general location as the activity causing the effects.
- Adverse and beneficial indirect effects are those that occur at a different time or location from the activity causing the effects. Both types of effects are described in terms of increase or decreases, intensity, duration, and timing.
- Cumulative Effects result from the incremental impacts of the Proposed Actions/alternatives when added to other past, present, and reasonably foreseeable actions, both on the Forest and Wild and Scenic River corridor as well as other adjacent federal, state, or private lands.

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

3.1.1 Project Area

The Wallowa-Whitman National Forest, (see Vicinity Map) located in the northeast corner of Oregon and west central edge of Idaho, covers 2.3 million acres. The Forest extends to the Hells Canyon National Recreation Area, and encompasses four wilderness areas, and eleven wild and scenic rivers. It lies within Wallowa, Union, Baker, Malheur, Umatilla, and Grant Counties in Oregon and Adams, and Nez Perce Counties in Idaho. The Forest is located on the east edge of the Blue Mountains and encompasses the Elkhorn and Wallowa Mountains, and ranges in elevation from 875 feet on the Snake River in the bottom of the Hells Canyon National Recreation Area to 9,845 feet in the Eagle Cap Wilderness of the Blue Mountains. The Forest is the largest administrative unit in the Pacific Northwest Region.

The Wallowa-Whitman National Forest is the home of the deepest river gorge in the nation (Hells Canyon), the largest wilderness area in Oregon (Eagle Cap), and hosts a portion of the Oregon Trail.

3.1.2 Basis for Cumulative Effects Analysis

Introduction

This section discusses cumulative effects: *the incremental impacts of the proposed action and alternatives when added to effects of other actions both on National Forest System lands and other adjacent federal, state, or private lands* (40 CFR 1508.7). Adverse and beneficial direct and indirect effects are predicted as a result of implementing any of the alternatives (and are discussed at length throughout Chapter 3). How these effects might interact with other actions is difficult to discern. Invasive plants are dynamic; some infestations may stay relatively static for a time, while other infestations may expand rapidly, and new infestations may be introduced in areas that are not currently infested. Ongoing land uses and natural events such as drought, weather, and wildfires, are likely to result in introduction and spread of invasive plants.

Invasive plants cross property lines and infest other landowners' properties. Effective treatment would reduce potential for spread onto other ownerships. Effective treatment of adjacent populations off National Forest System land would increase the effectiveness of the overall treatment. Currently, 22 invasive weed sites (approximately 6,600 acres) are adjacent to other land ownerships on the Forest (Table 14). The largest reported area is the common bugloss site located on Hells Canyon National Recreation Area[4].

Table 14-Invasive weeds located on land adjacent to National Forest System lands

Invasive plant species	Adjacent Infested Acres	Percent of Total Mapped acres
Russian knapweed	23.3	0.4
Common bugloss	5472.9	82.5
White-top	51.3	0.8
Diffuse knapweed	155.6	2.3
Spotted knapweed	81.6	1.2
Knapweed species	76.4	1.2
Yellow star thistle	60.7	0.9
Rush skeleton weed	5.0	0.1
Canada thistle	131.6	2.0
Poison hemlock	1.4	0.0
Common crupina	188.6	2.8
Houndstongue	76.8	1.2
Scotch broom	0.1	0.0
Leafy spurge	1.9	0.0
Meadow hawkweek	0.0	0.0
St john's wort	103.0	1.6
Dalmation toadflax	107.3	1.6
Yellow toadflax	0.3	0.0
Scotch thistle	83.5	1.3
Sulphur cinquefoil	6.5	0.1
Tansy ragwort	2.3	0.0
Medusahead	3.4	0.1
Total	**6633.6**	**100.0**

[4] It is likely that more acres are present, as these acres represent small scale cooperative weed mapping projects.

Potential effects of herbicide treatment to nontarget vegetation, including SOLI, on National Forest System land is relatively small as reported in the direct/indirect section above. Data from 2007 shows glyphosate would likely make up the majority of use off of National Forest System land. Since this herbicide is nonselective, SOLI and other nontarget plants may be killed if an accidental spill, drift, or run off reaches them. However, used according to label, these impacts may be avoided, especially because glyphosate is not biologically active once it binds to organic matter and is rapidly absorbed by target plants.

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

The specific timing, place and prescription for invasive plant treatments during the life of this project are not known. A catalog of specific foreseeable future actions within any 6^{th} field watershed or river basin is not possible to obtain. Thus, the cumulative effects analysis must rely on certain assumptions and past reports to characterize the potential cumulative effects of the alternatives.

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

Human activities are known to have influenced the spread of invasive plants into North America, the Pacific Northwest and specific sites within the project area. A catalog of past actions is unnecessary to understand how land uses have contributed to the current distribution of invasive plants. The vectors and mechanisms of invasive plant spread are discussed at length in the R6 2005 FEIS. The baseline for cumulative effects analysis is the current condition.

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

The following bulleted list summarizes many of the activities associated with invasive plants establishment and spread on Forest System lands and adjacent ownerships:

- Past invasive plant management
- Recreational forest use
- Other ground disturbing activities such as construction or maintenance of recreation sites
- Road use
- Fires and associated management activities
- Logging and thinning activities
- Agricultural crop production adjacent to forest boundaries
- Grazing and dispersal of propagules by animals
- Climatic events such as wind and drought are all documented to contribute to the spread of invasive plants
- Wildlife dissemination of invasive plant seeds
- Fuel reduction
- Road maintenance

In addition to these above stated activities, the Wallowa-Whitman proposes a new travel management plan (Federal Register, Volume 72, No. 85). In this environmental impact statement the Forest proposes to designate a portion of National Forest System roads, trails, and areas, open to public motor vehicle use on the Wallowa-Whitman National Forest (WWNF), and assign the type of use(s) and season of use allowed on each road and trail or portion thereof. Roads, trails and areas not selected for designation will be closed to public motor vehicles year round (excepting the use of over-snow vehicles). Additionally, the Wallowa-Whitman National Forest currently has 1,337,760 acres open to motorized cross country travel. These acres will be closed year round to motorized cross country travel, excluding over-snow vehicles. With the closure of many of these previously impacted areas infested with invasive plants, it is expected that over time these areas will recover and will not require continued treatment associated with repeated disturbance.

Cooperation with local partners such as other federal and state land management agencies, local service districts, tribal governments, nonprofit organization cooperative weed management areas and interested citizens will continue. For instance, Wallowa County has an integrated weed management plan that comprehensively prioritizes noxious weeds based on morphological characteristics as well as bio-physical and topographical attributes of where these weeds occur. Their plan identifies management zones and a prioritization process providing a baseline for decision making by land managers in the area. Their approach combines chemical, mechanical, and cultural and biological control methods in a strategic fashion to minimize inputs and maximize weed control (see http://www.co.wallowa.or.us for more information). Other cooperating entities include Tri-county and Tri-State Weed Management areas, the Lower Grand Ronde Noxious Weed Program, and the Nez Perce Tribe.

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

Context for Cumulative Effects Analysis

Herbicide Use in Oregon

Herbicides are commonly applied for a variety of agricultural, landscaping and invasive plant management purposes. Herbicide use occurs on tribal lands, state and county lands, private forestry lands, rangelands, utility corridors, road rights-of-way, and private property. Studies (see sections below) have shown that pesticides are commonly found in surface waters. However, no studies have shown that the herbicide use proposed in this project result to harmful concentrations of herbicide in water. The contribution to the presence of herbicide in downstream waters from any of the alternatives would be very low.

The extent of treatment in relation to the size of the total Wallowa-Whitman National Forest landbase is small: less than 0.3 percent of the total Wallowa-Whitman National Forest landbase would be treated annually with herbicides under any of the action alternatives. Herbicide use on national forests is a small fraction of total herbicide use (R6 2005 FEIS estimated 3 percent of the herbicide use within Oregon and Washington is on national forests).

The following section discusses herbicide use in the state of Oregon. Beginning in 2007, the State of Oregon required Pesticide Use Reporting to a centralized database (http://www.oregon.gov/ODA/PEST/purs_index.shtml). Reporting requirements applied to those who use pesticides in the course of business or any other for-profit enterprise, to government entities, and for use in a locations intended for public access. Herbicide use was reported at the large river basin scale. The reporting system has since been discontinued, and the data inconsistencies were reported (ibid). However, the report does provide a way to contrast the potential for herbicide use under the alternatives to total use at the river basin scale. For 2007, approximately 5,732 reporters filed 284,984 reports of pesticide use into the Oregon System. Approximately 551 active ingredients were used in the state. The top five active ingredients, by pounds, for the entire state were:

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

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

The Wallowa-Whitman National Forest overlaps primarily the Lower and Middle Snake River Basins. Of the foremost five ingredients used in the Lower and Middle Snake River water basins, glyphosate is the only herbicide that is also proposed for use on the Wallowa-Whitman NF. Just over 107,416 pounds of glyphosate was used in the Lower Snake basin and 23,695 pounds in the Middle Snake-Powder Basin in 2007.

By contrast, at the typical application rate, glyphosate is proposed for use on a maximum of 8,000 acres per year on the Wallowa-Whitman NF under this project, which would amount to a maximum of 16,000 pounds per year. A portion of this total would contribute to the total amount used in each water basin, but this additional glyphosate use is very unlikely to contribute to cumulative effects. Glyphosate is quickly taken up by plants or bound up with soils so that it is not mobile in the environment very soon after application. Effects of glyphosate from invasive plant treatments are very limited in time and space to the immediate area of the treatment. If vegetation adjacent to or emergent from flowing water is treated, glyphosate may be detected downstream from the treatment. However, it is very likely bound to organic matter and not biologically active, and very unlikely to cause any effect. Therefore, glyphosate use as proposed in the action alternatives will not create cumulative effects with glyphosate use from other lands in the water basins.

Similarly, the effects from use of other herbicides in the action alternatives, if any, are very unlikely to accumulate with potential effects from herbicide use in other areas because of the limited spatial and temporal scale at which use would occur. Most of the proposed herbicides have limited mobility in the environment so effects are mostly limited to areas immediately adjacent to the treatment sites. Herbicides with high mobility are limited in use by PDFs so that conditions in which effects could be transported far off site are avoided. Most of the herbicides proposed for use do not persist in the environment for more than a few weeks or months, and those that remain longer have PDFs limiting the frequency of use so that effects do not accumulate at the treatment site.

Three other herbicides proposed for use in the alternatives are within the top 100 reported statewide in 2007: imazapyr, sulfometuron methyl, and triclopyr. Few acres are currently proposed for the use of imazapyr in the alternatives; sulfometuron methyl is an effective herbicide for about 2,471 acres of known sites on the Wallowa-Whitman National Forest (amounting to about 111 pounds of herbicide active ingredient total assuming typical label rates, as compared to 2007 statewide use of more than 21,000 pounds); and triclopyr is an effective herbicide on about 3,671 acres of known sites (amounting to 3,671 pounds of herbicide active ingredient total at typical label rates, as compared to 2007 statewide use of nearly 216,000 pounds).

No water quality issues related to pesticides have been identified for the waters in the project area (none of the streams in the area are 303d listed for chemical contamination). However, pesticides are likely to be part of the background existing condition within streams, based on the studies described below:

NWQAP Pesticide Study

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

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

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

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

The study also stated:

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

Clackamas River Pesticide Study

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

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

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

The study stated that pesticides were most prevalent in the Clackamas River during storms, and were present in all storm-runoff samples — averaging 10 individual pesticides per sample from these streams. Two tributaries contained 17–18 different pesticides each during a storm in May 2005. These medium-sized streams drain a mix of agricultural land (row crops and nurseries), pastureland, and rural residential areas. Two small streams that drain the highly urban and industrial northwestern part of the lower basin had the greatest pesticide loads.

Streams draining predominantly forested basins contained fewer pesticide detections (2–5 pesticides). The study stated that pesticide use on the Mount Hood National Forest, which comprises most of the Federal land in the upper Clackamas River Basin, was a relatively insignificant contribution.

None of the detections related to any of the herbicides proposed for use on the Wallowa-Whitman NF were above a threshold of concern in the Clackamas study. However the study noted that the thresholds do not account for simultaneous exposure to multiple pesticides and degradates and that it is difficult to determine the cumulative effect of such a mixture.

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

BLM Herbicide Use Proposals

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

Cumulative Effects Analysis throughout Chapter 3

The cumulative effects analysis throughout Chapter 3 is based on assumptions about herbicide use given the information available. The previous discussions make clear that pesticides occur at some level in streams and rivers within and adjacent to National Forest System lands. At the current time, beneficial uses of surface waters on the Wallowa-Whitman National Forest are not adversely affected by pesticide use[5]. The baseline for cumulative effects analysis is the current condition.

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

AgDisp modeling results indicate the concentration of herbicides drops off to very low levels within 200-300 feet of aerial application sites (see discussion under water quality). Previous monitoring studies show drift from aerial applications to actually travel less than 60 feet under

[5] Beneficial uses are described in the water resources section of chapter 3.

similar conditions to those expected for this project (ODF 2004). Monitoring of similar aerial treatments was conducted on national forests in Montana.

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

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

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

Bitterroot National Forest Aerial Application Monitoring: On September 30, 2004 and October 1, 2005, the Bitterroot National Forest (USDA 2005) implemented an aerial spray project in two areas to control weed species. Water quality sampling was carried out before, during, and after the aerial spraying on both of the sites treated that fall 2005. Three hundred-foot-wide riparian buffer strips were established and marked with white feed sacks for pilot identification. Drift cards were placed at set intervals across the buffer, between the stream and the marked line. Results from the lab indicated herbicide detection as “below detection limit” for all tested chemicals in all samples. No herbicides used in the spraying operation were detected in the water samples. All drift cards were visually scanned for droplet presence. No cards were found with visible droplets after the spray treatments.

AgDisp modeling indicates that the concentration of herbicide reaches very low levels within 100 feet from broadcast treatment sites (see figure 15). Several factors influence drift, including weather, equipment, and height at which the spray is released. During broadcast applications, applicators would endeavor to minimize or eliminate drift, and nontarget plants away from the infested area and not likely to be killed. Drift would be virtually eliminated with spot and selective treatments that direct spray to individual plants.

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

However, worst case project modeling results indicate potential for picloram aerially sprayed in this project to wash or run off, enter surface waters, and have a negative impact on the aquatic environment (see Aquatic Organisms sections later in Chapter 3). The acreage proposed for this treatment is discrete and far from fish habitat so actual impacts are unlikely.

In addition, the acreage proposed for treatment is relatively small and the invasives to be treated are widely scattered. This dilutes the potential for impacts at the 6th field watershed scale. Therefore, while this project may occur throughout the Forest and over an extended period of time, the impacts at any one time and place, if any, are very small. This limits the potential for this project to combine with another project and cause cumulative adverse effects on people or the environment.

The release of biological control agents on National Forest System lands and adjacent lands by the Oregon Department of Agriculture, as analyzed by Animal Plant Health Inspection Service (APHIS), will continue to reduce the invasive plant infestations and decrease the spread of invasive plants. Biocontrol agents would cross land ownership boundaries in all alternatives.

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

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

3.1.3 Incomplete and Unavailable Information

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

In addition, invasive and native plants, wildlife, soil and water bodies are dynamic resources that change locations and characteristics depending upon time, season, weather patterns, land use activities, random events, and other influences. This limits our ability to precisely predict effects (e.g. amount and duration of herbicide exposures, spread and impact of invasive plants, nature and amount of background contamination, etc.) even if more toxicity information were available.

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

Plants

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

Terrestrial and Aquatic Organisms (Fish and Wildlife)

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

- There are no data on herbicide effects to reptiles or butterflies found in Region Six.
- There are only limited data available on herbicide effects to amphibians found in Region Six.
- Analysis of effects for any project involving herbicide use relies upon extrapolations from laboratory animals to free-ranging wildlife and controlled conditions to the natural environment.

- There are more data available for mammals than for birds, which require the use of mammal toxicity values in bird exposure scenarios for some of the herbicides considered in this FEIS.
- Very few studies are available on sublethal effects to fish from acute exposures. Of studies that are available, some indicate temporary effects at low herbicide concentrations (e.g. Tierney et al. 2006).

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

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

Limitations notwithstanding, there is substantial scientific data on the toxicity of these herbicides to birds and mammals, as well as amphibians and some invertebrates. The data is generated by manufacturers to meet EPA regulations before an herbicide may be registered for use, and by independent researchers that have published findings in peer-reviewed literature. This data is then analyzed according to standard risk assessment methodology to reach a characterization of risk for each herbicide. The summary of the available scientific evidence and our evaluation of reasonably foreseeable impacts are detailed in the following sections.

Soil and Water Resources

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

Human Health

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

3.1.4 Life of the Project

This project would be implemented over several years as funding allows, until no more treatments were 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; treated infestations would be reduced in size, untreated infestations would continue to spread, specific nontarget plant or animal species of local interest could change, 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.

The relative proportion and timing of integrated treatments including herbicides and other methods; the effectiveness of invasive plant management on neighboring lands; and available funding also affect the treatment that would be implemented. The analysis assumes the following maximums over the life of the project:

- A maximum of 8,000 acres treated per year forestwide
- A maximum for the life of the project of 40,000 acres (combined treatment acreage of known, presently undetected and future new infestations)
- A maximum of 4,000 acres of riparian treatment per year

Newly discovered infestations could be prioritized over existing sites.

3.1.5 Herbicide Risk Assessments

The effects from the use of any herbicide depends on the toxic properties (hazards) of that herbicide, the level of exposure to that herbicide at any given time, and the duration of that exposure. The R6 2005 FEIS relied on herbicide risk assessments to evaluate the potential for harm to nontarget plants, wildlife, human health, soils and aquatic organisms from the herbicides considered for use on the Wallowa-Whitman National Forest. Risk assessments were done by Syracuse Environmental Research Associates, Inc using peer-reviewed articles from the open scientific literature and current EPA documents, including Confidential Business Information. Information from laboratory and field studies of herbicide toxicity, exposure, and environmental fate was used to estimate the risk of adverse effects to nontarget organisms.Table 15 displays the risk assessments available by chemical; these may be accessed via the Pacific Northwest Region website at http://www.fs.fed.us/r6/invasiveplant-eis/Risk-Assessments/Herbicides-Analyzed-InvPlant-EIS

Table 15-Risk assessments for herbicides considered in this EIS

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

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

In some cases, toxicity data on inerts and adjuvants is produced to comply with other federal laws that regulate nonherbicide uses of these chemicals, such as the Federal Food, Drug, and Cosmetic Act. Appendix G displays a list of adjuvants approved for use in this EIS.

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

Herbicide Toxicology Terminology

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

Hazard Quotient (HQ)

The 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. An HQ less than or equal to one indicates an extremely low level of risk; therefore, an HQ less than or equal to one is presumed to indicate a level of exposure below the threshold of concern for adverse health effects.

Exposure Scenario

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

Plausible Effects

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

Uncertainty Associated with Risk Assessments

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

Further, a risk assessment has only been completed on one surfactant type (NPE) (Bakke, 2003b). Limited information on other surfactants, adjuvants, and inert ingredients is available in Bakke (2003a) and various risk assessments. Since risk assessments have not been completed for the surfactants, adjuvants and inert ingredients, information regarding the toxicity and effects of these chemicals is largely unavailable. However, the SERA analysts reviewed confidential information on inert ingredients in herbicide forumulations. Information is made public regarding any inert ingredients given a toxic ranking by EPA.

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

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. 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.). Project design features (PDFs) would ensure proposed herbicide exposures do not exceed conservative thresholds of concern for people and botanical, wildlife, and aquatic Species of Local Interest. The analysis throughout Chapter 3 demonstrates that herbicide use under the Proposed Action is unlikely to result in exposures of concern. This is true for known infestations as well as those found in the future, because the PDFs limit the rate, type and method of herbicide application sufficiently to eliminate exposure scenarios that would cause concern, based on the site conditions at the time of treatment. The implementation planning and monitoring processes described in Chapter 2 ensure that effective treatments are completed according to PDFs and undesired effects are indeed minimized.

3.1.6 Climate Change

Effects of Climate Change on Invasive Species

Global climate change is predicted to alter precipitation and seasonal temperature patterns as a result of increased levels of atmospheric carbon dioxide (CO_2) and other factors (Mote 2004). Most recent studies on the interaction between climate change and invasive plants conclude that climate change is likely to favor invasive plant species to the detriment of native plant species for individual ecosystems (Chornesky et al. 2005, Climate Change Science Program 2008, Dukes and Mooney 1999, Hellmann et al. 2008, Pyke et al. 2008). In some studies, invasive plant species have demonstrated increased growth rates, size, seed production, and carbon content in the presence of elevated CO_2 levels (Rogers et al. 2008; Rogers et al. 2005; Smith et al. 2000; Ziska 2003). Warming climates may remove elevation barriers to invasive plant distribution that currently exist (Tausch 2008).

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

Predicted conditions may also make management of invasive species more difficult. Some current treatments used on invasive plants may be less effective under conditions of climate change scenarios and/or elevated CO_2 (Hellmann et al. 2008, Pike et al. 2008, Ziska, Faulkner, and Lydon 2004).

It is more difficult to predict how climate change will affect invasive plants, and invasive plant management, at the local or even regional scale than are these general indications. Anticipated changes in the climate for the Pacific Northwest (e.g. more rain, less snow, warmer temperatures (Mote 2004, Mote et al. 1999, National Assessment Synthesis Team 2000)) or elevated CO2 may not be realized at a local area, particularly within the time frame of this analysis. Growth of invasive plants under elevated CO_2 conditions will also be influenced by environmental conditions such as soil moisture, nutrient availability, and the plant community in which the invasive species occurs (Cipollini, Drake and Whigham 1993; Curtis, Drake, and Whigham 1989; Dukes and Mooney 1999; Johnson et al. 1993; Taylor and Potvin 1997). The complex interaction of multiple and uncertain variables make site-specific predictions speculative.

Affected Environment

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

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

Relevance for Environmental Consequences

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

Because Alternative A does not allow an effective ‘early detection rapid response’ strategy, it would be considered least effective at controlling the spread of invasive plants that may be encouraged by climate change factors. Given that all action alternatives include control of invasive plants with an ‘early detection rapid response’ component, and the large uncertainties regarding effects of climate change at any specific location over the time frame of this project, there is insufficient information to discern any meaningful differences between alternatives B, C and D. All actions are consistent with recommendations for management response in the face of potential influences of climate change on invasive plants.

3.1.7 Treatment Strategy, Type, and Effectiveness Common to All Alternatives

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

Integrated weed management, cooperation with private and public landholders, and prevention of invasive plant introduction, establishment and spread would apply to all alternatives. This section also briefly describes treatment effectiveness of each treatment type and method proposed in this EIS (as tiered to the R6 2005 FEIS and accompanying ROD) and describes the resultant ability of native vegetation to recover.

Integrated Weed Management

All alternatives strive towards integrated treatments, such as using manual treatment as a follow-up to get plants missed by herbicide spraying, or using a mechanical method, such as weed whacking, on tall stems to reduce biomass and reduce the amount of herbicide used. Herbicide treatment is often followed up by manual treatment later in the season to get plants that were missed by the herbicide or several years later when invasive plant populations are reduced to the point at which they can be hand-pulled.

Cooperation with Private and Public Landholders as well as Other Agencies

Cooperative treatment of weeds by various land ownerships and neighboring parcels also contributes to optimizing effectiveness of all alternatives. Invasive plants are currently being treated on county and state lands and on some private lands and this work would continue regardless of the alternative that is selected. On-going partnerships will continue, such as Oregon Department of Agriculture, Tri-County Cooperative Weed Management Area, Tri-State Weed Management Area, Wallowa-Resources, Wallowa County Vegetation Department, The Nature

Conservancy, Salmon River CWMA, and the Rocky Mountain Elk Foundations to name a few. Efforts such as these are imperative for the promotion of healthy ecosystems by reducing invasive plants and for promoting the economic and community benefits that healthy ecosystems provide.

Prevention

Prevention practices as outlined by the R6 2005 FEIS and adopted into the Wallowa-Whitman National Forest Plan are expected to reduce the spread of invasive plant species. Prevention methods that apply to all alternatives are listed in R6 2005 ROD (pages10-19).

Early Detection Rapid Response (EDRR)

Sometimes considered the "second line of defense" after prevention, EDRR is a critical component of any effective invasive plant species management program. A prompt and coordinated containment and eradication response can reduce environmental and economic impacts when new invasive plant infestations are detected. This action results in lower cost and less resource damage than implementing a long-term control program after the species is established. The No Action Alternative presently uses manual methods to treat new infestations, whereas, the proposed Alternatives B, C, and D could treat new or previously undiscovered infestations using the range of methods described in this EIS as directed in the decision process (Figure 12) and in full accordance with PDFs listed in Chapter 2 of the EIS. EDRR is considered to be one of the four primary elements in the Forest Service National Strategy and Implementation for Invasive Plant Species (USDA Forest Service 2004c) and implementation on any scale would lead to future protection of native plant biodiversity. However, treatment effectiveness for control and eradication increases with the more treatment options available.

Manual and Mechanical Treatments

Manual and mechanical treatments physically remove and destroy, disrupt the growth of, or interfere with the reproduction of invasive plants. These treatments can be accomplished by hand, hand tool (manual), or power tools (mechanical); and include pulling, grubbing, digging, hoeing, tilling, cutting, mowing, and mulching of the target plants. Appendix J of the R6 2005 FEIS indicates a low level of risk from these treatments and therefore a full range of manual and mechanical control methods are available. Thermal techniques such as steaming, super heated water and hot foam are also considered as viable treatments.

Manual Methods - Manual methods can be effective on small infestations if the entire root is removed. With new, small infestations, hand pulling may be desirable to reduce dependence on chemical methods. Even larger populations, though, can be controlled with hand pulling if the workforce is available. The Bradley Method is one sensible approach to manual control of invasive plants (Fuller and Barbe 1985). This method consists of hand weeding selected small areas of infestation in a specific sequence, starting with the best stands of native vegetation (those with the least extent of infestation) and working towards stands with the worst infestation.

The greatest opportunity to control noxious weeds using manual methods is near population centers like La Grande and Baker city where volunteer or paid crews have short travel time to get to small infestations and can complete the task in a few days. Longer periods can discourage workers because manual weed pulling requires sustained arduous labor. The Wallowa-Whitman National Forest has large, remote areas with small towns from which to draw labor (such as the Hells Canyon National Recreation Area); therefore, the potential of large work crews traveling to remote areas to control medium or large infestations would often be logistically impractical and cost prohibitive.

Manual methods are usually not as effective for deep-rooted or rhizomatous perennials such as leafy spurge where hand-pulling and hoeing often leave root fragments that can generate new plants. Hand-pulling or hoeing also disturbs the soil surface, which may increase susceptibility of a site to reinvasion by weeds (Brown et al. 2001). Manual methods are labor-intensive and usually ineffective for the treatment of large, well-established infestations of perennial invasive plants with long term viable seed such as knapweeds (Brown et al. 2001). A local effort where larger community support or funding for hand crews exists does show promise, if efforts can be sustained. Erickson (2006) reported that on the Umatilla National Forest manual and mechanical methods were shown to be 25 percent effective when used as primary methods prior to the use of herbicides. The low percentage of effectiveness results from a number of factors such as removal of the plant from above ground only, or root breakage resulting in resprouting; also difficulty in retaining and sustaining crews because of labor fatigue and monotony. Repeated treatments to pull or root-out new germinant or resprouted weeds is physically more challenging using manual methods than spot spraying herbicide treatments, and commonly results in higher mortality of target plants.

The Nature Conservancy reported success with the use of manual control (Tu et al. 2001). Hand pulling by volunteers has successfully controlled diffuse knapweed (*Centaurea diffusa*) in the Tom McCall Preserve in northeast Oregon. Yellow bush lupine (*Lupinus arboreus*) was also controlled in coastal dunes in California by pulling small shrubs by hand. Larger shrubs were cut down with an ax, and re-sprouting was uncommon (Pickart and Sawyer 1998). Hand pulling has also been fairly successful in the control of small infestations of thistles (*Centaurea spp.*), white and yellow clover (*Melilotus officinalis*), and purple loosestrife (*Lythrum salicaria*) at TNC preserves scattered across the country. Manual tools such as the Weed Wrench (www.weedwrench.com) can improve effectiveness on herbaceous plants that have a stem or bundle of stems strong enough to withstand the crush of the jaws.

Mechanical Methods - Mowing or cutting is more effective on tap-rooted perennials such as spotted knapweed compared to rhizomatous perennials (Brown et al. 2001). Cutting or mowing plants can reduce seed production if conducted at the right growth stage. For example, a single mowing at late bud growth stage can reduce the number of seeds produced on spotted knapweed (Watson and Renny 1974). Mowing can also weaken an invasive plant's competitive advantage by depleting root carbohydrate reserves, but mowing must be conducted several times a year for consecutive years to reduce the competitive ability of the plant.

Oregon Department of Agriculture staff compared mowing and pulling mature plants to no treatment in two western Oregon spotted knapweed infestations. They applied one treatment annually at the optimum time for each of four consecutive years, and concluded that neither method was effective in reducing population density or cover.

They recommend consideration of pulling and mowing only where the goal is to contain spotted knapweed infestations or to suppress seed production (Isaacson et al. 1997 in USDA 2005a, Appendix J).

Because invasive plants flower throughout the summer, it is difficult to time mechanical treatments to prevent flowering and seed production. Repeated mechanical treatment too early in the growing season can result in a low growth form that is still capable of producing flowers and seed (Benefield et al. 1999; Goodwin and Sheley 2001).

Mechanical treatments on some rhizomatous weeds, such as leafy spurge, can encourage sprouting and result in an increase in stem density (Goodwin and Sheley 2001).

Thermal Techniques - Thermal techniques are being tested or used with some success throughout Region Six by such agencies as Oregon Department of Transportation (ODOT), the Nature Conservancy and the Bureau of Land Management (BLM). The Nature Conservancy (Tu et al. 2001) tested the Eco-Weeder, an infrared technology device that uses the combustion of liquid gas to reach extremely high temperatures that place intense radiation directly on weeds to explode plant cells. The tool could be useful for small area treatments, especially on sidewalks, but the effectiveness on deep-rooted plants, sedges or rhizomatous grasses may not be as high. The Nature Conservancy also tested hot water pressure washers. The brand tested could apply hot water through a pressure nozzle with a wide spray or intense stream which would act as an injection device for below ground portions of plants. They found it effective on seedlings and annual plants within reach of the washer, but the effectiveness on plants with extensive underground roots or rhizomes would be less. Hot foam has been tested by the Nature Conservancy and used by the BLM effectively on puncture vine and slender false brome. Again, this technique is limited to the reach of the foam generator, but is an excellent nonchemical method. It is effective on seedlings and annuals and can be applied under weather conditions including wind and light rain.

Herbicide Treatments

The objectives of herbicide treatments are often twofold: (1) to more efficiently reduce the size of moderate to large infestations of invasive plants to a point at which they can be hand-pulled or manual or mechanical methods are ineffective due to invasive plant growth morphology, or (2) more efficiently treat large expansive areas where invasive plants thrive due to the nature of the site. Different herbicides vary in effectiveness and length of control on different invasive plants, and herbicide techniques can vary in effectiveness, environmental effects, and costs.

Herbicides vary in selectivity of control for various plant groups. Those differences in selectivity are the basis for developing effective plant control treatments while minimizing adverse effects and facilitating native plant community maintenance or restoration.

Physical forms of herbicide vary. Some may be oil- or water-soluble molecules dissolved in liquid, or attached to granules for dry application to soil surface.

Herbicides may move from their location of application through leaching, volatilization, or adsorption. For a complete review of all physical properties and risk assessments of herbicides approved for use in this EIS see Regional Invasive Plant Herbicide Information http://www.fs.fed.us/r6/invasiveplant-eis/Region-6-Inv-Plant-Toolbox/ (accessed 4/2007). Herbicides can also be applied with a variety of equipment and techniques. The techniques vary in effectiveness, environmental effects and costs. Aerial application of sprays or granules can be used for rapid broadcast coverage of large or inaccessible areas.

In general, herbicides provide and effective method of controlling invasive plants and is projected to be 80 percent effective at controlling invasive plants when used with other methods of treatment in the region (R6 2005 FEIS).

Just as changes in plant diversity or species composition can occur due to invasive plants, changes can also occur due to treatments. Short-term changes in species dominance can lead to long-term shifts in plant community composition and structure. Repeated treatments over time could favor tolerant species, which in turn could shift pollinators available to a community. DiTomaso (2001) points out that continuous broadcast use of one or a combination of herbicides will often select for herbicide tolerant plant species. When broadleaf selective herbicides are used, noxious annual grasses such as medusahead, cheatgrass or barbed goatgrass may become dominant. Population shifts through repeated use of a single herbicide may also reduce plant diversity and cause nutrient changes. Alternatively, plant diversity is reported to be maintained on sites with repeated applications of Picloram and Clopyralid for control of spotted knapweed in Montana (Rice 2000). Additionally, analyses based on 60 published studies of terrestrial plants and animals in temperate zone forests and agro-ecosystems indicate species richness and diversity of vascular plants was either unaffected or increased (particularly herbaceous species) in response to glyphosate (Sullivan and Sullivan 2003).

It is obvious there are still unanswered questions related to recovery of native vegetation after herbicide treatment. Project design features such as the development of a long-term site strategy, monitoring, and restoration would be directed towards sites that could experience repeated herbicide applications (i.e. areas where recovery to native vegetation may not be possible such as campgrounds, highly disturbed areas). It is likely that due to the nature of repeated disturbance activities in some areas on the forest, long-term site objectives may be focused on containment of these areas to prevent future spread into other areas of the forest and a fully restored native plant component is not attainable. In these cases, desirable vegetation that reduces the potential for invasive plant re-establishment and protects other resources such as soil and water is likely.

Herbicide Application Methods

The risk to nontarget vegetation also varies with the herbicide application method. Spot and hand methods substantially reduce potential for impacts to nontarget vegetation because there is reduced chance for drift.

Drift is associated primarily with broadcast treatments and can be mitigated to some extent by the applicator. Drift can also be minimized by adjustment of numerous factors such as spray particle size, release height, spray pressure, nozzle size/type in addition to climatic variables such as wind speed, air temperature, and relative humidity.

Figure 14 – Aerial application

Impacts to these factors related to drift are summarized in Table 16 that follows.

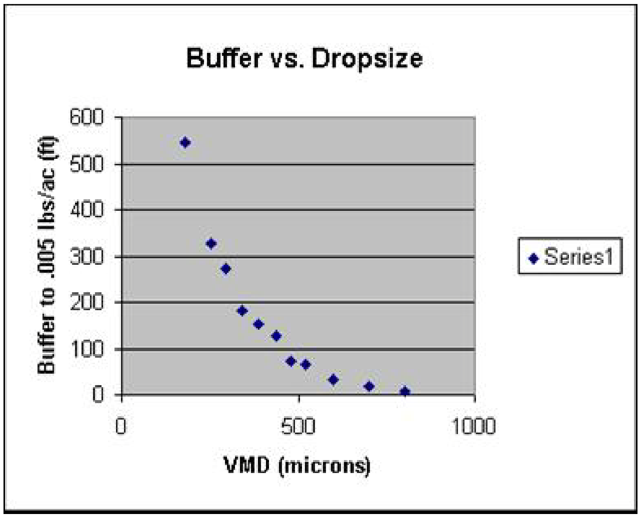


Figure 15 demonstrates the relationship between droplet size and buffer distance. As droplet size increases, the distance herbicide may travel in concentrations sufficient to harm plants decreases.

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 nontarget vegetation from drift.

Figure 15 – Droplet size and drift distance

The model predicted a 100-foot broadcast buffer would prevent glyphosate from harming plant species that are further away (Spray Drift Task Force 2001).

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

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

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

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

Marrs (1989) examined the distances drift affected nontarget vascular plants using broadcast treatment methods similar to those considered in this analysis. 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 nontarget vegetation further than 66 feet from the broadcast treatment zone. Little information is available for how drift distances may affect nonvascular nontarget vegetation. The distance spray drift will travel can vary substantially based on wind speed, topography, temperature, the herbicide applied, and the vegetation present, see Figure 15.

Drift is the most likely vector for herbicides coming in contact with water from riparian area treatment sites. Some locations may have some invasive plants such as reed canary grass, or purple loosestrife growing on streambanks above ordinary high water that would be treated with a spot-spray. Such areas are limited in spatial extent, and given the distance between target vegetation and water, it is likely that much of the herbicide will have been sprayed on to the plant.

The maximum safe distance at which no impacts are found is greater with aerial application due to the distance above the ground at which the herbicide is sprayed. For sites where aerial herbicide treatments are proposed, helicopters, not fixed wing aircraft would be used due to terrain and access issues on the Wallowa-Whitman National Forest (Pope 2006). Helicopters would likely apply herbicides at heights of 10 to 20 feet above the ground in most cases. In steep terrain, the pilot would attempt to fly up and down the slope in order to maintain an equal distance of the boom to the ground, typical distances above the ground in steep terrain can vary but generally range to 10-50 feet.

New applicator technology also exists for more precise application with minimal drift of herbicide to very small areas from helicopters (spray balls). These small applicator tools are lowered via a boom from the helicopter and the pilot applies herbicide (by a trigger mechanism and pump) to approximately a 4 foot radius area two to four feet above the ground (Pope 2006).

Because distances above the ground and boom widths are similar to ground based herbicide application the same buffer distances will be applied in these special case scenarios.

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

Previous aerial herbicide applications in the area indicate sensitive areas were fully protected using a 300 foot buffer (no aerial deposition) in a study using three commonly used helicopters, with various nozzle types applying picloram at a rate of 2 gallons/acre (USDA 2006c). Additionally, helicopter application of clopyralid and picloram to control yellow starthistle in Hells Canyon area in Idaho reported greater than 90 percent control and no apparent damage to the native grasslands following treatment (TNC 2006). This application method was reported to be very accurate and negligible drift was observed (Talsma 2006). Some temporary set-back of some arrowleaf balsamroot (*Balsamorhiza sagittata*) was observed, however, most plants recovered. Additional aerial drift tests conducted near sensitive areas (stream side and threatened plant species) in northern Idaho indicated that these areas were fully protected with a 50-100 foot buffer (Huibregtse, 2007).

PDF Group F8 relates to aerial application. Drift would be minimized in aerial and other broadcast application by controlling as many of the factors in the table below as possible.

Table 16-Summary of the influence of various factors on spray drift

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

Surfactants

Inerts, Adjuvants and Impurities - 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. 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, for example: Inerts and adjuvants, including surfactants, are not under the same registration guidelines as are pesticides. The EPA classifies these compounds into four lists based on the available toxicity information. If the compounds are not classified as toxic, then all information on them is considered proprietary and the manufacturer need not disclose their identity. Therefore, inerts and adjuvants generally do not have the same amount of research conducted on their effects compared to active ingredients (See Appendix B of this EIS) for a detailed discussion of surfactants). Impurities are inadvertent contaminants in the herbicide, usually present as a result of the manufacturing process.

Biological Control (Biocontrol)

Biological control can be defined as the use of natural enemies to reduce the damage caused by invasive plant populations. Biocontrol is often viewed as a progressive and environmentally friendly way to control some invasive species that have known biocontrol agents because it leaves behind no chemical residues. Where successful, it can provide essentially permanent, widespread control with a very favorable cost-benefit ratio. Biological control is potentially useful where: eradication is not possible, sites are too large to be sprayed with herbicides, and invasive plant species are so abundant that other methods would not be practical, or the biological control agent reduces or eliminates the need to use herbicides. The time frame for controlling invasives using biocontrols is very long, and agents would likely spread throughout the forest where food sources are available.

Stem weevil biocontrol agents have proven very successful for Dalmatian toadflax control on infested forest and adjacent landownership sites on the forest (Dawson 2007). Several biocontrol agents are available for yellow starthistle and diffuse knapweed and effectiveness appears to be higher when biocontrol agents work in concert. However, where fire has entered into yellow starthistle sites, biocontrol agents appear to be less effective, likely a result of biocontrol population dynamics, impacts from fire and available food source.

Biocontrol agents for control of purple loosestrife have been released on the Idaho side of the Snake River, however, the fluctuating water levels have negatively affected the establishment of a productive biocontrol population and effectiveness is minimal (Dawson 2007).

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

Cultural Treatments/Restoration

Cultural treatments include the establishment or maintenance of competitive vegetation, use of fertilizing, mulching, prescribed burning, or grazing animals to control or eliminate invasive plants. No prescribed burning or use of grazing animals is proposed within this EIS.

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

Restoration or reclamation of sites infested with invasive plants follow treatment restoration Standard 13 (W-W LRMP as amended by the R6 2005 ROD) and incorporate guidelines for revegetation of invasive weed sites and other disturbed areas on National Forests and Grasslands in the Pacific Northwest (Erickson et al. 2003, also Appendix B – Revegetation Guidelines) *This document was printed in full in appendix B for the DEIS and removed for the FEIS printing. Information from this document is available on http://fsweb.r6.fs.fed.us/nr/native-plants/project-planning/* On degraded sites where reproducing individuals of desirable species are absent or in low abundance, revegetation with well adapted and native competitive grasses, forbs and legumes can be used to direct and accelerate plant community recovery and achieve site management objectives in a reasonable timeframe (Sheley et al. 1996 in Erickson et al. 2003).

Mulching with plastic or organic materials can be used on relatively small areas (less than 0.25 acre). Mulching prevents seeds and seedlings from receiving sunlight necessary to survive and grow, and can smother some established invasive plants, but may also stunt or stop growth of desirable native species. Hay mulch was used in Idaho to reduce flowering of Canada thistle (Tu et al. 2001), but most rhizomatous perennial invasive plants cannot be controlled by this method or by shading because extensive root reserves allow regrowth through and around mulch or shade materials.

Restoration and revegetation projects that would include ground disturbing activities such as disking or plowing using heavy equipment would require additional NEPA analysis.

Treatment Effectiveness by Alternative

Table 17 and Table 18 were developed to compare alternatives. Alternative A, the No Action Alternative would continue to implement treatments according to existing plans; no new invasive plant treatments would be approved. Alternative B, the Proposed Action Alternative, would apply an initial treatment strategy and prescription, along with re-treatments in subsequent years if needed, until the long-term site objectives were met. This would likely include herbicides as part of the prescription, however, the use of herbicide is expected to decline over time as invasive sites are controlled, contained or eradicated. Alternative B has the all proposed treatment methods available for use and could apply them on the broadest array of treatment sites, so this alternative is considered the potentially most effective of all alternatives. The 'Alternatives at a Glance' tables in sections 2.2.3, 2.2.4 and 2.2.5 estimate treatment effectiveness as a percentage of all treatments available compared to the proposed action. Alternatives C and D were developed in response to public issues related to herbicide use and the two alternatives vary in method of application of herbicide. Alternative C would not allow any broadcast application of herbicides in riparian areas, however, spot spraying or hand application such as wiping or wicking of herbicides would be allowed. This alternative addressed human health issues associated with contamination of drinking water supplies as well as potential impacts to nontarget wildlife, plant species, soil, aquatic biota and riparian ecosystems. Alternative D would eliminate the option to aerially apply herbicides. This addresses issues also associated with drift of herbicides into drinking water supplies as well as impacts to nontarget wildlife, plant species, soils and aquatic biota and riparian ecosystems. The Forest Service preferred alternative is Alternative B. For a complete discussion of alternatives see Chapter 2 of this EIS.

Table 17-Treatment type, method of application and acres proposed for treatment by alternative

Treatment Methods	Alternative A No Action[1]	Alternative B Proposed Action	Alternative C No Broadcast in Riparian Habitat Conservation Areas	Alternative D No Aerial Herbicide
Chemical Methods				
Upland Areas				
Ground-based broadcast and spot treatments[2]	2,577 [3]	13,556	13,556	13,556
Aerial treatments	0	875	875	0
Riparian Habitat Conservation Areas				
Ground-based broadcast treatment	1,932[3]	3,104	0	3,104
Spot spray/selective treatment (including wicking and wiping)	663[3]	3,241	6,345	3,241
NonChemical Methods				
Upland Areas and Riparian Habitat Conservation Areas				
bio-control only	See note	1,955	1,955	2,797
manual only[6]	0	111	111	111
Total Acres Treated	**5,172**	**22,842**	**22,842**	**22,809**

1 A designation of chemical treatment could be changed to manual, mechanical or biological treatment if, at the time of treatment, one of these alternative methods would be effective. A site initially treated with chemicals may be treated with manual or mechanical methods during follow-up treatments.
2 Whether each site will be broadcast or spot treated will be determined locally before each field season so the acres to be broadcast treated and the acres to be spot treated are not known at this time. Determination of where broadcast versus spot treatments will occur depends on access to site, size of site, and density of weed coverage.
3 No action alternative includes '92 Environmental Assessment for the Management of Noxious Weeds and the '94 Environmental Assessment for Management of Noxious Weeds and Forest Plan Amendment #4.
4 Acres proposed in aerial application that could be treated with ground based methods although likely to be less effective or more costly than those proposed in Alternative B. Approximately 33 acres would not treated due to inaccessibility and no other means of control i.e. biocontrol agents.
5 Riparian Habitat Conservation Areas (RHCA) are: 300' of perennial stream and 100' of intermittent stream–as designated under PACFISH, INFISH
6 Manual only sites will not be treated with herbicides because the desired weed management goal can be effectively achieved using manual methods. Such sites are typically very small or having widely scattered weeds or are in sensitive areas like a campground along a stream or a combination of these factors.
Biocontrol note: the '94 EA approved the use of biocontrol agents, however, all sites were analyzed for chemical treatments to attain highest amount of flexibility and greater invasive plant species control. The forest has also released

APHIS and state of Oregon approved biocontrol agents on approximately 2,500 acres for the control of invasive weeds (Yates 2007).

Table 18-Herbicide formulations, invasive plant sites, total acres treated and treatment effectiveness by alternative

Measuring Factor	Alternative A – No Action Includes ’92 EA and ’94 EA	Alternative B – Proposed Action	Alternative C – Restricted Riparian[4]	Alternative D – No Aerial Application of Herbicide
# of herbicide formulations available for use	4[1]	10	10	10
# of invasive plant sites that could be treated	124	1,740	1,740	1,737
# of invasive plant sites that could be treated with herbicides either alone or in combination with other techniques	52	1,427	1,427	1,424
# of invasive plant sites that would be treated with bio-control or manual methods only	0	313	313	341
Total acres treated using all methods	5,172 total[2]	22,842	22,842	22,809[3]
EDRR (including herbicide use)	No	Yes	Yes	Yes
Treatment Effectiveness Relative Ranking	Low	Highest	High	High
% of Total Forest Landbase Treated with Chemicals (all identified acres and annually)	0.23% <0.02% annually	0.9% 0.16% annually	0.9% 0.16% annually	0.8% 0.16% annually

1 Four herbicides: glyphosate, dicamba, picloram (with restrictions), and triclopyr approved under ’92 EA. Dicamba was restricted from use in the R6 2005 ROD and will not be used in the future by the Forest.
2 This acreage represent acres approved under existing NEPA documents; additional new acres are treated using manual and/or mechanical methods.
3 Sites proposed for aerial herbicide application could still be treated with other methods/treatments (backpack/horseback sprayers, or bio-control methods) however, may be less effective. It is estimated that 33 acres proposed for aerial could not be treated using any other alternative methods (no bio-control available or safety concerns related to terrain and access for ground based applications).
4 Riparian Habitat Conservation Areas (RHCA) as designated under PACFISH, INFISH

Alternative A – No Action

Under the No Action Alternative, invasive plant treatments would be limited to areas authorized under existing NEPA documents and new infestations would be treated with manual methods.

Based on monitoring and increased inventory efforts forest wide, invasive plant sites have continued to increase over the years (Yates 2007) and, if left untreated, will continue to expand based on regional spread projections (Figure 16). These expanding, spreading populations would become increasingly more difficult and costly to control in the future and would further degrade native plant habitats. Invasive plants would continue to displace native plant species, reduce plant diversity, and serve as seed sources for distribution both on and off federal lands.

The total number of acres approved for chemical treatments with this alternative represents only 23 percent of existing infested acres and 0.23 percent of the entire forest land base. (Yates 2007). Since the incorporation of the R6 2005 ROD Standards, the No Action Alternative is now limited to 3 herbicides (glyphosate, triclopyr and picloram with restrictions) for use on approved sites (5,172 acres). Some of these herbicides may not always be the preferred herbicide for use in certain situations.

For instance, picloram may pose a higher risk to the environment and nontarget species due to higher mobility, and higher levels of HCB, compared to some of the newer herbicides approved in the R6 2005 ROD and proposed for treatment in Alternatives B, C, and D (Bautista 2006). Glyphosate is a nonselective herbicide, and may have the potential for increased impacts to nontarget vegetation compared to the newly approved selective herbicides.

The No Action Alternative provides only manual methods for EDRR strategy to treat newly identified infestations. Past monitoring of these treatment methods (by the forest) indicates limited success using these methods (Yates 2006). Repeated manual treatments may be effective for controlling or containing small populations of certain plants and may pose less risk to nontarget vegetation compared to herbicide treatments. However, associated labor, time and cost may make manual treatments less practical and effective, especially when treating large infestations of invasives. The absence of a more effective EDRR strategy increases the potential for new invasive plant infestations to establish and spread, potentially reducing native plant community biodiversity and affecting other ecosystem structure and functions such as plant-pollinator relationships, and mycorrhizal associations.

All remaining infested acres currently identified in addition to unknown future sites would be treated manually likely requiring multiple years of repeated treatment to control contain or eradicate. Biocontrol agents that currently are present within or adjacent to the forest could move onto forests lands and provide a method of treatment, however, control may take a number of years and control is subject to target species and appropriate biocontrol agent presence. These less effective methods of control would likely lead to the continued displacement of native plant species and the increased spread potential of invasive plants currently infesting the forest.

Since fewer treatment and herbicide options would be available, preferred herbicides either from the resource protection or effectiveness standpoint may not be available. For instance, clopyralid on knapweeds, chlorsulfuron, imazapic and metsulfuron methyl for whitetop, and metsulfuron methyl for ground based applications on bugloss. Also, treatment methods do not include use of aerial herbicide methods which can be an effective and rapid means of controlling or eradicating large infestations of invasive weeds, particularly in areas that have steep slopes, rocky soils, and are difficult or lack access to effectively treat from the ground.

Alternative B –Proposed Action

Under the Proposed Action Alternative all currently mapped invasive plant species would be treated with the most effective treatment types and method of application to control, contain or eradicate invasive plants, including the 10 newly approved herbicides and surfactants approved in the R6 2005 ROD.

Early detection and rapid response to newly identified infested areas would follow the implementation planning process (as described in Chapter 2 of this EIS) for treating invasive plants using all treatment methods available, except aerial application, and would comply with all PDFs as outlined in Chapter 2 of the EIS. No more than 8,000 acres of known and/or new sites would be treated annually, and no more than 40,000 acres would be treated over the life of the project.

Summary of Treatment Effectiveness for Alternative B – Proposed Action Alternative

Because more sites and acres will be approved for treatment using more effective methods, the Proposed Action provides the most effective means for reducing the populations of invasive plant species to the forest compared to the No Action Alternative. This alternative also allows the use of all 10 herbicides approved in the R6 2005 ROD, which facilitates more effective control of existing invasive plant species present on the forest at this time. EDRR using the decision process outlined in Figure 12 and the PDFs (both in Chapter 2) also allows for the use of these 10 herbicides on unknown future sites while protecting forest resources which will provide a more effective treatment of invasive plants compared to the No Action Alternative.

Aerial application of herbicides to proposed sites would provide the most cost efficient and effective method of treatment compared to the No Action Alternative and Alternative D.

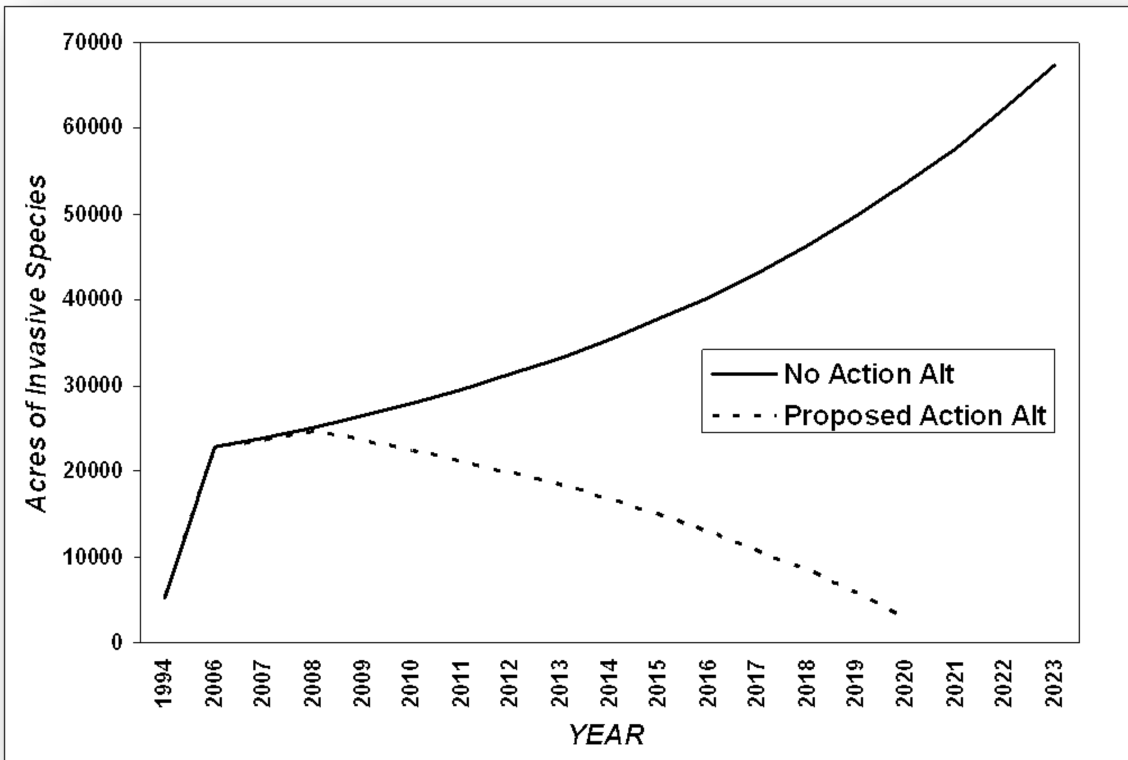


Figure 16 – Comparison of estimated invasive plant spread between Alternatives A and B

In this case, currently proposed and potential future infestation have and will undergo site specific long-term site strategy for restoring/revegetating invasive plant sites prior to treatment (W-W LRMP as amended by the R6 2005 ROD Standard 12). PDFs and common control measures are designed to protect native vegetation. Additionally, cooperation with public and private landholders is anticipated on presently proposed aerial sites further increasing the effectiveness of treatments and reducing the potential spread across adjacent ownerships.

Estimates of invasive weed spread are projected for the No Action Alternative and the Proposed Action Alternative (Figure 16). These estimates are based on very broad assumptions, and predictions are based on currently identified areas. The assumptions for these projects include:

- No Action Alternative treatment effectiveness of 25-35 percent
- Proposed Action Alternative treatment effectiveness of 80 percent.

The effectiveness assumptions were applied to all 40 invasive species within presently identified acres, forest wide land base; with a maximum of 8,000 acres treated annually. These broad scale assumptions can vary based on numerous factors, such as specific geographic areas, specific invasive plant species characteristics, and specific treatment types and methods of applying those treatments. Alternatives C and D are similar to the Proposed Action Alternative and do not vary considerably compared to the Proposed Action projections due to the broad scale assumptions.

Alternative C –No Broadcast Herbicide Treatment in Riparian Areas

Under Alternative C all currently mapped invasive plant species would be treated the same as the Proposed Action; however, no broadcast treatment methods (only spot treatments) would be allowed in riparian areas (3,104 acres, Table 17). Within the riparian areas treatment would include chemical treatments such as spot spraying, wicking, wiping, and stem injection as well as manual and mechanical methods as dictated by site- specific conditions. All PDFs would be implemented as outlined in Chapter 2 for riparian areas. Estimates of annual treatment acres would be similar to those reported in the Proposed Action. EDRR to newly identified infested areas would follow the decision process outlined in Figure 12 for treating invasive weeds and would comply with all PDFs (as outlined in Chapter 2). The elimination of ground based broadcast as a method of treatment in riparian areas may reduce the effectiveness of treatment in these areas because treatments would be directed only on existing plants and any potential new invasive recruits from seedbanks or other underground vegetative parts capable of establishment would need to be treated individually as they emerge in upcoming years.

For instance, where diffuse knapweed is present inside RCHA boundaries the increased potential for spread from the less effective method of application (no broadcast) can serve as a continual propagule source in other areas (Figure 19).

There is an increased potential for spread in riparian areas that could serve as a source to infest upland sites. The effectiveness of this alternative, however, would be significantly greater compared to the No Action Alternative because it authorizes treatment of many more known infestations and allows for more effective treatment of EDRR sites.

Alternative C is similar to Alternative B. All herbicide restrictions and buffers as described in the PDFs remain the same as in Alternative B; except no ground based broadcast herbicide treatment would be allowed in RHCA areas (3,104 acres).

Herbicide methods of treatment that reduce the potential for offsite drift such as spot, wiping, or wicking herbicide applications as well nonherbicide methods are possible. This alternative would reduce the effectiveness of the treatment in RHCAs especially for species that are widespread and the seedbank or underground vegetative parts capable of re-establishment in future years is probable. Repeated treatments over multiple years would be needed to treat areas such as these and effective control, eradication or containment is likely questionable under certain circumstances.

Alternative D –No Aerial Herbicide Treatment

Under Alternative D all currently mapped invasive plant species would be treated the same as Alternative B, except no aerial treatment methods would be allowed on any proposed (875 acres) or future infested acres in extremely inaccessible sites that would warrant aerial application. The aerial site acres are yellow starthistle, (96%) so can be treated with a bio control agent; however, these methods have not proven to be successful over the past 6-10 years due to variable environmental conditions (Dawson 2007). The elimination of aerial treatment reduces treatment effectiveness in these areas now and in the future due to the potential inability to treat either from a safety standpoint, or from prohibitive cost associated with alternative methods of treatment (i.e. hiking in with backpack sprayers).

Figure 17 – Starthistle on inaccessible site

Sites that are presently proposed for aerial herbicide application are high priority, aggressive invasive plant species (yellow starthistle, and scotch thistle), and if left untreated are expected to increase. Appendix B includes maps detailing location of aerial application sites.

Cumulative Effects of All Alternatives

Section 3.1 described the basis for cumulative effects analysis. The introduction, establishment and spread of invasive plants will continue, with prevention practices and effective treatments slowing but not stopping the rate of spread (R6 2005 FEIS). The effectiveness of the proposed invasive plants treatment project would be increased if there is coordination with adjacent landowners to treat invasive plants infestations across land ownerships. Alternative B would more effectively control invasive infestations on the Forest because more acres are proposed for treatment, and the more efficient and cost effective treatment methods are proposed. The likely result of this would be improved weed control effectiveness on adjacent land ownerships. That is because aggressive treatments are expected to reduce invasive infestations on the National Forest, so there would be less weed seed and invasive plants available to spread onto neighboring lands. As the future spread of invasive plants on National Forest System lands decreased, so the likelihood of weeds spreading onto private, tribal, state and other ownerships would also decrease. Over time, this could reduce herbicide use on National Forest and adjacent land ownerships.

3.2. Botany

3.2.1 Introduction

Proposed treatment of invasive plants would be effective in reducing threats to desirable, nontarget *vegetation;* however there are some risks to native plants from the treatments themselves. This section discloses the effects of the alternatives on nontarget vegetation, including SOLI (e.g. threatened and endangered species, Regional Forester Sensitive Species).

3.2.2 Affected Environment

Invasive Plants

An invasive plant is a nonnative plant whose introduction does or is likely to cause economic or environmental harm or harm to human health (Executive Order 13112). Invasive plants are distinguished from other nonnative plants in their ability to spread (invade) into native ecosystems. Some species of invasive plants are listed by the Secretary of Agriculture or by the responsible State official as “noxious weeds.” This analysis includes all State-listed noxious weeds plus other invasive plant species that are of concern because of their impacts to ecosystem health. The term “invasive plants” more broadly encompasses all invasive, aggressive, or harmful nonindigenous plant species, whether designated noxious or not. Invasive plants impact the biological diversity of native plant communities by altering ecosystem processes and can completely displace native plant species and cause a decline in overall species richness. Invasive plants are highly adept at capturing available moisture and nutrients, and often spread quickly. Invasive plant infestations can threaten wild or domestic pollinators by outcompeting host plant species.

Present levels of infestation that incorporate previously treated acres, and adjustments to data for past eradication of invasive plant sites indicate there are 40 different invasive plant species present on 1,740 sites covering approximately 22,842 acres across the 7 districts on the Wallowa-Whitman National Forest (Table 19 and Table 20). In some cases a single mapped site may contain more than one species, and therefore the total acres listed by species may be slightly higher than acres reported here. Diffuse and spotted knapweeds and yellow starthistle and whitetop are four of the species with the most known sites forestwide (Table 19). Annual bugloss, diffuse knapweed, Canada thistle, and yellow starthistle comprise the largest infested acres forestwide (Table 20). These acreages indicate the presence of the invasive plant species within an area and do not indicate level of infestation by percent cover. Therefore, some areas may be heavily infested while others may have only a few scattered invasive plants amongst native vegetation. Estimates of total infested acres listed in Table 20 are based on physiological characteristics of specific invasive plants and local knowledge of individual sites in the area (Dawson 2007).

About 40 percent of inventoried sites are less than one acre in size and 66 percent of the sites are less than five acres in size (Table 21). Acres of invasive plant species associated with forest roads including acres spreading out into areas beyond 100 feet of a road represent 20,681 acres (91% of the presently identified acres forestwide). This does not imply that all infested acres are caused by roads, but that a forest road exists within a calculated invasive site. Acres of invasive plants within 100 feet of a road total 9,028 acres. Additional invasive plant sites likely exist but have not yet been detected by annual inventory and mapping efforts. Some species, such as cheatgrass (*Bromus tectorum*), North Africa grass (*Ventenata dubia*) and Russian thistle (*Salsola kali*) are abundant but have been given a low priority for treatment by the local district office due to task force and/or monetary constraints, or species naturalization. These species are too well established and abundant to treat everywhere they are found; however, could be treated where encroaching on uninfested or special areas. Further, some cheatgrass or Ventenata sites may be treated if they are associated with other infestations treated within the scope of this document. Canada thistle (*Cirsium arvense*) has been given a low priority on some districts, while others may choose to treat it, especially when associated with high priority target species.

Table 19-Invasive plant species sites identified on each district within the Wallowa-Whitman National Forest

Scientific Name	Common Name*	Districts and Number of Sites							
		Baker	Wallowa-Valley	HCNRA	Eagle Cap	LaGrande	Pine	Unity	Total
Acroptilon repens	Russian knapweed	1		3					**4**
Alopecurus myosuroides	Blackgrass			1					**1**
Anchusa officionalis	Common bugloss			1					**1**
Cardaria draba	Hoarycress (Whitetop)	10	1	84		21	42	21	**179**
Carduus nutans	Musk thistle					3		3	**6**
Centaurea diffusa	Diffuse knapweed	23	128	47	16	108	29	33	**384**
Centaurea maculosa	Spotted knapweed	16	73	39	9	16	3	13	**169**
Centaurea species	Knapweed species	1	17	1		1	3	2	**25**
Centaurea debeauxii	Meadow knapweed				1				**1**
Centaurea solstitialis	Yellow starthistle	3	12	136		28	2		**181**
Centaurea virgata	Squarrose knapweed	2							**2**
Chondrilla juncea	Rush skeleton weed			34			2		**36**
Cirsium arvense	Canada thistle	24	4	18	6	40	13	49	**154**
Cirsium vulgare	Bull thistle					2			**2**
Convvolvulus arvensis	Field bindweed						1		**1**
Conium maculatum	Poison hemlock			2			1		**3**
Crupina vulgaris	Common crupina		1						**1**
Cuscuta sp.	Dodder			1			1		**2**
Cynoglossum officinale	Houndstongue	13				1	14	36	**64**
Cytisus scoparius	Scotch broom	1	1			2			**4**
Dipsacus fullonum	Teasel	1						1	**2**
Euphorbia esula	Leafy spurge	1	1	1		7		2	**12**
Polygonum cuspidatum	Japanese knotweed			2					**2**
Hieracium caespitosum	Meadow hawkweek		1	4	24				**29**
Hypericum perforatum	St john's wort	32		4			15	5	**56**
Lepidium latifolium	Pepperweed						1		**1**
Linaria dalmatica	Dalmation toadlfax	8	60	18	1	4	5	34	**130**
Linaria sp.	Toadflax species		3						**3**
Linaria vulgaris	Yellow toadflax	2	2	1			2	1	**8**
Lythrum salicaria	Purple loosestrife			3					**3**

Scientific Name	Common Name*	Districts and Number of Sites							
		Baker	Wallowa-Valley	HCNRA	Eagle Cap	LaGrande	Pine	Unity	Total
Onopordum acanthium	Scotch thistle	12	37	95		5	3	5	**157**
Potentilla recta	Sulphur cinquefoil	12	1			3	18		**34**
Rubus discolor	Himalayan blackberry			3					**3**
Salvia aethiopis and Salvia sclarea	Mediterrenean and clary sage			1					**1**
Salsola tragus	Russian thistle						1		**1**
Senecio jacobaea	Tansy ragwort	1	2	1	1	36		8	**49**
Senecio sp.	Senecio species		3	1					**4**
Solanum elaeagnifolium	silverleaf nightshade			2					**2**
Taeniatherum caput-medusae	Medusahead			21			1		**22**
Tribulus terrestris	Puncturevine			1					**1**
Grand Totals Species and Sites	**40 Species**	**163**	**347**	**525**	**58**	**277**	**157**	**213**	**1740**

*Common names will be used throughout the remainder of this document

Table 20-Invasive plant species and acres by district

Invasive plant species	District								
	Baker	Wallowa-Valley	HCNRA	Eagle Cap	LaGrande	Pine	Unity	Acres (gross)	Estimate of Total Infested Acres[1]
Russian knapweed	21.0		5.3					26.3	6.6
Blackgrass or slender meadow foxtail*			0.3					0.3	0.1
Common bugloss*			5812.9					5812.9	1500.0
Hoarycress-White-top	104.4	15.3	555.9		87.8	475.7	250.3	1489.3	819.1
Musk thistle*					1.6		25.6	27.2	6.8
Diffuse knapweed**	420.2	827.4	433.2	706.6	888.1	336.7	538.1	4150.2	1037.6
Spotted knapweed*	75.8	212.0	417.2	34.6	31.8	11.4	123.9	906.7	226.7
Knapweed species*	35.0	37.6	2.1		2.3	31.4	10.2	118.7	29.7
Meadow knapweed*				0.0				0.0	0.0
Yellow starthistle**	9.9	96.9	868.0		419.0	572.3		1966.1	491.5
Squarrose knapweed*	6.6							6.6	1.7
Rush skeleton weed*			375.1			15.3		390.4	97.6
Canada thistle	471.2	200.3	738.4	127.5	462.4	167.8	1227.4	3395.0	848.8
Bull thistle					22.2			22.2	5.6
Field bindweed						3.3		3.3	0.8
Poison hemlock			6.5			0.6		7.1	1.8
Common crupina*		284.2						284.2	71.1
Dodder			7.2			2.4		9.6	2.4
Houndstongue	211.0				39.9	406.6	321.6	979.1	244.8
Scotch broom*	0.3	114.7			0.1			115.1	28.8
Teasel	22.0						8.1	30.1	7.5
Leafy spurge*	51.6	0.6	0.9		22.3		26.6	102.1	25.5
Meadow hawkweek*		0.1	6.9	9.2				16.2	8.9
St john's wort	258.5		213.1			100.4	31.5	603.4	150.9
Pepperweed*						0.7		0.7	0.2
Dalmation toadflax*	77.8	191.8	14.9	2.9	1.7	137.0	302.1	728.3	182.1
Toadflax species		3.8						3.8	0.9
Yellow toadflax	34.9	1.9	7.5			6.2	0.1	50.6	12.6
Purple loosestrife*			2.5					2.5	0.6

Invasive plant species	District								
	Baker	Wallowa-Valley	HCNRA	Eagle Cap	LaGrande	Pine	Unity	Acres (gross)	Estimate of Total Infested Acres[1]
Scotch thistle	88.9	426.8	1194.3		16.8	20.6	96.8	1844.2	461.0
Japanese knotweed*			77.5					77.5	19.4
Sulphur cinquefoil	80.9	0.1			9.8	96.1		187.0	46.8
Himalayan blackberry			15.2					15.2	3.8
Mediterranean and clary sage**			21.9					21.9	5.5
Russian thistle						9.7		9.7	2.4
Tansy ragwort	3.0	2.4	0.9	0.5	7.4		63.9	78.2	19.6
Senecio species		4.3	4.1					8.4	2.1
Silverleaf nightshade*			10.9					10.9	2.7
Medusahead			6.0			914.7		920.7	230.2
Puncturevine			12.3					12.3	3.1
Total	**1973.2**	**2420.2**	**10811.0**	**881.4**	**2013.1**	**3309.2**	**3026.3**	**[2]24434.3**	**6108.6**

* = Ranked as priority species 1 across all districts, ** = 85% of districts ranked as priority species 1, *** 71% of districts ranked as priority species 1.
[1]Estimates of total infested acreages represent 55% for whitetop and hawkweed and 25% for all other species, common bugloss site estimated at 1,500 acres (L. Dawson 2007).
[2]Total includes multiple species occurring on the same site; therefore acres reported here are larger than 22,802 acres infested

Table 21-Range of acreage of infested sites documented on the Wallowa-Whitman National Forest

Size of Infestation	Number of Sites	Percent of Known Sites
Less than 1 acre	715	41.1
1 to < 5 acres	432	24.8
5 to < 10 acres	276	15.8
10 to < 50 acres	241	13.8
50 to < 100 acres	50	2.8
100 to < 500 acres	22	1.2
500 acres or more	4	0.2
Total	1740	100%

Recent Forest Service mapping efforts have also identified approximately 6,633 infested acres on private, state or county lands adjacent to or overlapping with forest service lands. In the future, these areas could be treated together as a cooperative effort to contain and control invasive species where invasives overlap ownership boundaries. Priorities will be set by the Districts on a project level basis.

Native Vegetation

The Wallowa-Whitman National Forest located in northeast corner of Oregon and the west central edge of Idaho contains a wide diversity of plant species (approximately 1,500 species) and communities due to varying elevation and precipitation zones that occur within eastern Oregon (USDA Forest Service 2007b). The 2.3 million plus acre forest lies within Wallowa, Union, Baker, Malheur, Umatilla, and Grant Counties in Oregon and Adams, Idaho, and Nez Perce Counties in Idaho. Included in this acreage are Hells Canyon National Recreation Area (HCNRA) (621,311 acres) and four designated wilderness areas (Eagle Cap, Hells Canyon Wilderness, Monument Rock, and North Fork John Day) representing approximately 26 percent of the Wallowa-Whitman Forest. There is also nine designated wild and scenic rivers on the forest covering an estimated 294 miles.

The complex geologic history of the area which included floods, volcanic eruptions, landslides and erosion have shaped the landscape of the forest into a unique combination of landforms and vegetation patterns. The unique combination of geology and topography has produced a distinctive, mosaic pattern of dense, heavily timbered slopes interspersed between open, rugged grasslands. Ecological habitats ranging from low to high elevation include: juniper, sagebrush, grasslands, ponderosa pine, mixed conifer, sub-alpine fir, Engelmann spruce, and alpine plants. Biophysical settings are aggregations of plant associations and represent a combination of temperature and moisture regimes for the Wallowa-Whitman National Forest and include those listed in Table 22. Given this combination of physiography and climate, habitats are highly variable and retain a legacy of botanical diversity.

Since the time of the pioneers, movement of people into the area and the associated establishment of invasive weed spread vectors (highways, railroads, canoes, rafts, and other transportation methods) have continued to alter habitats and vegetation types across the landscape. For example, many areas within the forest have become permanently altered by cheat grass, which has become naturalized. In certain instances this permanent alteration of habitat has affected native vegetation and species of local interest (SOLIs) in the past (Morse et al. 2006). Eastside forests are more susceptible to invasive plants than other forests in the region (R6 2005 ROD). In general, their grasslands, riparian areas, and relatively dry, open forests are more susceptible to invasion than are dense moist forests and high montane areas (R6 2005 ROD). The grasslands, riparian areas, and relatively dry, open forests have frequent gaps in the plant cover, which favor invasive plant establishment. The moist forests and high montane areas have relatively closed plant cover or have extreme climate or soils, which are tolerated by fewer invasive plant species. Invasive plants tend to colonize disturbed ground along and around developments such as roads, highways, utility (powerline) corridors, recreational residences, trails, campgrounds and quarries. These are all places where native vegetation has been removed and disturbance has been created areas for invasive plants to establish.

Plant communities can be classified by a variety of factors such as vegetation structure, site moisture, overstory, and understory. The R6 2005 FEIS used broad potential vegetation groups (PVGs) to rate the susceptibility of vegetation. Table 22 provides a summary of the PVGs found in the Wallowa-Whitman Forest, their susceptibility to damage from invasive plants, the local plant community types that correspond to these broad PVG types, and mapped acres of invasive plants within the plant community types. The susceptibility of plant communities to invasion can be influenced by many factors, including disturbance levels, community structure, and the biological traits of the invader species. The majority of plant community types found on the Wallowa-Whitman National Forest are moderately to highly susceptible to invasion.

Table 22-Potential vegetation groups on the Wallowa-Whitman National Forest's 2.3 million acres and their susceptibility to invasive plants

Potential Vegetation Group	Percent of Forest	Susceptibility to Invasion[1]	Infested acres (all species)[2]
Admin	0.1		183.1
Cold dry upland forest	16.9	Moderate	761.4
Cold moist upland herbland	2.0	Moderate	95.2
Cold moist shrubland	0.8	Moderate	1.5
Dry upland forest	31.3	Moderate	8926.6
Dry upland herbland	13.9	High	6727.3
Dry upland shrubland	2.0	High	1150.4
Dry upland woodland	0.6	Moderate-high	117.0
Warm dry riparian herbland	0.1	High	12.9
Warm riparian forest	0.1	Moderate	0.2
Warm low dry herbland	0.0	High	76.7
Warm riparian shrubland	0.0	Moderate	0
Warm riparian forest	0.0	Moderate-high	167.5
Warm riparian herbland	0.3	Moderate-high	153.6
Moist forest	16.4	Moderate-high	1925.7
Moist herbland	3.0	Moderate-high	1664.0
Moist shrubland	0.8	Moderate	117.3
Moist woodland	0.2	Moderate-high	25.4
Nonveg	4.2	-----	221.2
Riparian	0.1	-----	152.9
Water	0.3	-----	104
Grand Total	**100.0**		**[2]22,583**

1 Susceptibility ratings (derived from R6 FEIS): High = high susceptibility to invasion. Invasive plant species invade the cover type successfully and becomes dominant or co-dominant even in the absence of intense or frequent disturbance; Moderate = moderate susceptibility to invasion. Invasive plant species is a "colonizer" that invades the cover type successfully following high intensity or frequent disturbance that impacts the soil surface or

removes the normal canopy; Low = low susceptibility to invasion. Invasive weed species does not establish because the cover type does not provide suitable habitat.
2 Some mapping error due to overlap in species occurrences in duplicate potential vegetation groups in GIS database

Botanical Species of Local Interest (SOLI)

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

- Threatened and/or endangered species (federally listed or proposed for listing under the Endangered Species Act- (for full analysis of effects see Biological Assessment for Plants)
- Regional Forester Sensitive Species (Forest Service Manual 2670)
- Plant species endemic to the forest
- Special species of local interest to the forest such as disjunct species located in HCRNA

The Forest Service is directed to manage habitats for all existing native and desired nonnative plants, fish, and wildlife species in order to maintain viable populations of such species. This direction comes from the Forest Service Manual section 2600 (USDA Forest Service 1995a, WO Amendment 2600-95-7) and stems from direction provided by the Endangered Species Act. Forest Service Manual (FSM) 2670.5 defines sensitive species as those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by significant current or predicted downward trends in population numbers, density, or habitat capability that would reduce a species' existing distribution. In FSM 2670.22, the management objective for sensitive species is, in part, to develop and implement management actions to ensure that species do not become threatened or endangered because of Forest Service actions and to maintain viable populations of all native and desired nonnative wildlife, fish, and plant species in habitats throughout their geographic range on National Forest System lands. A viable population is a population that has the estimated numbers and distribution of reproductive individuals to ensure the continued existence of the species throughout its existing range (or range required to meet recovery for listed species) within the planning area.

A biological evaluation (BE) is conducted to review Forest Service programs and activities for possible effects on sensitive species, as required in Forest Service Manual 2672.4 (USDA Forest Service 1990a, 1995a) and the Wallowa-Whitman Forest Plan (USDA Forest Service 1990). The specific requirements of a BE include a prefield review of available information to identify known or potentially occurring TES plant species, a field reconnaissance of the proposed project, and an evaluation of potential effects to TES plant species from the proposed project. The biological evaluation for this project is available upon request from the project record.

Prefield Review

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

The following sources were consulted for the prefield review:

- Regional Forester's Sensitive Species List (USDA Forest Service 2004d)

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

The following two tables list all SOLI for Wallowa-Whitman National Forest and Hells Canyon National Recreation Area. The two lists are separate because HCNRA administers part of the Payette National Forest (Region 4) and the Nez Perce National Forest (Region 1). Two federally listed species, MacFarlane's four o'clock (*Mirabilis macfarlanei*) and Spalding's catchfly (*Silene spaldingii*) are documented on the forest and a separate biological assessment (BA) prepared for submission to US Fish and Wildlife service will directly assess the impacts of this project on these two federally listed species.

Table 23-Regional sensitive plant species for the Wallowa-Whitman National Forest

Species	Documented or Suspected to Occur on Forest
Achnatherum wallowensis	D
Allium geyeri var. geyeri	D
Arabis hastatula	D
Botrychium ascendens	D
Botrychium campestre	D
Botrychium crenulatum	D
Botrychium fenestratum	D
Botrychium lanceolatum	D
Botrychium lineare	D
Botrychium lunaria	D
Botrychium minganense	D
Botrychium montanum	D
Botrychium paradoxum	D
Botrychium pedunculosum	D
Botrychium pinnatum	D
Calochortus longebarbatus var. longebarbatus	D
Calochortus macrocarpus var. maculosus	D
Calochortus nitidus	D
Carex atrata var. atrosquama	D
Carex backii	D
Carex dioica .	D
Carex hystericina	D
Carex interior	D
Carex nardina	D
Carex norvegica	D
Carex nova	D
Carex stenophylla (C. eleocharis)	D
Castilleja fraterna	D
Castilleja rubida	D
Cypripedium fasciculatum	D

Species	Documented or Suspected to Occur on Forest
Erigeron disparipilus	D
Erigeron engelmannii var. davisii	D
Kobresia bellardii (K. myosuroides)	D
Kobresia simpliciuscula	D
Leptodactylon pungens ssp. hazeliae	D
Listera borealis	D
Lomatium erythrocarpum	D
Lomatium greenmanii	D
Lycopodium complanatum	D
Mimulus clivicola	D
Mimulus hymenophyllus	D
Mirabilis macfarlanei	D
Pellaea bridgesii	D
Phacelia minutissima	D
Phlox multiflora	D
Platanthera obtusata	D
Primula cusickiana	D
Rubus bartonianus	D
Salix farriae	D
Saxifraga adscendens var. oregonensis	D
Senecio dimorphophyllus	D
Silene spaldingii	D
Thalictrum alpinum var. hebetum	D
Townsendia montana	D
Townsendia parryi	D
Trifolium douglasii	D
Trollius laxus var. albiflorus	D
Carex parryana	S
Cicuta bulbifera	S
Howellia aquatilis	S
Lomatium ravenii	S
Lomatium salmoniflorum	S
Pleuropogon oregonus	S
Rorippa columbiae	S
Suksdorfia violacea	S
Thelypodium eucosmum	S
Dermatocarpon luridum	S
Leptogium burnetiae var. hirsutum	S
Leptogium cyanescens	S
Peltigera neckeri	S
Rhizomnium nudum	S
Schistostega pennata	S
Scouleria marginata	S
Tetraphis geniculata	S

Table 24-Hells Canyon National Recreation Area - Threatened, Endangered or Proposed; Candidate, Sensitive, Endemic and Disjunct Species

Plant Species	Federal[1] Status	Forest Service[2] Sensitive Species			Doc[3]	Habitat*
		Region 6	Region 4	Region 1		
Threatened, Endangered, or Proposed Species						
Howellia aquatilis	LT	X	X	X		R
Mirabilis macfarlanei	LT	X	X	X	X	G
Silene spaldingii	LT	X	X	X		G
Spiranthes diluvialis	LT		X			R
Thelypodium howellii var. spectabilis	LT					R, G
Candidate Species						
Botrychium lineare		X				R, MWM
Sensitive Species						
Adiantum aleuticum			X			RCB, R
Achnatherum wallowaensis		X			X	L
Allium madidum			X			MWM
Allium tolmeii var. persimile			X		X	L
Allotropa virgata			X	X		CF
Arabis hastatula		X			X	RCB
Astragalus paysonii			X	X		CF
Astragalus vexilliflexus var. vexilliflexus			X			G
Blechnum spicant				X		CF
Botrychium ascendens		X		X		R, MWM
Botrychium campestre		X				R, MWM
Botrychium crenulatum		X		X		R, MWM
Botrychium fenestratum		X				R, MWM
Botrychium lanceolatum		X		X		R, MWM
Botrychium lunaria		X				R, MWM
Botrychium minganense		X		X		R, MWM
Botrychium montanum		X		X		R, MWM
Botrychium paradoxum		X		X		R, MWM
Botrychium pedunculosum		X		X		R, MWM
Botrychium pinnatum		X		X		R, MWM
Botrychium simplex				X	X	R, MWM
Bryum calobryoides			X			CF
Buxbaumia aphylla				X		CF
Buxbaumia piperi			X			CF
Buxbaumia viridis			X	X		CF
Calamagrostis tweedyi			X			CF, G
Calochortus longebarbatus var. longebarbatus		X				R, MWM
Calochortus macrocarpus var.		X			X	G

Plant Species	Federal[1] Status	Forest Service[2] Sensitive Species			Doc[3]	Habitat*
		Region 6	Region 4	Region 1		
maculosus						
Calochortus nitidus		X	X	X	X	G
Camassia cusickii			X		X	R
Cardamine constancei				X		CF
Carex aenea			X			MWM, R
Carex atrata var. atrosquama		X				MWM, A
Carex backii		X				R
Carex buxbaumii			X	X		MWM
Carex dioica var. gynocrates		X				R
Carex flava				X		MWM
Carex flava var. rustica					X	R, MWM
Carex hendersonii				X		G
Carex hystericina		X			X	MWM, R
Carex interior		X			X	MWM, R
Carex livida			X			MWM
Carex nardina		X				A
Carex norvegica		X				A, MWM, R
Carex nova		X				A, MWM
Carex parryana		X				MWM
Carex paupercula				X		MWM
Carex scirpoidea var. stenochlaena		X				MWM
Carex stenophylla		X				G, MWM
Carex straminiformis			X			A, RCB
Castilleja fraternal		X				A, RCB, MWM, R
Castilleja rubida		X				RCB, A
Ceanothus prostratus ssp. Prostrates			X			CF
Cetraria subalpina				X		CF
Chrysothamnus nauseosus			X			RCB
Cicuta bulbifera		X	X			R
Cornus nuttallii				X		CF
Crepis bakeri ssp. idahoensis			X			G
Cypripedium fasciculatum		X	X	X		CF, R
Dasynotus daubenmirei				X		CF
Diphasiastrum complanatum = Lycopodium complanatum		X				CF, R
Douglasia idahoensis			X	X		CF,
Epipactis gigantea			X	X	X	R
Erigeron disparipilus		X			X	L
Erigeron engelmanni var. davisii		X			X	G, RCB
Hackelia davisii			X			RCB

Plant Species	Federal[1] Status	Forest Service[2] Sensitive Species			Doc[3]	Habitat*
		Region 6	Region 4	Region 1		
Halimolobos perplexa var. perplexa		X	X	X	X	G
Haplopappus hirtus var. sonchifolius				X	X	MWM
Haplopappus insecticruris			X			G
Haplopappus radiatus = Pyrrocoma radiata			X			G
Helodium blandowii			X			MWM
Hookeria lucens				X		CF, R,
Kobresia bellardii		X				A
Kobresia simpliciuscula		X				MWM, R
Leptodactylon pungens ssp. hazeliae		X	X		X	G, RCB
Lewisia kelloggii			X			A
Listeria borealis		X				CF
Lobaria scrobiculata			X			RCB
Lomatium erythrocarpum		X				A
Lomatium greenmanii		X				A
Lomatium ravenii		X				L
Lomatium salmoniflorum		X	X	X		G
Mimulus ampliatus				X		R
Mimulus clivicola		X	X	X	X	G
Mimulus hymenophyllus		X			X	R, RCB
Pellaea bridgesii		X				RCB
Pentagramma triangularis				X	X	RCB
Peraphyllum ramosissimum			X			G
Phacelia minutissima		X	X		X	MWM,
Phlox multiflora		X				G, RCB
Platanthera obtusata		X				MWM
Pleuropogon oregonus		X				R, MWM
Primula cusickiana		X			X	R, L
Ranunculus oresterus		X				MWM
Rhizomnium nudum				X		CF
Rhynchospora alba			X	X		MWM
Ribes wolfii			X			CF
Rorippa columbiae		X				R
Rubus bartonianus		X	X		X	R, RCB
Salix farriae		X				MWM, R
Salix glauca			X			A
Sanicula graveolens			X			G
Saxifraga adscendens var. oregonensis		X				RCB, A
Saxifraga bryophora var. tobiasiae			X			RCB
Saxifraga tolmiei var. ledifolia			X			CF, A
Scheuchzeria palustris			X			MWM

Plant Species	Federal[1] Status	Forest Service[2] Sensitive Species			Doc[3]	Habitat*
		Region 6	Region 4	Region 1		
Sedum borschii			X			RCB
Senecio dimorphophyllus		X				MWM, A
Sphagnum mendocinum				X		MWM
Stylocline filaginea			X			G
Suksdorfia violacea		X				RCB
Syntheris platycarpa				X		CF
Thalictrum alpinum var. hebetum		X				MWM
Thelypodium eucosmum		X				G
Tofieldia glutinosa var. absona			X			MWM
Townsendia montana		X				A
Townsendia parryi		X				A
Triantha occidentalis ssp. Brevistyla			X			MWM, R
Trifolium douglassii		X				G, MWM
Trifolium longipes ssp. multipedunculatum			X			G, MWM
Trollius laxus var. albiflorus		X			X	MWM, R
Waldsteinia idahoensis				X		CF
Endemic Species						
Arabis crucisetosa					X	MWM
Astragalus vallaris					X	G
Frasera albicaulis var idahoensis					X	G
Lomatium rollinsii					X	G
Lomatium serpentinum						G
Nemophila kirtleyi					X	CF
Penstemon elegantulus					X	G
Phlox colubrina					X	G, RCB
Ribes cereum var. colubrinum					X	R
Disjunct Species						
Allium geyeri var. geyeri					X	MWM, R
Bupleurum americanum					X	A
Carex limosa					X	MWM
Cryptogramma stelleri					X	RCB
Drosera anglica					X	MWM
Geum rossii var. turbinatum					X	RCB
Pediocactus simpsonii var. robustior					X	G
Potentilla palustre					X	MWM
Xerophyllum tenax					X	CF, A-MWM

1. Federal Status. LT- Listed Threatened as defined by the Endangered Species Act of 1973.
2. Region 6 Regional Forester's Sensitive Species List. Applies to all Hells Canyon land in Oregon (June 10, 1991) updated by April 1999 listing.
Region 4 Regional Forester's Sensitive Species List. Applies to all land on the Payette National Forest in Idaho that is administered by the HCNRA (November 1995).
Region 1 Regional Forester's Sensitive Species List. Applies to all land on the Nez Perce National Forest in Idaho that is administered by the HCNRA (March 12, 1999).

3. Doc - Documented in the HCNRA - Indicates that the species has been documented in the HCNRA.
*. Habitat: A=Alpine; CF = Coniferous Forest; G = Grassland; L = Lithosol; MWM = Moist and Wet Meadows; R = Riparian Areas; RCB = Rock Outcrops, Cliffs, and Bluffs.

Field Surveys

Botanical surveys for SOLI have been conducted on the Wallowa-Whitman National Forest and in general were associated with proposed projects and/or focused surveys in specific habitats as directed by the forest botanist (Yates 2006). Survey routes and documented occurrences and habitats for SOLI are on file at the Wallowa-Whitman National Forest Supervisor's office. Because of incomplete forestwide surveys, some undocumented SOLI may exist in or near identified invasive plant sites. To determine SOLIs currently identified on the forest with the highest potential for invasive plant treatment effects and highest risks from invasive plant impacts, GIS databases and records from Wallowa-Whitman National Forest weed surveys over the past 20 years (Yates 2007) were used to identify SOLIs within 100-1000 feet of identified invasive plants. Invasive plant sites were identified for SOLI as follows:

- Invasive plant sites within 1000 feet of a federally listed plant species for any proposed treatment
- Invasive plant sites within 300 feet of a nonfederally listed plant species where aerial herbicide application is proposed
- Invasive plant sites within 100 feet of nonfederally listed SOLI for all ground based treatments

Presently, there are 22 species of plant SOLI representing 80 individual locations within 100 feet of an invasive plant site proposed for treatment (Table 25). No SOLI are presently identified within 300 feet of a proposed aerial site. No federally listed SOLI are within 1000 feet of a proposed aerial site.

3.2.3 Environmental Consequences

The public has expressed concerns that there is and will continue to be a loss of vegetation diversity within native plant communities from the continued spread of invasive plants. The public has also expressed concern that the application of herbicides has the potential to adversely affect nontarget plant species, including SOLI.

Continued loss of vegetation diversity is addressed through the analysis of treatment effectiveness of Proposed Actions of reducing invasive plants. Treatment effectiveness is measured by the decrease or elimination of the invasive plant species and the concomitant recovery of the area with native or desirable vegetation. Effectiveness for all treatment methods were derived from a thorough review of the literature. Sources of information included Effects of Nonherbicidal Methods of Invasive Plant Treatments on Wildlife, Fish and Plants (R6 2005 FEIS, Appendix J), nonherbicidal methods and technical handbooks such as the Nature Conservancy Weed Control Handbook (Tu et al. 2001), county and state extension service or weed control board publications, peer reviewed journal articles, and invasive weed experts in the region. A compilation of these reviews can be found in Appendix A this document and Appendix N of the R6 2005 FEIS (*Common Control Measures for Invasive Plants of the Pacific Northwest Region Draft* Mazzu 2005).

Concerns related to impacts to nontarget plant species including SOLI from treatments have been described previously within herbicide risk assessments (R6 2005 FEIS), assessments of herbicide best management practices (Berg 2004), a review of the literature nonherbicidal effects to plants (R6 2005 ROD, Appendix J), risks to pollinators of native plant communities (R6 2005 FEIS), and peer reviewed scientific papers. Risks to nontarget species including SOLI are based on the combination of treatment effectiveness between alternatives and direct and indirect effects from proposed treatments.

Determination of effects are based on the assumption that all PDFs as listed in Chapter 2 of this EIS will be implemented in accordance with all the standards outlined in the Wallow-Whitman National Forest LRMP as amended by the R6 2005 ROD. Treatment effects to native plant communities and pollinators associated with these communities is evaluated at a forest wide scale. Effects to individual SOLI are based on individual site occurrences, proposed treatment to nearby invasive plant species and overall risk of treatment effectiveness by alternative.

Herbicide Effects on Plant Diversity

Changes in plant diversity or species composition can occur due to invasive plants; changes can also occur due to treatments. Short-term changes in species dominance can lead to long-term shifts in plant community composition and structure. Repeated treatments over time could favor tolerant species, which in turn could shift pollinators available to a community. DiTomaso (2001) points out that continuous broadcast use of one or a combination of herbicides will often select for tolerant plant species. Noxious annual grasses such as medusahead, cheatgrass or barbed goatgrass may become dominant with a broadcast application of broadleaf selective herbicides.

Population shifts through repeated use of a single herbicide may also reduce plant diversity. Alternatively, plant diversity is reported to be maintained on sites with repeated applications of picloram and clopyralid for control of spotted knapweed in Montana (Rice 2000).

Additionally, analyses based on 60 published studies of terrestrial plants and animals in temperate zone forests and agro-ecosystems indicate species richness and diversity of vascular plants was either unaffected or increased (particularly herbaceous species) in response to glyphosate (Sullivan and Sullivan 2003). Project design features such as the development of a long-term site strategy, monitoring, and restoration would be directed towards sites that could experience repeated herbicide applications (i.e. areas where recovery to native vegetation may not be possible such as campgrounds, highly disturbed areas). It is likely that due to the nature of repeated disturbance activities in some areas on the forest, long-term site objectives may be focused on containment of these areas to prevent future spread into other areas of the forest.

Herbicide treatments may impact soil biology which may in turn impact plant diversity, such as shifting plant composition. Effects are expected to be transitory based on the herbicide type and frequency applied. For a complete review of soil biological effects see the Soils section. It is expected that adverse effects would be minimized by adjusting herbicide use to avoid soil buildup and leaching to groundwater (see Hydrology section in this chapter and soil and water PDFs in Chapter 2). In general, most of the proposed herbicides are highly mobile and therefore buildup is not a concern. For immobile herbicides such as picloram (tordon) and glyphosate (Rodeo, Roundup), spraying frequency restrictions alleviate risk for soil buildup. Soil erosion from loss of vegetative cover is only a concern for monocultural stands of weeds. The highest erosion concern is associated with steep roadside treatment of knapweeds and broadcast treatment of common crupina and whitetop monocultures on disturbed areas with moderate slope. Erosion risk is for 1-2 years while desired species revegetate. For complete analysis of herbicide effects to soils see the Soils report.

Herbicide Effects on Fungi and Mycorrhizal Associations

Mycorrhizae are mutualistic associations between specialized soil fungi and the roots of vascular plants. The fungal partners of this association come from several phyla in the fungi kingdom (*Basidiomycetes, Ascomycetes, and Zygomycetes*). Most vascular plants (95%) form mycorrhizae and they have been shown to be essential for maintaining plant health. Benefits include improved nutrient and water uptake, improved root growth, improved plant growth and reduced drought stress.

No studies investigating the relations between pesticide applications and edible forest mushroom production or consumption have been found (Pilz and Molina 2001).

Herbicide Effects on Lichen and Bryophytes

Impact of invasive species to lichens, and bryophytes is not widely documented in the literature, likely due to taxonomic problems, lack of experts in this field of study, the small size and intermixing of taxa in the environment and the life history and variation observed within individual species. Impacts to lichen and bryophytes from herbicide applications are better documented. Glyphosate and triclopyr applications studies in the field and laboratory have indicated negative impacts to lichens and bryophytes and a reduction in species diversity (Newmaster et al. 1999). However, other studies indicate little effect on bryophytes and lichens in field and laboratory conditions (Atkinson et al. 1980; Balcerkiewicz and Rusińska 1987, Bond 1976, Mabb 1989, Pihakaski and Pihahaski 1980, Ronoprawiro 1975, Rudolph and Samland 1985, Stjernquist 1981). Herbicide drift may impact some species because bryophytes and lichens receive their mineral nutrition and water from precipitation, splash water, or directly from the atmosphere. Physiological research is also needed to explain whether herbicides directly alter the physiology of bryophytes and lichens or affect their associated microhabitats.

It is expected that the implementation of PDFs that outline effectiveness monitoring will not only adjust buffers to protect these species if negative impacts are observed, but also help fill information gaps for projects such as these in the future. Short term impacts could be expected. Long-term positive effects to habitats are expected because effective treatment of existing and future invasive plants would restore, protect and maintain habitats these species require.

Herbicide Effects to Pollinators and Colony Collapse Disorder

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

In relation to treatment effectiveness, it is assumed that any treatment that reduces invasive plants within a native plant community will result in a positive impact on the community when that native plant community is restored. Very little information is available on the effect of herbicides on native pollinators.

Most information is related to impacts on the nonnative honey bee. It is known that pollinators can be directly affected by spray or indirectly when plants needed as food for adults or larvae are eliminated by herbicides (Shepherd et al. 2003). The only known quantified effects are from direct spray. The herbicides approved for use in the regional FEIS are not expected to have toxic effects when directly sprayed on honeybees at the typical Forest Service application rates. However, glyphosate may have some toxic effects if applied at the maximum application rate proposed by the Forest Service, and triclopyr approaches toxicity levels for bees but does not exceed levels considered to be toxic (SERA 2003-glyphosate; SERA 2003-Triclopyr).

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

Another concern is the contribution herbicides might have on “colony collapse disorder” (CCD). In 2006-2007, commercial honey bees in North America and other parts of the world experienced alarming declines characterized by:

- The disappearance of adult bees from the hives, and no bees or a few dead bees near the hive
- Healthy, capped brood
- Food reserves that have not been robbed
- Minimal evidence of wax moth or hive beetle damage;
- A laying queen with immature bees and newly emerged attendants

(CCD Steering Committee 2007, Winfree et al. 2007) By 2007, almost 30 percent of beekeepers in the United States reported losses of up to 90 percent of their colonies (Cox-Foster et al. 2007; Winfree et al. 2007). Colony Collapse Disorder has not been reported in wild native bees (Winfree et al. 2007).

Suspected causes of colony collapse disorder include the following factors, alone or in combination: 1) environmental and nutritional stress; 2) new and /or re-emerging pathogens; 3) pests that attack bees; and 4) pesticides (CCD Steering Committee 2007). Several major setbacks to honey bee populations over the last two decades have combined to increase stress on the remaining hives as they are moved and worked for their pollination services over longer seasons and larger geographic areas. Climate change, drought, and unseasonably cold weather combine to create increased stress on bee populations. Commercial bees are often fed high fructose corn syrup, which may contribute to some nutritional deficiencies.

Pathogens are primary suspects because colony collapse disorder is transmissible to other hives through the reuse of equipment from colony collapse disorder-affected colonies. Such transmission can be broken by irradiation of the equipment before use (Pettis et al. 2007). The Varroa Mite (Shen et al. 2005) and Israeli acute paralysis virus (Cox-Foster et al. 2007, Kaplan 2008) are pathogens suspected of significant damage to honey bee populations.

Herbicides, as proposed herein, have little potential of damaging commercial honey bee populations because bee colonies found on National Forest System lands are native wild bees, not commercial honey bees whose colonies are mostly on private agricultural lands. Colony collapse disorder has not been documented in native wild bee colonies even though herbicide application has been ongoing on National Forest System lands where wild colonies are found. There is little concern that this project could adversely affect commercial bees given that just 1.7 percent of the Forest is expected to be treated during the life of this project, and the small likelihood commercial honey bees would be present at the time of application. Finally, even if this project included spraying private agricultural lands, (which it does not) herbicides are use is not among the likely causal agents of CCD.

Invasive plant infestations that shift plant communities and adjust plant species make-up away from those communities where pollinators commonly associate may be the greatest threat to wild or domestic pollinators (J. Laufman, personal observation).

Manual and Mechanical Effects on Nontarget Plants, Native Plant Communities and SOLI

Manual treatments proposed in this EIS are mostly on small patches of invasive plants on sites less than three acres in size. Species targeted for manual treatment methods include: houndstongue, scotch thistle, blackgrass (slender meadow foxtail), whitetop, dodder, poison hemlock, meadow hawkweek, silver nightshade, medusahead, and sulphur cinquefoil.

The variation between alternatives is reflected in the number of herbicides available for use, the method of applying the herbicides and other available treatment methods. The following paragraphs provide specific information related to the effectiveness and impacts to native vegetation of all treatments.

The removal of invasive plants using manual techniques (i.e. handpulling, digging with hand tools, clipping flower heads with hand tools) could directly affect nontarget vegetation, including botanical SOLI in situations where the invasive plants are co-located with these species. Direct negative effects would be unintentional removal of flowers, fruits, or root systems of these species. Vigor could be reduced in individuals through reduction in photosynthesis or reproduction potential. Solarization coverings may have negative effects on soil microorganisms and nontarget species' seed viability and would not selectively allow other plants to grow, as would a selective hand application of an herbicide. Hot water and foaming treatments, shown to be effective on small areas on annual weeds and seedlings, is less effective on underground roots or rhizomes, is restricted to proximity to steam generating equipment (i.e. roadsides), has high risks of applicator burns, and unknown impacts to soil microorganisms and co-located nontarget species.

These short-term impacts, if kept to a minimum in relation to population size, would be more than compensated by the long-term positive benefits of removal of aggressive, competitive invasive plants. Manual control crews could also directly impact nontarget vegetation, including botanical SOLI through trampling of individuals or creation of erosive conditions within or upslope of populations. These impacts may have a more long-term negative impact, but again if minimized, the benefit to the species would be more positive than negative.

Indirect negative impacts from manual control could be attributed to soil disturbance and opening of the canopy (understory, shrub layer or overstory depending on the species). This could cause shifts in microsite condition such as reduction in soil moisture, disruption of mychorrhizal associations and cause an increase in surface temperatures. All of these indirect effects could lead to a shift in species composition away from the native community upon which listed plants depend. One possible scenario is that the removal of one invasive plant species would encourage another invasive to take its place through various means of introduction (e.g. windblown seeds, human transport, breaking dormancy of other species seeds). It is likely that these impacts would occur at a small scale (less than 1 acre patches or scattered in small patches across an area) and follow-up monitoring of the treated sites and additional treatments or restoration methodologies would likely reduce negative impacts.

Positive benefits from the removal of the invasive plants overshadow the indirect negative impacts. Nontarget vegetation, including botanical SOLI populations would be affected positively by providing the space for increased growth in population size. One possible scenario is that removal of invasive plants will encourage native seed dormant in the soil to germinate due to less competitive conditions.

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

Bio-control Effects on Nontarget Plants, Native Plant Communities and SOLI

The analyses for effects of biocontrol agents have already been completed under documents developed by Agricultural Plant Health and Insect Service (APHIS) for approval of entry of such organisms and are hereby incorporated by reference.

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 nontarget effects (page J-16).

Cultural Treatment Effects on Native Plant Communities

Cultural methods of invasive plant management focus on enhancing desirable vegetation to minimize invasion. Common cultural treatments include planting or seeding desirable species to shade or out-compete invasive plants, applying fertilizer to desirable vegetation, and mulching. Soluble nitrogen fertilizer applied after herbicide treatment could increase the competitiveness of perennial grasses and beneficial forbs. This method is most effective in pastures or rangelands where nitrogen levels are not high enough for optimum grass performance (Rinella and Sheley 2002).

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

Effects by Alternative

Alternative A – No Action

Native Vegetation

Current acres approved for herbicide use would remain the same placing heavy reliance on manual treatments for currently identified sites and all future sites. The removal of invasive plants using manual techniques could directly affect native plant and plant communities. Direct negative effects would be unintentional removal or trampling of flowers, fruits, or root systems of nontarget native plants, but should be minimized with properly trained crews. Vigor could be reduced in individuals due to repeated treatments, however, impacts would be short lived, not likely to last a completed growing season.

The removal of invasive plants using manual techniques within an area could directly affect remaining native plant community by creating soil disturbance, and opening the canopy (understory, shrub layer or over story depending on the species), creating areas for new or existing invasive plants to re-establish. For instance, hand-pulling trials conducted on spotted knapweed in western Montana and on diffuse knapweeds in west-central Montana resulted in an increase in bare ground from 2.7 percent to 13.7 percent during the first year after treatment (Brown et al. 2001). These hand-pulling trials as were shown to reduce the potential for knapweed seed production by exhibiting 100 percent flower control and 56 percent plant control (Brown et al. 2001), however, follow-up investigation on resultant vegetation after treatment from resident seedbanks after treatment were not reported. The potential for re-establishment of invasive weeds can be high after ground disturbing activity or a significant reduction of plant cover, especially if other invasive plant species are nearby or the resident seed bank contains a high proportion of invasive weed seeds. Additionally, at these sites, changes could occur such as reduction in soil moisture, increases in soil temperatures and disruptions of mycorrhizal connections.

No impacts are anticipated from the use of biocontrol agents as a method of invasive plant control (See Chapter 3.2.4, and Appendix B). Herbicide use under this alternative would likely cause mortality to some, nontarget native plants. Only three herbicides are available under the No Action Alternative for use on 23 percent of the currently mapped invasive plant species acres (0.23% of the forest landbase). Only 18 invasive plant species of the 40 currently identified on the forest could be treated using the three herbicides presently approved under the no action alternative.

Of these 18 species, six species would not be treated with the most effective herbicide available for use and would likely require repeated applications of a less effective herbicide to gain site objectives of control contain or eradicate. For example, under the No Action Alternative the more effective herbicides for the treatment of whitetop (chlorsulfuron, imazapic or metsulfuron methyl) would not be available and the only choice for herbicide treatment would be glyphosate. Glyphosate is a broad spectrum, nonselective herbicide with high potential to kill all contacted vegetation, whereas the more effective herbicides available are more selective with less potential to impact nontarget vegetation.

The herbicides available for use under the No Action Alternative are less effective (See Common Control Measures Chapter 2). The following table compares proposed treatment acres by species for all alternatives. Species shaded in the No Action Alternative indicate species not treated with the most effective herbicides based on recommendations from local experts.

Table 25-Invasive plant species treatment acres comparison between the No Action Alternative, Proposed Action Alternative, and additional action alternatives

Species	No Action Alternative	Alternatives B, C and D
	Acres	
Russian knapweed	20.9	26.3
Slender Meadow Foxtail**	73.2	0.3
Whitetop	454.9	1489.3
Musk thistle	18.7	27.2
Diffuse knapweed	1637.1	4150.2
Spotted knapweed	11.8	906.7
Knapweed species	40.3	118.7
Yellow star thistle	64.8	1966.1
Rush skeletonweed	318.9	390.4
Canada thistle	1376.3	3395.0
Leafy spurge	15.5	102.1
St. John's wort	86.2	543.8
Dalmatian toadflax	349.1	728.3
Purple loosestrife	2.4	2.5
Scotch thistle	955.2	1844.2
Tansy ragwort	4.7	78.2
Medusa head	25.9	920.7
Puncture vine**	43.5	12.3
Common bugloss	0.0	5812.9
Squarrose knapweed	0.0	6.6
Bull thistle	0.0	22.2
Field bindweed	0.0	3.3
Poison hemlock	0.0	7.1
Common crupina	0.0	284.2
Dodder	0.0	9.6
Hounds tongue	0.0	979.1
Scotch broom	0.0	115.1
Teasel	0.0	30.1
Meadow hawkweek	0.0	16.2
Pepperweed	0.0	0.7
Toadflax sp.	0.0	3.8
Yellow toadflax	0.0	50.6
Japanese knotweed	0.0	77.5
Sulphur cinquefoil	0.0	187.0
Himalayan blackberry	0.0	15.2
Clary sage	0.0	21.9
Russian thistle	0.0	9.7
Senecio sp.	0.0	8.4
Silverleaf nightshade	0.0	10.9
Total Acres*	**5,499.4**	**24,434.3**

* Multiple species may occur within on the same site; therefore total acreages are slightly inflated above total on the ground infested acres. **Species effectively treated under the no action alternative.

SOLI

Direct and indirect impacts to SOLI from treating invasives with manual techniques would be similar to those discussed above in the native vegetation section. Impacts to SOLI could be unintentional removal or trampling of flowers, fruits, or root systems of nontarget native plants, but should be minimized with properly trained crews. Vigor could be reduced in individuals due to repeated treatments/trampling, however, impacts would be short lived, not likely to last a completed growing season. Additionally, removal of invasive plants using manual techniques within an area could directly affect remaining native plant community by creating soil disturbance, and opening the canopy (understory, shrub layer or over story depending on the species), creating areas for new or existing invasive plants to re-establish.

Herbicides can be used in addition to manual methods to treat invasive plant near 11 SOLI species (on 27 individual locations) (Table 26); therefore, this effect is likely to be minimized. However, on the remaining 11 SOLI (on 53 individual locations), treating invasives with manual methods of treatment in addition to bio-control agent availability nearby are the only option available. No impacts are anticipated from the use of biocontrol agents as a method of invasive plant control (see Bio-control Effects on Nontarget Plants, Native Plant Communities and SOLI)

Treating invasives with herbicide under this alternative could cause mortality to some SOLI from accidental spray. Less effective herbicides with little or no selectivity for target invasive plants could be used. In comparison to Alternatives B, C and D fewer impacts would occur from herbicide treatment because fewer acres of invasive sites near SOLI would be treated. In general, fewer impacts from herbicide treatments are expected with this alternative in comparison with Alternatives B, C, and D, however, invasive plants encroachment and impacts to habitat are expected to increase as time progresses.

Table 26-Number of SOLI within 100 feet of an invasive plant species site and proposed treatment by alternative

	Alt A **No Action Alt**	**Alt B** **Proposed Action**	**Alt C** **Restricted Riparian**	**Alt D** **No Aerial Herbicide Application**
# of SOLI (and individual locations) within 100' of Invasive plant species	11 sp 27 locations	22 sp 80 locations	Same as B	Same as B
Invasive plant species proposed treatment	*Upland* Chemical = 10 sp, (20 locations) *RHCAs*[1] Chem spot only 7 sp (11 locations) *Aerial* None	*Upland* Chemical = 15 sp (50 loc) Bio-control = 2 sp (2 loc) Manual = 1 sp (1 loc) *RHCAs*[1] Chemical (bcast and/or spot) = 17 sp (44 loc) Biocontrol =1 sp. (6 loc) Manual = 1 sp. (1 loc) *Aerial* None	*Upland* Chemical = 15 sp (50 loc) Bio-control = 2 sp (2 loc) Manual = 1 sp (1 loc) *RHCAs*[1] Chemical (Spot Only) = 17 sp (44 loc) Biocontrol =1 sp, (6 loc) Manual = 1 sp, (1 loc) *Aerial* None	Same as B

1 Riparian Habitat Conservation Areas

Determination Statement for All SOLI: Implementation of the No Action Alternative would not significantly impact SOLI in the near future from invasive plant treatments; however, long-term effects are likely. Long-term effects to SOLI and their habitats will result from lower effectiveness of invasive plant treatments and continued spread into SOLI habitats. Each individual SOLI occurrence is evaluated for effects based on treatment and can be found in Appendix B.

Impacts to Fungi, Lichens and Bryophytes

Unknown effects from herbicide treatments are possible. Most of the nonvascular SOLI and other native fungi, lichen and bryophytes do not commonly occur in the disturbed areas often associated with invasive species. In Alternative A, less impact from herbicide would be possible because fewer acres would be approved for treatment.

However, it is likely that if invasive species continue to spread across the forest as predicted with this alternative, habitats for these species would likely be more negatively impacted compared to the treatments proposed in Alternatives B, C and D.

Impacts to pollinators

Small numbers of pollinators may be affected by glyphosate applied at the maximum application rate proposed by the Forest Service (SERA 2003). Less than 0.02% of the Forest would be treated with herbicides annually; therefore, it is assumed that the remaining areas on the Forest would adequately supply areas where native plant pollinators could recover if impacted from herbicide treatments.

Alternative B – Proposed Action

Native Vegetation

Impacts from manual and mechanical treatments would be similar to those as described in Alternative A. The removal of invasive plants using manual or mechanical techniques could directly affect native plants and plant communities. Direct negative effects would be unintentional removal, mowing or trampling of flowers, fruits, or root systems of native plants, but should be minimal with properly trained crews. Removal, mowing or trampling of nontarget plants could reduce native seed production, create soil disturbance, and open the canopy (understory, shrub layer or overstory depending on the species). However, under this alternative, manual and mechanical methods would typically follow herbicide or be used in conjunction with herbicide treatments and seldom used as a primary control method.

Undocumented future sites may be appropriate for foaming or solarization/mulching techniques for invasive plant control. Such sites would be very small patches because both of these types of treatments are very expensive (TNC 2006). Impacts to nontarget vegetation would be limited to the small area of treatment. Both of these treatments use heat (plastic mulch in solarization and steam combined with biodegradable sugar producing foam) as a method to kill target invasive plants and therefore kill all plants in the treated area. Such treatments would likely be used where there are special resource concerns or where other methods are ineffective. These sites would likely have higher levels of prioritization and monitoring and likely receive immediate revegetation and restoration methodologies. Only short term effects in very limited areas are expected with these treatments.

EDRR sites may also be appropriate for the use of fertilizer/soil amendments and competitive planting as a cultural treatment method for controlling invasive weeds. Some minor impacts to community diversity may occur from the establishment of native species that thrive in the modified conditions as established by the addition of soil amendments or seeding in the short term. No long-term impacts are expected because passive restoration techniques are designed to promote the establishment of desirable plant communities (R6 2005 FEIS).

Approximately 0.9 percent of the 2.3 million acres of the Wallowa-Whitman-National Forest are proposed for herbicide treatments in Alternative B. Maximum annual herbicide treatments could treat about 0.32 percent of the Forest area or approximately 8,000 acres annually. Over time it is expected that herbicide use would be reduced as known sites are effectively controlled and EDRR methodologies eradicate new invasive sites.

This alternative has the greater potential to impact nontarget plants than Alternative A. Because Alternative B proposed use of broadcast herbicide spraying in riparian areas it would likely have more negative effects to nontarget riparian vegetation than Alternative C. Because Alternative B proposed aerial application of herbicides, it would likely have more negative effects on nontarget plants due to chemical drift than Alternative D. The effects are considered short term and minor because the Regional prevention and restoration standards in the Forest Plan as amended by the R6 2005 ROD, the common control measures, and the additional protection of project design features (PDFs) are considered adequate to protect native plant populations.

This alternative allows the use of several new herbicides, some of which are associated with hazards to nontarget vegetation (R6 2005 FEIS 4-27-4-33). Alternatively, some herbicides allowed in the action alternatives are more specific to certain plant families which would reduce impacts to native vegetation in comparison to the three herbicides available in the no Action Alternative. In turn, the reduced impacts to nontarget species would aid the recovery of affected native plant communities. For instance Alternative A only allows use of picloram and glyphosate. However, metsulfuron methyl and chlorsulfuron are recommend for treating houndstongue compared to other herbicides, clopyralid and chlorsulfuron controls tansy ragwort more effectively than picloram and glyphosate, and imazapic and sulfometuron methyl/chlorsulfuron, sulfometuron methyl and sethoxydim controls medusa head more effectively than glyphosate. Infestations of houndstongue, tansy ragwort and medusa head are 979; 78, and 921 acres respectively. Being more effective means reducing the number of applications and volume of herbicide required compared to Alternative A. Risks to nontarget vegetation are further reduced by careful implementation of PDFs and common control measure notes and supplemental information provided by local experts. Although some short-term negative effects to native vegetation likely will occur, this alternative would be more effective at accomplishing the projects purpose and need of containing, controlling and eradicating invasive plant infestations. Long term, Alternative B would likely be more effective at allowing native vegetation and plant communities to recover compared to Alternative A.

In summary, there would likely be more risk from herbicide impacts to nontarget native vegetation because more acres and sites would be treated compared to Alternative A. The annual forestwide risk to nontarget effects from herbicide use between the No Action and the Proposed Action is less than 0.008 percent and 0.3 percent of the Forest acres respectively. Although more acres may be impacted by Alternative B, in the long-term native plant community health will improve because existing and potential future invasive plant sites will be more effectively treated.

Proposed Aerial Applications

Invasive sites currently proposed for herbicide treatments using aerial application methods consist of approximately 875 acres. Additionally, invasive plants within these proposed areas exist in small patches across the landscape, and aerial treatments within those areas would be applied where sufficient invasive weed cover would warrant the need for a broadcast application. The use or nonuse of picloram to control target invasive species and subsequent potential impacts to conifers would be considered (PDF F-8o).

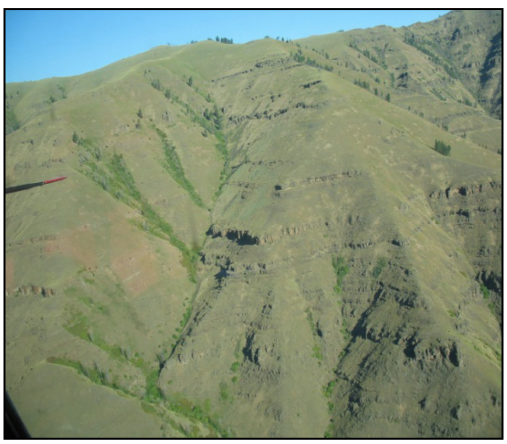
Picloram would be applied at a less than typical application rate (0.25lb/ai/acre, PDF F-8o and clopyralid would not exceed typical application rates (0.35lb ai/acre). Buffers described in the PDFs would limit the drift to levels below quantities known to have adverse effects. Table 27 describes the areas where aerial application methods are currently proposed (See Figure 9 and Appendix B aerial site maps). Picloram would not be used more than once every other year on individual sites. For a complete description and acres of proposed aerial treatment sites, see Appendix F. Aerial drift modeling (AGDISP 2003) was used to develop PDF buffers to protect resources and predict impacts. Picloram (0.25lbs ai/acre) and clopyralid (0.35lbs ai/acre) are proposed for use in aerial applications to yellow star thistle and scotch thistle. Future EDRR sites will not use aerial as a method of application.

Clopyralid is an extremely selective post emergent herbicide for broadleaved invasive species. The target families for this herbicide are *Asteraceae*, *Fabaceae,* and *Solanaceae*. Grasses are tolerant of clopyralid and conifers are not impacted. With the use of this herbicide, there would likely be direct negative effects to native species in target families in the area of application. Picloram is also a selective herbicide for the *Asteraceae, Fabaceae, Apiaceae* and *Polygonaceae* families with some potential effect to the *Brassicaceae, Liliaceae*, and *Scrophulariaceae* families. Picloram has a higher potential for runoff and leaching (high mobility in sandy soils with low organic matter). There are additional PDFs that limit the use of Picloram near sensitive areas listed in Chapter 2 of this EIS. Picloram also has the potential to impact conifers. In areas where aerial treatments are proposed and small conifers are also present, such as along edges of meadows, long-term site objectives that are in agreement with forest management guidelines would be developed.

Table 27-Existing Vegetation Types In Proposed Aerial Treatment Sites

Acres[1] of Existing Vegetation Types Infested with Invasive plant species	
LaGrande District	
Yellow Star thistle	
Grasslands	160
Dry Meadow with water table part of the season	31
Forested areas including: Douglas Fir/NineBark and/or ocean spray-Grand Fir/Huckleberry and/or elk sedge	75
Hells Canyon Natural Recreation Area	
Yellow Star thistle	
Grasslands	625
Shrublands	10
Forested areas including: Douglas fir	14
Rocky areas	9
Scotch Thistle	
Grasslands	23
Shrublands	8
Forest (hardwoods)	2

1 Acres presented here are gross acres infested. Patches of invasive plants are dispersed within these acreages and it is likely that only relatively small portions of these acreages would be treated aerially. For analysis purposes, however, total acres were analyzed to address 'worst-case' scenarios.



Site Description Summary

Yellow star thistle and scotch thistle sites occur primarily in grassland, meadow or shrub land vegetation types (88% of mapped acres). The sites are located adjacent to private lands and/or found in remote locations within Hells Canyon Natural Recreation Area (Figure 18). All proposed aerial sites are highly inaccessible limiting the potential for ground based treatments.

Figure 18 – Proposed Aerial site otherwise inaccessible

Picloram (0.25lb ai/acre) or clopyralid (0.35lb ai/acre) are proposed for treatment of these sites and would provide effective control of these two species on these sites.

Bio-control agents are available for yellow star thistle; however, accessibility to these sites for release can be extremely difficult and may not prove to be the most effective method of treatment. Biological control efforts would usually leave enough plants to allow yellow star thistle to continue to produce seed, which would allow this invasive plant to spread farther from this site for many years.

If Alternative D (no aerial treatment) is chosen, biocontrol treatments will be implemented to the best extent possible on yellow star sites.

SOLI

Direct and indirect impacts to SOLI from manual techniques would be similar to those discussed above in the native vegetation section and in the No Action Alternative. Impacts to SOLI could be unintentional removal or trampling of flowers, fruits, or root systems of nontarget native plants, but should be minimized with properly trained crews. Vigor could be reduced in individuals due to repeated treatments/trampling, however, impacts would be short lived, and not likely to last a complete growing season.

Invasive plant sites proposed for herbicide treatments within 100 feet of botanical SOLI are identified in Table 26. Compared to Alternative A, the Proposed Action is associated with greater potential for herbicide drift, and more invasive sites would be treated near SOLI sites. The increased potential for exposure is mitigated by the PDFs that provide protection buffers and other limitations on herbicide use near botanical SOLI.

Alternative B proposes invasive plants treatment adjacent to 22 SOLI species (80 locations). This would protect SOLI and their habitats more effectively than in Alternative A.

Implementation of the Proposed Action "may affect individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species" of all sensitive plant species analyzed in this document. Each individual SOLI occurrence is evaluated based on treatment proposed for each individual site.

Impacts to Fungi, Lichens and Bryophytes

Impacts of invasive species to fungi, lichens, and bryophytes, are not widely documented in the literature. Most of the nonvascular SOLI and other native fungi, lichen and bryophytes do not commonly occur in the disturbed areas often associated with invasive species.

Bryophytes and lichens receive their mineral nutrition and water from precipitation, splash water, or directly from the atmosphere; therefore, it is possible that the SOLI listed in Appendix B as well as other native fungi, lichen, and bryophytes could be impacted by herbicide drift. There is a potential for more impacts from herbicides with Alternative B as compared to Alternative A because more acres of herbicide are proposed for treatment in addition to future EDRR treatments. Implementation of PDFs that outline effectiveness monitoring will provide additional impact information as well as adjustment of buffers to protect these species if negative impacts are observed. Short term impacts could be expected; however, long-term positive effects to habitats are expected because effective treatment of existing and future invasive plants would restore, protect and maintain habitats these species require.

Impacts to pollinators

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

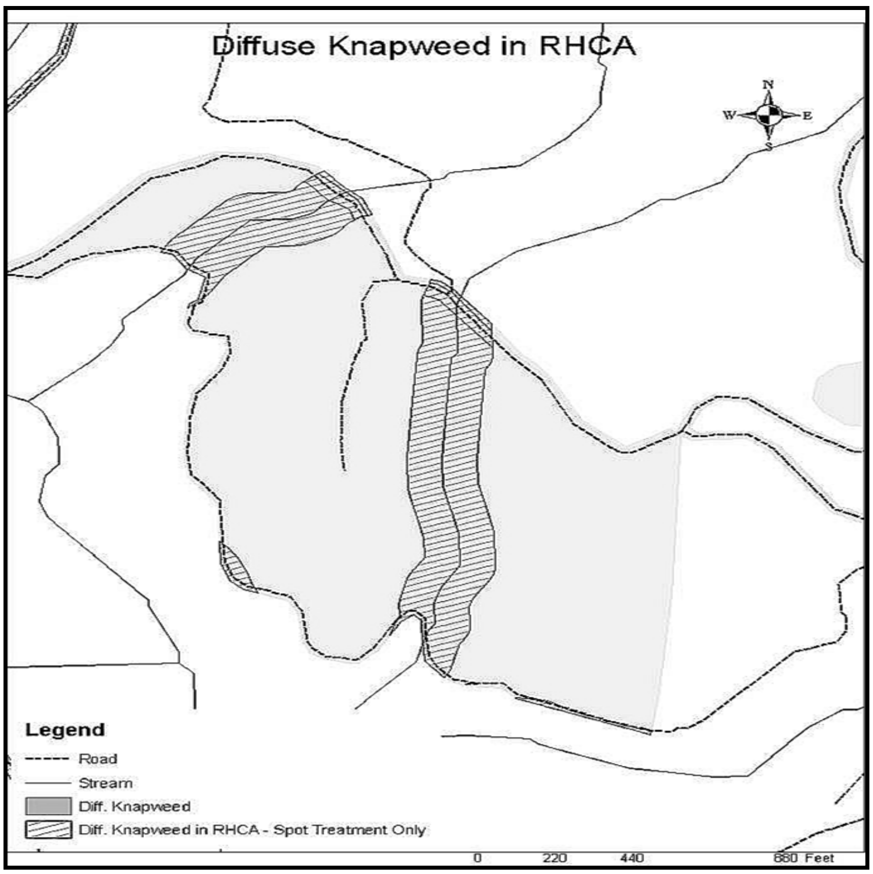
Little to no effect to pollinators is expected from manual or mechanical treatments in the long term. Some short-term (year of treatment) effects could occur due to the reduction of flower heads used as food sources for pollinators.

Alternative C – Restricted Riparian

This alternative is very similar to Alternative B except broadcast methods (hand broadcast and boom mounted sprayers on vehicles) would not be allowed in RHCAs. This alternative addresses concerns about the risk of herbicide delivery to water and potential impacts to fish. Based on GIS mapping and stream buffers, an estimated 3,104 acres could not be treated using broadcast methods of application.

Native Vegetation

Direct and indirect effects to native vegetation would be very similar to those discussed in Alternative B. Broadcast herbicide application would not occur in the RHCAs. Spot treating individual invasive plants would be less effective and more costly than broadcast treatments especially where individuals are dispersed over a large area. Repeated treatments (within the same growing season or annually) for some invasive plants within the same site are probable to effectively treat emerging invasive plant seedlings arising from a resident seedbank.



Invasive plants that span the designated RHCA buffers (that delineate where spot and broadcast treatments are approved) could likely provide sources for re-infestation if diligent spot treatments are not possible. Figure 19 depicts where less effective spot treatments would be used and where more effective broadcast methods could be used.

Figure 19 – Example of spot treatment areas within RHCA, and broadcast treatment areas for diffuse knapweed on the Wallowa-Whitman National Forest.

SOLI

Direct and indirect impacts to SOLI from manual techniques would be similar to those discussed above in the native vegetation section and in the No Action Alternative. Impacts to SOLI could be unintentional removal or trampling of flowers, fruits, or root systems of nontarget native plants, but should be minimized with properly trained crews. Vigor could be reduced in individuals due to repeated treatments/trampling, however, impacts would be short lived, not likely to last a complete growing season.

Direct and indirect effects from treating invasive plants with herbicides near SOLI sites would generally be the same as those listed for Alternative B. Approximately 44 treatment sites (17 species) within RHCAs would not be broadcast under Alternative C. SOLI present within these areas would not be susceptible to any inadvertent accidental herbicide drift that could be associated with broadcast treatment methods. However, the increased cost or loss of effectiveness from this limitation could reduce the acreage effectively treated in RHCAs, resulting in continued threats to riparian habitat and SOLI in these areas.

Determination Statement for All SOLI: Implementation of Alternative C **"may affect individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species"** of all sensitive plant species analyzed in this document. Each individual SOLI occurrence is evaluated based on treatment proposed for each individual site and can be found in Appendix B.

Impacts to Fungi, Lichens and Bryophytes

As previously discussed impacts of invasive species to lichens, bryophytes, and fungi is not widely documented in the literature. Potential herbicide treatment impacts from this alternative would be similar to those discussed in Alternative B; however, the degree of impact would be lessened in the riparian areas where herbicide drift is reduced because of restrictions on broadcast applications.

Impacts to pollinators

Impacts to pollinators would be similar to those discussed in Alternative B.

Alternative D – No Aerial Herbicide Application

This alternative is very similar to Alternative B, except it does not allow aerial herbicide application on known sites. This alternative addresses concerns about the risk of herbicide drift, impacts to nontarget plants, herbicide delivery to water and potential impacts to fish. All but 33 acres could be treated with other application methods (with less cost-effectiveness than aerial). Invasives not treated will likely expand at the average rate disclosed in this EIS of 8-12 percent per year. Biocontrol agents could be used for yellow star thistle; although, in the past previous biocontrol treatments have not been successful due to frequent fire events in the area (Dawson 2007), and are predicted to be less effective and/or more costly than those proposed in Alternative B.

Native Vegetation

Effects would be the same as Alternative B, except that the acreage proposed for aerial application of herbicide would be sprayed using ground based methods (842 acres) or not treated with herbicide (33 acres). Effects from drift associated with aerial application would be eliminated. Because aerial sites are often associated with limited access and higher treatment costs, the potential for invasive weeds to continue to spread in this remote area would be similar to Alternative A. Over time, adverse impacts to native vegetation are probable.

SOLI

Effects would be the same as those described in Alternative B. There are presently no nonfederally listed species that are within 300 feet, or any federally listed species within 1000 feet of a proposed aerial treatment site.

Determination Statement for All SOLI: Implementation of Alternative D **"may affect individuals or habitat, but will not likely contribute to a trend towards federal listing or loss of viability to the population or species"** of all sensitive plant species analyzed in this document. Each individual SOLI occurrence is evaluated based on treatment proposed for each individual site and can be found in Appendix B.

Impacts to Fungi, Lichens and Bryophytes

As previously discussed impacts of invasive species to lichens, bryophytes, and fungi is not widely documented in the literature. Potential herbicide treatment impacts from this alternative would be similar to those discussed in Alternative B, however, the degree of impact would be lessened in the areas proposed for aerial application because some aerial locations are not accessible either due to location or safety and no herbicide would be applied in these areas.

Impacts to pollinators

Impacts to pollinators would be similar to those discussed in Alternative B.

Cumulative Effects

Chapter 3.1.2discussed what is known about herbicide use on all ownerships. While the schedule or type of herbicide use off National Forest System land cannot be precisely known, the potential negative effects of past, present and foreseeable future treatments on nontarget plants, when combined with the effects of any of the alternatives, would be minor and short term.

As described above, some damage to individual nontarget plants from manual and mechanical treatments is possible from all treatments. While crews treating weeds on National Forest System land would be trained to identify and avoid damage to SOLI, the effect on SOLI of manual/mechanical treatments could vary on other ownerships.

Biological control agents cross land ownership boundaries. Though biocontrol agents introduced anywhere near the project area could occasionally affect nontarget plants, the potential impacts are controlled by restrictions on releasing agents that only affect the host (target) species. Coordination with Oregon Department of Agriculture would ensure releases meet Forest Service standards.

The more acres treated on and off National Forest System land, the more nontarget plant damage and mortality is possible, especially from broadcast or aerial spraying. However, given the PDFs and buffers, potential for direct and indirect effects to nontarget plants from invasive plant treatments in any alternative is low, even when the potential actions on land of other ownerships are considered. The differences between alternatives regarding risk from spraying to nontarget plants are not significant at the project scale. Compared to No Action, the action alternatives would treat more acres; but this would not necessarily lead to more impacts on nontarget species. Treatments would still occur on a small percentage of the Forest's total area, and nontarget plant communities would likely recover quickly because damage would be limited to individual plants. Botanical SOLIs would receive more protection than common plants and sites would be visited following treatment to evaluate whether nontarget vegetation was affected, and buffers would be adjusted if needed to minimize future impacts (see PDFs I-8 through I-12).

Drift associated with herbicide treatments near Forest System land is possible, and adjacent land owners would not necessarily add as many layers of caution to herbicide use; however, the analysis assumes all herbicide use would conform to label guidance. Thus, the risks from treatment to nontarget vegetation and botanical SOLIs from treatments on and off Forest are outweighed by the benefits of treatment, assuming label guidance and legal requirements are followed.

Summary of Effects SOLI Determination Statements

Determination statements for all SOLI are based on the implementation of all PDFs as listed in Chapter 2 of this EIS, and follow all standards outlined in the Wallowa-Whitman LRMP as amended by the R6 2005 ROD. Effects to SOLI are based on proximity and proposed treatments to known invasive species sites, other occurrences of SOLI on the Forest not presently impacted by invasive species, and overall risk to SOLI based on treatment effectiveness by alternative. Table 28 displays determination statements derived from effects analysis for SOLI identified to be at greatest risk from all alternatives.

Table 28-SOLI determination statements by Alternative

GENUS	SPECIES	Total number of SOLI occurrences on the forest (total acreage of SOLI occurrence mapped on the forest)	Number of SOLI occurrences in or near invasive sites (acres of SOLI occurrence mapped in or near invasive species sites)[1]	Invasive species in or near SOLI sites (acres of each invasive species)[2]	Invasive species within mapped SOLI site (acres)	Determination statements derived from impacts from invasive plant treatments in combination with treatment effectiveness				Proposed treatment for Alternative B, C and D 1st choice. Other methods also available
						Alt A	Alt B	Alt C	Alt D	
Achnatherum	*wallowaensis*	*23 (389)*	*2 (5)*	*CEMA (3) CEDI (6)*	*<1*	MIIH	MIIH	MIIH	MIIH	Chemical
Allium	*geyeri*	*1 (104)*	*1 (104)*	CEDI (11)	3	MIIH	MIIH	MIIH	MIIH	Chemical
Arabis	*hastatula*	26 (56)	2 (3)	CEDI3[3] (86)	<1	MIIH	MIIH	MIIH	MIIH	Chemical
Botrychium	*crenulatum*	12 (621)	1 (<1)	HYPE (7)	<1	MIIH	MIIH	MIIH	MIIH	Chemical
Botrychium	*minganense*	120 (1,125)	5 (164)	HYPE (7) CIAR4 (2) CEDI3 (14)	4	MIIH	MIIH	MIIH	MIIH	Chemical
Botrychium	*montanum*	56 (65)	6 (13)	HYPE (7) CIAR4 (39)	<1	MIIH	MIIH	MIIH	MIIH	Chemical
Botrychium	*pinnatum*	66 (513)	4 (0.5)	HYPE (7) SEJA (<1)	1	MIIH	MIIH	MIIH	MIIH	Chemical
Calochortus	*longebarbatus*	30 (763)	5 (627)	CEDI3 (138) CIAR4	16	MIIH	MIIH	MIIH	MIIH	Chemical

GENUS	SPECIES	Total number of SOLI occurrences on the forest (total acreage of SOLI occurrence mapped on the forest)	Number of SOLI occurrences in or near invasive sites (acres of SOLI occurrence mapped in or near invasive species sites)[1]	Invasive species in or near SOLI sites (acres of each invasive species)[2]	Invasive species within mapped SOLI site (acres)	Determination statements derived from impacts from invasive plant treatments in combination with treatment effectiveness				Proposed treatment for Alternative B, C and D 1st choice. Other methods also available
						Alt A	Alt B	Alt C	Alt D	
				(77)						
Calochortus	*macrocarpus*	1 (9)	1 (9)	CEDI3 (4)	1	MIIH	MIIH	MIIH	MIIH	Chemical
Carex	*hystericina*	12 (18)	2 (1)	CEMA4 (1) CADR (1)	<1	MIIH	MIIH	MIIH	MIIH	Manual and Chemical
Carex	*interior*	16 (11)	2 (2)	CIAR4 (37)	<1	MIIH	MIIH	MIIH	MIIH	Chemical
Erigeron	*engelmannii*	47 (2,015)	12 (726)	CEDI3 (23) ONAC (49) CEMA4 (2) CESO3 (45)	41	MIIH	MIIH	MIIH	MIIH	Chemical
Leptodactylon	*pungens*	6 (660)	2 (10)	CEDI3 (11) CESO3 (1)	1	MIIH	MIIH	MIIH	MIIH	Chemical
Mimulus	*clivicola*	52 (2,712)	13 (1,360)	CYOF (30) CIAR4 (767) HYPE (206) CEDI3	53	MIIH	MIIH NI	MIIH NI	MIIH NI	Chemical/ Biocontrol

GENUS	SPECIES	Total number of SOLI occurrences on the forest (total acreage of SOLI occurrence mapped on the forest)	Number of SOLI occurrences in or near invasive sites (acres of SOLI occurrence mapped in or near invasive species sites)[1]	Invasive species in or near SOLI sites (acres of each invasive species)[2]	Invasive species within mapped SOLI site (acres)	Determination statements derived from impacts from invasive plant treatments in combination with treatment effectiveness				Proposed treatment for Alternative B, C and D 1st choice. Other methods also available
						Alt A	Alt B	Alt C	Alt D	
				(1)						
Mirabilis	*macfarlanei*	14 (77)	2 (6)	CESO3 (1) ONAC (254)	<1	LAA	LAA	LAA	LAA	Chemical/ Biocontrol/ Manual
Phacelia	*minutissima*	13 (500)	1 (495)	CIAR4 (3)	3	MIIH	MIIH	MIIH	MIIH	Chemical
Phlox	*multiflora*	65 (1188)	5 (718)	CEDI3 (66) CIAR4 (77)	68	MIIH	MIIH	MIIH	MIIH	Chemical
Platanthera	*obtusata*	5 (218)	1 (214)	CEMA (<1)	<1	MIIH	MIIH	MIIH	MIIH	Chemical
Primula	*cusickiana*	67 (5,018)	5 (1,828)	CEMA4 (1) CYSC4 (115) HYPE (176) CIAR (677) LIVU (1)	46	MIIH	MIIH NI	MIIH NI	MIIH NI	Chemical Biocontrol
Rubus	*bartonianus*	14 (2,386)	2 251)	CESO3 (1) LIDA (<1)	3	MIIH	MIIH	MIIH	MIIH	Chemical

GENUS	SPECIES	Total number of SOLI occurrences on the forest (total acreage of SOLI occurrence mapped on the forest)	Number of SOLI occurrences in or near invasive sites (acres of SOLI occurrence mapped in or near invasive species sites)[1]	Invasive species in or near SOLI sites (acres of each invasive species)[2]	Invasive species within mapped SOLI site (acres)	Determination statements derived from impacts from invasive plant treatments in combination with treatment effectiveness				Proposed treatment for Alternative B, C and D 1st choice. Other methods also available
						Alt A	Alt B	Alt C	Alt D	
				ONAC (17) CEMA4 (3)						
Trifolium	*douglasii*	45 (324)	5 (16)	PORE5 (9) CIAR4 (77) CEDI3 (19)	1	MIIH	MIIH	MIIH	MIIH	Chemical
Trollius	*laxus*	1 (1)	1 (1)	CEDI3 (85)	0	MIIH	MIIH	MIIH	MIIH	Chemical

1-Acres represent SOLI habitat associated with occurrence
2-Invasive species acres represent size of infestation identified in or near SOLI occurrence or mapped habitat. Multiple species may occur on the same site
3-See Appendix B, Common control measures for invasive species codes and associated names
4-MIIH = May Impact Individuals or Habitat, But Will Not Likely Contribute to a Trend towards Federal Listing or Loss of Viability for the Population or Species. LAA = Likely to Adversely Affect is a determination for federally listed species.
5- Silene spaldingii is not included on this list due to the fact that currently no invasive weeds occur close to any known sites. The determination for Silene spaldingii is LAA due to the possibility of future occurances of invasives near known sites in EDRR. The Biological Assessment (BA) addresses these effects.

3.3 Terrestrial Wildlife

Changes between the Draft EIS and the Final EIS

The status of some species indicated here has been changed from when the DEIS was published. Those changes have been recognized in this FEIS. The bald eagle was delisted and is now identified as a Sensitive Species; Rocky Mountain bighorn sheep is identified as removed from the Sensitive Species list; but information about the sheep remains, and the gray wolf is recognized as now having a presence on the Forest.

3.3.1 Introduction

Invasive plant species have become established and continue to spread rapidly, posing a risk of injury to wildlife and causing a loss of wildlife habitat. In an effort to reduce the spread of invasive plants and restore native plant diversity, the Wallowa-Whitman National Forest has proposed to conduct invasive plants treatment projects within its administrative boundaries. Methods used to treat invasive plants also have the potential to adversely affect individual animals as well as wildlife habitat. The analysis presented in this EIS evaluates the effects on wildlife and wildlife habitat from proposed invasive plants treatments.

3.3.2 Affected Environment

Methodology

The analysis of the wildlife resource presented here was done using a multi-scale assessment that includes 1) an assessment to Management Indicator Species (FSM 2620.1, 2621.4, 2620.3), which assesses the habitat and effects to wildlife species associated with vegetation communities or key habitat components identified in the Forest Plan (USDA-FS 1990), 2) an assessment of the habitat and effects to those species considered most at risk. These include Federally Threatened and Endangered Species and Regionally Sensitive Species (FSM 2670.32, 16 USC 1536), 3) an assessment of Species of Local Interest (SOLI) that are uncommon and/or important in ensuring that wildlife diversity is maintained, and 4) an assessment of priority/unique habitats and associated species identified in the Partner In Flight (PIF) landbird conservation plans (Altman 2000a and Altman 2000b).

Collectively an assessment of the species/habitats identified above are used to identify the scope of the proposed action and alternatives, identify species most at risk, and ensue that a diversity of plant and animal communities are maintained across the planning area.

Information used in this analysis includes site specific information collected during invasive plant inventories, forestwide wildlife monitoring information, and GIS coverages and data sets related to wildlife habitat and site and landscape conditions. The sensitive species addressed in this analysis are those identified on the 2004 Regional Forester’s Sensitive Species list. It is recognized that this list was updated in 2008. Also because of the timeframes involved with project implementation (10 years), it is likely that the Forests sensitive species list will change again during implementation. As a result, if the pre-treatment assessment (PDF A-1) identifies potential impacts to any Regionally Sensitive species not addressed in this analysis, potential effects would be evaluated at that time. Also if necessary, this analysis would be updated to incorporate any new information.

Invasive Plants and Wildlife

Invasive plants have adversely impacted habitat for native wildlife. Any species of wildlife that depends upon native understory vegetation for food, shelter, or breeding, is or can be adversely affected by invasive plants. Species restricted to very specific habitats, for example pond-dwelling amphibians, are more susceptible to adverse effects of invasive plants.

Although it is rare, some wildlife species utilize invasive plants for food or cover. For example, American goldfinch (*Carduelis tristis*), and red-winged blackbird (*Agelaius phoeniceus*) will utilize purple loosestrife (Kiviat 1996, Thompson, Stuckey, and Thompson 1987), and native bighorn sheep will utilize cheatgrass (Csuti et al., 2001). While not preferred, it has been reported that elk, deer and rodents eat rosettes and seed heads of spotted knapweed. Also doves, hummingbirds, honeybees, and the endangered southwestern willow flycatcher (*Empidonax trailii extimus*) are known to use saltcedar (Barrows 1996).

However while some species will utilize invasive plants, the few uses that they may provide do not outweigh the adverse impacts to an entire ecosystem (Zavaleta 2000). Displacement of native plant communities by nonnative plants result in alterations to the structure and function of ecosystems and constitutes a principle mechanism for loss of biodiversity at regional and global scales (Lacey and Olsen 1991). Also Mills et al. (1989) and Germaine et al. (1998) found that native bird species diversity and density, were positively correlated with the volume of native vegetation, but were negatively correlated or uncorrelated with the volume of exotic vegetation.

Invasive plants can adversely affect wildlife species by eliminating required habitat components, including surface water (Brotherson and Field 1987, Dudley 2000, Horton 1977), reducing available forage quantity or quality (Bedunah and Carpenter 1989, Rice et al. 1997, Trammell and Butler 1996); reducing preferred cover (Rawinski and Malecki 1984, Thompson et al. 1987); drastically altering habitat composition due to altered fire cycles (D'Antonio and Vitousek 1992, Mack 1981, Randall 1996, Whisenant 1990); and physical injury, such as that caused by long spines or "foxtails" (Archer 2001).

Invasive plants can act as a population sink by attracting a species and then exposing them to increased mortality or failed reproduction (Chew 1981). For example, Schmidt and Whelan (1999) reported that native birds increased their use of exotic *Lonicera* and *Rhamnus* shrubs over native trees, even though nests built in the exotic shrubs experienced significantly higher mortality rates.

Some invasive plants (such as knapweed) contain chemical compounds that make the plant unpalatable to grazing animals. Chemical compounds in these invasive plants disrupt microbial activity in the rumen, or cause discomfort after being ingested, resulting in a reduced or avoided consumption of the invasive plant (Olson 1999). In the case of common burdock (*Arctium minus*), the prickly burs can trap bats and hummingbirds and cause direct mortality to individuals (Raloff 1998). Also invasive plants that grow large and dense (e.g., giant reed, Himalayan blackberry) can act as physical barriers to water sources and essential habitat (S. Bautista, personal observation).

Habitats that become dominated by invasive plants are often not used, or used much less, by native and rare wildlife species. Washington Department of Fish and Wildlife (2003) identified noxious weeds, such as yellow star thistle and knapweed, as threats to upland game bird habitat. Some hunters and wildlife managers are concerned that invasive plants are degrading the quality of remaining habitat for deer and elk and are adversely affecting the animal's distribution and hunting opportunities. Trammell and Butler (1995) found that deer, elk, and bison avoided sites infested with leafy spurge (*Euphorbia esula*). Tamarisk stands have fewer and less diverse populations of mammals, reptiles, and amphibians (Jakle and Gatz 1985, Olson 1999). Invasion by purple loosestrife makes habitat unsuitable for numerous birds, reptiles and mammals (Kiviat1996, Lor 1999, Rawinski 1982, Thompson, Stuckey, and Thompson 1987, Weihe and Neely 1997, Weiher et al. 1996).

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 and Sensitive (TES) Species

Species discussed here include federally listed species, or species currently listed under the Endangered Species Act (ESA), as amended, Federal candidate species, or species currently being considered for listing under ESA (U.S. Fish and Wildlife Service 1996), and Sensitive species, or species listed on the Regional Foresters Sensitive Species List[6] (Sensitive). These species are collectively referred to as TES species throughout this analysis.

The analysis presented here provides brief general descriptions of the species' life history, threats, generally recognized species protection measures and forest-status or occurrence. Additional detailed accounts can be found in the Biological Assessment prepared for the Regional Invasive Plant Program (USDA Forest Service 2005), which is incorporated by reference into this analysis and in the Terrestrial Wildlife Specialist Report/Biological Evaluation prepared for this document. These reports are available upon request from the Project Record at the Wallowa-Whitman National Forest Supervisor's Office in Baker City, Oregon.

Federally Listed Species

Table 29 displays federally listed T&E species, as well as candidate species for the Wallowa-Whitman NF. Each species' status and known occurrence on the forest are also displayed.

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

There is no officially designated critical habitat for any federally listed Threatened or Endangered Species (16 U.S.C. 1532 (5)(A)) on the forest.

The two candidate species found on the Wallowa Whitman National Forest, as well as the de-listed bald eagle are included in the Regional Forester's Sensitive Species (Sensitive) List, and are discussed under the sensitive species portion of this analysis.

Table 29-Federally listed or candidate species known to occur on the Wallowa-Whitman National Forest

Species	Scientific Name	Status	Presence
Canada lynx	*Lynx canadensis*	Threatened	No
Gray wolf	*Canis lupus*	Endangered	Possible
Pacific fisher	*Martes pennanti*	Candidate	No
Columbia spotted frog	*Rana luteiventris*	Candidate	Yes

The following is a discussion of the preferred habitat for listed Threatened and Endangered species (Canada lynx and gray wolf), their action area status and Forestwide habitat. The amount of suitable or preferred habitat currently affected by invasive plants is also identified.

Canada lynx

Preferred Habitat

Lynx occur in mesic coniferous forest that have cold, snowy winters and provide a prey base of snowshoe hare (*Lepus americanus*) (Ruediger et al. 2000). Both snow conditions and vegetation types are important factors in defining lynx habitat. Crusting or compaction of snow may reduce the competitive advantage that lynx have in deep, soft snow. Primary vegetation that contributes to lynx habitat is subalpine fir types where lodgepole pine is a major seral species, generally between 4,100-6,600 feet (Ruediger et al 2000, Ruggiero et al.1999, and Verts and Carraway 1998). Riparian areas, aspen stands, and high-elevation willow communities are important lynx prey habitats and denning habitat must be in or adjacent to foraging habitat to be functional (Ruediger et al. 2000). Lynx seem to prefer to move through continuous forest, and frequently use ridges, saddles, and riparian areas. Home range sizes for lynx can be variable, but it appears that at least 6,400 acres of primary vegetation should be present to support survival and reproduction.

Action Area Status and Habitat

Canada lynx are thought to occur in Oregon as dispersers that have never maintained resident populations. They are considered an infrequent and casual visitor by the state of Oregon (Ruediger et al. 2000, pp. 4-7).

To be considered "occupied" habitat, the Forest would have to have at least two verified lynx observations or records within the past 5 years or evidence of lynx reproduction. Winter track surveys for lynx and wolverine were conducted by the Forest from 1991-1994 and no confirmed lynx tracks were found. Hair snares were used to survey for lynx, according to the National Lynx Survey, during the summers of 1999-2001. There were no lynx detections confirmed from the survey effort. It is unknown whether lynx are currently present on the Forest, because there are no verified records of lynx, and there is no evidence of occupation or reproduction that would indicate colonization or sustained use by lynx. The Wallowa-

Whitman National Forest has not had a verified lynx observation within the last 5 years; therefore, the Forest is considered “unoccupied” habitat. To be considered “occupied” habitat, the Forest would have to have at least two verified lynx observations or records within the past 5 year, or evidence of lynx reproduction.

Lynx habitat on the Wallowa-Whitman National Forest was mapped using the vegetation and environmental conditions for the Northern Rocky Mountains Geographic area, and more specifically, the Blue Mountain Section, including NE Oregon and west-central Idaho. Primary vegetation was based on the direction provided in the Canada Lynx Conservation Assessment and Strategy (LCAS) (Ruediger et al. 2000), and follow-up guidance from the Forest Service Regional Office and the Lynx Biology Team. Sixth code Hydrologic Unit Codes (HUC), were used as the basis for delineating lynx habitat across the Forest. The majority of the potential lynx habitat rests on both sides of I-84 in a wide swath within the center of the Forest. There is also an isolated parcel of potential habitat south of Unity. However, the Lynx Conservation Agreement (May 2006), states that the LCAS does not apply to forests that are considered as having unoccupied habitat.

Table 30 displays acres of different lynx habitat types as defined in the LCAS, and acres of known invasive plant sites that exist within suitable habitat.

Table 30-Lynx Habitat types and acres of invasive plants

Potential Lynx Denning	Potential Lynx Forage	Currently Unsuitable	Total Potential Lynx Habitat	Acres of Invasive Plants Within Potential Habitat
287,510	129,971	73,975	602,573	706 (<1%)

Gray Wolf

Preferred Habitat

Habitat preference for the gray wolf appears to be more prey dependent than cover dependent. The wolf is more of a habitat generalist inhabiting a variety of plant communities, typically containing a mix of forested and open areas with a variety of topographic features (NatureServe 2006, Verts and Carraway 1998, Witmer et al. 1998). Wolves prefer fairly large tracts of roadless country; generally avoiding areas with an open road density greater than one mile per square mile (Witmer et al. 1998). Gray wolves have extensive home ranges and both denning and rendezvous sites are often characterized by having nearby forested cover, remote from human disturbance (NatureServe Explorer 2006).

Wolves are strongly territorial; defending an area of 75-150 square miles. Home range size and location is determined primarily by the abundance of prey, which includes primarily large ungulates such as elk and deer (NatureServe Explorer 2006, Verts and Carraway 1998, Witmer et al. 1998). Their alternate prey base typically consists of smaller mammals and birds, such as, beaver, ground squirrels, rabbits, and grouse (NatureServe Explorer 2006, Witmer et al. 1998). It is not uncommon to observe wolves “mousing” in grassy meadows much like coyotes and red fox.

Action Area Status and Habitat

There have been numerous reported wolf sightings and some evidence to indicate their existence in this area. Also, numerous sightings have been reported in the Eagle Cap Wilderness. Sightings seem to indicate transient or lone individuals that are not part of a resident pack, and to date, there are no den or rendezvous sites known to occur on the forest

No specific habitat was identified for wolf in this analysis since they are a wide ranging species that utilize a variety of habitat. However, they prefer more remote areas away from humans and high road densities.

Forest Service Sensitive Species

Species discussed here include those listed as Sensitive on the Regional Forester's Sensitive Species list[7]. The primary objectives of the Sensitive Species program are to ensure species diversity is maintained, and to avoid 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. Also the Bald Eagle (*Haliaeetus leucocephalus*), which was de-listed as threatened in August 2008 (USDI 2007) is included on the R6 Sensitive species list.

It should be pointed out that the Wallowa-Whitman National Forest administers the entire Hells Canyon Natural Resource Area (HCNRA), which includes a small portion in Idaho. The Idaho portion of the HCNRA includes a small number of acres in both Forest Service Regions 1 and 4. Both Regions have their own Regional Forester's Sensitive Species lists. Many of the species on their list are the same as Region 6 or are forest dwelling species that would not be impacted by any of the proposed invasive plant treatments because the proposed treatments on the Idaho portion are all in open grassland vegetation. The one exception is Region 4's Northern Ground Squirrel, which has a very limited distribution and has not been located anywhere in the HCNRA.

Since none of Region 1 or 4 sensitive species will be impacted by proposed treatments, they will not be analyzed in this document. Appendix C contains a list of additional Regional Forester's Sensitive Species.

Terrestrial wildlife species found or suspected to occur on the Wallowa-Whitman National Forest that are included in the Regional Forester's Sensitive Species List are listed in Table 31.

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

Table 31-Suspected (S) or Documented (D) Wildlife of the Wallowa-Whitman NF on the Regional Forester's Sensitive Species List (July 2004)

Common Name	Scientific Name	Occurrence
Mammals		
California wolverine	*Gulo gulo*	D
Pacific Fisher	*Martes pennanti*	S
Rocky Mountain Bighorn Sheep	*Ovis canadensis canadensis*	D
Spotted Bat	*Euderma maculatum*	D
Birds		
Bald eagle	*Haliaeetus leucocephalus*	D
American peregrine falcon	*Falco peregrinus anatum*	D
Upland sandpiper	*Bartramia longicauda*	D
Gray flycatcher	*Empidonax wrightii*	S
Horned Grebe	*Podiceps auritus*	S
Bufflehead	*Bucephala albeola*	S
Greater Sage Grouse	*Centrocercus urophasianus phaios*	S
Columbia Sharp-tailed Grouse	*Tymphanuchus phasieanellus*	D
Greater Yellowlegs	*Tringa melanoleuca*	S
Tricolored Blackbird (OR only)	*Agelaius tricolor*	S
Bobolink (OR only)	*Dolichornyx oryzivorus*	S
Amphibians		
Northern Leopard frog	*Rana pipiens*	S
Columbia spotted frog	*Rana luteiventris*	D
Reptiles		
Painted Turtle	*Chrysemys picta*	S

D = Documented – in the context of the Forest Service sensitive species program, an organism that has been verified to occur in or reside on an administrative unit.
S = Suspected – in the context of the Forest Service sensitive species program, an organism that is thought to occur, or that may have suitable habitat, on Forest Service land or a particular administrative unit, but presence or occupation has not been verified.

The following is a discussion of the preferred habitat for species listed in Table 31; their action area status and Forestwide habitat. The amount of suitable or preferred habitat currently affected by invasive plants is also identified. More detailed information can be found in the project wildlife report available in the project record, and Appendix C of this document.

California Wolverine-Documented

Preferred Habitat

Wolverines inhabit dense coniferous forests and use open sub-alpine forests up to and beyond timberline. Typically, they use high elevation alpine wilderness areas in the summer and montane forest habitats in the winter (Copeland 1996). They are associated with rocky outcrops, steep mountainous areas and transition zones between primary cover types. Forested riparian zones at upper elevations are likely to be important forage habitats for these furbearers and provide relatively safe travel corridors that allow for animals to move within and between watersheds. Natal denning habitat includes high elevation open rocky slopes (talus or boulders), that maintains a snow depth greater than 3 feet into March and April (Forest Service 1994). Wolverines are known to regularly avoid humans and are sensitive to any human related disturbance.

The wolverine is an opportunistic scavenger, with large mammal carrion the primary food source year-round. Prey items also include small and medium-sized mammals, birds and their eggs, insects, fish, roots, berries, and carrion. While foraging, they generally avoid large open areas and tend to stay within forested habitat at the mid and high elevations (greater than 4,000') and typically travel 18-24 miles to forage/hunt (Forest Service 1994).

Action Area Status and Habitat

Prior to 1973, wolverines were classified as furbearers in Oregon. They are considered rare throughout all of Oregon, Washington, Idaho, and California, and recent sightings, tracks, and a road kill document their continued presence at low densities (Csuti et al. 2001). Records for eastern Oregon include a partial skeleton and tufts of fur found near Canyon Mountain, Grant County (1992), as well as tracks and a possible denning site discovered in the Strawberry Mountain Wilderness (1997). Tracks have also been documented in the Monument Rock Wilderness (1997).

Although there are historical records and more recent sightings from wilderness, or more remote high elevation areas, there are no recent verified locations or physical evidence of their occurrence. Also although formal track surveys for wolverine were conducted during the winters of 1991 through 1994, no tracks were documented.

There are no known den sites on the Wallowa-Whitman National Forest. Due to their preference for high elevation remote habitat for dens, and considering this species is strongly associated with low levels of population density and roads (Carroll et al. 2001), the most likely places wolverines would be found on the Forest are wilderness and roadless areas. However because this species is capable of traveling long distances in a single day, it could occur in other areas.

The Wallowa-Whitman NF has four wilderness areas totaling approximately 586,780 acres. There are approximately 979 acres known to have invasive plants within all the wilderness areas. Wolverine denning habitat, which tends to be above 7,000 feet, has no known invasive plants sites.

Pacific Fisher-Suspected

Preferred Habitat

Fishers primarily use mature, closed-canopy coniferous forests with some deciduous component, frequently along riparian corridors. They are known to occasionally use cut-over areas, but this in not their optimal habitat. Fishers use a variety of resting sites such as hollow logs, rock piles, and snow dens, but the maternal den is almost always in a tree. The fisher is an opportunistic carnivore whose diet includes small rodents, rabbits, squirrels, porcupines, amphibians, reptiles and birds and their eggs. It also eats some carrion, fruits, and berries.

Action Area Status and Habitat

In April 2004, the FWS determined that federal listing for the West Coast Distinct Population Segment (DPS) of the fisher was "warranted, but precluded by other higher priority listing actions" (U.S. Fish and Wildlife Service 2004). This DPS includes Washington, Oregon, and California. The fisher is a FWS candidate species.

In Oregon, the fisher apparently has been extirpated from all but two portions of its historical range (Aubrey and Lewis 2003) and the two known extant populations are in the southwestern portion of the state: one in the southern Cascade Range that was established through reintroductions of fishers from British Columbia and Minnesota that occurred between 1961 and 1981, and one in the northern Siskiyou Mountains of southwestern Oregon, that is presumed to be an extension of the population in northern California. Genetic testing has revealed the populations are isolated from each other (Aubrey et al. 2002). The same study revealed juvenile male fishers are capable of long distance dispersal with one collared male relocating to the Crescent Ranger District in the summer of 1999, having traveled over 34 miles from point of capture on the Rogue River National Forest (Since the Rogue River-Siskiyou National Forest). The radio signal from this animal was lost in December 1999 and it is unknown if this animal is still alive on the district or if it may have eventually occupied a territory.

There are no known resident populations of fisher on the Forest. Fisher were reintroduced onto the Forest in the 1970s, both in the Minam and in the Eagle Creek drainage outside of Halfway, Oregon. The re-introductions were not successful and fisher have not become established. Although there is documented evidence that at least one individual fisher existed on the Wallowa-Whitman National Forest, there is no known or confirmed reproducing population. It is highly unlikely fisher are present on the Forest. If fisher were found, it/they would most likely be related to the Rocky Mountain population rather than the western Oregon population.

Potential broad scale fisher habitat on the Forest was determined by mapping multi-storied, mature and old forest stands with trees and snags 15 inches in diameter at breast height (dbh) or larger, with a canopy closure equal to or greater than 50 percent and at 4,000 feet in elevation or above. No acres of juniper woodland, hot-dry ponderosa pine or whitebark pine habitat was calculated into the fisher habitat. Using these factors to determine potential fisher habitat; the action area contains approximately 174,954 acres of habitat. Of this approximately 941acres (close to 0.5 percent) contain known invasive plant sites, with 60 percent of the invasive sites adjacent to roads (545 acres) and (21 acres) trails.

Rocky Mountain Bighorn Sheep-Documented

Preferred Habitat

Bighorn sheep generally inhabit open areas of rocky slopes, ridges, rim rocks, cliffs, and canyon walls with adjacent grasslands or meadows, and few trees (Verts and Carraway 1998). Dense forest communities are avoided. Their primary diet consists of bunchgrass, but also includes significant amounts of forbs and shrubs during the growing seasons. In the winter and spring they will also utilize cheatgrass, which is an invasive annual plant. Use is largely determined by the availability of escape terrain and most bighorn sheep forage within 0.5 mile of escape terrain and generally are not seen farther than 1.0 mile from escape cover.

Summer range varies from subalpine meadows above 7,500 feet to canyon grasslands at 1,000 feet. Winter range is usually below 4,500 feet. Some herds are yearlong residents on a given area, with little or no spatial separation of summer and winter ranges (Drewek 1970). Other herds migrate several miles between summer and winter range and occupy areas that include a variety of elevations and environmental conditions (Geist 1971). Both summer and winter range must provide freedom from disturbance and a proper juxtaposition of forage, escape terrain, and water.

Terrain for lambing is rugged, precipitous and remote (Van Dyke et al. 1983). Such terrain provides pregnant ewe's security and isolation during the lambing season. Ewes select rugged cliffs of at least 5 acres for lambing. Ewe-lamb groups prefer more rugged topography than ram groups (Valdez and Krausman 1999) and are more restricted in use of their range. Ram groups will range farther from escape terrain than ewe groups.

Action Area Status and Habitat

Rocky mountain bighorn sheep are mainly found in areas within the HCNRA and the Eagle Caps. Table 32 displays the eight areas bighorn sheep are found on the Forest and the number of acres within which invasive plants are found. The Burnt River Herd, which consists of R6 Sensitive California bighorn sheep, resides mostly on BLM administered lands. Approximately 3,140 acres of the Wenaha/Haas/Cottonwood herd's normal home range is on the Wallowa-Whitman National Forest, although the majority of it is on the Umatilla National Forest. The Wenaha/Haas/Cottonwood herd was covered in the Umatilla's Invasive Plants analysis. In addition, the Black Butte/Joseph Creek bighorn sheep herd range lies directly to the north of the northern-most portion of the Forest. Invasive plants do not appear to be currently impacting bighorn sheep habitat to any measurable degree since only a small portion of the bighorn sheep habitat includes invasive plants.

Table 32-Bighorn sheep locations and the approximate number of acres of invasive plants

Bighorn Sheep Location	Approximate Acres Within The Area	Acres with Invasive Plants	Percent of Bighorn Sheep Area with Invasive Plants
Bear Creek/Minam River	14,052	297	2.1%
Burnt River (California bighorn sheep subspecies)	111	0	0%
Lostine	49,085	42	<1%
Lower Hells Canyon	68,052	1,211	1.8%
Lower Imnaha River	46,775	580	1.2%
Upper Hells Canyon	14,418	18	<1%
Upper Joseph Creek	44,957	479	1%

Spotted Bat-Documented

Preferred Habitat

The spotted bat has been observed in a wide variety of habitat types, from ponderosa pine forests to desert water holes. It is known to nest in crevices in cliffs, which may be more important in determining its distribution than any particular vegetation type. Spotted bats are solitary foragers and they primarily feed on moths. They emerge from day roosts after sunset, and are most active between midnight and 3:00 a.m.

The spotted bat is considered one of the rarest mammals in North America. Surveys using echolocation calls are discovering that it is more common and widespread than previously thought. It was discovered in canyons in Owyhee County, Idaho in 1987.

Action Area Status and Habitat

There are two spotted bat records from eastern Oregon (neither of which are in the Tri-Forest area), where it is probably rare but widely distributed; however, more surveys are required to determine its distribution and status. The Region 6 Regional Forester's Sensitive Species list shows spotted bats as documented on the Forest; however it is now thought that the individual was misidentified. Although at one time this species was thought to exist in the HCNRA, surveys have not found spotted bats on the Forest, and there is only a low probability that this species occurs within the action area.

Potential habitat acres were not developed for the spotted bat, because cliff sites are not identified in the Forest data base and their habitat preferences are not clearly understood. There are approximately 221,514 acres of dry ponderosa pine forest, hot dry pine forest and juniper woodland, that would likely provide the most desirable habitat. Within these areas there are approximately 3,161 acres (1.4 percent) of known invasive plant sites.

Bald Eagle-Documented

Preferred Habitat

Bald eagle populations have made substantial recoveries in recent years. Formerly listed as endangered in 1978, the bald eagle was down-listed to threatened status in the lower-48 states in 1995. In March 1999, FWS proposed to delist the bald eagle throughout its entire range (Federal Register 1999). The bald eagle was delisted on August 8, 2007, and it is now a Region 6 sensitive species (USDI Fish and Wildlife Service 2007).

Nesting territories are normally associated with lakes, reservoirs, rivers, or large streams (U.S. Fish and Wildlife Service 1986). In the Pacific Northwest recovery area (for more information see the Bald Eagle Recovery Plan, U.S. Fish and Wildlife Service 1986), preferred nesting habitat for bald eagles is predominately uneven-aged, mature coniferous (ponderosa pine, Douglas-fir) stands or large black cottonwood trees along a riparian corridor (NatureServe 2006 and USDI 1986). Adults tend to use the same breeding areas year after year, and often the same nest, although a breeding area may include one or more alternative nests (U.S. Fish and Wildlife Service, 1999). The size and shape of a defended breeding territory varies widely (1.6 to 13 square miles) depending upon the terrain, vegetation, food availability, and population density of an area (USDI 1986)

The most common food sources for bald eagle in this region are fish, waterfowl, rabbits, and various types of carrion (NatureServe Explorer 2006 and USDI 1986). The main food source for bald eagles during the breeding season is fish; therefore, habitat of most importance during this period consists of areas near large bodies of water and major river systems (U.S. Fish and Wildlife Service, 1995). During the winter communal roosts, which generally hosts several eagles are established near a rich food source (high concentrations of waterfowl or fish) (Anthony et al. 1982). Communal winter roosts tend to be isolated from disturbance and offer more protection from the weather than diurnal roosts (NatureServe and USDI 1986).

Action Area Status and Habitat

The Wallowa-Whitman National Forest occupies the Bald Eagle Blue Mountains Recovery Zone 11. The main threats identified by the Recovery Plan for Zone 11 are recreation disturbance, commercial timber harvest, shooting, and trapping. However, since the plan's approval, new habitat issues have evolved; large potential nesting or roosting trees (e.g., ponderosa pine and Douglas-fir) have been significantly impacted by insects, disease, blowdown, and wildfire.

The Wallowa-Whitman National Forest has three known bald eagle nest sites. Two are located on the Whitman Ranger District including one in close proximity to Phillips Lake Reservoir and the other near the West Fork of the Burnt River, northwest of Unity Reservoir. Both are located in open ponderosa pine forest. Although nest success varies for the Phillips Lake nest, most years one to two young fledge each year. The Unity nest site moved a few times and has had less success in fledging young than the Phillips Lake nest site, but has still successfully fledged a number of offspring. The area surrounding the Phillips Lake nest site is closed year-round to motorized travel. The Unity nest site has a motorized closure from January 1 through August 31 each year. Nests are monitored annually and a site-specific management plan was developed, for both Whitman Ranger District bald eagle nest site areas. Each plan developed a Bald Eagle Management Area (BEMA) boundary, which is entirely within National Forest System lands.

The third bald eagle nest is near the Hells Canyon Dam and is within the Hells Canyon National Recreation Area. It was discovered in 2005 and has successfully fledged young the past two seasons. There is currently no Bald Eagle Management Plan for this nest site.

There is one designated bald eagle winter roost site on the Forest. This winter roost is on the Whitman Ranger District, in close proximity to Oregon Department of Fish and Wildlife (ODF&W) Salmon Creek elk feeding station. The Salmon Creek Bald Eagle Winter Roost site is closed to motorized use from December 1 to May 1 each year. There is only one designated bald eagle winter roost site; however, bald eagles do roost in various other places on the Forest during winter months. The birds often utilize private lands in the valleys during the day and fly to different roost areas on the Forest in the evening. These roost sites often vary from year to year. Winter bird count surveys occur along the Upper Grande Rhonde River and the Snake River each year. Bald eagle numbers appear to be fairly small and both the roost and perch sites often vary somewhat from year to year. The majority of the bald eagle migration and winter sightings are within the Baker Valley as well as along the Grande Ronde and Snake Rivers.

There are no treatments proposed near known nests or roost sites. Invasive plants do not threaten the bald eagle or its habitat, although disturbance of nest sites can adversely affect the bald eagle. The FWS has calculated some standard distances where disturbance could adversely affect the success of nesting bald eagles. The distances vary depending on the activity, topography and time of year. For specific information see the National Bald Eagle Guidelines (USDI FWS 2007)

American peregrine falcon-Documented

Preferred Habitat

Peregrine falcons inhabit cliffs located generally within approximately 0.5 miles of riparian habitat. Peregrines nest on ledges clear of rock rubble, located approximately 40 - 80 percent of total cliff height. Peregrines are aerial predators who feed mostly on birds. Much of the prey consists of species the size of pigeons and doves; however avian prey ranges in size from hummingbirds to Aleutian Canada geese (Pagel, unpub. data). Preferred peregrine falcon habitat includes various open habitats from grassland to forest in association with suitable nesting cliffs. The falcon often nests on ledges or holes on the face of rocky cliffs or crags. Ideal locations include undisturbed areas with a wide view, near water, and close to plentiful prey.

Foraging habitats of woodlands, open grasslands, and bodies of water are generally associated with the nesting territory. Falcons are known to forage over large areas, often ten to fifteen miles from the eyrie.

Peregrines lay 2-4 eggs in March-May, and commence incubation after the clutch is complete. Eggshell thinning induced by the metabolite of the pesticide known as DDT (DDE), affected populations in the Pacific Northwest and elsewhere, and residual levels of DDE continue to affect the reproductive success of peregrines. Reproductive failure at all peregrine nests has been chronic in northern CA and OR since at least 1983 due to eggshell thinning.

Invasive plants do not directly affect peregrine falcons. Peregrine falcons in the Pacific Northwest are most affected by bioaccumulation of contaminants, and direct disturbance to their nesting at known or suspected nest sites; both which have caused numerous nesting failures during the previous 20 years of observation (Pagel unpub. data in USDA Forest Service 2008, Deschutes National Forest Invasive Plants Treatment EIS).

Action Area Status and Habitat

Peregrine nest site surveys have been conducted in potential nesting habitat during the1990s and suitable habitat continues to be intermittently and informally surveyed. There are currently four known active peregrine falcon nests on the Wallowa-Whitman National Forest. The Hells Canyon Dam (HCNRA), Mt. Emily (La Grande) and the Mt. Morian (Eagle Caps Wilderness) nests were all located in the 1990s. The Castle Ridge nest on the La Grande District was discovered in 2005. Since they nest on generally inaccessible cliffs, no invasive plants are located in known or potential peregrine falcon nesting habitat. Since peregrines are aerial predators who feed mostly on birds they often feed on prey many miles from their nest.

Upland Sandpiper-Documented

Preferred Habitat

Upland sandpipers generally nest in extensive, open tracts of short grassland habitat, including native prairie, dry meadows, pastures, domestic hayfields, and short-grass savanna, plowed fields along highway rights-of-ways and on airfields.

Preferred habitat includes large areas of short grass for feeding and courtship with interspersed or adjacent to taller grasses for nesting and brood cover. The species migrates along shores and mudflats, and winters in South America (NatureServe 2006). It may perch in coniferous trees or snags surrounding the nesting site. They will forage in open meadows for favorite foods, grasshoppers and crickets. They also eat ants, berries, and seeds of grasses and forbs (Csuti et al. 2001).

In Oregon, the upland sandpiper nests in partly flooded meadows and grasslands, usually with a fringe of trees, and often in the middle of higher-elevation sagebrush communities. Meadows favored by this sandpiper are little grazed and have some growth of forbs.

Action Area Status and Habitat

Upland sandpipers are not known to occur regularly on the Wallowa-Whitman National Forest. A pair was documented nesting on the La Grande District towards Ukiah in the 1990s, but they haven't been found since. Surveys for upland sandpipers are conducted on a regular basis. Potential upland sandpiper habitat was queried by using all dry herbland (grassland) and dry shrubland that had less than 10 percent slope and was greater than 5,000 feet in elevation. Using this broad scale analysis, there are approximately 37,514 potential acres of upland sandpiper habitat within the action area. Of this, approximately 330 acres have known invasive species infestations. However this analysis includes a much higher number of acres of potential habitat, since it does not specifically identify partly flooded meadows or grasslands or short grass.

Gray flycatcher-Suspected

Preferred Habitat

Gray flycatchers are uncommon in Oregon and southern Idaho, but may be fairly common in specific locations (Marshall et al. 2003). They are locally fairly common in dry habitats in other areas of the western United States. In northern Washington the habitat used by gray flycatchers is fairly specific. Dry open ponderosa pine stands with extensive bitterbrush and bunchgrasses understory. Tree size ranges from small (6" diameter breast height) to large (40 inches diameter breast height). In central Oregon, they are commonly found in juniper, sage, and bunchgrass habitat. The common factor seems to be scattered vertical structure of evergreen trees over an extensive shrub and grass understory (savannah).

They are migratory and spend winters in Arizona and Mexico, leaving breeding grounds by the end of September (Csuti et al. 2001).

Gray flycatchers take insects on the wing as well as by foraging on the ground. Their diet includes a variety of species ranging from small beetles to butterflies.

Action Area Status and Habitat

Gray flycatchers have not been documented on the Forest. Since gray flycatchers are difficult to distinguish from the dusky flycatcher they may or may not be more widespread than is currently recognized. Their territory has been reported to vary from three to nine acres, and the home range seems to be about 10 acres (Csuti et al. 2001). Broad scale mapping of potential breeding gray flycatcher habitat included: all dry shrublands and ponderosa stands with less than 30 percent canopy closure or juniper woodlands with less than or equal to 40 percent canopy closure.

Using these broad parameters, a total of approximately 162,741 acres of potential gray flycatcher breeding habitat exist. Of this a total of approximately 2,617 acres or about 1.6 percent of potential gray flycatcher habitat contains known infestations of invasive plant species.

Horned grebe-Suspected

Preferred Habitat

Horned grebes breed from Alaska and northern Yukon south to eastern Oregon and Idaho. The species' winter range extends along the Pacific coast from the Aleutian Islands to Baja California. Horned grebes rarely breed east of the Cascade Range in Oregon (Marshall 2003).

Horned grebes prefer large areas of open water surrounded by emergent vegetation. Nesting habitat is found in tall vegetation in shallow water.

The primary diet of horned grebes consists of fish and tadpoles; although it will also take aquatic insects, crustaceans, amphibians, mollusks, and leeches.

Action Area Status and Habitat

Horned grebes may migrate through the Wallowa-Whitman National Forest during October and November as they move to winter habitat areas, however none have been documented on the Forest. It is highly unlikely horned grebes breed on the Forest, although potential breeding habitat for horned grebes exists within lakes and larger ponds with emergent vegetation.

There are a total of 193 lakes within the Forest boundary, of which 181 are on NFS lands. These water-bodies range in size from three-tenths of an acre to 1,747 acres (Phillips Lake). There are approximately 11,373 acres of water in lakes and ponds on the Forest. Of those acres, approximately 665 acres have mapped emergent vegetation. Less than 3 acres of emergent vegetation has known invasive plants. This project does not treat emergent vegetation.

Bufflehead-Suspected

Preferred Habitat

The bufflehead is a tree-nesting, diving duck whose population has declined throughout some of its range due to clear cutting, over harvest of habitat, and in some locations throughout its range, over-hunting (Marshall et al. 2003). It is still harvested in Washington and Oregon. For nesting, it uses mountain lakes surrounded by woodlands with snags (mostly aspen, but it will use ponderosa pine and Douglas-fir). Buffleheads are common in parts of Oregon and Washington during winter, but are rare during the breeding season. Most breeding occurs in Alaska and Canada. In Oregon, buffleheads use a high preponderance of artificial nest boxes. Buffleheads eat animal matter, with common diet items including aquatic insects and larvae, physid snails, fish and sometimes herring eggs or salmon carrion. They also eat seeds of aquatic plants, such as smartweed, alkali bulrush, and sago pondweed (Marshall et al. 2003).

Action Area Status and Habitat

No breeding has been documented in eastern Oregon and this species has not been documented on the Forest. However limited potential breeding habitat exists at some of the lakes and ponds on the Forest, where suitable nesting cavities occur. Also buffleheads have been found in ponds in the Baker Valley (off the Forest), when they migrate through the area in the spring. Consequently suitable habitat could be also be used during migration. Although habitat suitability would depend on the availability of snags, for the purpose of this analysis suitable habitat is the same as that described for the horned grebe.

Greater Sage Grouse-Suspected

Preferred Habitat

Greater sage grouse (hereafter simply called sage grouse) have been extirpated in British Columbia and in five states (Arizona, New Mexico, Oklahoma, Kansas, and Nebraska), and is "at risk" in six states (Washington, California, Utah, Colorado, North Dakota, and South Dakota) and in the Canadian provinces of Alberta and Saskatchewan (NatureServe 2008).

In five states (Oregon, Nevada, Idaho, Wyoming, and Montana), long-term population declines have averaged 30 percent since 1950.

In Oregon, sage grouse were common to abundant in the nonforested areas east of the Cascades during much of the 19th century, but began to decline by the late 1890s (Crawford 1982). By 1940, sage grouse occupied only half of their historic range in Oregon, and numbers declined 60 percent between the late 1950s and the early 1980s (Crawford and Lutz 1985). The Baker Resource Area of the BLM has local sage grouse information associated with the Virtue Flats area; however, no sage grouse have been documented on the Wallowa-Whitman National Forest. The sage grouse population in northeast Oregon is thought to be nonmigratory, but has been observed to move extensively between seasonal use areas, and may therefore require large areas of sagebrush habitat with sufficient suitable habitat between to provide connectivity (Hanf et al. 1994).

On February 7, 2003, the FWS announced a 90-day finding on a petition to list the western sage grouse under the Endangered Species Act of 1973, as amended. Because there is insufficient evidence to indicate that the western population of sage grouse is a valid subspecies or a Distinct Population Segment, the FWS found that the petition does not present substantial scientific or commercial information indicating that listing may be warranted (U.S. Fish and Wildlife Service 2003).

Sage grouse breed on sites called leks (strutting grounds) in March-April. The same lek sites tend to be used year after year. They are established in open areas surrounded by sagebrush, which is used for escape and protection from predators. Habitats used by pre-laying hens are also part of the general breeding habitat. These areas provide forbs that are high in calcium, phosphorus, and protein, all of which are necessary for egg production. The condition and availability of these areas are thought to have a significant effect on reproductive success (Barnett and Crawford 1994). Most sage grouse nests are located under sagebrush plants (Crawford et al. 2004); however, nests have been found under other plant species (Connelly et al. 1991). Sage grouse nesting and early brood-rearing occurs in April-June; this is a critical time for sage grouse.

Early brood-rearing generally occurs relatively close to nest sites; however, movements of individual broods may be highly variable (Connelly 1982). Hens with broods tend to select habitats having a wide diversity of plant species that tend to provide an equivalent diversity of insects that are important chick foods.

Late brood-rearing occurs June-October. In June and July, as sagebrush habitats dry and herbaceous plants mature, hens usually move their broods to moister sites in or adjacent to sagebrush cover where more succulent vegetation is available (Connelly and Markham 1983, Connelly et al. 1988, Fischer et al. 1996b, Gates 1983). As fall progresses, sage grouse move towards their winter ranges and shift their diet primarily to sagebrush leaves and buds (Connelly et al. 1988, Connelly and Markham 1983). The exact timing of this movement varies; depending on the sage grouse population, geographic area, overall weather conditions, and snow depth.

Sage grouse winter habitats, used in November-February, are relatively similar throughout most of their range. Winter habitats must provide adequate amounts of sagebrush because their winter diet consists almost exclusively of sagebrush (primarily leaves and buds). If snow covers the sagebrush, the birds move to areas where sagebrush is exposed.

Declines in sage grouse populations have been linked to agricultural conversion, rangeland conversion, livestock management, wildfire, prescribed fire, fire rehabilitation, structure and infrastructure development, juniper expansion, and invasions of exotic species (PIF 2000, Blus et al. 1989; Braun 1987, Braun 1998, Byrne 2002, Connelly et al. 2000, Enyeart 1956, Higby 1969, Mack and Thompson l982, Pellant 1990, Peterson 1970, Quigley and Arbelbide 1997, Swensen et al. 1987, Valentine 1990, Wisdom et al. 2000, Wright et al. 1979).

Invasive plants can reduce native plant diversity important to sage grouse and biological objectives for the Shrub-Steppe habitat include maintaining sites dominated by native vegetation and initiating actions to prevent infestations of exotic vegetation (PIF 2000). Greater Sage Grouse and Sagebrush Habitat Conservation Team, consisting of state and federal agencies, private landowners, conservation groups and academics, was established in 2001 to craft a comprehensive set of planning guidelines for sage grouse and sagebrush habitats in Oregon. Sage grouse and Sagebrush-Steppe Ecosystem Management Guidelines have been also been developed (USDI BLM et al. 2000). The primary goal of these guidelines is to maintain existing sagebrush-steppe habitats in order to sustain sage grouse populations and protect options for future management.

Action Area Status and Habitat

Although small populations of sage grouse live in outlaying areas and surveys have been conducted at different times of the year, to date no sage grouse have been detected on the Forest. Sagebrush habitat on the south sides of Dooley and Black Mountain and near Unity are the most likely areas to provide habitat for sage grouse, because they are adjacent to large tracts of BLM land with suitable sagebrush. Isolated patches of sagebrush are not likely to contribute to sage grouse habitat since the birds need large acreage of fairly contiguous habitat to provide for all their habitat needs. There are 18 areas on the Forest that have 250 acres of sagebrush or more. These 18 sites include eight areas with 250 to 500 acres of sagebrush, six with 500 to 800 acres, two with 800 to 1000 acres, and two with slightly over 1,000 acres of sagebrush mix. Also three Forest sagebrush sites are adjacent to BLM lands and combined these areas may be large enough habitat to contain sage grouse. These areas currently contain 6 acres of invasive plants.

Columbia Sharp-tailed Grouse-Documented

Preferred Habitat

The sharp-tailed grouse is found from central Alaska and the Yukon east to Hudson Bay and south in the Rocky Mountains to New Mexico and, in the Great Plains and Midwest, south to Kansas and Illinois. It has disappeared from many areas along the southern periphery of its range.

Sharp-tailed grouse habitat includes grasslands, prairies, mountain meadows, and, to a certain extent, sagebrush or woodlands with a grass understory. This species seeks cover in brushy draws or riparian thickets. It uses agricultural fields, but generally disappears from land under cultivation.

Young sharp-tailed grouse eat a variety of insects and a few berries. As adults, the diet is up to 90 percent plant material, including grain, berries from brush like serviceberry, chokecherry, huckleberry, wild rose. They also eat plant buds and flowers. During the summer, adults may eat up to 40 percent insects, but the winter food consists of berries and buds.

Action Area Status and Habitat

Sharp-tailed grouse in Oregon declined throughout most of the 20th century and vanished by the 1980s. They were re-introduced into Wallowa County (HCNRA) in 1992 but did not thrive and eventually died out. This area contains the most suitable habitat available for sharp-tailed grouse on the Forest. It is highly unlikely sharp-tailed grouse exist on the Forest or in the vicinity.

The query that was used for sharp-tailed grouse was broad and includes all the dry herbland, dry shrub, moist herbaceous riparian and warm-hot riparian herbland habitat. Using this broad query there are approximately 477,431acres of potential sharp-tailed grouse habitat on the Forest, of which approximately 9,426 acres (less than one percent) have known invasive plant species.

Greater Yellowlegs-Suspected

Preferred Habitat

The greater yellowlegs breeds in Alaska and most of Canada, except along its southern border. A few pairs have been found nesting in Oregon. They winter along the U.S. coasts and south to the southern tip of South America.

Greater yellowlegs prefer boggy areas where there are some coniferous trees and open water in close proximity. They actively hunt animal food in the water, even chasing small fish. Its usual diet is aquatic invertebrates, such as insects and their larvae, mollusks, crustaceans, worms, tadpoles, and an occasional berry (Custi et al. 2001).

Breeding begins in late May or early June and eggs are incubated for about 23 days. Young are capable of first flight in about 18-20 days.

Action Area Status and Habitat

During migration, this species can be seen most anywhere in Oregon where there is shallow water for feeding. The only Oregon breeding location was found at Downy Lake, in the Wallowa Mountains in the 1990s. Breeding at this site has occurred at least four times, although has not occurred in recent years (T. Schommer, personal communication 2007). In winter, they are common along the coast of Oregon and locally, inland.

There is approximately 11,373 acres of potential greater yellowlegs habitat on the Forest. Of this, 104 acres have known invasive plant infestations.

Tricolored Blackbird-Suspected

Preferred Habitat

Tricolor blackbirds are designative restricted breeders with a distribution from southern Oregon south through northern Baja, California. It is rare in Oregon, and prefers to breed in freshwater marshes with emergent vegetation (cattails) or in thickets of willows or other shrubs. Although it has also been confirmed breeding in Himalayan blackberry growing in and around wetlands and is often found in the company of red-winged blackbirds. Tricolor blackbirds breed in April after migrating to Oregon breeding grounds. The nest is made up of plant fibers attached to emergent vegetation or secured in a thicket of shrubs (Beedy and Hamilton 1999). This blackbird is colonial rather than territorial, defending only a few feet from the nest. After breeding season, it forms large flocks. Most of Oregon's tricolored blackbirds winter in California (Beedy and Hamilton 1999).

Action Area Status and Habitat

Tri-colored blackbirds have not been documented on the Wallowa-Whitman National Forest or any of the adjoining Forests. Limited habitat exists in areas that have emergent vegetation, willows or other water-loving shrubs; however these birds have not been documented in northeastern Oregon. Inadequate information exists for areas with emergent vegetation, willows and other water-loving shrubs on the Forest, so potential acres of tricolor blackbird habitat were not estimated.

Bobolink-Suspected

Preferred Habitat

Bobolinks breed nearly coast to coast, from southern Canada south across the northern United States. It reaches the Atlantic Coast in the East, but remains east of the Cascade Mountains in Oregon and Washington.

The bobolink is a bird of open prairies, grasslands, wet meadows, pastures, and grain crops. In Oregon, there are only a few disjunct populations that breed in irrigated hay meadows fringed with willows or in wet, grassy meadows with local growths of forbs and sedges. Many of these areas are mowed and/or grazed, which facilitates nesting for bobolink.

Bobolink eat grass and forb seeds as well as insects. During the breeding season more insects are included in the diet, especially caterpillars.

Action Area Status and Habitat

Bobolinks have not been documented on the Wallowa-Whitman National Forest or any of the adjoining Forests. Limited habitat exists in areas that have grasslands, wet meadows, willows or other water-loving shrubs. Bobolinks have been observed in the Bowen Valley just outside the Forest but not within the Forest boundaries. Estimates place the total number of bobolinks breeding in Oregon at less than 1,000 individuals (Csuti et al. 2001).

Northern Leopard Frog-Suspected

Preferred Habitat

The most cold-adapted of all the leopard frogs, northern leopard frogs occur in a wide variety of habitats (springs, marshes, wet meadows, riparian areas, vegetated irrigation canals, ponds, and reservoirs) and requires a high degree of vegetative cover for concealment (NatureServe Explore 2006, McAllister et al. 1999). They are also found in grasslands, woodland, and forest that range high into the mountains (Stebbins 1985). They prefer quiet or slowly flowing waters and avoid areas without cover (McAllister et al. 1999, Csuti et al. 2001). Typically, they are found between 500 and 3,000 feet in elevation (Corkran and Thoms 2006). They breed in ponds or lake edges with fairly, dense aquatic emergent vegetation in mid spring, and attach their eggs to submerged vegetation well below the surface (NatureServe Explore 2006, Corkran and Thoms 2006). Hatchlings cling to the egg mass or nearby vegetation while tadpoles live in dense aquatic vegetation, and juveniles and adults live in aquatic vegetation and in adjacent grass, sedge, weeds or brush (Corkran and Thoms 2006). Over-wintering habitats are larger lakes and streams that do not freeze completely during winter (NatureServe Explore 2006, McAllister et al. 1999).

Larvae eat algae, plant tissue, and other organic debris (Csuti et al. 2001). Carnivorous adults eat both invertebrates (spiders, insects, snails, and leeches) and vertebrates (tadpoles, small frogs, small snakes, and fish (McAllister et al. 1999, Csuti et al. 2001).

This frog is known in Oregon mostly from older records and recent surveys have failed to find it in Oregon (Csuti et al. 2001). Corkran and Thoms (2006) stated "we were lucky enough to find the only northern leopard frog egg mass seen in Oregon or Washington for quite a few years." Leopard frogs have not been found during any of the Forest amphibian surveys that have taken place. Their occurrence in the Action area is unknown but unlikely.

Action Area Status and Habitat

The Wallowa-Whitman National Forest does not have GIS coverage for all manmade and natural ponds, reservoirs, wet meadows, and stockponds; however it does have GIS coverage for waterbodies and springs. Although waterbodies and springs contain only a portion of the potential leopard frog habitat available in the action area, it does provide a sense of what proportions of mapped waterbodies currently contain invasive plants.

Forestwide there are 181 waterbodies and 426 springs defined in the Wallowa-Whitman GIS coverages. In the model used for leopard frog potential habitat, the springs and waterbodies were buffered by 300 feet to the outside to capture shore habitat and buffered 25 feet to the inside to capture emergent vegetation habitat types. Based on these parameters, there are approximately 8,669 acres of potential shoreline northern leopard frog habitat, of which approximately 29 acres are known to contain invasive plant species. There are approximately 2,703 acres of spring habitat, of which 76 acres (approximately 2.8 percent) have known invasive plants.

Columbia Spotted Frog-Documented

Preferred Habitat

Columbia spotted frogs range from southeastern Alaska to central Nevada, east to Saskatchewan, Montana, western Wyoming, and north central Utah. The Great Basin Distinct Population Segment (DPS) of the Columbia spotted frog is a federal candidate for listing. This DPS is found in Oregon, Idaho, and Nevada. The Columbia spotted frog is considered a Forest Service sensitive species and has been documented on the Malheur, Ochoco, Umatilla, and Wallowa-Whitman National Forests. This species was once considered to be included in *Rana pretiosa* with the Oregon spotted frog.

The spotted frog frequents waters and associated vegetated (grassy) shorelines of ponds, springs, marshes, and slow-flowing streams and appears to prefer waters with a bottom layer of dead and decaying vegetation (NatureServe Explore 2006, Hayes et al. 1997, Csuti et al. 2001). They occur along the grass and sedge margins of streams, lakes, ponds, springs, and marshes. They typically occur between 1,700 and 8,000 feet in elevation (Corkran and Thoms 2006). The Columbia spotted frog exhibits strong fidelity to breeding sites and often deposits eggs in the same locations in successive years. They deposit egg masses in still, shallow waters atop submergent herbaceous vegetation or among clumps of herbaceous wetland plants. Breeding habitats include a variety of relatively exposed, shallow-water (less than 60 centimeters), emergent wetlands such as sedge fens, riverine over-bank pools, beaver ponds, and the wetland fringes of ponds and small lakes. Vegetation in the breeding pools generally is dominated by herbaceous species such as grasses, sedges and rushes. After breeding, adults often disperse into adjacent wetland, riverine and lacustrine habitats. Tadpoles live in the warmest parts of ponds (Corkran and Thoms 2006). Froglets and adults live in well-vegetated ponds, marshes or slow, weedy streams that meander through meadows (Corkran and Thoms 2006). Springs may be used as over-wintering sites for local populations of spotted frogs (Hayes et al. 1997).

Larvae have a diet of algae, plant material, and other organic debris. Adults eat insects (ants, beetles, mosquito larvae, and grasshoppers), spiders, mollusks, tadpoles, crayfish, and slugs (NatureServe Explore 2006, Hayes et al. 1997, Csuti et al. 2001). Columbia spotted frogs eat arthropods, earthworms and other invertebrate prey. Predators of the species include mink, river otter, raccoon, herons, bitterns, corvids, garter snakes, dragonfly larvae, and predacious diving beetles (McCallister and Leonard 1997). Environmental stressors such as pesticides, herbicides, fertilizers, and heavy metals may slow reactions or cause behavioral changes that make spotted frog tadpoles more vulnerable to predation (Lefcort et al. 1998, Rosenshield et al. 1999, Marco et al. 1999, Bridges 1999, Bridges and Semlitsch 2000). Threats to the species include mining, livestock grazing, road construction, agriculture, and direct predation by bullfrogs and nonnative fishes (USDI 1998).

Like all amphibians, spotted frogs absorb some of the oxygen and water they need to survive through their skin. There are many advantages to having permeable skin, like being able to breathe in and out of water. But there are disadvantages as well. In addition to oxygen and water, chemicals can easily penetrate the skin of an amphibian and enter its body. This is one of the reasons why frogs may be particularly susceptible to potential harm from herbicides and environmental pollutants.

Spotted frogs are characterized by their special anatomy that allows them to live in and out of the water. For example, spotted frogs start as tadpoles that live in water and then transform into frogs that live on land. This means that they may be exposed to both aquatic and terrestrial pollution. These frogs are also threatened by pollutants in the environment because their eggs do not have a hard shell acting as a barrier between the unhatched amphibian and the water that surround it.

Action Area Status and Habitat

Columbia spotted frogs occur in a number of locations on the Wallowa-Whitman National Forest. This species is often found in natural ponds and lakes, rock pits, old mining ponds, livestock stockponds, and slow moving streams that retain water year-round. More locations have been found on the south end of the Forest and most spotted frog sites found in created habitat such as mining ponds and small lakes. None of the known spotted frog sites have invasive plants directly adjacent to the site.

Potentially suitable habitat for this species within the action area, as well as the amount of habitat that is known to be affected by invasive species is the same as that described above for the Northern Leopard Frog.

Painted Turtle-Suspected

Preferred Habitat

Painted turtles are usually found below 3,500 feet in elevation (St. John 2002). This turtle occurs in slow moving, shallow, quiet waters, with muddy or sandy substrates with aquatic vegetation and basking sites (NatureServe Explore 2006, St. John 2002, Csuti et al. 2001, and Johnson 1995). Painted turtles are found in lakes, ponds, marshes, and slow moving streams located in a variety of surrounding vegetation types (St. Johns 2002). The turtle is active diurnally, April through October and hibernates in water in bottom mud (NatureServe Explore 2006 and Csuti et al. 2001). They nest in soft soil in open areas up to 500 feet from water (NatureServe Explore 2006, St. John 2002, and Csuti et al. 2001).

The turtle eats both plants; including algae, duckweed, bulrush, and animal matter including spiders, beetles, insect larvae, earthworms, crayfish, fish, frogs, and tadpoles (NatureServe Explore 2006, St. John 2002, and Csuti et al 2001). The young are more carnivorous, while the adults are more herbivorous.

Action Area Status and Habitat

The painted turtle appears to be declining in Oregon due to lack of recruitment. Predation on young by introduced bullfrogs may be responsible for the decline (Csuti et al. 2001). This may be true for other parts of Oregon; however the Action area currently does not have any known bullfrog populations. Surveys for painted turtles have been sporadically conducted. Although potential habitat does exist for this species, there are currently no known painted turtle locations on the Wallowa-Whitman NF (T. Schommer, personal communication).

Potentially suitable habitat for this species within the action area, as well as the amount of habitat that is known to be affected by invasive species is the same as that described above for the Northern Leopard Frog.

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 et al. 1979). The MIS approach is used in concert with other indicators to gauge the effects of management on wildlife. Table 33 includes those wildlife species that were identified as MIS for the Wallowa-Whitman National Forest (USDA 1990).

Table 33-Management Indicator Species and their associated habitat for the Wallowa-Whitman NF

Species	Habitat Types
Rocky Mountain elk	General forest habitat and winter ranges
Pileated Woodpecker	Dead/down tree habitat (mixed conifer) in mature and old growth stands
Northern goshawk	Mature and old growth forest stands
Pine Marten	Mature and old growth stands at high elevations
Primary cavity excavators	Dead/down tree (snag) habitat

Rocky Mountain elk

Preferred Habitat

Rocky Mountain elk is an important game species on the Wallowa-Whitman National Forest (USDA Forest Service 1990). Elk habitat consists of a mosaic of woodland cover and open area. Forest habitat provides escape cover from human disturbance and predators and provides travel corridors between seasonal habitats (USDA NRCS 1999). Elk forage consists of a wide variety of grasses, forbs and woody plants, with grasses, sedges and spring forbs being the primary forage items in summer. As summer progresses, more forbs and woody material are consumed and dry grasses and browse are utilized heavily in autumn. Although grasses are preferred, shrub and browse species are used during the winter months (USDA NRCS 1999).

In the Blue Mountains, optimum landscape level elk habitat includes a mixture of approximately 40 percent cover and 60 percent in forage (Thomas 1979). Proximity to cover is also important and for maximum use, elk forage areas should be within 600 ft. of cover, as use significantly declines beyond that point (Thomas 1979). The amount of canopy cover also affects suitability of foraging habitat and once the forest reaches or exceeds 60 percent canopy closure, understory forage begins to decline rapidly. So while forested habitat provides some forage, forage areas include primarily natural and man-made openings, in close proximity to cover (Thomas 1979).

While elk utilize a diversity of forest and nonforest conditions, preferred use areas can be affected by human access and disturbance (Rowland et al 2000). For example researchers have reported decreased use of areas adjacent to roads for distances ranging from 400 ft (Whitmire and Wisdom) to ½ mile (Thomas 1979). Also elk have been found to select habitats preferentially based on increasing distance from open roads (Rowland et al. 2000). Vulnerability and hunting mortality have been found to be higher in forested stands with greater road densities and less vegetation to provide screening (Weber et al. 2000).

Elk require water, particularly on summer range and studies in Montana indicate elk make disproportionate use of areas within 1,050 feet of water (Thomas 1979). Optimum calving habitat for elk contains forage areas, hiding cover and thermal cover within forest stands, generally on slopes less than 15 percent (Thomas 1979).

Action Area Habitat

Because of the diversity of habitats utilized, elk were selected as an indicator of general forest habitat. Elk habitat, which includes a variety of forest and nonforest communities, was mapped as part of a cooperative effort sponsored by the Rocky Mountain Elk foundation and currently, over 96 percent of the action area provides elk habitat. Approximately 1 percent of the Forestwide elk habitat is currently infested with invasive plants and Table 34 displays the amount of existing elk habitat infested by seasonal use area. The total acreage of infested plants that occurs along road corridors is also displayed in Table 34.

Table 34-Elk Habitat affected by invasive plants

Elk Habitat	Acres of Suitable Habitat	Acres of Infestation	Percent of Habitat Affected
Summer Range Only	1,603,380	8,517	0.5
Winter Range Only	85,383	1,429	1.8
Year-long Use	607,371	10,722	1.8
Migration Corridor	64,670[1]	450	.7*
Total Infestation	**2,296,314**	**21,118**	**0.9***
Infested Acres Along Roads		**7,870**	**37[2]**

* - percent of forestwide habitat
1 – Acreage also included in summer/winter range
2 - % of the total acres of forestwide elk habitat infested

Pileated woodpecker

Preferred Habitat

The pileated woodpecker was selected as an indicator species in the Forest Plan to represent dead and down tree habitat in mature and old growth mixed conifer stands. The pileated woodpecker is the largest woodpecker species in the western United States and nests in cavities of large trees or snags. It is an occupant of mature forests, relying on dead and decaying trees for foraging and nesting. The pileated woodpecker is fairly common throughout the Wallowa-Whitman National Forest in mature and late-successional mixed conifer forest. Pileated woodpeckers rely on large areas of unburned, mature and old-growth forests for their foraging resources, because they forage primarily on ants (*Hymenoptera* and *Formicidae*) within softened wood (Bull and Holthausen 1992).

Action Area Habitat

Parameters used for mapping potential habitat for pileated woodpecker included late forest structure in mixed conifer stands consisting of ponderosa pine, western larch, grand fir and Douglas-fir, which had greater than or equal to 50 percent canopy closure and trees and snags that were at least 15 inches diameter breast height. Using this analysis there are approximately 133,318 acres of potential pileated woodpecker habitat within the action area. Since pileated woodpeckers utilize down logs and snags and forage on beetles and ants buried inside decaying wood, their habitat is not impacted by invasive plant infestations. There are approximately 1,177 acres (0.9 percent) of known invasive plant species infestations within this potential pileated woodpecker nest habitat.

Northern Goshawk

Preferred Habitat

The northern goshawk was selected as an indicator species in the Forest Plan to represent species that require mature to over mature closed-canopy forests. The goshawk uses mature to over mature dense canopy forests for nesting and forested areas with open inclusions for foraging on birds and small mammals. Goshawks have a high fidelity to nest areas, which are often used more than one year, and sometimes used intermittently for decades (Reynolds et al. 1992, Wisdom et al. 2000). Many pairs of goshawks have two to four alternate nest areas within their home range.

Goshawk nest areas typically have high tree canopy cover and a higher proportion of larger trees then surrounding areas. Studies suggest that dense vegetation provides relatively mild and stable microenvironments, as well as protection from predators. Nest areas are usually classified as mature and late structural forest stands (Reynolds et al. 1992, Graham and Jain 1998). Human activity during the nesting period may cause the nest to be abandoned and subsequent nest failure (Reynolds et al. 1992).

Action Area Habitat

Parameters used for mapping potential habitat for northern goshawk included late forest structure in mixed conifer stands consisting of ponderosa pine, western larch, grand fir and Douglas-fir, which had greater than or equal to 50 percent canopy closure and trees and snags that were at least 15 inches diameter breast height. Using this analysis there are approximately 174,956 acres of potential goshawk habitat within the action area. Since goshawks tend to utilize dense forest with openings, their habitat is less likely to be impacted by invasive plant infestations however infestations may occur in nesting or foraging habitat. There are approximately 941 acres (0.5 percent) of known invasive plant species infestations within this potential northern goshawk habitat. Approximately sixty percent (566 acres) of those acres are adjacent to roads and trails.

Pine marten

Preferred Habitat

The pine marten (aka American marten) was selected as an indicator species in the Forest Plan to represent complex mature and old growth stands. Preferred habitat for the marten consists of higher elevation (greater than 4000 feet) stands of dense conifer and large down-wood often associated with streams. Pine martens occur in dense forests containing snags and down logs, which provide suitable denning sites. The pine marten is most closely associated with heavily forested east and north-facing slopes that contain numerous windfalls (Maser 1998). Martens spend a great deal of time in trees. They tend to avoid areas that lack overhead protection and the young are born in nests within hollow trees, stumps, or logs. They eat a variety of small mammals, particularly squirrels, as well as voles, mice, pika, and rabbits. Martens do not tolerate concentrated human use or habitat modification. The historical and current density and distribution of marten in the Forest is unknown, but they are thought to occur in low numbers.

Action Area Habitat

Multi-storied mature and old forest stands with trees and snags 15 inches in diameter at breast height or larger, with 50 percent canopy closure and at least 4,000 feet in elevation were used to determine broad-scale potential pine marten habitat. No acres of juniper woodland, hot-dry ponderosa pine or whitebark pine habitat was calculated into the marten habitat. Using these parameters, the action area contains approximately 174,956 acres of pine marten habitat. Approximately 941 acres (0.5 percent) contain known invasive plant sites. Approximately 60 percent of those sites are adjacent to roads (545 acres) and (21 acres) trails.

Cavity Excavators

Preferred Habitat

A large number of species rely on cavities in trees for shelter and nesting. Primary cavity excavators include 16 species of birds with potentially suitable habitat on the Wallowa-Whitman National Forest. These species include Lewis' woodpecker, Williamson's sapsucker, red-naped sapsucker, downy woodpecker, hairy woodpecker, white-headed woodpecker, three-toed woodpecker, black-backed woodpecker, northern flicker, pleated woodpecker, black-capped chickadee, mountain chickadee, chestnut-backed chickadee, red-breasted nuthatch, white-breasted nuthatch, and pygmy nuthatch (Johnson and O'Neil 2001,Thomas 1979). Habitat for primary cavity excavators includes dead trees in various size and decay classes with coniferous and hardwood vegetation and a variety of structural stages (ibid). This group of primary cavity excavators is considered one management indicator in the Forest Plan and represents a vast array of vertebrate species that depend upon dead trees and down logs for reproduction and/or foraging (USDA 1990).

Secondary cavity users such as owls, bluebirds, and flying squirrels may use cavities created by primary cavity users for denning, roosting, and/or nesting. By addressing available habitat for primary cavity excavators, it is expected that habitat for secondary cavity users will be provided (USDA 1990).

Action Area Habitat

Because primary cavity nesting species utilize a wide variety of snag species and size classes, virtually all forested land or approximately 70 percent of the action area provides potentially suitable habitat. Although invasive plant infestations occur within forested habitat, they are not adversely affecting habitat for cavity nesting species.

Species of Interest

Landbirds (migratory birds)

Landbirds include neo-tropical migratory birds that have been defined as those species that regularly breed in continental North America and winter south of the Tropic of Cancer, typically in Central and South America and the Caribbean. Landbirds are defined as all birds except loons, grebes, seabirds, waterfowl, long-legged waders, shorebirds, gulls, terns, alcids, cranes, and rails. Widespread declines in populations of many landbirds have intensified interest in avian conservation and resulted in policy direction to evaluate the impact of proposed activities on the nesting habitats of these species.

The North American Breeding Bird Survey Program found that 75 percent of forest dwelling migrants in eastern North America declined in population during the 1980s (Robbins et. al. 1989). Potential causes of these declines are numerous and diverse, and may involve corridors and stopover sites, or a combination of these factors (Sherry and Holmes 1992).

Related to these potential causes is the problem of nest parasitism by the brown-headed cowbird, populations of which have expanded significantly in the last few decades due primarily to human-induced changes in the landscape (Ehrlich et al. 1988). One hundred sixty two species of landbirds breed in Oregon and Washington including common passerine songbirds, hawks, and owls (Andelman & Stock 1994).

Landbirds occur in a wide variety of habitat types including early and late-seral forests (Finch & Stangel 1992). In the relatively arid western United States, however, densities of neo-tropical migrants are highest in riparian areas, with coniferous forests being the second-most used habitat by this assemblage of species (Saab and Rich 1997).

Focal Species

In 2000, Partners in flight released conservation strategies for landbirds in Oregon and Washington (Altman 2000, Altman 2000a, and Altman 2000b). These documents identified 1) priority habitats, or habitats most important to landbirds within the region, 2) focal species, or species most highly associated with priority habitats and their attributes, and 3) conservation recommendations to achieve desired objectives. Table 35 identifies the priority habitat, habitat attribute and focal species identified in these plans that occur on the Forest. Unique habitats, as well as the amount of action area habitat affected by invasive plants are also displayed.

Table 35-Priority and Unique Habitats on the Forest and the associated Focal Species

Priority Habitat	Habitat Attribute	Focal Species	Percent of Action Area
Priority Habitat			
Dry Forest	Old forest-large patches Grassy openings-dense thickets Open understory-regeneration Burned old forest	White-headed woodpecker Flammulated owl Chipping sparrow Lewis' woodpecker	49
Mesic Mixed Conifer	Large snags Multi-layered, structurally diverse Canopy foliage cover Dense shrub layer Fire edges and openings	Vaux's swift Townsend's solitaire Varied thrush MacGillivray's warbler Olive-sided flycatcher	27
Riparian woodland/shrub	Large snags Canopy foliage cover Understory cover Dense shrub patches	Lewis' woodpecker Red-eyed vireo Veery Willow flycatcher	<1
Unique Habitats			
Subalpine forest	Patches	Hermit thrush	2
Mountain meadows	Mesic and dry conditions	Upland sandpiper	15
Steppe shrublands	Patches	Vesper sparrow	2
Aspen	Large trees/snags with regeneration	Red-naped sapsucker	<1
Alpine	Patches	Gray-crowned rosy finch	2

Large-scale declines in open park-like dry forests with large trees and snags have led to population declines of the white-headed woodpecker, flammulated owl, white-breasted nuthatch, pygmy nuthatch, Williamson's sapsucker, and Lewis' woodpecker. These bird species have likely suffered some of the greatest population declines and range retractions (Altman 2000). Local overstory nesting species and foliage or crown feeders may include the pine siskin, golden-crowned kinglet, mountain chickadee, hermit thrush, ruby-crowned kinglet, yellow-rumped warbler, and western tanager.

Riparian woodland and shrub habitats are typified by the presence of hardwood tree and shrub species, along with associated wetland herbaceous species. Water is an important component of these habitats, whether it is in the form of standing wetlands, springs, seeps, or flowing water (streams). Riparian vegetation is particularly important to neo-tropical migratory songbirds (Sallabanks et al. 2001). Although these habitats generally comprise only a small portion of the landscape, they usually have a disproportionately high level of avian diversity and density when compared to surrounding upland habitats.

All three plans (Altman 2000, Altman 2000a and Altman 2000b) identify invasion by exotic plants as an important issue adversely affecting landbird populations. Conservation strategies include reducing impacts to sensitive habitat from invasive plants, as well as minimizing the potential for herbicides to adversely affect nontarget species.

3.3.3 Alternatives Analyzed

Treatments proposed under each of the alternatives can be found in Table 36, whereas a summary of how well each alternative responds to the significant issues can be found in Table

13 in Chapter 2. Throughout this analysis Alternative A is referred to as the No Action alternative, whereas Alternatives B, C and D are often referred to as the action alternatives. Differences between these alternatives in terms of their effects on wildlife are discussed in detail in the Environmental Consequences section.

Table 36-Treatment methods by alternative

Treatment Methods	Alternative A No Action[1]	Alternative B Proposed Action	Alternative C No Broadcast in Riparian Habitat Conservation Areas	Alternative D No Aerial Herbicide
Chemical Methods				
Upland Areas				
Ground-based broadcast and spot treatments[2]	2,577[3]	13,556	13,556	13,556
Aerial treatments	0	875	875	0
Riparian Habitat Conservation Areas				
Ground-based broadcast treatment	1,932[3]	3,104	0	3,104
Spot spray/selective treatment (including wicking and wiping)	663[3]	3,241	6,345	3,241
NonChemical Methods				
Upland Areas and Riparian Habitat Conservation Areas				
bio-control only	See note below	1,955	1,955	2,797
manual only6	0	111	111	111
Total Acres Treated	**5,172**	**22,842**	**22,842**	**22,809**

1 A designation of chemical treatment could be changed to manual, mechanical or biological treatment if, at the time of treatment, one of these alternative methods would be effective. A site initially treated with chemicals may be treated with manual or mechanical methods during follow-up treatments.
2 Whether each site will be broadcast or spot treated will be determined locally before each field season so the acres to be broadcast treated and the acres to be spot treated are not known at this time. Determination of where broadcast versus spot treatments will occur depends on access to site, size of site, and density of weed coverage.
3 No action alternative includes '92 Environmental Assessment for the Management of Noxious Weeds and the '94 Environmental Assessment for Management of Noxious Weeds and Forest Plan Amendment #4.
4 Acres proposed in aerial application that could be treated with ground based methods although likely to be less effective or more costly than those proposed in Alternative B. Approximately 33 acres would not treated due to inaccessibility and no other means of control i.e. biocontrol agents.
5 Riparian Habitat Conservation Areas (RHCA) are: 300' of perennial stream and 100' of intermittent stream–as designated under PACFISH, INFISH
6 Manual only sites will not be treated with herbicides because the desired weed management goal can be effectively achieved using manual methods. Such sites are typically very small or having widely scattered weeds or are in sensitive areas like a campground along a stream or a combination of these factors.

Biocontrol note: the '94 EA approved the use of biocontrol agents, however, all sites were analyzed for chemical treatments to attain highest amount of flexibility and greater invasive plant species control. The forest has also released APHIS and state of Oregon approved biocontrol agents on approximately 2,500 acres for the control of invasive weeds (Yates 2007).

3.3.4 Environmental Consequences

Methodology

The appropriate methodology and level of analysis needed to determine effects to the wildlife resource are influenced by a number of variables including the presence of species or habitat, the scope and nature of activities associated with the proposed action and alternatives and the potential risks that could ultimately result in adverse effects. The multi-scale analysis used in this assessment includes the following:

Site-level Assessment – This was started very early in the planning process and involved an evaluation of individual sites currently affected by invasive plants. Sites at this scale vary from less than one acre to several hundred acres in size. This assessment was used to identify wildlife habitat affected by invasive plants, as well as the invasive plant species involved and relative risk to wildlife habitat. This assessment was also used to identify unique or specialized habitats that need to be protected and to identify site specific mitigation measures or Project Design Features (PDFs) identified in Chapter 2.

Site-level assessment also occurs during implementation (PDF A-1) and would; 1) identify species/habitats of local interest or concern that need to be protected, 2) identify the appropriate treatment method, and 3) ensure that all applicable mitigation measures (PDFs) are implemented to reduce effects. This level of assessment also involves implementation of species/habitat monitoring necessary to ensure that impacts to nontarget species from proposed aerial broadcast treatments (PDF F-8e) are within acceptable tolerances.

Landscape level Assessment – Landscape level effects were assessed by evaluating effects and changes in habitat on NFS lands within the project area (the Wallowa-Whitman National Forest). This level of assessment uses GIS information, as well as Forestwide wildlife monitoring and observation data to assess landscape level effects to wildlife including; total acres of suitable habitat affected, the distribution of infestation/treatment areas, proximity of affected habitat to roads, riparian areas or other physical or vegetative features that would affect wildlife use of treatment areas, and effects to occupied or key habitats.

The wildlife analysis is broken down into two sections. The Wildlife Effect Section includes an assessment of the effects of invasive plant treatments on wildlife, an analysis of the effects associated with herbicide exposure and risk, cumulative effect considerations, and an analysis of how the alternatives identified in Table 36 affect wildlife and wildlife habitat. The Species Analysis Section evaluates direct, indirect and cumulative effects of proposed actions on T& E, sensitive species, Forest MIS and species/habitats of local interest.

Collectively the information provided in these two sections evaluate anticipated effects of the proposed alternatives on wildlife, assess the effects to the different habitats across the action area (MIS species), and ensure that regulatory direction related to wildlife is met.

Wildlife Effects Section

Direct and Indirect Effects

Effects of invasive plant treatment methods to wildlife were evaluated and discussed in detail in the R6 2005 FEIS, the corresponding Biological Assessment (USDA Forest Service 2005b), project files, FS/SERA risk assessments (SERA 2001, 2003a-d, 2004a-e), the Effects of Nonherbicidal Methods of Invasive Plant Treatment on Wildlife, Fish and Plants (USDA-

FS 2005c), Source and Effectiveness of Project Design Features/Criteria for Herbicide Use in Invasive Plant Treatment Projects Forest Service Region Six (USDA-FS 2008) and Appendix C (Wildlife) of this EIS. These documents also provide detailed information on herbicide toxicity and risk and the effects evaluation presented here relies heavily on these documents, which are incorporated by reference into this analysis.

Results of numerous field studies indicate that the likelihood for direct effects to wildlife from herbicide use is low (e.g., Marshall & Vandruff 2002, Dabbert et al. 1997, Fagerstone et al. 1977, Rice et al. 1997, Sullivan et al. 1998a, Cole et al. 1997, Cole et al. 1998, Johnson and Hansen 1969, Nolte and Fulbright 1997, McMurray et al. 1993a, McMurray et. al. 1993b). However the use of herbicides to treat invasive plants does have the potential to harm free-ranging wildlife. Adverse effects to wildlife from manual and mechanical invasive plant treatments are also possible (USDA-FS 2005b). Consequently, effects to wildlife and wildlife habitat will be evaluated by looking at potential risks from proposed treatments, as well as effects from invasive plant infestation.

Many site specific concerns related to potential effects of proposed treatment on nontarget wildlife were addressed during the development of project PDFs, which are identified in Chapter 2 of this document and are discussed throughout this analysis. It is important to note that while potential effects or “risks” to wildlife are discussed throughout this analysis, the anticipated effects of treatments proposed under the action alternatives are based on implementation of PDFs, which are designed in part to avoid or reduce the likelihood of adverse effects from herbicide use by limiting the herbicide rate, application method, timing or formulation used in proximity to wildlife or terrestrial and aquatic habitat (USDA Forest Service 2008)

General Effects and Considerations (Alternatives A through D)

Infestation Size

Potential effects to wildlife vary depending on the species and extent of infestation, as well as the amount of native vegetation remaining within infested areas. For example, while treatment of larger infestations may create more disturbances for longer periods than small infestations, potential effects to wildlife would be reduced, because the presence of native wildlife in these areas is greatly reduced in comparison to native habitat (Duncan and Clark, 2005). Conversely moderately infested areas may pose a greater risk to wildlife because these areas continue to support suitable habitat and are more likely to contain native wildlife. Small infestations would be expected to pose the least risk to wildlife because of the small amount of habitat affected and considering PDFs are in place to protect sensitive areas (e.g. wetlands) and occupied habitat of TES species.

The size range of infested sites is displayed in Table 21. Of the currently infested sites within the action area 65 percent are currently less than one acre in size, 15 percent are less than 10 acres, 14 percent are between 10 and 50 acres in size, and only approximately 6 percent are greater than 50 acres.

Infestation Location

The effects of the invasive plant treatment also depend partly on the locations of existing and future invasive plant infestations. For example treatments of infestations along disturbed roadsides would likely have fewer effects, because these areas do not provide essential wildlife habitat and consist of long, narrow areas spread over large distances (USDA 2005a

Appendix J p. J-17). Conversely, treatments within wilderness or remote areas would pose a greater risk to species sensitive to disturbance. Similarly because riparian areas often receive a disproportionate amount of wildlife use and can contain sensitive or important habitats (e.g. wetlands), potential impacts in these areas from treatment would likely be greater than many upland sites. All alternatives include PDFs to reduce potential impacts within riparian and/or sensitive wildlife habitats.

Potential effects to wildlife are also affected by the amount of habitat affected by invasive plants/treatment within a species home range or territory. For example species with small home ranges and less mobile species may be at greater risk, if a large portion of their daily or seasonal use area is affected by invasive plants/treatment. Conversely risks would be less for species with large home ranges or species that forage or travel over large areas, because invasive plants/treatment would affect less of their available daily/seasonal habitat.

Table 52 displays the distribution of invasive plant treatments by watershed (5^{th} level HUC). Although up to 22,842 acres are proposed for treatment, existing infestations and treatments are spread out across 53 watersheds. While the size of individual watershed varies, only three would have one percent or more of the watershed affected by treatment, whereas 50 watersheds have less than one percent proposed for treatment. Implications on wildlife are that due to the widely scattered nature of proposed treatments and considering only a small amount of any affected watershed would be treated, adverse effects would generally be reduced, particularly for widely ranging species.

Proximity of Suitable Habitat to Treatment Sites

Potential adverse effects to wildlife are determined largely by the potential exposure to treatment. Because most invasive species are shade intolerant, the majority of treatments occur in openings, early structural habitat or in forested habitat with a relatively open canopy. Consequently species that occur primarily in mature forest are less likely to be affected by treatment to invasive plants. Conversely, species that prefer or require relatively open habitats preferred by most invasive plants are more likely to be adversely affected by both plant infestation and treatment. This is discussed in more detail under the individual species analysis.

Invasive Plant Treatment Methods Effects to Wildlife (Alternatives A through D)

A description of the invasive plant treatments can be found in Chapter 2 and the following is a discussion of the direct effects associated with proposed treatments on wildlife. Because indirect effects to wildlife habitat are a function of the type and amount of treatment proposed, indirect effects are discussed under the alternative analysis.

Manual

Manual methods are labor-intensive and usually ineffective for the treatment of large, well-established infestations of perennial invasive plants with long term viable seed such as knapweeds (Brown et al. 2001). Manual treatments can result in trampling of nontarget plants (habitat) and animals and create bare ground. The degree of threat and effect from manual treatments depends on the number of workers present and the size of the area being treated. Because manual techniques are slower than mechanical or chemical methods, the duration of disturbance may be longer in the treatment area. However the slower pace of work allows animals in the area to leave and reduces the risk of direct harm from trampling. Bare ground is likely to be patchy in distribution with this method and less likely to interfere with animal movement or dispersal.

Mechanical

Mechanical methods generate more noise than other treatments, except for aerial applications, and have a higher likelihood of disturbing species that are secretive or sensitive to noise. For several species loud and sudden noises above background or ambient levels (those above 92 dB) can cause disturbance that might flush a bird off the nest or abort a feeding attempt. Based on interviews with State and County weed control operators, the vehicles used to spray roadside vegetation with herbicides do not make noise as loud as logging trucks or large delivery trucks and are therefore within the background noise level for open roads. Other mechanical 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 some wildlife. Because disturbance related effects would only occur during treatment, effects to wildlife would be short-term in nature (generally 1 to 2 days).

Because some mechanical treatments may crush small mammals, reptiles, amphibians, or eggs of ground-nesting birds, potential mortality to less mobile species/nests is greater than manual treatment. Hand-held mechanical equipment, like chainsaws and string trimmers, can be used very selectively on target plants and may be less likely than larger equipment to directly harm wildlife. Use of vehicle-mounted mechanical equipment (mowers, or hammer flails etc.) is much less selective and more likely to directly harm small wildlife species. Vehicle-mounted equipment is most often applied to monocultures of invasive plants on gentle slopes or road verges, and even though those areas do not provide preferred or suitable habitat for most native wildlife, adverse effects from disturbance or crushing are still possible.

Mechanical treatments may produce more bare ground, reducing cover, exposing more soil to erosion, potentially disrupting dispersal or foraging patterns of small animals, and possibly exposing some to increased predation as a result of decreased cover. Although with implementation of site restoration treatments described below, any loss of cover would be short-term (1 growing season).

Biological

Biological control is proposed on sites are either too large to be sprayed with herbicides, where the invasive plant species is so abundant that other methods would not be practical, or where the biological treatment can reduce or eliminate the need to use herbicides.

Effects during the use or treatment of biological controls would be similar to that described above under manual treatment. Although some bio control agents available can have adverse effects to nontarget wildlife, only APHIS and State-approved biological control agents would be used. Also agents demonstrated to have direct negative impacts on nontarget organisms would not be released. As a result other than effects associated with treatment, there are no adverse effects related to biological control to wildlife anticipated under any alternative.

Cultural/Restoration

Restoration or reclamation of sites infested with invasive plants follow treatment restoration standard 13 (WW LRMP as amended by the R6 2005 ROD) and incorporate guidelines for revegetation of invasive weed sites and other disturbed areas on National Forests and

Grasslands in the Pacific Northwest (Erickson et al. 2003, also Appendix B – Revegetation Guidelines); *This document was printed in full in appendix B for the DEIS and removed for the FEIS printing. Information from this document is available on http://fsweb.r6.fs.fed.us/nr/native-plants/project-planning/* . On degraded sites where reproducing individuals of desirable species are absent or in low abundance, revegetation with well adapted and native competitive grasses, forbs and legumes can be used to direct and accelerate plant community recovery and restore native wildlife habitat conditions. Restoration and revegetation projects that would include ground disturbing activities such as disking or plowing would require additional NEPA analysis on a site specific level.

Herbicide Application

Herbicides would be used in accordance with label instructions, except where more restrictive measures are required. Also herbicide applications would only treat the minimum area necessary to meet site objectives (F-1). For example, larger infestations that cannot be effectively treated using manual or mechanical treatments or because biological control is not feasible, would be treated with herbicides. Also, for some plant species manual or mechanical treatments are ineffective due to plant morphology and initial control would require the use of herbicides. In many cases herbicides would only be used to reduce infestations to the point that they can be effectively controlled with other methods. Consequently herbicide application would decline over time, because infestations would be adequately reduced to allow for control with nonchemical methods.

Herbicide treatment methods are described in Chapter 2. Methods of ground-based or aerial application of herbicides would be used based on accessibility, topography, the size of treatment area and the expected efficiency and effectiveness of the method selected.

Application methods include wicking, wiping, stem injection, spot spraying, hand broadcast, or boom broadcast. Wicking, wiping, and stem injection are done by hand and spot spraying can be done by hand or using a hose off a vehicle or pack animal mounted tank. All of these treatment methods target individual plants. These activities can result in short-term disturbance and possible mortality during treatment; however, spot and hand treatments are explicitly not considered high risk (USDA Forest Service 2008) and therefore reduce potential for exposure of nontarget wildlife to herbicides.

Hand and boom broadcast techniques cover an area of ground rather than individual plants. Hand broadcast is done using a backpack sprayer or hand spreader, whereas boom broadcast uses a hose and nozzle from a tank mounted on a truck, all terrain vehicle (ATV), or pack animal. Boom broadcast is used in areas where invasive plants cover on the site makes spot spraying impractical. Both treatment activities can result in disturbance or mortality during treatment; although potential for mortality of less mobile species or destruction of eggs and nests are greater using the mechanized equipment associated with the boom broadcast technique.

Aerial applications (Alternatives B and C only) occur in areas where physical features, such as topography, raise applicator safety concerns or where cost of ground application is prohibitive. In these areas invasive plants may be treated with the use of helicopters. Although potential for mortality is reduced, noise related disturbance would be greater. Also because application can cover large areas, potential wildlife exposure to herbicides is greater, although PDFs F-8a through F-8o were developed to minimize potential effects to nontarget species. All aerial broadcast projects also require effectiveness monitoring, to ensure that impacts are within acceptable tolerance.

Early Detection Rapid Response (EDRR)

EDRR is designed to be aggressive in the control of invasive plants. This is necessary to ensure success in managing and controlling the spread of these highly competitive and easily established plants.

The treatment of newly found sites adds additional risk factors to wildlife just by adding additional exposure areas. This also expands the treatment into areas that may not have been originally anticipated. However, the decision process identified in Chapter 2 would be used with each new infestation site to determine treatment. In addition, the PDFs have been set up to provide layers of caution so that even if the exact locations are not known, the potential for adverse effects are minimized. The limitation on treatment type (no herbicide use), and the addition of PDFs, buffers and treatment limits (i.e. leaving stream corridors untreated) all work together to provide sideboards to deal with the uncertainty of treating new sites (USDA Forest Service 2008).

The management direction included in all alternatives as well as the environmental conditions and animal behavior would tend to minimize actual impacts for EDRR. At the project scale, choices could be made to avoid situations that could cause harm to wildlife. For example, certain herbicides could be avoided in specific areas or times of the year where/when species that utilize grass such as amphibians may be at risk, or more specific application methods could be used. These factors would be evaluated during the pre-treatment assessment (PDF A-1) and this assessment in combination with implementation of PDFs that restrict herbicide use and methods would greatly reduce potential impacts to wildlife.

Treatment Effects Summary

Effects of invasive plant treatment methods to wildlife were evaluated and discussed in detail in the R6 2005 FEIS, Appendix P, the corresponding Biological Assessment (USFS 2005d), project files, and SERA risk assessments (2001, 2003, 2004). The effects of nonherbicide treatments are disclosed in Appendix J of the R6 2005 FEIS. The analysis presented in these documents indicates that disturbance from manual and mechanical treatment pose greater risks to terrestrial wildlife species of local interest than herbicide use. While all alternatives would result in disturbance and possible mortality to less mobile species, disturbance would be short-term and implementation of PDFs would reduce potential mortality and herbicide exposure to nontarget wildlife.

Herbicide Effects (Alternatives A through D)

Background

Effects of herbicide application presented here rely heavily on the Invasive Plants R6 2005 FEIS, which is incorporated by reference into this analysis. This document, in combination with Appendix C of this EIS provides detailed information related to herbicide risks, exposure scenarios and effects from proposed herbicide application. The invasive plant treatments proposed were designed to reduce or eliminate adverse effects to wildlife under all alternatives; however, short-term, minor adverse effects (See individual species discussions) could occur under any alternative from the herbicide treatment methods.

When considering the effects of herbicides on wildlife species, it is important to remember these herbicides are designed to affect plants at relatively low rates, while much higher rates would be required to kill animals. It is also important to note that plants have metabolic systems that do not exist in animals. It is these metabolic systems at which the herbicides are targeted. Michael (2002) explained it well when he said, "All chemicals, natural or man-made, are toxic at some level of exposure. The difference between acute and chronic toxicity versus the no observed effect level (NOEL) is primarily a function of the amount of exposure in a unit of time and the mode of action of the chemical.

While results of numerous field studies indicate the likelihood for direct adverse effects to wildlife from herbicide use is low (e.g., Marshall & Vandruff 2002, Dabbert et al. 1997, Fagerstone et al. 1977, Rice et al. 1997, Sullivan et al. 1998a, Cole et al. 1997, Cole et al. 1998, Johnson and Hansen 1969, Nolte and Fulbright 1997, McMurray et al. 1993a, McMurray et. al. 1993b), the use of herbicides to treat invasive plant does have the potential to harm free-ranging wildlife (USDA 2005c p. 1-11). For example, certain herbicides can affect the vital organs of some wildlife species, change body weight, reduce the number of healthy offspring, increase susceptibility to predation, or cause direct mortality.

Herbicides may also cause some malformations or mortality to amphibians that have been exposed to herbicides or surfactants in water (Relyea 2005). In addition, herbicides contain impurities and additives, and produce metabolites that could be toxic to wildlife. A metabolite of triclopyr, 3, 56-trichloro-2-pyridinol (TCP), is toxic to animals. The impurity hexachlorobenzene, found in picloram and clopyralid, is carcinogenic (exposure levels associated with this project are immeasurably low). Surfactants added to herbicides could substantially increase toxicity to aquatic species, like amphibians.

Herbicide Toxicity and Wildlife Risk

Potential toxicity risk from herbicide exposure was determined using data and methods outlined in the SERA risk assessments (2001, 2003, and 2004), Tables 5 and 6 in Appendix P, and the Wildlife Biological Assessment (USDA 2005c pp. 24 – 27). Collectively these assessments list the toxicity indices used as the thresholds for potential adverse effects from each herbicide. A quantitative estimate of dose using a "worst case" scenario was compared to these toxicity indices. If a dose exceeded a toxicity index, then it was determined to have potential for an adverse effect (see Appendix C).

Application rates are the amount of herbicide applied during treatment in pounds per acre and are displayed in Table 4. While these vary by herbicide/surfactant, many of the PDFs were specifically designed to ensure that any application rates used were below levels that would result in an exposure of a nontarget species that exceeded the NOAEL. For example, NPE surfactant exceeded the toxicity index for some acute exposures at the typical application rate. As a result, PDFs require that NPE only be applied at levels well below the typical application rate. Similarly, triclopyr exceeded the acute toxicity index of some species at typical application rates if broadcast sprayed. As a result, the R6 2005 FEIS restricts the use of triclopyr to spot spray and selective techniques only. Consequently, even though some herbicides/surfactants resulted in adverse effects during the exposure scenario, implementation of PDFs (See Chapter 2) reduces the potential for nontarget wildlife to receive a toxic dose of herbicide/surfactant. Appendix C provides a detailed summary of anticipated effects on wildlife from proposed herbicides and includes risk assessment summaries and exposure scenarios at typical and high application rates.

The risk assessments prepared by SERA (2001, 2003, and 2004) contains the detailed analysis of the potential effects of each herbicide. Portions of the risk assessments pertaining to terrestrial wildlife are summarized in USDA Forest Service 2005d, Appendix B. This summary contains a detailed description of factors influencing exposure and dose, use of surrogate species for toxicity data, field studies, and analysis results for each individual herbicide. Refer to this summary, found in Appendix C of this document, for more information on analysis methods used to determine the potential effects to wildlife.

Risk Summary

Of the herbicides/surfactants proposed for treatment, triclopyr has the highest potential to adversely affect wildlife. Clorsulfuron, imazapic, imazapyr, and metsulfuron methyl do not appear to pose any plausible risk to terrestrial wildlife at either the typical or highest application rates. Clopyralid and glyphosate, applied at typical application rate have little potential to adversely affect birds or mammals. An exception might be insectivorous birds that experience chronic exposures of glyphosate. At typical application rates NPE surfactant exceeded the acute toxicity index for a small mammal, large mammal and large bird that consumed contaminated vegetation, and a small mammal and small bird that consume contaminated insects.

When an herbicide does pose plausible risk, it is consistently insectivorous and grass-eating animals that are most likely to receive doses above the toxicity index. Amphibians appear to be at higher risk of adverse effects due to their permeable skin and aquatic or semi-aquatic life history, although data is very limited or lacking on potential adverse effects of herbicides to reptiles and amphibians. There is some data to suggest that amphibians may be as sensitive to herbicides as fish (Berrill et al. 1994, Berrill et al. 1997, Perkins et al. 2000); so for the purpose of this analysis, herbicides that pose potential risk to federally listed fish (as determined by the quantitative estimates from exposure scenarios) will also be considered to pose a risk to amphibians.

Direct spray of mammals is a concern only for NPE surfactants at the typical application rate. Fish-eating birds do not receive a dose above the toxicity index for any herbicide or application rate. Consumption of contaminated water, even as the result of an accidental spill, results in doses well below the toxicity index for all herbicides. Although chronic toxicity data on birds is often limited, birds are less sensitive than mammals to acute exposures of the herbicides proposed.

Incomplete and Unavailable Information

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

- For several herbicide/species group combinations, both NOAEL and LOAEL values have not been determined.
- There is insufficient data to assess risk of chronic exposures for a large grass-eating bird or small insect-eating birds and mammals.
- The toxicity of the herbicides to amphibians, reptiles, terrestrial invertebrates, birds, and other animals found in Region Six is either unknown or limited, and cannot be fully characterized with the available data on surrogate species.

- Analysis of effects for any project involving herbicide use relies upon extrapolations from laboratory animals to free-ranging wildlife and controlled conditions to the natural environment.
- There are less data available for birds than mammals, so mammal toxicity values must be used in bird exposure scenarios for some of the herbicides considered in this EIS.

Limitations notwithstanding, a substantial amount of scientific data on the toxicity of these herbicides to birds and mammals, and some amphibians and invertebrates exist. The data are generated by manufacturers to meet EPA regulations before an herbicide may be registered for use, and by independent researchers that have published findings in peer-reviewed literature. So while some data is lacking, adequate information exists to assess potential impacts of the herbicides proposed on wildlife.

Toxicity Summary and Assumptions

The results of the herbicide analysis indicate that birds or mammals that eat vegetation (primarily grass) that has been sprayed with herbicide have relatively greater risk for adverse effects because herbicide residue is higher on grass than it is on other herbaceous vegetation or seeds (Kenaga 1973, Fletcher et al. 1994; Pfleeger et al. 1996).

- Exposure scenarios do not account for factors such as timing and method of application, animal behavior and feeding strategies, seasonal presence or absence within a treatment area, or implementation of Project Design Features and therefore exaggerate risk when compared to actual applications proposed in this EIS.
- At proposed application rates the herbicides proposed for use in this document were determined to have minimal impacts to wildlife species in the analysis conducted for the R6 2005 FEIS (USDA 2005c p. 4-42). For typical application rates and exposures to birds and mammals, only broadcast application of triclopyr and NPE surfactants produced doses that exceeded acute toxicity indices to wildlife, fish or amphibians. However PDFs require that NPE surfactants only be applied at 0.5 pounds of active ingredient per acre, which is well below the application rates used in the exposure scenarios and triclopyr is restricted to selective methods only. As a result the potential for adverse effects to wildlife from herbicide exposure are effectively reduced
- Aquatic organisms such as frogs would have the same sensitivity to herbicides as fish.
- All herbicides are excreted rapidly (often within 24-48 hours) and do not bio-accumulate.

Cumulative Effects

Potential cumulative effects to wildlife are assessed for each of the alternatives evaluated in the FEIS (Alternative Effects below), as well as for the individual species evaluated. For species with small home ranges and limited ability to disperse, cumulative effects are evaluated within the affected watershed (See species analysis section). However for species that are highly mobile or migratory species, the cumulative effects analysis area includes all lands within the Wallowa-Whitman proclamation boundary. This area was selected for analysis because it contains a diversity of habitat conditions, is large enough to assess species with large home ranges as well as migratory species, and would allow for assessment of potential impacts on other ownerships. The following assumptions and land use considerations were used in the cumulative effect analysis for wildlife.

- Herbicides are commonly applied on lands other than National Forest System lands for a variety of agricultural, landscaping and invasive plant management purposes. Herbicide use occurs on tribal lands, state and county lands, private forestry lands, rangelands, utility corridors, road rights-of-way, and private property. However there is no central source for compiling invasive plant management information off National Forests within the State or by water basin, nor is there a requirement for private or corporate land owners, or counties to report invasive plant treatment information. As a result an accurate accounting of the total acreage of invasive plant treatment for all land ownerships is unavailable.

- Since wildlife move and migrate, some species could be exposed to herbicides on adjacent lands or along their migration routes. Species could be exposed to the same herbicide on multiple ownerships, or a combination of different herbicides. Wildlife could also be exposed to other chemicals, such as insecticides, rodenticides, fungicides, and others.
- Past, present and foreseeable future actions (See Chapter 2) have and will continue to contribute to the establishment of invasive weeds. Recreational activity on NFS land is expected to increase and on-going activities across all ownerships would continue to cause ground disturbances that can contribute to the introduction, spread and establishment of invasive plants on NFS lands (USDA, 2005). Wallowa County has an active program to treat invasive plants and requires private property owners to control invasive plants on their property.
- Three watersheds currently have more than one percent of their total acreage proposed for chemical treatment. They are the Middle Imnaha River, the Snake River/Temperance Creek and South Fork Burnt River Watersheds. Most of the treatment in the Middle Imnaha River is the common bugloss site (5,500 acres) that would be treated (broadcast application of herbicide) the same year the private land would be treated. Also due to steep terrain and difficult access, it is likely some of this acreage may not be treated.
- The herbicides proposed for use a do not significantly bio-accumulate (R6 2005 FEIS). For additive doses to occur, two exposures would have to occur at approximately at the same time. The application rates and extent considered in this EIS are unlikely to result in additive doses beyond those evaluated for chronic and acute exposures in the USDA Forest Service risk assessments, which formed the basis for the effects analysis in the Region 6 2005 FEIS.
- Herbicide persistence is managed through PDFs (See Chapter 2) to reduce impacts to nontarget species and minimize risk of herbicide concentrations of concern near water. Effects of treatments each year under early detection-rapid response, by definition, would not exceed those predicted for the most ambitious conceivable treatment scenario. This is because the PDFs do so much to control the potential for adverse effects and because if the most ambitious treatment scenario were implemented, the potential for spread into new areas would be greatly reduced.
- PDFs add a measure of protection for nontarget wildlife and SOLI on NFS lands; though wildlife may be more vulnerable on other ownerships where protective measures are unknown. Potential herbicide treatments that could affect nontarget wildlife on NFS lands would only occur on a relatively small area (<1% of the analysis area). As a result and considering that all herbicides used are excreted within 48 hours, and that implementation of PDFs that restrict herbicide use and methods would reduce potential for herbicide exposure to nontarget wildlife (USDA Forest Service 2008), it is unlikely that any proposed treatments would measurably contribute to any other activities on private land that would result in significant effects to wildlife. Further, the overall

positive effect of killing target invasive infestations and maintaining native diversity/habitat is far greater than anticipated impacts to nontarget wildlife

Alternative Effects

Chapter 2 of the EIS provides a detailed description of each of the alternatives considered. The following is a summary of the proposed treatments and treatment effectiveness of the no action (Alternative A) and action (Alternatives B, C and D) alternatives related to wildlife.

Alternative A - No Action

Direct Effects

Alternative A would continue to implement treatments under the existing decisions from the Wallowa-Whitman National Forest 1994 Environmental Assessment for the Treatment of Noxious Weeds and no new invasive plant treatments would be approved.

Under this alternative, approximately 23 percent of existing invasive plant infestations would be treated. All remaining infested acres currently identified in addition to unknown future sites would be treated manually, before herbicides could be used. This would likely require multiple years of repeated treatment and associated disturbance to wildlife (described above) to achieve control. However because fewer acres are proposed for treatment, this alternative would result in less risk of adverse effects to wildlife associated with treatment or herbicide exposure.

Since incorporation of the R6 2005 ROD standards, the no action alternative is now limited to three herbicides (glyphosate, triclopyr and picloram with restrictions). Triclopyr has the greatest risk to terrestrial wildlife. Plausible scenarios indicate risk to amphibians, deer and elk, migratory birds, and small insect eating mammals. However these scenarios assume that triclopyr is broadcast sprayed and restrictions under the 1994 EA would limit the use of triclopyr and reduce potential impacts to wildlife from herbicide exposure.

The herbicide effects analysis indicated that glyphosate has the greatest potential for harmful doses to amphibians. The surfactant found in some glyphosate formulations is particularly toxic to aquatic species. However management direction in this alternative severely restricts herbicide use in aquatic amphibian habitat, making this scenario less likely to occur.

Since fewer treatment and herbicide options would be available, “lower risk” herbicides would not be available. For example, chlorsulfuron, clopyralid, imazapic, imazapyr, sulfometuron methyl and sethoxydim pose fewer risks to wildlife (See Table 28) and can be effectively used to control many of the invasive plant species that currently occur on the Forest. Because these are not approved for use under this alternative, herbicides with higher risk to nontarget wildlife such as triclopyr, glyphosate and picloram would have to be used.

Invasive plant treatments will not alter native habitat structure or composition for terrestrial wildlife species, including MIS, TES, or the Partners in Flight strategy for landbirds (Altman 2000). In some cases, removal of invasive plants could cause a localized decrease in the amount of vegetative cover provided. However due to the scattered nature of the invasive plant infestations, the amount of cover lost would be small and of limited extent. Unlike other management activities, such as grazing or timber harvest, invasive plant treatments do not reduce habitat available to native wildlife. Likewise, prey availability would not be reduced because invasive plants are located in relatively small patches, or along narrow road corridors, within and adjacent to the much larger natural habitats in which the prey reside.

Indirect Effects (Treatment Effectiveness)

Under the No Action approximately 23 percent of existing invasive plant infestations would be treated. Also this alternative provides only manual methods for EDRR strategy to treat newly identified infestations. Past monitoring of these treatment methods (Yates 2006) indicates that these methods may be effective for controlling small populations of certain plants and may pose less risk to nontarget wildlife compared to herbicide treatments. Conversely the absence of a more effective EDRR strategy increases potential for new invasive plant infestations to establish and spread. Because all remaining infested acres in addition to any new sites would be treated manually, multiple years of repeated re-treatment would likely be necessary to contain or eradicate infestations.

Alternative A does not approve the use of biocontrol. Biocontrol agents that currently are present within or adjacent to the forest could move onto forests lands and provide some level of control, however, it would likely take a number of years and control is subject to target species and appropriate biocontrol agent presence. These less effective methods of control would likely lead to the continued displacement of native plant species and the increased spread potential of invasive plants currently infesting the forest.

Because this alternative fails to treat 77 percent of existing infestations, limits EDRR treatments to less effective manual methods, and would not propose use of more effective herbicides, it is estimated that treatment would only be approximately 25 percent to 35 percent effective. Roads would continue to act as vectors that facilitate the spread of invasive plants. Consequently under this alternative, invasive plants would continue to spread across the Forest (See Figure 16) and reduce native plant diversity, reducing wildlife forage and cover within the affected watersheds.

Because invasive plants would continue to increase under this alternative, adverse effects to wildlife habitat would be greatest for early successional species and species that utilize grasslands, meadows, riparian habitat or open canopy mature forest susceptible to invasive plant infestations.

Cumulative Effects

This alternative is covered under previous NEPA projects. Treatments would occur on an extremely small percentage of any watersheds in the action area. Due to the small amount of acreage proposed for treatment, short-term nature of effects and considering that treatments would be spread out over 33 watersheds, Alternative A would not measurably contribute to any other past, current or reasonably foreseeable future activity that may be impacting wildlife and there are no significant cumulative impacts to wildlife anticipated.

Alternative B - Proposed Action

Direct Effects

Treatments proposed under this alternative are displayed in Table 36. Under this alternative all currently mapped invasive plant species would be treated with the most effective treatment types and methods necessary to control, contain or eradicate invasive plants, including the 10 newly approved herbicides and surfactants approved in the R6 2005 FEIS.

A total of 13,556 acres of upland habitat would be treated under this alternative using a combination of manual, mechanical or chemical treatments, 111 acres would be treated using only manual methods and 1,955 acres would be treated using bio-control. Effects of manual, mechanical and bio-control treatments are the same as described above under treatment effects.

Herbicides proposed under this alternative include chlorsulfuron, clopyralid, glyphosate, imazapic, imazapyr, metsulfuron methyl, picloram, sethoxydim, sulfometuron methyl, and triclopyr. A total of 3,241 acres of riparian habitat would be treated using spot techniques only. Spot spray and selective treatments are explicitly not considered high risk (USDA-FS 2005); therefore, potential for adverse effects from herbicide exposure would be greatly reduced on this acreage. Relative risk of these herbicides to nontarget wildlife from broadcast applications of herbicides is discussed above under herbicide toxicity and risk. As described previously, PDFs identified in Chapter 2 were specifically designed to reduce potential for adverse effects associated with herbicide exposure. The following is a summary of possible adverse effects from broadcast application of herbicides under this alternative, as well as specific PDFs and their anticipated effectiveness at reducing effects to nontarget wildlife:

Prior to treatment, species/habitats of local interest will be confirmed to determine the type and method of treatment (A-1). This assessment will ensure that applicable PDFs are implemented, identify any known risks to species or habitats of local interest and modify treatment methods/timing if necessary to reduce potential risks to these species/habitats.

No broadcast application of herbicide or surfactant will exceed typical label rates (F-4). At typical application rates proposed only triclopyr and NPE surfactant resulted in an acute exposure that exceeded the reported NOAEL, whereas triclopyr also resulted in possible chronic exposures to large mammals and birds and small carnivorous mammals. However these scenarios assume broadcast application and implementation of (F-1) restricts the use of triclopyr to spot spray and selective techniques only. Also NPE would not be broadcast at a rate greater than 0.5 lbs of active ingredient per acre (F-4) (which is well below typical application rates). As a result implementation of these PDFs would effectively reduce the possibility that any terrestrial wildlife species would receive an acute toxic dose of herbicide/surfactant, or a chronic dose of triclopyr or NPE.

Although data is lacking, if effects are assumed by comparing acute dose vs. chronic NOAEL, at typical application rates chronic exposures to insectivorous birds and mammals identified in the SERA risk assessments are possible for clopyralid, glyphosate, picloram, sethoxydim and sulfometuron methyl; however this is a conservative approach that will likely over-estimate risk. Exposure scenarios do not account for factors such as timing and method of application, animal behavior and feeding strategies or implementation of PDFs and therefore exaggerate risk when compared to actual applications proposed in this EIS. For example, in addition to PDFs described above, herbicide applications would only occur on the minimum area necessary (F-1) and potential impacts are further reduced by PDFs that are designed to reduce drift during treatment including; 1) avoiding herbicide applications during inversions or windy conditions (F-5), 2) restricting use of sulfonylurea herbicides (chlorsulfuron, sulfometuron methyl and metsulfuron methyl on dry or sandy soils (F-7) and 3) using only low nozzle pressure and a coarse spray during application (F-6). Research has shown that 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 (USDA Forest Service 2008). Additionally, the herbicides do not bio-accumulate and most breakdown fairly quickly. Consequently an individual would have to encounter recently contaminated vegetation for 90 days under most circumstances to actually receive chronic doses modeled in the risk assessment. Exposure is further reduced considering that (1) invasive plants do not provide preferred habitat/forage, (2) that only 1% of the analysis area is proposed for treatment and that treatment areas are widely scattered and interspersed with pockets of un-treated suitable habitat (3) that the physical disturbance associated with treatment would likely scare off birds or mammals in the area and (4) that foliar interception would prevent many insects from being contaminated. Collectively for these reasons, it is highly unlikely that chronic exposures to herbicides would occur from proposed application of any herbicide under this alternative.

A total of 875 acres are proposed for aerial application of herbicides under this alternative. Because aerial treatment increases the potential for herbicide exposure, particularly for insectivorous or grass eating birds and mammals, in addition to application restrictions described previously, several PDFs are in place to reduce potential adverse effects to nontarget species from aerial application of herbicides including; 1) aerial application would not be used for EDRR treatments (F-8a), 2) chlorsulfuron, metsulfuron methyl, sulfometuron methyl and triclopyr will not be applied aerially (F-8b) and aerial application rates of Picloram would only be applied at levels below typical application rates (F-8o), 3) buffer distances for federally listed SOLIs will follow Recovery Plan recommendations and no aerial application will occur within 300 feet of nonfederally listed SOLIs (F-8g), 4) aerial spray units will adhere to aquatic habitat buffers (F-8f) and aerial swath displacement buffers would be applied as needed (F-8n), 5) aerial spraying would not occur in areas with 30 percent or more live tree cover and spraying in areas between 10 and 29% canopy cover would require an on-site decision (F-8h), 6) aerial spray units will be ground checked, entered into GPS prior to spraying, and a GPS system will be used in spray helicopters to ensure that only targeted areas are treated (F-8i). Also, constant communication will be maintained between the helicopter and ground observers to monitor drift and deposition of herbicide (F-8m) and 7) all projects involving aerial application will implement effectiveness monitoring to ensure impacts to nontarget species are within acceptable tolerance (F-8e).

Potential impacts from aerial spraying to wildlife are further reduced by the fact that all but 32 acres would occur on sites that are infested with yellow star-thistle. This species is aggressive and can form dense near-monotypic infestations (Ditomaso 2006); therefore, it can greatly reduce native plant diversity. As a result, it is unlikely that any species would be utilizing these areas for forage or cover or be exposed to toxic levels of herbicide. Prior to treatment, all currently proposed and potential future infestation will undergo a site specific long-term strategy for restoring/revegetating invasive plant treatments (USDA Forest Service 1990 as amended by the R6 2005 ROD). Also cooperation with public and private landholders is anticipated on presently proposed aerial sites, which would further increase the effectiveness of treatments and reduce the potential spread across adjacent ownerships. Collectively for these reasons and with implementation of the above PDFs, potential adverse impacts to wildlife from aerial spraying would be greatly reduced and the potential for adverse effects associated with aerial application of herbicides is low.

A total of 3,104 acres of broadcast application of herbicides within riparian areas would occur under this alternative and potential exists for herbicide exposure to riparian dependent wildlife, amphibians and the aquatic resource. However; 1) herbicide use buffers (F-3, H-1, H-2, H-3, H-8, H-10 through H-12) virtually eliminate the potential for herbicide to be delivered to streams in concentration of concern (USDA Forest Service 2008), 2) herbicide restrictions on certain soil types (H-4 through H-7) reduce potential for runoff and leaching, 3) restrictions on extent of treatment in a given site condition (i.e. aquatic influence zone, H-9 and H-13) ensure that herbicides would not be delivered in amounts greater than the SERA risk assessment scenarios and reduce potential of harm to amphibians (USDA Forest Service 2008) and riparian dependent wildlife, and 4) spills are extremely unlikely to occur given the many safety precautions in place (Bulkin, personal communication). As a result and based on monitoring of similar treatments (Berg 2004), implementation of these PDFs would ensure that adverse effects to fish, amphibians and the aquatic resource are avoided (USDA Forest Service 2008).

EDRR to newly identified infested areas would follow the decision process (as described in Figure 12 of Chapter 2) for treating invasive weeds. Over time it is expected that herbicide use would be reduced as known sites are effectively controlled and EDRR methodologies eradicate new invasive sites. Maximum annual treatment including known sites and new sites is 8,000 acres.

Most invasive plant infestations occur in open areas; therefore, potential effects to species that utilize forested areas are minor. Conversely, the largest amount of treatment is proposed in nonforest, early-successional habitat and open canopy forested habitats and species that utilize these habitats are at greater risk from treatment/herbicide exposure. The use of herbicides represents potential risks to wildlife; however in practice, PDFs described above as well as the environmental conditions and animal behavior greatly reduce actual impacts.

In summary, Alternative B represents more than a four-fold increase in acres of potential herbicide treatment compared to Alternative A. Also, due to proposed aerial application and broadcast application within riparian areas, potential for herbicide exposure would be greatest under this alternative. However taken together, implementation of the PDFs described above eliminate potential for adverse effects to species of local interest (USDA-FS 2008) and effectively reduce potential risks to nontarget wildlife and the aquatic resource. As a result and considering the small amount of habitat (1% of the Forest) and scattered nature of treatments (spread out over 53 watersheds (5th level HUC), 8,000 acres per year represents a negligible risk to wildlife.

Indirect Effects

Although there may be localized, short-term effects to habitat due to proposed treatments (See treatment effects), like Alternative A, invasive plant treatments are not expected to alter the structure or compositions of wildlife habitat. Indirect effects under this alternative are primarily related to control of invasive plants and restoration of wildlife habitat.

It is estimated that treatments proposed under this alternative would be approximately 90 percent effective at controlling invasive plants. Alternative B provides the most effective means for reducing invasive plant species on the Forest, because more sites and acres will be approved for treatment using more effective methods. As a result, the proposed action would be expected to rehabilitate the greatest amount of wildlife habitat. This rehabilitation would restore native vegetation and preferred wildlife cover and forage, and result in the long-term maintenance of native plant and wildlife habitat diversity across the Forest.

Cumulative Effects

The cumulative effects analysis area and potential cumulative effects to wildlife are described above. As described, proposed herbicide treatments on other lands within the cumulative effect analysis area will increase the likelihood for herbicide exposure to highly mobile wildlife.

- Although data is lacking that would permit any quantitative estimates of cumulative exposure or risk, treatments proposed under this alternative would affect less than 1 percent of the analysis area. Consequently the additive effects from herbicide exposure are not likely to occur, or would be minimal. As a result, and based on the above analysis for this alternative, cumulative effects considerations identified above and the following rationale, implementation of Alternative B, would not measurably contribute to any other past, present or reasonably foreseeable future activity that would result in significant effects to wildlife.
- Less than 1 percent of the analysis area would be affected by treatment; sites would be widely scattered across 53 watersheds. Consequently, unaffected habitat would be widely available within all affected watersheds, reducing the likelihood that wildlife would be adversely impacted.
- The herbicides proposed for use a do not significantly bio-accumulate (R6 2005 FEIS). For additive doses to occur, two exposures would have to occur at approximately the same time (24-48 hours). The application rates and extent considered in this EIS are unlikely to result in additive doses beyond those evaluated for chronic and acute exposures in the USDA Forest Service risk assessments, which formed the basis for the effects analysis in the R6 2005 FEIS.
- With implementation of PDFs, potential for herbicide exposure to wildlife is greatly reduced.
- Adverse effects anticipated would be offset by the long-term benefits of maintaining wildlife habitat and native plant species diversity.

Alternative C

Direct and Indirect Effects

Under Alternative C all currently mapped invasive plant species would be treated the same as the proposed action; however, no broadcast treatment methods would occur in riparian areas (3,104 acres, Table 36). Treatment within these areas would include chemical treatments such as spot, wicking and wiping, as well as manual and mechanical methods. This would reduce the potential riparian dependent wildlife to be exposed to herbicides. Although disturbance in these areas may increase due to the longer period of time necessary for application, the manual methods used would decrease the likelihood of mortality to less mobile species/nests.

Direct effects to wildlife on 13,556 acres proposed for ground based treatment on upland sites, 875 acres proposed for aerial treatment, 111 acres proposed for manual only treatment and 1,955 acres of bio-control would be similar to those described under Alternative B. Because the same acreage is proposed for treatment, estimates of annual treatment acres would also be similar and as described under Alternative B, implementation of PDFs would be expected to protect SOLI and reduce impacts to nontarget wildlife.

EDRR to newly identified areas would occur and follow the decision process in Chapter 2. However under this alternative future treatment within riparian areas would not include broadcast application of herbicides and potential of herbicide exposure from future treatments within riparian areas would be reduced under this alternative.

The elimination of ground based broadcast treatment within riparian areas may reduce the effectiveness of treatment in some areas because treatments would be directed only on existing plants. As a result, any potential new invasive recruits from seedbanks or other underground parts would need to be treated as they emerge in future years. Repeated treatments over multiple years would be needed to treat these areas and effective control, eradication or containment is likely questionable under certain circumstances. Consequently there may be increased potential for spread in riparian and adjacent upland areas from some sites.

Although this alternative may reduce treatment effectiveness of some riparian treatments, all riparian sites would be treated and the overall effectiveness of Alternative C is similar to Alternative B. As a result, implementation of this alternative would restore native vegetation and preferred wildlife cover and forage on sites affected by invasive plants and result in the long-term maintenance of native plant and wildlife diversity across the Forest.

Cumulative Effects

Although risks to some wildlife would be reduced within riparian areas, cumulative effects under Alternative C would be the same as those described under Alternative B and implementation of Alternative C would not measurably contribute to any other past, current or reasonably foreseeable future activity that would result in significant effects to wildlife.

Alternative D

Direct and Indirect Effects

Under Alternative D all currently mapped invasive plant species would be treated the same as Alternative B, except no aerial treatment methods would be allowed on any proposed or future infested acres. Direct effects to wildlife on 13,556 acres proposed for ground based treatment on upland sites, 3,104 acres of riparian broadcast chemical, spot herbicide, manual and mechanical treatment, 3,241 acres of riparian chemical spot treatment only, and 111 acres proposed for manual only treatment would be similar to those described under Alternative B. Although there is a small reduction in total acres treated, estimates of annual treatment acres would also be similar and as described under Alternative B, implementation of PDFs would be expected to protect SOLI and reduce impacts to nontarget wildlife.

Under this alternative 875 acres proposed for aerial spraying would be treated using bio-controls. Of this acreage, 96 percent is infested with yellow starthistle and over the past 6-10 years, success of bio control methods on this species has been variable and adequate control has not occurred on all sites (D'Antonio 2007). Also some future sites would likely go untreated due to safety concerns and/or access. As a result and considering that sites proposed for aerial application contain high priority, aggressive invasive plant species (yellow starthistle, and scotch thistle), it is possible that invasive plants would continue to increase within and beyond these areas.

This alternative would reduce the likelihood that species that utilize steep, rugged terrain and open grassland would be adversely affected by herbicide treatment. This alternative would reduce treatment effectiveness in these areas; however, the overall effectiveness of Alternative D is similar to Alternative B and significantly greater than that of Alternative A. As a result, implementation of this alternative would restore native vegetation and preferred wildlife cover and forage on sites affected by invasive plants and result in the long-term maintenance of native plant and wildlife diversity across the Forest.

Cumulative Effects

Although risks to wildlife would be reduced somewhat because no aerial treatment would occur, cumulative effects under Alternative D would be the same as those described under Alternative B and implementation of Alternative D would not measurably contribute to any other past, current or reasonably foreseeable future activity that would result in significant effects to wildlife.

Species Analysis Section

This section provides an analysis of the alternative effects on TES, MIS, and species/habitats of local interest. Nine species including the Canada lynx, Pacific fisher, horned grebe, bufflehead, greater yellowlegs, upland sandpiper, tricolored blackbird, bobolink and northern leopard frog have not been recently documented on the Forest (See Affected Environment Section) or will not occur within treatment areas. As a result, there are no effects to these species under any alternative and they will not be discussed further in this analysis. Additional information on these species is provided in the wildlife report.

Species and anticipated effects considered in this analysis are summarized in Table 37. Based on the analysis provided, all species and habitats evaluated also include a final determination related to potential impacts (TES species), anticipated effects to local populations and distribution on the Forest (MIS and SOLI), or effects to priority and unique habitats (identified in Altman 2000). These determinations, as well as the rationale used to make the final determination are summarized in Table 37.

Table 37-Wildlife Determination Summary

Species/Habitat	Determination All Alternatives	Rationale
Threatened and Endangered Species		
Canada lynx	No Effect	Forest is unoccupied habitat. Not present in treatment areas.
Gray wolf	NLAA[1]	Wolves are extremely rare; PDFs minimize potential for disturbance and exposure to herbicides. Habitat for prey maintained.[3]
Sensitive Species		
California wolverine	No Impact	Not likely to be present in treatment areas. PDFs and foraging behavior minimize potential for adverse effects from herbicide exposure and disturbance.
Pacific Fisher	No Impact	No recent documentation on the forest. Not present in treatment areas.
Rocky Mountain Bighorn Sheep	MINL[2]	Small amount of suitable habitat proposed for treatment. Short-term disturbance possible. PDFs minimize potential for adverse impacts from herbicide exposure. Maintenance of foraging habitat[3].
Spotted Bat	No Impact	PDFs and foraging behavior effectively eliminate potential for adverse effects from herbicides. No treatment effects anticipated. Foraging habitat maintained[3]
Horned grebe	In Impact	No documented breeding. Not present in treatment areas.

Species/Habitat	Determination All Alternatives	Rationale
Bufflehead	No Impact	No documented breeding. Not present in treatment areas.
Bald eagle	MINL[2]	No nest habitat adversely affected. PDFs minimize potential for adverse effects to roosting and foraging birds from herbicide exposure and disturbance.
American peregrine falcon	MINL[2]	No nest habitat adversely affected. PDFs minimize potential for adverse effects to foraging birds from herbicide exposure and disturbance.
Greater sage grouse	No Impact	No documentation on the forest and not likely to be present in treatment areas. Small amount of suitable habitat proposed for treatment. PDFs minimize potential impacts to nesting and foraging birds and herbicide exposure. Preferred cover/forage maintained. [3]
Columbia sharp-tailed grouse	No Impact	Not documented on the forest and unlikely to occur within treatment areas. PDFs minimize potential impacts from herbicide exposure, disturbance and mortality. Small amount of suitable habitat proposed for treatment. Preferred cover/forage improved. [3]
Greater yellowlegs	No Impact	No documented breeding on the forest. Not present in treatment areas.
Upland sandpiper	No Impact	No documentation on the forest. Not present in treatment areas.
Gray flycatcher	MINL[2]	Small amount of suitable habitat proposed for treatment. PDFs minimize potential for adverse effects from herbicide exposure, disturbance and mortality.
Tricolored blackbird	No Impact	No documentation on the forest. Not present in treatment areas.
Bobolink	No Impact	No documentation on the forest. Not present in treatment areas.
Northern Leopard frog	No Impact	No documentation on the forest. Not present in treatment areas.
Columbia spotted frog	MINL[2]	No occupied habitat affected. Small amount of suitable habitat proposed for treatment. PDFs minimize potential for adverse effects from herbicide exposure and disturbance/mortality. Riparian/wetland habitat improved. [3]
Painted Turtle	No Impact	No documentation on the forest and unlikely to occur within treatment areas. Small amount of suitable habitat proposed for treatment. PDFs minimize potential for adverse effects from herbicide exposure and disturbance/mortality. Riparian/breeding habitat maintained. [3]
Management Indicator Species		
Rocky mountain elk	No effects to local populations; Distribution and use of the Forest maintained.	Short-term disturbance; implementation of PDFs and widely scattered nature of treatment areas make adverse effects associated with herbicide exposure unlikely; long-term maintenance of suitable habitat[3]

Species/Habitat	Determination All Alternatives	Rationale
Northern goshawk Pileated Woodpecker	No effects to local populations; Distribution and use of the Forest maintained.	No treatments proposed within preferred nest habitat. Short-term disturbance to foraging birds. PDFs, habitat requirements and foraging behavior minimize potential for adverse effects from herbicide exposure.
Cavity Excavators	No effects to local populations; Distribution and use of the Forest maintained.	Small amount of habitat proposed for treatment. Short-term disturbance possible. PDFs, habitat requirements and foraging behavior minimize potential for adverse effects.
Pine Marten	No effects to local populations; Distribution and use of the Forest maintained.	Not likely to be in treatment areas. Short-term disturbance possible. PDFs and foraging behavior minimize potential for adverse effects.
Landbirds and Partner In Flight Habitat		
Landbirds	No effects to local populations or distribution across the Forest.	Scattered treatment areas, small amount of treatment within any single vegetative community and PDFs reduce risks and minimize potential for herbicide exposure.
Dry Forest, Riparian woodland/shrub, Steppe Shrubland, mountain meadow	Ecological community and habitat for associated species maintained or improved.	Treatments would reduce invasive plants and maintain native plant and wildlife diversity. [3]
Mesic Mixed Conifer, subalpine forest, aspen, alpine	No change to the ecological community or associated wildlife.	Invasive plants do not threaten this community and little or no treatments are proposed.

1 – NLAA - Not Likely To Adversely Affect
2 – MINL - May Impact Individuals or Habitat, but Not Likely to cause a trend in federal listing or a loss of viability.
3 – Maintenance/Improvement would only occur under the Action Alternatives

3.3.5 Effects to Threatened, Endangered and Sensitive (TES) Species

Gray Wolf

Table 36 displays the treatment method and the acreage proposed for treatment under each of the alternatives. While occasional wolf sightings have been reported, there are no known established packs and no den or rendezvous sites on the Forest. Consequently suitable habitat consists of foraging and dispersal habitat, which is widespread across the Forest.

Effects of treatments, biological control, EDRR, and herbicide application/exposure are discussed under the Wildlife Effect Section. The following discusses alternative effects specific to the gray wolf.

Direct Effects of Treatments

Alternatives A through D

Direct effects from invasive plant treatment include disturbance caused by noise, aircraft, people and vehicles, which are activities common to manual and mechanical methods. These activities could potentially disturb gray wolves. However, invasive plant projects involve very short-term disturbance with few people and might only be repeated once in the same growing season. Also all sites would be evaluated prior to treatment (A-1) and if it is determined that wolves could be present, treatment methods/timing would be modified to avoid possible adverse effects. As a result the potential for disturbance is remote.

Currently wolves may be transient within the action area and are unlikely to encounter any individual project. Although wolves will travel over large distances, they are most likely to occur in wilderness and roadless areas, away from human disturbance. These areas tend to have minimal invasive plant infestations so the likelihood of disturbance would be remote. The life history traits of the species, current literature, existing guidelines, and expert opinion of biologists familiar with the species (Gaines, pers. comm.; Naney, pers. comm.) indicate that the level of disturbance expected from any invasive plant project is not likely to adversely disturb the gray wolf. In addition PDF (J2a-c) restricts activities in close proximity to known denning or rendezvous sites, should a pack become established on the Forest.

Herbicides

Alternatives A though D

Exposure scenarios used to analyze potential effects from herbicides are discussed in "Summary of Herbicide Effects to Wildlife" Appendix P, and in R6 2005 FEIS, Appendix P and discussed above. Small mammals are not the typical prey item for wolves. Nonetheless, the scenario in which a medium-sized canid eats small mammals that have been directly sprayed was used to evaluate a general risk to carnivores from herbicide use. At typical and highest application rates, the estimated doses from the exposure scenario are all less than the reported NOAELs for all herbicides except triclopyr. However these scenarios are based on broadcast application that would directly spray an entire day's diet of small mammals. Because PDFs restrict the use of triclopyr to spot spray and selective application techniques, there are no adverse impacts to gray wolves from the use of triclopyr anticipated under any alternative. At the highest application rate, NPE exceeded the toxicity index for chronic exposure. However PDF F-4 requires that NPE only be broadcast sprayed at levels below typical application rates and no adverse impacts from this surfactant are anticipated.

Alternative B

Under Alternative B a total of 22,842 acres of potentially suitable foraging/dispersal habitat could be treated, including 875 acres of aerial spraying and 3,104 acres of riparian habitat that could be broadcast sprayed. Because this alternative would treat the largest amount of suitable habitat and because treatment involves aerial application of herbicides, as well as broadcast application of herbicides within riparian habitat, the potential for herbicide exposure to the gray wolf (described above) would be greatest under this alternative. However, because of the small amount of suitable habitat proposed for treatment (<1%), the infrequent occurrence of this species and with implementation of PDFs, it is unlikely that adverse effects associated with herbicide exposure would occur to the gray wolf.

Alternatives C and D

Treatments proposed under Alternative C and the associated effects (described above) would be similar to Alternative B, except that herbicide application within riparian areas would be restricted to selective techniques only. Any treatment in these areas (selective or broadcast) would result in disturbance to wolves if they were present during treatment. However because wolves would utilize riparian corridors for dispersal and foraging, potential for herbicide exposure under this alternative would be reduced on 3,104 acres.

Treatments proposed under Alternative D and the associated effects (described above) would be similar to Alternative B, except that no aerial application of herbicides would occur. Sites proposed for aerial application typically occur in steep, rugged terrain that would provide suitable dispersal/foraging habitat for wolves. Any treatment in these areas (aerial or ground based) would result in disturbance to wolves if they were present during treatment. However because these sites would be treated using bio-control methods, potential for herbicide exposure would be reduced on this acreage.

Early Detection Rapid Response

Alternatives A through D

Although treatment method would vary (See Alternative Comparison above), future treatments to new infestations could occur within suitable gray wolf habitat under these alternatives. If this occurs, additional disturbance (All alternatives) and/or herbicide exposure (Alternatives B, C and D only) could occur. Future herbicide treatments would use the same herbicides and comply with the same PDFs/management restrictions as currently proposed treatments, or if necessary in a new NEPA document. Consequently effects from future treatment under EDRR are the same as described for current infestations and it is unlikely adverse effects would occur under any alternative.

Indirect Effects

Alternative A

Not all sites currently infested with invasive plants would be treated under this alternative. Also EDRR treatment is restricted to less effective manual treatments. While this would help to contain invasive plants in some locations, invasive plants would continue to expand in untreated areas. As a result and considering that more effective herbicides are not approved for treatment, invasive plants would continue to reduce habitat for deer and elk (wolf prey) within affected watersheds.

Alternative B through D

These alternatives will treat similar acreages of existing invasive weed infestation and include herbicides during EDRR to control future infestations. Although herbicides would not be applied aerially under Alternative D, or broadcast sprayed within riparian areas under Alternative C, control between alternatives would be similar. As a result all three alternatives are expected to reduce invasive weed infestation across the Forest and maintain wolf foraging habitat.

Cumulative Effects

Alternatives A through D

Anticipated cumulative effects to wildlife are discussed above and include possible exposure to herbicides and on-going land uses on other ownerships and continued disturbance associated with recreation and other forest uses on NFS lands. As wolves move into Oregon, they will be subject to the same pressures and conflicts with humans that occur in Idaho, Wyoming and Montana. The projected increases in population for Oregon will likely increase recreation on the National Forests. This could increase human disturbance and potential sources of mortality to wolves. Also because wolves travel large distances, it is possible that they would be exposed to herbicides on other ownerships. However as described above under the cumulative effect section, proposed herbicides do not bio-accumulate and it is unlikely that additive doses beyond those evaluated would occur. Also over 99% of the suitable wolf habitat on the Forest would be left un-treated. As a result and considering that implementation of PDFs would greatly reduce potential impacts from treatment and herbicide exposure, implementation of any of the alternatives evaluated would not measurably contribute to any other past, current or reasonably foreseeable future activity that would result in significant effects to the gray wolf.

Summary of Effects and Determination for the Gray Wolf

Alternative A

This alternative would not reduce invasive plants within suitable gray wolf foraging habitat. Proposed treatments could result in short-term disturbance to wolves that may be near a site during treatment. However, 99 percent of the forest would be unaffected and management restrictions would reduce the likelihood of adverse effects associated with herbicide treatment. As a result implementation of Alternative A **may affect, but is not likely to adversely affect** the gray wolf.

Alternatives B through D

Treatments under all alternatives have the potential to result in short-term disturbance to the gray wolf. While potential exposure of the gray wolf to herbicide varies by alternative, due to the infrequent occurrence of this species on the Forest and considering it would likely avoid areas proposed for treatment, the risk of herbicide exposure is remote under all alternatives. Also due to the pre-treatment assessment (A-1) and with restrictions to treatments near den or rendezvous sites (J-2), it is unlikely wolves would be adversely affected by proposed treatments under any alternative. As a result and based on the above analysis and the following rationale, implementation of Alternatives B through D **may affect, but are not likely to adversely affect** the gray wolf.

- The R6 2005 FEIS prevention standards will help to protect foraging habitat of their prey from invasive plants
- Distribution of gray wolves within the infested areas would likely be very limited, and sporadic, so the opportunity for wolves to be in or near treatment areas is remote.
- Disturbance from invasive plant treatment projects is low level, short duration, and infrequent. While disturbance could occur, wolves are uncommon on the Forest and it is unlikely that disturbance would be of a magnitude or intensity that would result in adverse effects.
- It is unlikely that doses of any herbicides from proposed treatments would exceed the reported NOAEL.

3.3.6 Effects to Sensitive[8] Species

California Wolverine

As described under the Affected Environment Section, California wolverine is not currently known to occur on the Forest; however, a number of unconfirmed sightings have occurred. The Forest contains 586,780 acres of preferred remote wilderness habitat including 979 acres that are infested with invasive plants. As a result, effects of proposed treatments on the California wolverine were evaluated.

Most of the existing wilderness areas containing invasive plants would be treated under Alternatives B through D, whereas no treatments within wilderness would occur under Alternative A.

Effects of treatment, biological control, site restoration/re-vegetation, and EDRR and herbicide application/exposure are discussed under the Wildlife Effect Section. The following discusses alternative effects specific to the California wolverine.

Direct Effects of Treatments

Alternatives A through D

Direct effects from invasive plant treatment are discussed under the Wildlife Effect Section and include short-term disturbance caused by noise, people and vehicles. However the wolverine is often characterized as a wilderness species whose persistence is linked to the presence of large areas of low human population density. Also this species has not been documented on the forest and if it occurs would occur in low numbers. As a result it is unlikely they would occur within treatment areas and no adverse effects are anticipated.

Herbicides

Alternatives A through D

Although wolverine often utilize big game carrion, the potential for exposure of wolverine to herbicides was evaluated using the scenario in which an individual would consume an entire days diet of prey that has been directly sprayed on 50 percent of its body surface. At typical application rates there are no herbicides that exceeded the toxicity index for an acute exposure to carnivorous mammal. At the highest application rate triclopyr can result in a chronic exposure and worst-case exposure for this species (carnivorous mammal in Appendix B) exceeds the toxicity index from ingesting prey that has been sprayed with triclopyr or NPE. However these scenarios are based on broadcast application and under the action alternatives use of triclopyr is restricted to spot spray and selective techniques only (F1). Also NPE would only be broadcast at a rate well below the typical application rate (F4).

Potential for exposure of wolverines to be exposed to herbicides is further reduced by the fact that they prefer forested areas that are less likely to contain invasive plants, avoid areas of

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

human activity and if they occur at all, would occur in very low numbers. As a result potential for herbicide exposure is greatly reduced.

Alternatives B and D

There is no aerial application proposed within wilderness areas under Alternative D. Because these areas would be preferred by wolverine, there is little difference between these alternatives. A total of 979 acres of potentially suitable foraging/dispersal habitat could be treated, including 703 acres of riparian habitat that could be broadcast sprayed. Because these alternatives would use broadcast application of herbicides within riparian habitat, the potential for herbicide exposure to the California wolverine (described above) would be greatest under these alternatives.

Alternatives C

Treatments proposed under Alternative C and the associated effects (described above) would be similar to those under Alternatives B and D, except that herbicide application within riparian areas would be restricted to selective techniques only. Any treatment in these areas (selective or broadcast) would result in disturbance to wolverine if they were present during treatment. Also because wolverine would utilize riparian corridors for dispersal and foraging, potential for herbicide exposure under this alternative would be reduced on 979 acres.

Early Detection Rapid Response

Alternatives A through D

Although treatment method would vary (See Alternative Comparison above), future treatments to new infestations could occur within suitable wolverine habitat under these alternatives. If this occurs, additional disturbance (All alternatives) and/or herbicide exposure (Alternatives B, C and D only) could occur. Future herbicide treatments would use the same herbicides and comply with the same PDFs/management restrictions as currently proposed treatments, or if necessary in a new NEPA document. Consequently effects from future treatment under EDRR are the same as described for current infestations and it is unlikely adverse effects from future treatment would occur under any alternative.

Indirect Effects

Alternative A

Alternative A treats fewer acres of existing invasive plant infestation Forestwide, fails to control existing infestations in wilderness, restricts chemical control to only three herbicides (See Chapter 2) and would not use herbicides to more effectively control future infestations. Collectively for these reasons over the long-term, invasive plants would continue to increase under this alternative. Effects to wolverine include a possible localized reduction in native plant diversity and habitat for wolverine prey (small mammals and big game carrion) within affected areas

Alternative B through D

Because approximately the same acreage of existing infestations would be treated, invasive plant control would be similar. While broadcast spraying would not be used in riparian areas under Alternative C, invasive plants would still be treated. All alternatives also include EDRR treatments to control future infestations.

Because of reduced costs (i.e. greater acreage treated) and more effective treatment methods, Alternatives B and D are expected to be most effective at containing or eradicating existing and future invasive plant infestations within riparian areas. However all alternatives would reduce existing and control future infestations. As a result all three alternatives are expected to reduce invasive weed infestation across the Forest and maintain wolverine foraging habitat within areas affected by invasive plants.

Cumulative Effects

Alternatives A through D

Anticipated cumulative effects to wildlife are discussed above and include possible exposure to herbicides and on-going land uses on other ownerships and continued disturbance associated with use of NFS lands. Winter recreation and hiking in particular have the potential to disturb wolverines because these uses can occur in preferred remote habitat. However at this time wolverines have not been detected on the Forest.

Although extremely unlikely, the proposed use of herbicides on and off National Forest System lands could result in additive doses of herbicides to wide ranging highly mobile species such as the wolverine. However as described above under the cumulative effect section, proposed herbicides do not bio-accumulate and it is unlikely that additive doses beyond those evaluated would occur. As a result and considering that over 99% of preferred wilderness habitat would be unaffected, that this species currently does not occur on the forest or any future occurrence would involve very low numbers and that PDFs effectively reduce the likelihood that adverse effects from herbicide exposure would occur, implementation of any of the alternatives evaluated would not measurably contribute to any other past, current or reasonably foreseeable future activity that would result in significant effects to the California wolverine.

Summary of Effects and Determination for California Wolverine

Alternative A

This alternative would not reduce invasive plants within suitable California wolverine habitat. However this species does not currently occur on the Forest and if it does would occur in very low numbers. Also there are no treatments proposed within preferred wilderness habitat and it is unlikely that this species would occur within treatment areas. As a result implementation of Alternative A would have **No Impact** on the California wolverine.

Alternatives B through D

California wolverine does not currently occur on the Forest. If they are discovered on the Forest in the future, proposed treatments could result in disturbance or exposure to herbicides or surfactants. However the likelihood of adverse effects is remote. Also these alternatives would reduce invasive plant infestations within preferred wilderness habitat and maintain native plant diversity and wolverine foraging habitat. As a result and based on the above analysis and the following rationale, implementation of Alternatives B through D would have **No Impact** on the California Wolverine.

- The California wolverine is not recently documented on the forest, and if it is found in the future would occur in very low numbers. Also potential den habitat and over 99 percent of preferred wilderness habitat would be unaffected under all alternatives. As a result and considering that this species avoids areas with human activity, it is unlikely that an individual would occur within a treatment area.

- Use of typical application rates and implementation of PDFs that restrict use of high and moderate risk herbicides would reduce potential adverse effects associated with herbicide exposure. As a result, and considering this species forages over large areas, it would not be exposed to toxic levels of herbicides and there are no adverse effects from herbicide exposure anticipated.

Bighorn Sheep

Table 36 displays the treatment method and amount proposed under each of the alternatives. Of the 237,450 acres of suitable habitat within the action area, 2,627 are currently infested with invasive plants. All of this acreage would be treated under the action alternatives, whereas Alternative A would treat approximately 600 acres.

Effects of treatments, biological control, site restoration/re-vegetation, and EDRR and herbicide application/exposure are discussed under the Wildlife Effect Section. The following effects are specific to the bighorn sheep.

Direct Effects of Treatments

Alternatives A through D

Effects of treatment are discussed under the Wildlife Effect Section and potential effects of invasive plant treatment methods on bighorn sheep include disturbance caused by noise, people and vehicles. Manual control is proposed on approximately 50 acres under all alternatives, whereas mechanical/herbicide treatments would occur on 2,583 acres or 94 percent of the acreage proposed for treatment under the action alternatives and approximately 550 acres under Alternative A. Approximately 24 percent (623 acres) of the bighorn sheep habitat with invasive plants is adjacent to roads and trails, where they would be fairly accustomed to human disturbance and noise. While these activities could potentially disturb bighorn, disturbance would be limited to a few days during treatment. Also, 1 percent of the suitable habitat is proposed for treatment; therefore, unaffected habitat which could be used for any displaced animals is widely available. Thus, the amount of disturbance would vary somewhat by treatment (See Wildlife Effect Section); nevertheless, disturbance associated with all treatments would be short-term in nature (a few days) and of limited extent (i.e. localized).

Herbicides

Alternatives A through D

The potential effects from herbicides are summarized under the Wildlife Effect Section and discussed in detail in Appendix C. If broadcast sprayed at the typical application rate, use of triclopyr or NPE can result in a dose that exceeds the toxicity index for large herbivorous mammals consuming contaminated vegetation. However triclopyr is restricted to spot spray and selective techniques only (F-1) and NPE would only be applied at a rate well below the typical application rate (F-4). While glyphosate and sulfometuron methyl exceeded the toxicity index at the highest application rate, PDF F-4 requires that the broadcast application of herbicides not exceed typical application rates. As a result implementation of these PDFs would effectively reduce the likelihood that bighorn would be exposed to toxic levels of herbicide.

Potential for herbicide exposure is also affected by the likelihood that bighorn would forage within treatment areas, or the likelihood that preferred forage would be exposed. Much of the bighorn sheep summer range is in the higher elevation habitat, which currently has less invasive plant sites. Also although some areas are occupied year-round, known infestations currently occur primarily in winter range, reducing potential conflicts with summer/fall invasive treatments. Further cheatgrass, which is considered an invasive plant and is utilized by bighorn sheep is not targeted for treatment. Finally, due to the widespread availability of un-treated suitable habitat (>=98% of available habitat) within all management units, and considering that the pre-treatment assessment (A-1) would likely reduce potential for conflict, it is unlikely that sheep would be in the area at the time of treatment or consume a large part of their diet from vegetation that had been sprayed with herbicide.

Alternative A

Less than one half of one percent of the suitable bighorn habitat would be treated with approved herbicides under this alternative. Because this alternative only applies herbicides if other methods have proven ineffective and because it treats the fewest acres, potential for herbicide exposure is lowest under this alternative.

Alternative B

Under Alternative B a total of 2,627 acres of suitable bighorn habitat would be treated. Approximately 692 acres of this is proposed for aerial spraying including 503 acres in the Lower Hells Canyon unit, 86 acres in the Lower Imnaha River unit, and 103 acres in Upper Joseph Creek. Disturbance may be reduced somewhat due to shorter application time, however, aerial application would apply herbicides to larger areas and greater amounts of nontarget vegetation may be sprayed. This would potentially increase the risk that bighorn would consume contaminated vegetation. Conversely, all but 32 acres of proposed aerial spraying would occur on sites that are infested with yellow star-thistle. This species is aggressive and can form dense near-monotypic infestations (Ditomaso J.M. 2006) that greatly reduce native plant diversity. As a result, it is unlikely that bighorn would be foraging in these areas. Additionally PDFs F-8a through F-8o, restrict the use of chlorsulfuron, metsulfuron methyl and sulfometuron methyl during aerial application, restrict application rates for picloram and clopyralid, prevent spraying within sites that have 30 percent or more live tree canopy, require on-site inspection for areas that have between 10 and 29 percent cover, and require constant communication between the helicopter and ground observers. Collectively these PDFs would reduce the potential for vegetation to be sprayed with levels of herbicide that would result in a toxic dose to bighorn sheep and reduce the likelihood that an animal would be directly sprayed during implementation.

Broadcast applications of herbicide could occur within approximately 1,400 acres of suitable bighorn riparian habitat, therefore, potential for exposure of bighorn to herbicides would be greater on this acreage. Three herd units would have riparian treatments on greater than 100 acres and these areas are scattered and interspersed with unaffected habitat, reducing likelihood that an individual would consume all of their daily diet from contaminated vegetation.

Alternatives C

Treatments proposed under Alternative C and the associated effects (described above) would be similar to those under Alternative B, except that herbicide application within riparian areas would be restricted to spot spray and selective techniques only (1400 acres). Potential for herbicide exposure to bighorn would be reduced on this acreage because less nontarget vegetation would be sprayed.

Alternative D

Treatments proposed under Alternative D and the associated effects (described above) would be similar to Alternative B, except that no aerial application of herbicides would occur. These sites would be treated using bio-control methods; therefore, potential for herbicide exposure would be reduced on this acreage (875 acres). This reduces risks somewhat on these sites from that of Alternatives B and C; however, these sites consist primarily of yellow star thistle, they are less likely to be utilized by bighorn.

A total of 875 acres of suitable bighorn habitat would be treated using aerial techniques described in the Wildlife Effects Section.

Early Detection Rapid Response

Alternatives A through D

Future treatments to new invasive plant infestations could occur within suitable bighorn habitat under these alternatives, although treatment method would vary (See Alternative Comparison above). If this occurs, additional disturbance (all alternatives) and herbicide exposure (Alternatives B, C and D only) could occur. Future herbicide treatments would use the same herbicides and comply with the same PDFs and management restrictions as currently proposed treatments, or if necessary in a new NEPA document. Consequently, effects from future treatment to bighorn under EDRR are the same as those described for current infestations and it is unlikely adverse effects would occur under any alternative.

Indirect Effects

Alternative A

Not all suitable habitat currently infested with invasive plants would be treated under this alternative. Also EDRR treatment is restricted to less effective manual treatments. This would help to contain invasive plants in some locations; however, invasive plants would continue to expand in untreated areas. As a result, and considering that more effective herbicides are not approved for treatment, invasive plants would continue to reduce bighorn sheep foraging habitat.

Alternatives B through D

Approximately the same acreage of existing infestations would be treated; therefore, invasive plant control would be similar. Broadcast spraying would not be used in riparian areas under Alternative C, and aerial spraying would not be used in Alternative D; nevertheless, invasive plants would still be treated. All alternatives also include EDRR treatments to control future infestations.

Alternative B is expected to be most effective at containing or eradicating existing and future invasive plant infestations within bighorn sheep habitat because of reduced costs (i.e. greater acreage treated) and more effective treatment methods. However, all alternatives would reduce existing as well as control new infestations. Effects under all alternatives to bighorn sheep would be the long-term maintenance of suitable foraging habitat across the Forest.

Cumulative Effects

Alternatives A through D

Anticipated cumulative effects are described under the Wildlife Effect Section. Anticipated cumulative effects include possible exposure to herbicides and disturbance from on-going land uses on other ownerships, as well as continued disturbance associated with use of National Forest System lands, because use of the forest by bighorn occurs on multiple ownerships. Requirement for steep, rugged inaccessible terrain include primarily dispersed recreational use in more remote areas, including Wilderness. The proposed use of herbicides on and off National Forest System lands could result in additive doses of herbicides to bighorn. Although for this to occur, the two exposures would have to occur approximately at the same time (24-48 hours). This is unlikely since the herbicides proposed are rapidly eliminated do not significantly bio-accumulate (R6 2005 FEIS). Also the application rates and extent considered in this EIS are unlikely to result in additive doses beyond those evaluated for chronic and acute exposures in the USDA Forest Service risk assessments.

The risk of exposure to herbicide/treatments is further reduced by the fact that 98 percent or more of all bighorn sheep herd units would be unaffected, that treatment in many areas would likely occur when bighorn are not present, and that implementation of PDFs would greatly reduce the potential for adverse effects associated with herbicide exposure and treatment. As a result, and considering that the long-term restoration/maintenance of suitable bighorn sheep habitat outweighs any anticipated adverse effects, none of the alternatives would measurably contribute to any other past, current or reasonably foreseeable future activity that may be impacting this species and there are no significant cumulative effects anticipated.

Summary of Effects and Determination for Bighorn Sheep

Alternative A

This alternative would not reduce all invasive plants within suitable bighorn sheep habitat, and invasive plants would continue to expand within untreated watersheds. Proposed treatments could result in short-term disturbance and herbicide exposure to bighorn. However, 99 percent or more of suitable bighorn habitat would be unaffected and management restrictions on herbicide use would reduce the likelihood of adverse effects associated with herbicide exposure. As a result implementation of Alternative A **may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability** for Rocky Mountain bighorn sheep.

Alternatives B through D

Treatments proposed under these alternatives could result in short-term disturbance and herbicide exposure to bighorn sheep. However all alternatives would result in the long-term maintenance of bighorn foraging habitat across the Forest. As a result and based on the above analysis and the following rationale, implementation of Alternatives B through D **may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability** for Rocky Mountain bighorn sheep.

- Only 1 percent of suitable bighorn habitat would be affected and because of the widespread availability of suitable habitat within all affected watersheds, it is unlikely that bighorn would occur within treatment areas.

- Treatments areas are widely scattered and use of typical application rates and implementation of PDFs that restrict use of high and moderate risk herbicides would effectively reduce potential adverse effects associated with herbicide exposure.
- Much of the broadcast and aerial application of herbicides would occur in large infestations of invasive plants, which would not provide desired forage and would not likely be utilized by bighorn.
- Prior to treatment localized habitat/species concerns would be assessed (A-1). If bighorn are known to be in the area, treatment methods/timing would be adjusted if necessary to reduce impacts. Additionally monitoring would be conducted to ensure nontarget vegetation and wildlife are adequately protected from aerial spraying (F-8e).

Spotted Bat

As described under the Affected Environment Section, the spotted bat is not currently known to occur on the Forest. However, the Forest contains approximately 221,514 acres of suitable habitat, including approximately 3,161 acres that are infested with invasive plants. Effects of proposed treatments on this species were evaluated because it is possible that they could become established during project implementation.

Table 37 displays the treatment method and amount proposed under each of the alternatives. Alternative A would treat approximately 500 acres or 20 percent of existing infestations, whereas Alternatives B through D would treat all currently infested acres (3,161). Effects of treatments, biological control, EDRR, and herbicide application are discussed under the Wildlife Effect Section. The following effects are specific to the spotted bat.

Direct Effects of Treatments

Alternatives A through D

Direct effects to roosting bats would not occur because no trees would be removed during any treatments. Additionally, no disturbance to foraging bats is anticipated because treatments occur during the day. As a result, there are no direct effects from treatment anticipated under any alternative.

Herbicides

Alternatives A through D

All alternatives include the use of herbicides; therefore, potential adverse effects from herbicide exposure could occur. Bats forage over relatively large areas catching insects (primarily moths) in flight or by gleaning from vegetation. As a result, there is the possibility that insects (moths in particular) could be contaminated by herbicides and ingested by bats.

Of the herbicides/surfactants proposed, only NPE could result in an acute dose that exceeds the reported NOAEL. However, NPE would only be applied at a rate well below the typical application rate (F-4) used in the exposure scenario. To receive this dose, the bat would have to consume nothing but contaminated insects for an entire nights feeding. Given that bats forage over large areas, this is not considered a plausible scenario.

Data is lacking on risk from chronic exposure to contaminated insects. However, 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. In addition, roosting bats would not be directly exposed to herbicides or surfactants because the bats roost in crevices well above ground level during the day.

In summary, although exposure of herbicides to bats would be reduced under Alternative A (fewer acres treated), Alternative C (no broadcast application in riparian areas) and Alternative D (no aerial application), with implementation of PDFs and considering bats foraging behavior, it is not anticipated that a spotted bat would be exposed to levels of any herbicide or surfactant that would exceed the reported NOAEL under any alternative.

Early Detection Rapid Response

Alternatives A through D

Future treatments to new infestations could occur within suitable spotted bat habitat under these alternatives; although treatment method would vary (See Alternative Comparison above). If this occurs, additional disturbance (all alternatives) and herbicide exposure (Alternatives B, C and D only) could occur. Future treatments would use the same herbicides and comply with the same PDFs as existing treatments; therefore, any potential effects from future treatment would be similar to those analyzed above. As a result, there are no adverse effects to spotted bat anticipated from future EDRR treatments.

Indirect Effects

Alternative A

A total of 591 acres or approximately 20 percent of preferred spotted bat habitat would be treated under this alternative. Treatments proposed under Alternative A would reduce invasive weed infestations on the sites treated; although, over 80 percent of existing infestations within suitable spotted bat habitat would go un-treated. Alternative A also restricts chemical control to only three herbicides (See Chapter 2) and would not use herbicides to more effectively control future infestations. Collectively for these reasons, over the long-term invasive plants would continue to increase under this alternative. Effects to the spotted bat include a possible localized reduction in native plant/insect diversity (foraging habitat) within affected watersheds.

Alternatives B through D

Invasive plant control would be similar because approximately the same acreage of existing infestations would be treated. Broadcast spraying would not be used in riparian areas under Alternative C, and aerial spraying would not be used in Alternative D; however, existing and future invasive plants infestations would still be treated. Also, all alternatives include a wide range of EDRR treatments to control future infestations.

Alternative B is expected to be most effective at containing or eradicating existing and future invasive plant infestations within spotted bat habitat because of reduced costs (i.e. greater acreage treated) and more effective treatment methods. However all alternatives would reduce existing and control new infestations and effects under all alternatives would be the long-term maintenance of native plant diversity and spotted bat foraging habitat.

Cumulative Effects

Alternatives A through D

Potential cumulative effects were described under the Wildlife Effect Section. The spotted bat forages over large areas; therefore, potential cumulative effects include possible herbicide exposure on other ownerships, which could result in additive doses of herbicides. However, as described above, it is unlikely that that they would consume enough contaminated insects to be exposed to a toxic dose of herbicides. As a result, implementation of any of the alternatives evaluated would not measurably contribute to any other past, present or reasonably foreseeable future activity that would result in significant effects to the spotted bat.

Summary of Effects and Determination for the Spotted Bat

Alternative A

While this alternative would not reduce invasive plants within suitable spotted bat habitat, there are no adverse effects anticipated and there are no adverse effects to the spotted bat from treatments or herbicide exposure anticipated. As a result there are no adverse effects from treatments anticipated and implementation of Alternative A would have **No Impact** on the spotted bat.

Alternatives B through D

All alternatives would improve spotted bat foraging habitat. While effects of treatment could occur, there are no adverse effects anticipated and based on the above analysis and the following rationale, implementation of these alternatives would have **No Impact** on the spotted bat.

- The spotted bat does not currently occur on the Forest and any future occurrence would involve very low numbers. Also less than 1 percent of the suitable spotted bat habitat would be treated and it is unlikely that they would occur within a treatment area.
- There are no disturbance/mortality related effects to roosting or foraging bats anticipated. Also with implementation of PDFs and considering this species foraging behavior, spotted bats would not be exposed to levels of herbicide that would result in adverse (exceeded the reported NOAEL) effects.

Bald Eagle

As described under the Affected Environment Section, invasive plants are no considered a threat to the bald eagle or its habitat. However invasive plant treatment could result in adverse effects to this species.

Table 36 displays the treatment method and amount proposed under each of the alternatives. Effects of treatments, biological control, site restoration/re-vegetation, and EDRR and herbicide application/exposure are discussed under the Wildlife Effect Section. The following effects are specific to the bald eagle.

Direct Effects of Treatments

Alternatives A through D

Potential effects of invasive plant treatment methods on bald eagles are associated with disturbance that may occur to nesting eagles. This could cause the birds to leave nests, or stay away from the nest long enough to have detrimental effects to eggs or young (USDI 1986). Short-term disturbance can also occur to roosting and foraging eagles.

At this time, no bald eagle nests occur within 0.50 miles of any proposed treatment areas, so existing nests would be unaffected under all alternatives. Additionally, PDFs (J-1) were developed for the action alternatives specifically to reduce potential effects to the bald eagle should new nests become established and would ensure that no treatment would occur near eagle nests during the nesting/fledgling season (January 1 to August 31), near occupied winter roosts, or concentrated foraging areas (J1b). Treatments would not involve removal of roost trees, there are no treatments proposed near winter concentration areas or known roosts and PDFs (J1a & 1b) would place seasonal treatment restrictions around occupied nests if new nest locations are discovered in the future. Consequently with implementation of these PDFs, there are no direct effects to the bald eagle from treatment application under any action alternative.

Herbicides

Alternatives A through D

None of the herbicides proposed for use in this EIS or NPE surfactants applied at typical application rates pose a risk to bald eagles. The potential for the herbicides to adversely affect bald eagles was determined using quantitative estimates of exposure from worst-case scenarios. Exposure scenarios used to analyze potential effects from herbicides are discussed in R6 2005 FEIS Appendix P, p. 24-27. The results of these exposure scenarios indicate that no herbicide or NPE surfactant proposed for use poses any plausible risk to birds from eating contaminated fish. All expected doses to fish-eating birds for all herbicides and NPE are well below any known NOAEL (see Appendix C). No ground applications of herbicide would reach the upper canopies of mature trees/snags where bald eagles nest and with implementation of PDFs (J-1), bald eagles are not likely to be directly sprayed, or encounter vegetation that has been directly sprayed.

Early Detection Rapid Response

Alternatives A through D

Although treatment method would vary (See Alternative Comparison above), future treatments to new invasive plant infestations could affect the bald eagle. However implementation of PDFs would eliminate potential impacts to nesting, roosting and foraging birds. As a result no adverse effects to the bald eagle are anticipated from future treatment of invasive plants.

Indirect Effects

Alternatives A through D

There are currently no invasive plant infestations affecting bald eagle nesting, foraging, or roosting habitat. Consequently there are no indirect effects to bald eagle habitat under any alternative.

Cumulative Effects

Alternatives A through D

Anticipated cumulative effects are described under the Wildlife Effect Section. As described, herbicides are commonly applied on lands other than National Forest system lands for a variety of agricultural, landscaping and invasive plant management purposes. Herbicide use occurs on tribal lands, state and county lands, private forestry lands, rangelands, utility corridors, road rights-of-way, and private property.

Because eagles have been documented traveling between NFS lands and other ownerships, the proposed use of herbicides under these alternatives could result in additive doses of herbicides to any eagles exposed to herbicides on other ownerships. Although for this to occur, the two exposures would have to occur at approximately the same time. This is unlikely since the herbicides proposed are rapidly eliminated and do not significantly bio-accumulate (R6 2005 FEIS). Also the application rates and extent considered in this EIS are unlikely to result in additive doses beyond those evaluated discussed in this EIS. As a result and considering that the risk of adverse effects from proposed treatment have been effectively eliminated though implementation of PDFs, no alternative would measurably contribute to any other past, current or reasonably foreseeable future activity that would result in significant effects to the bald eagle.

Summary of Effects and Determination for the Bald Eagle

Alternatives A through D

Although there is a remote possibility that a foraging/roosting bird could be disturbed during treatment, with implementation of PDFs that prevent treatment near occupied nest and winter roost habitat there are no adverse effects to nesting birds anticipated. As a result and based on the above analysis and the following rationale, implementation of Alternatives A through D **May Impact Individuals or habitat, but would not likely contribute towards a trend in federal listing or cause a loss of viability** to the bald eagle:

- There are no bald eagle nest locations within ½ mile of proposed treatment areas and no known winter roost areas affected.
- Implementation of Project Design Features (J1a and 1b) would ensure that concentrated foraging areas, existing winter roosts and future nesting/roosting areas would be protected and minimize potential adverse effects from treatment.
- Studies have shown that even if a bald eagle fed for a lifetime upon fresh-water fish that had been contaminated by an accidental spill of herbicide, they would not receive a dose that exceeds any known NOAEL. Consequently adverse effects to bald eagles from herbicide exposure are not plausible.

American peregrine falcon

Peregrine falcon habitat is not being adversely affected by invasive plants and there are no invasive plant treatments proposed near any known nests. However this species could forage on prey (birds) that have been adversely affected or new nests could become established near invasive plant sites. As a result potential for adverse effects to the peregrine falcon could occur from proposed treatments.

Table 36 displays the treatment method and amount proposed under each of the alternatives. Effects of treatments, biological control, site restoration/re-vegetation, and EDRR and herbicide application/exposure are discussed under the Wildlife Effect Section. The following effects are specific to the peregrine falcon.

Direct Effects of Treatments

Alternatives A through D

Potential effects of invasive plant treatment methods were described in the Wildlife Effect Section and direct effects to the peregrine falcon include disturbance caused by noise, people and vehicles associated with proposed treatments. Currently no peregrine falcon nest sites occur within 1.5 miles of any proposed treatment area. Additionally, implementation of PDFs (J3) will ensure that no treatment would occur near any new nests established (J3a through J3f). Although potential exists for treatments to result in short-term disturbance to foraging birds, due to the small amount of habitat proposed for treatment the possibility of disturbance is low and with implementation of PDFs there are no adverse effects to nest habitat anticipated under any alternative.

Herbicides

Alternatives A through D

There is no quantitative scenario for a predatory bird that eats primarily other birds, such as the peregrine falcon, so the “fish-eating bird” scenario and the “mammal-eating bird” were used as surrogate scenarios. No herbicide or NPE dose exceeded the toxicity indices for fish-eating birds even in a “worst case” scenario. Under the small mammal eating bird scenario, no herbicides or surfactants exceed the toxicity index at typical application rates. At the highest application rates, NPE, glyphosate and sulfometuron methyl exceeded the reported NOAEL. However PDFs restrict the use of glyphosate and sulfometuron methyl to typical application rates and restrict NPE to 0.5 lbs active ingredient per acre (less than typical application rate). Consequently there are no adverse effects from proposed herbicides/surfactants anticipated under any alternative.

Potential impacts to this species are further reduced by the fact that this species forages over large areas, effectively eliminating the possibility that all or most of its prey would be contaminated and that a falcon would be exposed to toxic levels of herbicides/surfactants.

No aerial spraying would occur in close proximity to any of the known nest sites (Alternatives B and C) and broadcast spraying in riparian habitat (Alternatives B and D) would not impact peregrine falcon nest sites. Also peregrine falcons do not forage exclusively within riparian areas and potential for herbicide exposure would be similar under all alternatives.

Early Detection Rapid Response

Alternatives A through D

Although treatment method would vary (See Alternative Comparison above), future treatments to new invasive plant infestations could affect this species. However implementation of PDFs and the peregrine falcons foraging behavior would eliminate potential impacts to nesting or foraging birds. As a result there are no adverse effects to the peregrine falcon anticipated from future EDRR treatments.

Indirect Effects

Alternatives A through D

Because invasive plants do not occupy preferred peregrine falcon habitat, there are no indirect effects to falcon habitat anticipated under any alternative.

Cumulative Effects

Alternatives A through D

As described under the Wildlife Effect Section, anticipated cumulative effects to wide ranging species such as the peregrine falcon could include possible exposure herbicides and disturbance from on-going land uses on other ownerships, as well as continued disturbance associated with use of NFS lands. However, as described above under the Wildlife Effect Section, proposed herbicides do not bio-accumulate and it is unlikely that additive doses beyond those evaluated would occur. As a result, and considering that existing and future nests would not be affected by treatment (J-J3a through J3d), that there are no chronic or acute effects to a predatory bird from proposed herbicides or surfactants at the typical application rates proposed (F1 and F-4), and that1percent of the analysis area is proposed for treatment, implementation of Alternatives A through D would not contribute to any other past, current or reasonably foreseeable future activity that would result in significant effects to the peregrine falcon.

Summary of Effects and Determination for the Peregrine Falcon

Alternatives A through D

There are four known peregrine falcon nests on the Forest. There could be minor effects to foraging peregrine falcon from treatments. However no alternative would alter or disturb nest habitat. As a result and based on the above analysis and the following rationale, implementation of Alternatives A through D **may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability** to the peregrine falcon.

- There are no nests located near any proposed treatment sites and PDFs are in place to protect existing and new nests from future treatment.
- There are no chronic or acute effects to a predatory bird from proposed herbicides or surfactants at the typical application rates proposed and with restrictions to moderate and high risk herbicides. As a result and considering the peregrine falcons foraging behavior (i.e. forage over large areas), there are no adverse effects from herbicide exposure anticipated under any alternative.

Greater Sage Grouse

As described under the Affected Environment Section, greater sage grouse are not currently known to occur on the Forest. However the Forest contains scattered patches of suitable habitat, and there is a relative large block of suitable habitat on adjacent BLM land. It is possible that they could become established during project implementation; therefore, effects of proposed treatments on this species were evaluated.

Currently three patches of suitable sage grouse habitat have a total of six acres of invasive plants. Table 36 displays the treatment method and amount proposed under each of the alternatives. There was no suitable greater sage grouse habitat identified in riparian areas. As a result and considering that no aerial spraying of suitable habitat is proposed, there is little difference between the action alternatives.

Effects of treatments, biological control, EDRR, and herbicide application are discussed under the Wildlife Effect Section. The following effects are specific to the greater sage grouse.

Direct Effects of Treatments

Alternative A

There are no direct effects to sage grouse under this alternative because there are no treatments proposed within suitable sage grouse habitat.

Alternatives B through D

Effects of treatment were discussed previously under the Wildlife Effect Section and direct effects to sage grouse include disturbance and possible nest mortality during implementation of proposed treatments. However, sage grouse have not been documented on the Forest and due to the scattered nature of suitable habitat; potential or occupancy is considered low. Additionally project design features are in place (J5b and J5c) to minimize disturbance around breeding sites. Further, the pre-treatment assessment (A-1) would identify concerns should sage grouse become established and the timing and method of treatment would be modified if necessary to reduce or eliminate impacts. Potential impacts are further reduced by because six acres of suitable sage grouse habitat are currently proposed for treatment. There are no adverse effects to nesting grouse anticipated, and any adverse effects to this species from treatment would be limited to short-term disturbance to foraging birds.

Herbicides

Alternative A

Because there is no suitable habitat proposed for treatment and considering that treatment of future sites would only use manual methods, there are no risks of herbicide exposure under this alternative.

Alternatives B through D

The potential effects from herbicides are summarized under the Wildlife Effect Section, and discussed in detail in Appendix C. Sage grouse are large vegetation-eating birds, so a scenario was used that estimated herbicide exposure for a large bird eating contaminated vegetation. Also because sage grouse chicks depend heavily on insects, estimated doses for small birds consuming contaminated insects was also evaluated.

At typical application rates for adult birds, only triclopyr (if broadcast sprayed) and NPE surfactants exceeded acute (100% of the daily diet consists of contaminated forage) toxicity thresholds (see Appendix P of R6 2005 FEIS) for adult birds. However, as described under the Wildlife Effect Section, application of triclopyr is restricted to spot spray and selective techniques only (F-1), NPE would be broadcast sprayed at levels below the typical application rate (F-4) and no broadcast application of herbicide would exceed typical application rates. As a result, the potential for adult or young sage grouse to be exposed to toxic levels of herbicides are greatly reduced.

The following considerations would further reduce the possibility that sage grouse would receive toxic doses of herbicides/surfactants; (1) Due to the small amount of infestation that currently exists within suitable habitat, it is unlikely that large infestations of invasive plants requiring broadcast applications of herbicides would be needed, (2) Because it is a nonselective herbicide, glyphosate is seldom used in dry habitats, (3) triclopyr is used on invasive woody vegetation like blackberries and Scotch broom, neither of which are present in sage grouse habitat and if they were, sage grouse would be unlikely to forage exclusively on or near these plants, (4) in order to receive a chronic dose of herbicides at typical application rates, birds would have to consume nothing but contaminated forage for 90 days. This scenario is highly unlikely considering that invasive plants do not provide preferred forage and only a small amount of suitable habitat would be treated. Also foliar interception would reduce the actual amount of sprayed on many insects present.

In summary, no impacts to sage grouse are predicted with any alternative, because their presence has not been established on the Forest and only six acres of suitable habitat are proposed for treatment. If sage grouse are discovered on the Forest, project PDFs (F-1, F-4, J-5a to J-5c) effectively minimize risk to sage grouse from exposure to herbicides or surfactants. As a result it is unlikely that adverse effects associated with herbicides would occur under any alternative.

Early Detection Rapid Response

Alternatives A through D

Future treatments to new infestations could occur within suitable sage grouse habitat under these alternatives; although treatment method would vary (See Alternative Comparison above). If this occurs, additional disturbance (all alternatives) and herbicide exposure (Alternatives B, C and D only) could occur. Future herbicide treatments would use the same herbicides and comply with the same PDFs and management restrictions as currently proposed treatments, or if necessary in a new NEPA document. Consequently, effects from future treatment to sage grouse under EDRR are the same as those described for current infestations and it is unlikely adverse effects would occur under any alternative.

Indirect Effects

Alternatives A through D

There would be little indirect effects to sage grouse habitat from existing infestations under any alternative because only six acres of invasive plants would be treated within suitable sage grouse habitat. Treatment of future sites could occur under all alternatives; however, the action alternatives would be more effective at controlling future infestations of invasive plants and maintaining sage grouse habitat.

Cumulative Effects

Alternatives A through D

Anticipated cumulative effects are discussed under the Wildlife Effect Section. Although not documented on the Forest, suitable habitat exists on National Forest System lands as well as adjacent BLM lands. The proposed use of herbicides on BLM land could result in additive doses of herbicides to sage grouse if a bird was also exposed to herbicides on National Forest System lands. Although for this to occur, the two exposures would have to occur at approximately the same time (24-48 hours). This is unlikely since this species is not documented on the forest and PDFs are in place to reduce impacts to breeding (J-5b & J-5c) and foraging (J-5a) birds should they become established. Potential effects would be further reduced due to coordination between Forest Service and BLM. Also the application rates and extent considered in this EIS are unlikely to result in additive doses beyond those evaluated. As a result, and considering that EDRR treatments would maintain native plant diversity and suitable sage grouse habitat on any areas affected by invasive plants in the future, none of the alternatives would measurably contribute to any other past, current or reasonably foreseeable future activity that may be impacting this species and there are no significant cumulative effects anticipated.

Summary of Effects and Determination for the Greater Sage Grouse

Alternative A

This alternative would not reduce invasive plants within suitable greater sage grouse habitat. However greater sage grouse do not currently occur on the Forest and because treatment of future sites is not expected to result in adverse impacts, implementation of Alternative A would have **No Impact** on the greater sage grouse.

Alternatives B through D

Greater Sage Grouse do not currently occur on the Forest and there are no adverse effects from proposed treatments under any alternative. As a result and based on the above analysis and the following rationale, implementation of Alternatives B through D will have **No Impact** on the greater sage grouse.

- This species does not currently occur on the forest and there are six acres of suitable habitat proposed for treatment. Typical application rates and PDFs that restrict use of moderate and high risk herbicides effectively minimize risk to sage grouse from disturbance or exposure to herbicides or surfactants, should they become established in the future.
- Prior to treatment, localized habitat and species concerns would be assessed to determine the appropriate type and method of treatment necessary to minimize potential effects.
- Existing and future invasive plant infestations would be controlled, contained or eradicated and native plant diversity and preferred sage grouse cover and forage conditions would be maintained within affected watersheds.

Sharp-tailed Grouse

Sharp-tailed grouse are not currently known to occur on the Forest; although historical use (1990s) did occur, and suitable habitat exists on 477,431 acres across the Forest. Effects of proposed treatments on this species were evaluated because it is possible that they could become established during project implementation.

Slightly less than 2 percent (9,426 acres) of the Forestwide suitable habitat have invasive plants. Alternative A would treat approximately 2000 acres or 21 percent of existing infestations, whereas Alternatives B, C and D would treat all existing infestations.

Effects of treatments, biological control, EDRR, and herbicide application/exposure are discussed under the Wildlife Effect Section. The following effects are specific to sharp-tailed grouse.

Direct Effects of Treatment

Alternatives A through D

Effects of treatment were discussed previously under the Wildlife Effect Section and direct effects to sharp-tailed grouse include disturbance during implementation of proposed treatments. The length and type of disturbance would vary by treatment method, and any disturbance is expected to be short-term in nature. Most treatment sites are widely scattered and interspersed with unaffected suitable habitat; therefore, grouse would move out of the area during treatment. As a result any disturbance would be short term and of limited (i.e. localized) extent.

Sharp-tail nest on the ground; therefore, potential also exists to have nests crushed or trampled, which could result in mortality and/or reduced reproductive success. As described under the Wildlife Effect Section, the likelihood of nest mortality varies depending on the treatment method. Alternative A treats the fewest acres of sharp-tail habitat and treatment of future sites and is restricted to manual methods; therefore, potential for nest mortality would be lowest under this alternative. Repeated treatment would be necessary on some sites; however potential nest mortality from manual treatment would still be low.

Alternatives B through D would treat the largest acreage of suitable sharp-tailed grouse habitat, as well as treat more sites with mechanical methods; therefore, potential for nest mortality exists under these alternatives. However, the small amount of suitable habitat proposed for treatment (2% or less under all alternatives), and considering that this species has not been recently documented and if it occurs would occur at very low numbers, ensures the likelihood is low that a nesting bird would occur within a treatment site. Potential for mortality is further reduced by the fact much of the broadcast applications would occur in areas that are dominated by invasive plants, which would not likely be utilized by sharp-tail. Also, if sharp-tail actually occurred within a treatment site, the pre-treatment assessment (A-1) would ensure that treatment methods or timing would be adjusted, if necessary, to reduce or eliminate adverse effects. While potential for mortality exists, implementation of PDFs, combined with the small amount of suitable habitat proposed for treatment would effectively eliminate the likelihood that treatment related mortality would occur.

Herbicides

Alternative A

Approximately 21 percent of the suitable sharp-tailed grouse habitat would be treated with approved herbicides under this alternative. Of this, up to 1643 acres could be treated using chemical treatments. Potential for herbicide exposure is lowest under this alternative because this alternative only applies herbicides if other methods have proven ineffective, and it treats the fewest acres.

Alternatives B through D

Under these alternatives up to 7,720 acres of chemical treatments could occur within suitable sharp-tailed grouse habitat. The potential effects from herbicides are summarized in the Wildlife Effect Section and are discussed in detail in Appendix C. Plant material can make up to 90 percent of an adult sharp-tailed grouse diet, including grains and berries. As a result, the potential for sharp-tailed grouse to receive a toxic dose of herbicides was evaluated under the scenario of large herbaceous bird consuming contaminated vegetation. Sharp-tailed chicks depend heavily on insects; therefore, estimated doses for small birds consuming contaminated insects were also used.

Potential effects of herbicide exposure to sharp-tailed grouse are similar to those described for the sage grouse. At typical application rates for adult birds, only triclopyr (if broadcast sprayed) and NPE surfactants exceeded acute (100% of the daily diet consists of contaminated forage) toxicity thresholds (see Appendix P of R6 2005 FEIS) for adult birds at typical application rates. However, as described under the Wildlife Effect Section, application of triclopyr is restricted to spot spray and selective techniques only (F-1) and NPE would be broadcast sprayed at levels below the typical application rate (F-4). As a result, it is not anticipated that adult or young sharp-tailed grouse would be exposed to toxic levels of herbicides are greatly reduced.

Additionally in order for a bird to receive a chronic dose of herbicides, its entire diet must consist of contaminated insects or vegetation for 90 days. This is highly unlikely considering that herbicides do not bioaccumulate and most break down fairly quickly *in the environment. P*otential for exposure is further reduced considering that; 1) sharp-tailed grouse are not known to forage within areas dominated by invasive plants, 2) that only patches of invasive plants would be treated and these would be interspersed with unaffected suitable habitat, 3) that the physical disturbance associated with treatment would likely to scare off birds, and 4) that foliar interception would reduce the actual amount of sprayed on many insects present. Collectively for these reasons, as well as implementation of PDFs that restrict application rates and use of hig*h and moderate risk herbicides* and require that the presence of SOLI such as sharp-tail be confirmed prior to treatment, it is unlikely that broadcast application of herbicides would result in a bird being exposed to toxic levels of herbicide.

Alternative B

Under Alternative B a total of 9,426 acres of suitable sharp-tailed grouse habitat would be treated including 2,590 acres of riparian habitat and 862 acres of aerial spraying. The potential for herbicide exposure to sharp-tailed grouse would be greatest under this alternative because it would treat the largest amount of suitable habitat and because treatment involves aerial application as well as broadcast application within riparian areas.

Herbicide buffers would restrict broadcast application of surfactant and herbicides within 150 feet of all streams, waterbodies, and wetlands; however, broadcast application of herbicides could occur within riparian areas outside these buffers on approximately 1300 acres. Potential for herbicide exposure would be greater on this acreage because sharp tails are known to utilize riparian areas for cover. However, PDFs that restrict application rates and timing, minimize drift, maintain un-treated areas along streams and waterbodies and require that the presence of SOLI such as sharp-tail be confirmed prior to treatment would effectively reduce the likelihood of adverse effects associated with treatment or herbicide exposure within riparian areas.

Herbicides would be aerially applied on 862 acres of suitable sharp-tailed grouse habitat under this alternative. As described under the Wildlife Effect Section, greater amounts of nontarget vegetation/insects would be contaminated because aerial application would apply herbicides to larger areas. This would increase the risk that a bird could consume contaminated vegetation/insects. All but 32 acres of proposed aerial spraying would occur on sites that are infested with yellow star-thistle. This species is aggressive and can form near monotypic infestations (Ditomaso 2006), which can greatly reduce native plant diversity. As a result, it is unlikely that sharp-tailed grouse would be utilizing these areas. Additionally, use of typical application rates and PDFs that restrict use of high and moderate risk herbicides further reduce the likelihood that a bird would be exposed to toxic levels of herbicide from aerial treatment.

Alternative C

Treatments proposed under Alternative C and the associated effects (described above) would be similar to Alternative B, except that herbicide application within riparian areas would be restricted to spot spray and selective techniques. These treatments are not considered high risk (USDA-FS 2005 ROD); therefore, potential for herbicide exposure would be reduced on approximately 1300 acres from that of Alternatives B and D.

Alternative D

Treatments proposed under Alternative D and the associated effects would be similar to Alternative B, except that no aerial application of herbicides would occur. These sites would be treated using biocontrol methods; therefore, potential for herbicide exposure would be reduced on 862 acres of habitat. This reduces risks somewhat from that of Alternatives B and C, however, these sites consist primarily of yellow star thistle and are less likely to be used by sharp-tail and risks of herbicide exposure are similar to those of Alternatives B and C.

In summary, by limiting application of triclopyr to spot spray and selective methods only (F-1), requiring that NPE only be applied at levels less than typical application rates (F-4), limiting application of all herbicides to typical application rates (F-4), and requiring pre-treatment assessment to confirm SOLI (A-1), PDFs are expected to effectively reduce potential for birds to be exposed to toxic levels of herbicides and reduce the possibility that treatments would occur within occupied habitat. As a result, and due to the small amount of suitable habitat likely affected by EDRR treatments, and considering this species has not been recently documented on the forest, it is not anticipated that adverse effects to this species would occur under any alternative.

Early Detection Rapid Response

Alternatives A through D

Future treatments to new infestations could occur within suitable sharp-tailed grouse habitat under these alternatives, although treatment method would vary (See Alternative Comparison above). If this occurs, additional disturbance (all alternatives) and/or herbicide exposure (Alternatives B, C and D only) could occur. Future herbicide treatments would use the same herbicides and comply with the same PDFs and management restrictions as currently proposed treatments, or if necessary in a new NEPA document. Consequently, effects from future treatment under EDRR are the same as described for current infestations and it is unlikely adverse effects would occur from these treatments under any alternative.

Indirect Effects

Alternative A

This alternative would reduce invasive plant infestations within suitable sharp-tail habitat; however, treatment effectiveness is low. It is likely future areas would become established on many sites because some areas currently infested would go untreated and because EDRR is limited to manual treatments only. Collectively for these reasons, invasive plants would continue to spread and native plant diversity and sharp-tail grouse habitat would decline within affected areas.

Alternatives B through D

All action alternatives would reduce existing infestations of invasive plants within suitable sharp-tailed grouse habitat and allow for control of future infestations. Alternative B is expected to be most effective at controlling invasive plants because of reduced costs (i.e. greater acreage treated) and more effective treatment methods. However, all of these action alternatives would reduce existing infestations, control new infestations, and result in the long-term maintenance of suitable sharp-tailed grouse habitat.

Cumulative Effects

Alternatives A through D

Anticipated cumulative effects are discussed under the Wildlife Effect Section. Sharp-tailed grouse are not documented on the forest; though suitable habitat exists and it is possible that birds could occur at very low numbers. The proposed use of herbicides on other ownerships could result in additive doses of herbicides to sharp-tail if a bird was exposed to herbicides on National Forest System lands. The two exposures would have to occur at approximately the same time (24-48 hours). This is unlikely since this species is not documented on the forest and PDFs are in place to minimize the likelihood that a bird would be exposed to toxic levels of herbicide and identify occupied sites prior to treatment. The herbicides proposed are rapidly eliminated and do not significantly bio-accumulate (R6 2005 FEIS). The application rates and extent considered in this EIS are unlikely to result in additive doses beyond those evaluated for chronic and acute exposures in the USDA Forest Service risk assessments. As a result, and considering that less than 2 percent of the forestwide habitat is proposed for treatment and that the long-term restoration and maintenance of suitable sharp-tailed grouse habitat outweighs any anticipated adverse effects, none of the alternatives would measurably contribute to past, present or reasonably foreseeable future activity that may be impacting this species and there are no significant cumulative effects anticipated.

Summary of Effects and Determination for the Sharp-tailed Grouse

Alternative A

Existing infestations would continue to expand and suitable habitat would be reduced within the affected watersheds because 75 percent of the suitable sharp-tailed grouse habitat that is currently infested with invasive plants would go un-treated. However, this species is not currently documented on the forest; therefore implementation of Alternative A would have **No Impact** on sharp-tailed grouse.

Alternatives B through D

Sharp-tailed grouse do not currently occur on the Forest. If this species were documented in the future, treatment timing and application would be modified if necessary to eliminate potential adverse effects. All action alternatives would reduce existing and control new invasive plant infestations within suitable sharp-tailed grouse habitat. As a result and based on the above analysis and the following rationale, implementation of Alternatives B through D would have **No Impact** on the sharp-tailed grouse.

- This species is not currently documented. Also less than 2 percent of the suitable grouse habitat would be treated and it is not expected that sharp-tailed grouse would occur within treatment areas.
- Project PDFs that restrict application rates and timing, minimize drift, maintain un-treated areas along streams and waterbodies and require that the presence of SOLI such as sharp-tail be confirmed prior to treatment would effectively reduce potential adverse effects to sharp-tailed grouse.
- Proposed treatments would result in the long-term maintenance of suitable sharp-tail grouse habitat.

Gray Flycatcher

A total of approximately 162,741 acres of potential gray flycatcher breeding habitat exist Forestwide. Of this, approximately 2,617 acres or about 1.6 percent of potential gray flycatcher habitat contains known infestations of invasive plant species. All currently infested acres would be treated under the action alternatives, whereas Alternative A would treat approximately 20 percent of existing infestations. This flycatcher is not documented on the forest, and is difficult to identify; therefore, it is possible that it could occur in low numbers. As a result effects to this species were evaluated.

Effects of treatments, biological control, EDRR, and herbicide exposure are discussed under the Wildlife Effect Section. The following effects are specific to the gray flycatcher.

Direct Effects of Treatment

Alternatives A through D

Effects of treatment were discussed previously under the Wildlife Effect Section and direct effects to gray flycatchers include disturbance during implementation of proposed treatments. Disturbance is expected to be short-term in nature; although the length and type of disturbance would vary by treatment method. Most treatment sites are widely scattered and interspersed with unaffected suitable habitat, therefore, the birds would move out of the area during treatment. As a result, any disturbance would be short term and of limited (i.e. localized) extent. Gray flycatchers nest in trees, and there is no mortality from trampling anticipated.

Herbicides

Alternatives A though D

Effects from herbicide exposure were evaluated using the insectivorous bird scenario. The bird is assumed to feed exclusively on contaminated insects for the entire day's diet. There is no chronic dose estimate because there is no data on long-term herbicide residue on insects. At typical application rates only triclopyr (if broadcast sprayed) and NPE surfactants exceeded acute (100% of the daily diet consists of contaminated forage) toxicity thresholds (see Appendix P of R6 2005 FEIS) for small insectivorous birds. However implementation of PDFs would limit the use of triclopyr to spot spray and selective methods only (F-1), NPE would only be applied at levels well below the typical application rate (F-4) and these PDFs would greatly reduce the likelihood that a bird would be exposed to toxic levels of herbicide.

This species has a small home range and territory (<10 acres); therefore, it is possible that an individual bird could consume insects primarily from an area that had been treated with herbicides. However, any exposure that did occur would be limited to the individual bird whose territory included the treatment site. These species select sites with vertical structure or multiple vegetative layers; therefore foliage would intercept much of the herbicide and it is unlikely that a bird would consume its entire diet of contaminated insects. Additionally use of typical application rates and PDFs that restrict use of high and moderate risk herbicides greatly reduce the potential for a bird to be exposed to toxic levels of herbicide. As a result and considering that less than 2 percent of the suitable habitat is proposed for treatment, the likelihood that a bird would be in a treatment unit and consume its entire diet of contaminated insects is remote.

Alternative A

Alternative A would pose the least risk from herbicide exposure and disturbance during treatment due to the fewer number of acres treated and considering EDRR is limited to manual treatments only.

Alternatives B

Under Alternative B a total of 2,617 acres of suitable gray flycatcher habitat could be treated, including 291 acres of aerial spraying and 621 acres of riparian habitat that could be broadcast sprayed. Potential for herbicide exposure to the gray flycatcher would be greatest under this alternative because the largest amount of suitable habitat would be treated and treatment involves aerial application of herbicides, as well as broadcast application of herbicides within riparian habitat. All but 32 acres of the areas proposed for aerial application would occur on sites infested with yellow star thistle. This species can form near monotypic stands; therefore it is unlikely that it would be utilized for foraging and no adverse effects from herbicide exposure are anticipated.

Alternative C

Treatments proposed under Alternative C and the associated effects (described above) would be similar to Alternative B, except that herbicide application within riparian areas would be restricted to spot spray and selective techniques only. This would reduce herbicide exposure somewhat; however, selective treatment within riparian habitat would not appreciably reduce risks and potential effects from herbicide exposure for this species because the gray flycatcher is not a riparian species. Effects would be similar to those of Alternatives B and D.

Alternative D

Treatments proposed under Alternative D and the associated effects would be similar to Alternative B, except that no aerial application of herbicides would occur. Potential for herbicide exposure would be reduced on 291 acres because these sites would be treated using biocontrols. This reduces risks somewhat from that of Alternatives B and C. However, these sites consist primarily of yellow starthistle and are less likely to be used for foraging by gray flycatchers; therefore, risks of herbicide exposure are similar to those of Alternatives B and C.

Early Detection Rapid Response

Alternatives A through D

Future treatments to new infestations could occur within suitable gray flycatcher habitat under these alternatives, although treatment method would vary (see alternative comparison above). If this occurs, additional disturbance (all alternatives) and/or herbicide exposure (alternatives B, C and D only) could occur. Potential effects from future treatment would be similar to those analyzed above because future treatments would use the same herbicides and comply with the same PDFs as existing treatments. Consequently it is unlikely adverse effects would occur under any alternative.

Indirect Effects

Alternative A

This alternative would reduce invasive plant infestations within suitable gray flycatcher habitat; however treatment effectiveness is low. Some of the currently infested areas would go untreated; therefore, invasive plants would continue to spread and native plant diversity and suitable gray flycatcher habitat would decline within affected areas.

Alternatives B through D

These alternatives allow approximately the same acreage of existing infestations treatment; therefore, invasive plant control would be similar. Broadcast spraying would not be used in riparian areas under Alternative C, and aerial spraying would not be used in Alternative D; however, invasive plants would still be treated. All alternatives also include EDRR treatments to control future infestations.

Alternative B is expected to be most effective at containing, controlling, or eradicating existing and future invasive plant infestations within gray flycatcher habitat because of reduced costs (i.e. greater acreage treated) and more effective treatment methods. However, all alternatives would reduce existing infestations and control new infestations. Effects under all alternatives would be the maintenance of native plant diversity and associated gray flycatcher nesting/foraging habitat.

Cumulative Effects

Alternatives A through D

It is unlikely that a bird would be exposed to herbicides on other ownerships because of this species' small home range, and considering treatment would not occur during migration. The gray flycatcher would likely respond favorably to any activities that result in restoration of pinion-juniper/sagebrush habitat (Natureserve 2006), and treatments proposed under the action alternatives would help maintain suitable habitat over the long-term. In addition, treatments are proposed on less than 2 percent of the Forestwide habitat and potential for adverse effects from herbicide exposure are effectively reduced by PDFs that require only typical application rates be used and restrict use of high and moderate risk herbicides; therefore, none of the proposed alternatives would measurably contribute to other past, present or reasonably foreseeable future activity that may be impacting this species.

Summary of Effects and Determination for Gray Flycatcher

Alternative A

This alternative would not reduce invasive plants within suitable gray flycatcher habitat. Also, proposed treatments could result in short-term disturbance and herbicide exposure to birds. However, over 99 percent of the suitable gray flycatcher habitat would be unaffected and management restrictions would apply, thereby reducing the likelihood of adverse effects associated with herbicide exposure. As a result, implementation of Alternative A **may impact individuals or habitat, but will not likely contribute to a trend towards federal listing** or cause a loss of viability for the gray flycatcher.

Alternatives B through D

Treatments proposed under these alternatives could result in short-term disturbance or exposure to herbicides and surfactants. However, all alternatives would maintain or restore suitable gray flycatcher habitat within areas affected by invasive plants. As a result, and based on the above analysis and the following rationale, implementation of Alternatives B, C and D **may impact individuals or habitat, but will not likely contribute to a trend towards federal listing** or cause a loss of viability for the gray flycatcher.

- Typical application rates, project PDFs that restrict use of moderate and high risk herbicides, and gray flycatcher foraging techniques (forages in areas where canopy would reduce contamination) would effectively minimize risk to gray flycatcher from exposure to herbicides or surfactants.
- Over 98 percent of suitable gray flycatcher habitat would be unaffected by treatment and the possibility that a bird would occur within a treatment unit is low.
- Aerial broadcast application of herbicides would occur largely in areas with larger invasive plant infestations, which would less likely be selected for nesting or foraging habitat.
- Proposed treatments would result in the long-term maintenance of gray flycatcher habitat.

Columbia Spotted Frog

The occurrence of these two species across the Forest varies, though both species occupy similar habitat and have similar life history requirements. As a result, the Columbia spotted frog and northern leopard frog will be evaluated together.

Although suitable habitat exists, the northern leopard frog has not been documented on the Forest. The Columbia spotted frog occurs in a number of locations on the Wallowa-Whitman National Forest and is often found in lakes, ponds, and slow moving perennial streams. Currently, none of the locations where the Columbia frog is known to occur contain invasive plants. Due to the small size and scattered nature of suitable habitat, it is not known exactly how much of the suitable habitat for these species is currently infested with invasive plants. However of the 8,669 acres of shoreline habitat and 2,703 acres of spring habitat, 29 acres and 76 acres respectively have known invasive plants.

All of the currently infested acreage would be treated under Alternatives B through D, whereas no spring or shoreline habitat would be treated under Alternative A. Also no emergent vegetation would be treated under any of the alternatives considered in this EIS.

Effects of treatments, biological control, EDRR, and herbicide exposure are discussed under the Wildlife Effects Section. The following effects are specific to the northern leopard frog and Columbia spotted frog.

Direct Effects of Treatments

Alternative A

Because there are no invasive weed treatments proposed within suitable habitat under Alternative A, there are no direct effects anticipated.

Alternatives B through D

no emergent vegetation or areas of known occupied habitat would be treated; although all alternatives would treat 105 acres of invasive plants within suitable habitat. Both species are restricted to aquatic habitat during the breeding season; however, implementation of treatment buffers ensures that adult frogs, eggs and larvae are not likely to be disturbed by invasive plant treatments during this period. After breeding Columbia spotted frogs will disperse into adjacent wetland and riparian habitat. Adults and juveniles would be susceptible to trampling and/or disturbance from treatment at that time. The probability that this would actually occur is low because the frogs are less likely to inhabit areas infested with invasive plants and they tend to jump back into the water whenever they detect disturbance close by.

While Alternatives B, C and D would all treat similar acreages of existing and future infestations, disturbance and potential nest mortality would vary somewhat. Under Alternative C a larger acreage of riparian habitat would be treated with manual methods. Although disturbance would increase due to the longer treatment period required (See general discussion of treatments), potential for mortality would be reduced. Conversely due to the greater acreage of mechanical treatments, Alternatives B and D would likely result in a shorter disturbance period, but increase the risk of mortality.

All alternatives could result in potential disturbance and/or mortality associated with proposed invasive plants treatments. However, the northern leopard frog does not currently occur on the Forest and considering sites where the Columbia spotted frog are known to occur are not currently infested with invasive plants, potential for adverse effects from proposed treatments is remote under all alternatives. Also, a pre-treatment assessment (A-1) would identify any new sites where the Columbia frog is documented, and treatment methods and timing would be adjusted to avoid adverse effects.

Herbicides

Alternatives B through D

Toxicity data for amphibians is much more limited than that available for mammals or birds. Appendix P of the R6 2005 FEIS summarized available data on effects of herbicide to amphibians and this discussion is incorporated by reference into this analysis. The data on amphibians for most herbicides are not sufficient to conduct quantitative estimates of exposure. The Forest Service/SERA Risk Assessments use information from the literature, when available, and the calculated concentrations of herbicide in water from runoff or accidental spill to determine risk to amphibians. For glyphosate and sulfometuron methyl there was sufficient data to do a quantitative evaluation of exposure and risk. However when data on amphibians was not available, fish were used as a surrogate species (US Forest Service 2005).

Although data is insufficient to evaluate risk of sub-lethal effects, results of the analysis indicate that the following herbicides pose a low risk of mortality to amphibians: chlorsulfuron, clopyralid, imazapic, imazapyr, metsulfuron methyl, and picloram. 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).Additionally, implementation of herbicide use buffers (described below), effectively eliminate the possibility that a frog would be exposed to toxic levels of herbicide..

Formulations of glyphosate that contain POEA surfactant are much more toxic to aquatic organisms than aquatic-labeled formulations, which do not contain POEA. At the typical application rate, concentrations in the water for acute and chronic exposures were well below any reported LC 50 for either version of glyphosate, with the exception of one study by Smith (2001). The Smith study is not consistent with other reported studies on glyphosate and so was not used to establish the threshold of concern for aquatic species in the Glyphosate Risk Assessment (SERA 2003 Glyphosate).At the highest application rate, some formulations of glyphosate that contain POEA could be lethal to amphibians if runoff from the treatment site were to occur (SERA, 2003-glyphosate). However herbicide use buffers (F-3, H-1, H-2, H-3, H-8, H-10 through H-12) virtually eliminate the potential for herbicide to be delivered to streams in concentration of concern (USDA FS 2008), and spills are extremely unlikely to occur given the many safety precautions in place (S. Bulkin personal communication).

NPE-based surfactants are known to cause adverse 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. Overspray or accidental spills could produce concentrations of NPE that could adversely affect amphibians, particularly in small stagnant ponds (USDA FS 2005); although, under normal operations use of NPE is not likely to adversely affect amphibians (S. Bulkin personal communication). Further, implementation of aquatic buffers (described below) would effectively eliminate potential for either species to be exposed to toxic levels of herbicide/surfactant within breeding habitat.

Triclopyr comes in two forms; triclopyr BEE and triclopyr TEA. Triclopyr BEE is much more toxic to aquatic organisms than is triclopyr TEA. Triclopyr use at the highest application rate could adversely affect responsiveness of tadpoles, subjecting them to increased risk of predation. Although some exposure could occur with spot spray or selective applications of triclopyr TEA (allowed up to 15 feet of perennial streams, lakes and ponds), spot spray or selective applications of Triclopyr BEE are prohibited within 150 feet of perennial and intermitted (wet or dry) streams, lakes and wetlands. Also 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.

Adult frogs could also be dermally exposed to herbicides as they move through treated vegetation or soil. There is insufficient data to quantify a dose received from dermal exposure to contaminated vegetation or soil, but it is likely to be much less than if the frog was in contaminated water and could easily absorb the solution through its skin. There is in-sufficient data to quantify dose received from dermal exposure to contaminated vegetation. However, for the purpose of this analysis, it is assumed that that risk exposure to contaminated water adequately assesses risk from all types of herbicide exposure for amphibians. Additionally, herbicide use buffers (F-3, H-1, H-2, H-3, H-8, H-10 through H-12) that restrict broadcast application of herbicides within breeding habitat and require that unsprayed areas provide refugia for amphibians living in a discrete pond, lake or wetland (H-9 and H-13), further reduce the likelihood that a frog would be receive toxic levels of herbicide through dermal exposure.

In summary, the actual likelihood of exposing amphibians depends on the application method, habitat treated, and season of application. Although potential for exposure to toxic levels of herbicides exist, adverse effects to amphibians are greatly reduced by PDFs that restrict herbicide application rates, restrict use of high and moderate risk herbicides, and require herbicide buffers. More specifically, 1) herbicide use buffers (F-3, H-1, H-2, H-3, H-8, H-10 through H-12) virtually eliminate the potential for herbicide to be delivered to streams in concentration of concern (USDA FS 2008), 2) herbicide restrictions on certain soil types (H-4 through H-7) reduce potential for runoff and leaching, 3) restrictions on extent of treatment in a given site condition (i.e. aquatic influence zone, H-9 and H-13) ensure that herbicides would not be delivered in amounts greater than the SERA risk assessment scenarios and that unsprayed areas provide refugia for amphibians living in a discrete pond, lake or wetland (USDA FS 2008), and 4) spills are extremely unlikely to occur given the many safety precautions in place (Bulkin personal communication). As a result and based on monitoring of similar treatments (Berg 2004), implementation of these PDFs would ensure that adverse effects to fish, amphibians and the aquatic resource are avoided (USDA-FS 2008?). Finally, prior to any treatment the pre-field assessment (A-1) would confirm the presence of SOLI including the Columbia spotted frog and adjust application timing/methods or herbicide formulation if necessary to reduce impacts. Collectively for these reasons and considering that no occupied sites and only 105 acres of suitable habitat are proposed for treatment, it is unlikely that the Columbia spotted frog would be exposed to toxic levels of herbicide under any alternative.

Alternatives B and D

PDFs under all action alternatives would prevent aerial and broadcast application of herbicides within 100 feet of breeding habitat (e.g. streams, lakes and wetlands). Also because all herbicides would be restricted to spot spray or selective methods within aquatic buffers, and considering that herbicides and surfactants that pose the greatest risk cannot be applied within 150 feet of suitable habitat, there is very little difference between these alternatives in terms of effects to breeding habitat. These alternatives would use broadcast application of herbicides within riparian areas outside of these buffers and the potential for herbicide exposure would increase if a frog moved outside of the herbicide buffers. However, this species would not likely be found within areas dominated by invasive plants that may be targeted for broadcast application. Also there are no occupied sites proposed for treatment and the pre-field assessment (A-1) would identify if a treatment site was occupied and adjust treatment methods, timing or formulation of herbicides if necessary to reduce impacts. Consequently and considering that implementation of PDFs (described above) effectively reduce the likelihood that this species would be exposed to toxic levels of herbicide, it is not anticipated that broadcast treatments proposed outside aquatic buffers under these alternatives would result in adverse effects from herbicide exposure to the Columbia spotted frog.

Alternative C

Although all alternatives restrict broadcast application within 100 feet of water, some broadcast application within riparian areas would occur under Alternatives B and D. This species is strongly associated with riparian areas, and considering application of herbicides within riparian areas is restricted to spot spray or selective techniques only under Alternative C, potential for herbicide exposure (particularly dermal exposure) to Columbia spotted frogs would be reduced under this alternative, from that of Alternatives B and D. Similarly, because riparian areas would be treated manually, potential for mortality would also be reduced.

Early Detection Rapid Response

Alternatives A through D

Future treatments to new infestations could occur within suitable for either species under these alternatives; although treatment method would vary (See Alternative Comparison above). If this occurs, additional disturbance (all alternatives) or herbicide exposure (Alternatives B, C and D only) could occur. Future herbicide treatments would use the same herbicides and comply with the same PDFs and management restrictions as currently proposed treatments, or if necessary in a new NEPA document. Consequently, effects from future treatment under EDRR are the same as described for current infestations and the potential for adverse effects is low under all alternatives.

Indirect Effects

Alternative A

This alternative would reduce invasive plant infestations within suitable northern leopard and Columbia spotted frog habitat; however, treatment effectiveness is low. Additionally, some areas currently infested would go untreated and because EDRR is limited to manual treatments only, it is likely future areas would become established on many sites. Collectively for these reasons, invasive plants would continue to spread and native plant diversity and suitable habitat for the Columbia spotted frog would decline within affected areas.

Alternatives B through D

Under these alternatives, approximately the same acreage of existing infestations within suitable habitat would be treated, and due to similar herbicide restrictions to stream and aquatic habitat, control of invasive plants within breeding habitat would be similar. Additionally all treatments include the use of EDRR, so some control of future infestations would occur under all alternatives. As a result, all alternatives would reduce existing infestations, control new infestations and result in the long-term maintenance of suitable habitat for both the northern leopard and Columbia spotted frog.

Cumulative Effects

Alternatives A through D

These species could be exposed to disturbance or mortality from other activities such as grazing, road maintenance or recreation that may be occurring within suitable breeding habitat. The Columbia spotted frog would not be expected to widely disperse during a single season; therefore, it is unlikely an individual would be exposed to other applications of herbicides. This species is strongly aquatic and it is unlikely it would occur in patches of upland invasive plants. Additionally, invasive treatments are of such low magnitude (105 aces), short duration and low intensity that no significant effects would occur. Also with implementation of PDFs (described above), herbicides proposed for use have a low likelihood of causing adverse effects to spotted frogs. As a result, considering there is no occupied habitat proposed for treatment, none of the proposed alternatives would measurably contribute to any other past, present or reasonably foreseeable future activity and result in significant impacts to this species.

Summary of Effects and Determination for the Columbia Spotted Frog.

Alternative A

No treatments are proposed within suitable habitat; therefore, invasive plants would continue to expand in suitable breeding and upland Columbia spotted frog habitat. Although the probability is low, potential exists for proposed treatments of future sites to result in adverse effects to this species. As a result, implementation of Alternative A **may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability** for Colombia spotted frog.

Alternatives B through D

All alternatives would reduce existing and future invasive plant infestations within suitable habitat; however treatment could result in adverse effects. As a result, and based on the above analysis and the following rationale, implementation of Alternatives B, C and D **may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability** for the Columbia spotted frog.

- There is no occupied Columbia spotted frog habitat proposed for treatment. As a result and considering the small amount of habitat proposed for treatment (105 acres) and that an existing PDF (A-1) requires that the presence of SOLI species be confirmed prior to treatment, it is unlikely that the Columbia spotted frog would occur within a treatment site.
- PDFs which restrict herbicide application rate and use, prevent high risk treatments (USDA FS 2005) within breeding habitat, minimize the likelihood for herbicide exposure and limit the extent of treatment within suitable breeding habitat, effectively reduce the potential for adverse effects from treatment and exposure to herbicides/surfactants.
- Proposed treatments would result in the long-term maintenance of native plant diversity within suitable breeding habitat for both the Columbia spotted frog.. Also the benefits of preventing the future loss of suitable habitat due to invasive plants, outweighs any anticipated adverse effects.

Painted Turtle

The painted turtle is not documented on the Forest; however, potential habitat exists on approximately 8,669 acres. This species has been documented within affected watersheds (Natureserve 2008). Twenty nine acres of the existing waterbody and shoreline habitat are proposed for treatment under the action alternatives. No treatments would occur within suitable habitat under Alternative A.

Effects of treatments, biological control, EDRR, and herbicide exposure are discussed under the Wildlife Effect Section. The following effects are specific to the painted turtle.

Direct Effects of Treatments

Alternative A

This species has not been documented on the Forest, and considering that there are no treatments proposed within suitable habitat, there are no direct effects anticipated.

Alternatives B through D

Effects of treatments are discussed under the Wildlife Effect Section and any ground based treatment could result in short-term disturbance to the painted turtle. In addition, ground based mechanical treatments could result in mortality under any of the alternatives. Because alternative C would reduce the acreage treated with mechanical treatments within any riparian habitat that occurred outside aquatic treatment buffers, the potential for mortality resulting from treatment would be reduced somewhat under this alternative. However, PDF J-4 requires that the local biologist review all areas proposed for treatment to ensure that known painted turtle locations are identified and that treatment timing, methods, or herbicide formulations can be adjusted if necessary to reduce impacts. As a result, the likelihood of adverse treatment related effects is low under all alternatives.

Herbicides

Alternatives B through D

Very little research has been done on the effects of herbicides to reptiles. Hall (1980) stated that reptiles are apparently less sensitive than fish and the FS/SERA risk assessments use amphibians and/or fish as surrogates for reptiles. While there is no data on the toxicity of herbicides to reptiles, amphibians and fish have very permeable skin, more so than reptiles, so they are more likely to absorb contaminants from their environment. As a result, potential effects to the painted turtle would be similar to those described above under the Columbia spotted frog and bald eagle.

Many reptile species would likely be under some cover during the day, when herbicides may be applied. But diurnal reptiles such as the painted turtle could conceivably be sprayed during applications, as well as be exposed through contact with contaminated vegetation and soil or ingestion of contaminated prey. The actual likelihood of exposing painted turtles depends on the application method, size of treatment area, habitat treated, and season of application. Because aquatic buffers restrict the use of herbicides within painted turtle breeding habitat to spot spray and selective methods only, potential risks to this species from herbicide exposure are reduced under all alternatives. Alternative C does not allow broadcast application of herbicides within riparian areas outside of these buffers; therefore, potential risks to painted turtles dispersing or foraging outside of these buffers would be reduced under this alternative.

In addition to PDFs that restrict herbicide use/treatment within aquatic habitats, PDF J-5 requires that the local biologist review treatment locations, timing and methods if necessary to minimize adverse impacts to this species. As a result, and considering the small amount of suitable habitat proposed for treatment (29 acres) it is unlikely that a painted turtle would occur within a treatment area, or be exposed to toxic levels of herbicides under any alternative.

Early Detection Rapid Response

Alternatives A through D

Future treatments to new infestations could occur within suitable painted turtle habitat under these alternatives, although treatment method would vary (See Alternative Comparison above). If this occurs, additional disturbance (all alternatives) or herbicide exposure (Alternatives B, C and D only) could occur. Future herbicide treatments would use the same herbicides and comply with the same PDFs and management restrictions as currently proposed treatments, or if necessary in a new NEPA document. Consequently, effects from future treatment under EDRR are the same as described for current infestations and the potential for adverse effects is low under all alternatives.

Indirect Effects

Alternative A

No infestations within suitable habitat would be treated, and considering that treatment of future sites would be restricted to less effective methods, it is likely that invasive plants would spread. If this occurs, native plant diversity and potentially suitable painted turtle habitat could be reduced within affected areas.

Alternatives B through D

Under the action alternatives all currently infested suitable habitat would be treated and EDRR treatments would be expected to control future infestations. Because herbicide buffers restrict the use of aerial application near ponds, lakes and wetlands and considering PDFs require that only spot or hand treatments occur within 100 feet of lakes or wetlands, there is virtually no difference between alternatives in terms of treatment effectiveness or invasive plant control.

Cumulative Effects

Alternatives A through D

Potential cumulative effects to wildlife are discussed under the Wildlife Effect Section. Because of the painted turtle’s small home range, it is highly unlikely that any turtles affected by proposed activities would be adversely affected by treatments on other ownerships. As a result, and with implementation of PDFs to minimize direct effects from treatment, and considering only 29 acres of suitable wetland/shoreline habitat would be affected by treatment, none of the alternatives would measurably contribute to any other past, present or reasonably foreseeable future activity that may be impacting this species and no significant cumulative effects are anticipated.

Summary of Effects and Determination for the Painted Turtle

Alternative A

No treatment is proposed within suitable habitat; therefore, invasive plants would continue to expand in suitable breeding, foraging and dispersal habitat. Although the probability is low, potential exists for proposed EDRR treatments to result in adverse effects to the painted turtle if it becomes established on the forest during project implementation. This species has not been documented on the forest and considering the small amount of suitable habitat proposed for treatment, implementation of Alternative A will have **No Impact** on the painted turtle..

Alternatives B through D

All alternatives would reduce existing and future invasive plant infestations within suitable habitat. Also this species has not been documented on the forest. As a result and based on the above analysis and the following rationale, implementation of Alternatives B, C and D will have **No Impact** on the painted turtle.

- This species has not been documented on the forest. As a result and considering the small amount of suitable habitat proposed for treatment (29 acres) and considering PDFs require that all sites proposed for treatment be assessed by a local biologist, it is unlikely that a painted turtle would occur within a treatment site.
- Project Design Features that require typical application rates, restrict use of high and moderate risk herbicides and require herbicide buffers within suitable breeding habitat, effectively reduce the possibility that an individual would be exposed to toxic levels of herbicide.
- Proposed treatments would result in the long-term maintenance of native plant diversity within suitable breeding and foraging habitat for the painted turtle. Also the benefits of preventing the future loss of suitable habitat due to invasive plants, outweighs any anticipated adverse effects.

3.3.7 Effects to Management Indicator Species

The purpose of this section is to evaluate and disclose the impacts of the Wallowa-Whitman National Forest Invasive Plants Treatment Project on Management Indicator Species (MIS).

Management indicator species are used in concert with other indicators to gauge the effects of management on wildlife habitat. In general, the MIS approach is used to reduce the complexity of discussing all wildlife species on the Forest, because MIS represent groups of wildlife associated with similar vegetative communities or key habitat components. Evaluating the effects of management practices on these species and their habitat also displays the effects of alternatives on the ecological communities they represent and helps to ensure that biodiversity is maintained. Species identified in the Wallowa-Whitman National Forest Land and Resource Management Plan (Forest Plan) (USDA 1990) as MIS includes elk, northern goshawk, pileated woodpecker, primary cavity excavators, and American pine marten. The following is a discussion of the effects of proposed treatments on these species.

Rocky Mountain Elk

Over 95 percent of the Forest provides suitable elk habitat and elk winter and summer range. The acreages of invasive plant infestations within suitable habitat are displayed in Table 34. Approximately 22,800 acres are proposed for treatment under the action alternatives (Alt. B through D) and approximately 5,400 acres would be treated under the no action alternative (Alt. A).

Direct Effects of Treatments

Alternatives A through D

Effects of treatments are discussed under the Wildlife Effect Section and include disturbance associated with proposed treatments. Less than 1 percent of the total suitable elk habitat on the forest is proposed for treatment, and the possibility that elk would be in the treatment area is low. However, any animals on-site during treatment would be displaced from the area. The length of time they would be displaced would vary by treatment (See Wildlife Effect

Section); however, any disturbance and displacement would be short term (a few days). Also, over 98 percent of all affected watersheds would not be treated, and elk could easily move into other areas where suitable forage and cover are available. Consequently, proposed treatments would not result in any long-term negative effects for this wide-ranging species. There would be no treatment related mortality because elk are highly mobile. None of the critical elk calving areas identified by the Forest or Rocky Mountain Elk Foundation are proposed for treatment

Herbicides

Alternatives A through D

Mammals that eat vegetation (primarily grass) that has been sprayed with herbicide have relatively greater risk for adverse effects because herbicide residue is higher on grass than it is on other herbaceous vegetation or seeds (Kenaga, 1973; Fletcher et al. 1994; Pfleeger et al. 1996). As a result the grazing and browsing habits of elk make it possible for them to walk through or consume vegetation that has been sprayed with herbicide.

At typical application rates only NPE (acute exposure) and triclopyr (chronic exposure) exceeded the toxicity dose for large herbaceous mammals consuming contaminated vegetation. However, implementation of PDFs restrict the use of triclopyr to spot spray and selective methods only (F-1), and require that NPE surfactant would not be ground based broadcast at a rate greater than 0.5 lbs. active ingredient per acre (F-4), which is only 30 percent of the typical application rate used in the exposure scenario. Although triclopyr is approved for use (with restrictions) under Alternative A, NPE would not be applied under this alternative, whereas both triclopyr and NPE surfactants would be used under the action alternatives.

In order for an animal to receive an acute dose, it would have to consume nothing but contaminated vegetation for its entire day's diet, whereas it would have to consume contaminated vegetation for 90 days to receive a chronic dose. Elk forage selectively and often will return to the same areas repeatedly; therefore, they are at risk from possible chronic exposure. However, implementation of the above PDFs would greatly reduce the likelihood that elk would receive toxic doses that occurred in the exposure scenarios. Additionally the following considerations would also be expected to reduce the likelihood that elk would receive adverse effects from herbicide exposure:

- Many broadcast applications of herbicides would occur on large infestations because they cannot be controlled effectively using other methods. Invasive plants can greatly reduce native plant diversity and areas of large infestations are not likely to contain preferred forage species. Also, when considering that elk are sensitive to human-related disturbance (Thomas 1979), the possibility that an animal would move into an area infested with invasive plants to select forage that would likely be available in undisturbed areas is extremely remote.
- Approximately 23,000 acres of suitable elk habitat are proposed for treatment, which is scattered across 53 watersheds. Of the affected watersheds (See Table 41), 50 have less than 1 percent of the watershed acreage proposed for treatment and very little suitable habitat would be affected within any watershed. Additionally use of typical application rates and PDFs that restrict use of high and moderate risk herbicides and provide for herbicide buffers and un-treated areas along streams and riparian areas, effectively reduce the likelihood that an individual would be exposed to toxic levels of herbicide. As a result

and considering that only 1 percent of the forestwide suitable habitat is proposed for treatment, and that elk forage over large areas and do not prefer to forage within areas dominated by invasive plants, it is unlikely that elk would either consume all of their daily vegetation from a treatment area, or forage within treatment areas for 90 days (i.e. exceed acute or chronic NOAEL).

- Approximately 50 percent of the elk habitat proposed for treatment occurs within 200 feet of road and most of these treatment areas occur as narrow linear strips along the road row. Elk are known to forage along roads; although it is unlikely they would forage exclusively along these narrow corridors, particularly if they are infested with invasive plants. Additionally, elk avoid areas with open roads (Thomas 1979); therefore, many of these treatment areas would not provide preferred foraging habitat.

In summary, use of triclopyr is restricted under Alternative A and PDFs for the action alternatives would ensure that triclopyr would not be broadcast sprayed, and that NPE surfactants would only be applied at levels well below typical application rates. As a result, it is unlikely that elk would be exposed to toxic levels of herbicide under any alternative considering, in addition, that less than 1 percent of suitable habitat would be affected, and elk would avoid many of the roadside areas proposed for treatment, and that many areas proposed for broadcast treatment would contain little preferred forage.

Alternative A

Approximately 31 percent of existing invasive plant sites would be treated under this alternative. While this alternative would not apply NPE surfactants, triclopyr, glyphosate and picloram could be used with restrictions. Although the potential exists, based on the analysis presented above, it is unlikely that elk would receive toxic doses of herbicides under this alternative.

Alternative B

Under Alternative B a total of 22,842 acres would be treated, including 13,566 acres of broadcast and spot spray/selective treatments and 875 acres of aerial spraying in upland areas, 3,104 acres of ground based broadcast treatment and 3,241 acres of spot spray/selective treatments in RHCAs, 1,955 acres of biocontrol only and 111 acres of manual treatment only in uplands or RHCAs.

Herbicide buffers would restrict broadcast application of surfactant and herbicides within 150 ft of all streams, waterbodies and wetlands; however, broadcast application of herbicides could occur within riparian areas outside these buffers. Elk make disproportionate use of areas within 1,050 feet of water (Thomas 1979), and broadcast application of herbicides could occur within riparian areas; therefore, potential for herbicide exposure within these areas would likely be greater than the adjacent uplands. This would vary depending on the availability of cover, which ultimately determines use of an area by elk (Thomas 1979). Also, many of these riparian areas are along open road corridors which would less likely be used, and larger infestations would not provide preferred foraging habitat.

Herbicides would be aerially applied on 875 acres under this alternative. As described under the Wildlife Effect Section, because aerial application would apply herbicides to larger areas, greater amounts of nontarget vegetation could be contaminated, potentially increasing the risk that elk would consume contaminated vegetation. All but 32 acres of proposed aerial spraying would occur on sites that are infested with yellow starthistle. This species is aggressive, and can form dense near-monotypic infestations (Ditomaso J.M. 2006), which can greatly reduce native plant diversity. As a result, it is unlikely that elk would be foraging in these areas. Additionally PDFs F-8a through F-8o:

- Restrict the use of chlorsulfuron, metsulfuron methyl and sulfometuron during aerial application
- Restrict application rates for picloram and clopyralid
- Prevent spraying within sites that have 30 percent or more live tree canopy
- Require on-site inspection for areas that have between 10 and 29 percent cover
- Require constant communication between the helicopter and ground observers

Collectively these PDFs would reduce the potential for vegetation to be sprayed with levels of herbicide that would result in a toxic dose to elk, and reduce the likelihood that an animal would be directly sprayed during implementation.

Alternative C

Treatments proposed under Alternative C and the associated effects (described above) would be similar to Alternative B, except that herbicide application within riparian areas would be restricted to spot spray and selective techniques only. This would reduce the potential for herbicide exposure on the 3,104 acres of riparian habitat that could be broadcast sprayed under Alternatives B and D. As a result, and because elk prefer to forage within riparian areas, this alternative would result in the least risk of herbicide exposure to elk of all the action alternatives.

Alternative D

Treatments proposed under Alternative D and the associated effects (described above) would be similar to Alternative B, except that no aerial application of herbicides would occur. Because these sites would be treated using bio-control methods, potential for herbicide exposure would be reduced on this acreage (875 acres). Although this reduces risks somewhat on these sites from that of Alternatives B and C, because these sites consist primarily of yellow star thistle, they are less likely to be utilized by elk.

Early Detection Rapid Response

Alternatives A through D

Future treatments to new invasive plant infestations could occur within suitable elk habitat under these alternatives, although treatment method would vary (See Alternative Comparison above). If this occurs, additional disturbance (all alternatives) and herbicide exposure (Alternatives B, C and D only) could occur. Future herbicide treatments would use the same herbicides and comply with the same PDFs and management restrictions as currently proposed treatments, or if necessary in a new NEPA document. Consequently, effects from future treatment to elk under EDRR are the same as those described for current infestations, and it is unlikely that adverse effects would occur under any alternative.

Indirect Effects

Alternatives A through D

The same factors that put elk at greater risk from herbicide exposure (i.e. forage primarily in open areas with grasses and forbs) also result in a greater risk to this species from the loss of habitat due to invasive plants. This is because invasive plants out compete and replace native forage species used by ungulates such as elk. Also, habitats that become dominated by invasive plants are often not used or used much less by native and rare wildlife species and a decrease in available foraging habitat for elk and other big game is possible (Rice et al. 1997). Invasive plants may also contribute to changes in elk distributions and densities (Bedunah and Carpenter 1989; Rice et al.1997; in USDA Forest Service 2005). Also some hunters and wildlife managers are concerned that invasive plants are degrading the quality of remaining habitat for deer and elk and are adversely affecting the animal's distribution and hunting opportunities.

Invasive plants can reduce the ability of an area to support deer and elk (Rice et al. 1997), and considering that invasive plants have been increasing on the Forest and are expected to continue to increase in the future (See Figure 16), the potential exists for elk to experience a long-term loss habitat. The following is a discussion of how effectively the alternatives evaluated address this concern.

Alternative A

Over 75 percent of the existing invasive plant infestations within suitable elk habitat would not be treated under this alternative. Also, EDRR is limited to manual treatments only. While this would help to contain invasive plants in some locations, they would continue to expand on sites where plant morphology or size of the infestation makes manual treatment ineffective. As a result, and considering that more effective herbicides are not approved for treatment, invasive plants would continue to expand within affected watersheds and result in the long-term loss of elk foraging habitat. Although Forestwide elk distribution would remain relatively unchanged, there might be localized shifts in elk use within some watersheds.

Alternatives B through D

Approximately the same acreage of existing infestations would be treated and invasive plant control would be similar. Broadcast spraying would not be used in riparian areas under Alternative C, and aerial spraying would not be used in Alternative D; however, existing and future invasive plants infestations would still be treated. All alternatives include a wide range of EDRR treatments to control future infestations.

Alternative B is expected to be most effective at containing or eradicating existing and future invasive plant infestations within elk habitat because of reduced costs (i.e. greater acreage treated) and more effective treatment methods. However, all alternatives would reduce existing and control new infestations, and effects under all alternatives would be the long-term maintenance of native plant diversity, elk foraging habitat and distribution and use of the Forest by elk.

Cumulative Effects

Alternatives A through D

Cumulative effects considerations are discussed under the Wildlife Effect Section. Use of the forest by elk occurs on multiple ownerships; therefore, anticipated cumulative effects include possible exposure to herbicides and disturbance from on-going land uses on other ownerships, as well as continued disturbance associated with use of National Forest System lands. The proposed use of herbicides on and off National Forest System lands could also result in additive doses of herbicides to elk. For this to occur, the two exposures would have to occur at approximately the same time. This is unlikely since the herbicides proposed are rapidly eliminated and do not significantly bio-accumulate (R6 2005 FEIS). Also with implementation of PDFs that restrict herbicide application and use, provide herbicide buffers along streams, waterbodies and riparian areas, minimize drift from broadcast and aerial application, require monitoring during all aerial application, and require pre-treatment assessment to confirm species/habitats of local interest.

The risk of exposure to herbicide/treatments is further reduced by the fact that 99% of the Forestwide habitat would be unaffected by treatment, that many areas proposed for treatment do not provide preferred forage, and that many of the sites treated occur along open roads which are less likely to be used by elk. As a result, and considering that the long-term improvement in elk foraging habitat outweighs anticipated adverse effects, none of the alternatives would measurably contribute to any other past, current or reasonably foreseeable future activity that may be impacting this species and there are no significant cumulative effects anticipated.

Summary of Effects and Determination for Elk

Alternative A

Proposed treatments could result in short-term disturbance and herbicide exposure to elk; though over 99 percent of the Forestwide habitat would be unaffected and management restrictions would reduce the likelihood of adverse effects associated with herbicide exposure. As a result, there are no effects that would be expected to alter local populations of elk. However, 75 percent of existing invasive plant infestations would not be treated and treatments approved under this alternative would not be expected to be effective on many future sites where invasive plants become established. As a result there **might be some localized changes** in elk distribution and use within affected watersheds.

Alternatives B through D

Treatments proposed under these alternatives could result in disturbance and herbicide exposure to elk; however, all alternatives would result in the long-term maintenance of elk foraging habitat across the Forest. Also, although adverse impacts are possible, based on the above analysis and the following rationale, there are **no effects** that would alter local populations or adversely affect distribution and use of the Forest by elk.

- Ninety nine percent or more of the Forestwide suitable elk habitat would be unaffected. Many of the treatments would occur along open road corridors that are avoided by elk.
- Much of the broadcast/aerial application of herbicides would occur in large infestations of invasive plants, which would not provide desired forage and would not likely be utilized by elk.
- With implementation of PDFs that restrict herbicide application and use, provide herbicide buffers along streams, waterbodies and riparian areas, minimize drift from broadcast and aerial application, require monitoring during all aerial application, and require pre-treatment assessment to confirm species/habitats of local interest, potential adverse effects associated with herbicide exposure are greatly reduced.
- If left untreated, potential exists for invasive plants to result in a long-term loss of elk foraging habitat. These alternatives would result in the long-term maintenance of elk habitat across the Forest, and benefits of invasive plant control resulting under these alternatives would outweigh any anticipated adverse effects associated with treatment.

Northern goshawk

The home range of the northern goshawk includes a diversity of successional stages; however, this species is closely tied to mature late-successional forest with closed canopies (>40%) and complex stand structure (multiple canopy layers and dead wood) (Reynolds et al. 1992). As a result, there are no treatments proposed within preferred goshawk nest habitat. Treatments may occur within foraging habitat or in close proximity of suitable nest habitat. As a result, proposed treatments could potentially adversely affect this species.

Direct Effects

Alternatives A through D

Treatment effects are discussed under the Wildlife Effect Section. Because there are no treatments proposed within preferred nest habitat, there are no adverse effects to nesting birds under any alternative. The pre-treatment assessment (A-1) would identify any treatment areas near active nests and treatment timing would be adjusted to avoid impacts. Goshawk forage in a wide variety of forest structural stages, as well as small openings; therefore, it is possible that foraging birds could be affected by treatments. If this occurs, there would be short-term disturbance until the birds moved out of the area; however any effect would be of limited extent since unaffected foraging habitat is widely available.

This species is highly mobile and primarily occurs within closed canopy forested habitat; therefore, it would not be directly sprayed. However, goshawks are classified as prey generalists (Squires and Reynolds 1997) and typically forage on a suite of 8–15 species including a variety of small mammals and birds (Reynolds et al. 1992). As a result, there is a possibility that a bird could forage on prey that had been exposed to herbicides and potential effects to this species were evaluated by looking at the predatory bird scenario. At the typical application rate, no herbicide or surfactant exceeded the lowest reported NOAEL for a predatory bird consuming small mammals. Also, PDFs that restrict use of high and moderate risk herbicides, prevent aerial application from occurring within forested areas preferred for nesting and foraging, and require pre-treatment assessment to confirm species/habitats of local interest, collectively would reduce impacts to nontarget wildlife such as the northern goshawk. Further, preferred forest habitat where most prey would be taken would not be sprayed, and the northern goshawk forages over a large area and would not consume all of its daily diet from contaminated prey. Collectively for these reasons, the likelihood that a bird would receive a toxic dose of herbicides is not considered plausible.

Early Detection Rapid Response

Alternatives A through D

Future treatments to new invasive plant infestations could occur within suitable northern goshawk foraging habitat under these alternatives, although treatment method would vary (See Alternative Comparison above). If this occurs, additional disturbance (all alternatives) and herbicide exposure (Alternatives B, C and D only) could occur. Future herbicide treatments would use the same herbicides and comply with the same PDFs and management restrictions as currently proposed treatments, or if necessary in a new NEPA document. Consequently, effects from future treatments under EDRR are the same as those described for current infestations, and adverse effects related to herbicide exposure/treatment would not be expected to occur under any alternative.

Indirect Effects

Alternatives A through D

Invasive plants generally do not occur within closed canopy forest preferred by this species; therefore, they are not adversely affecting northern goshawk habitat and there are no indirect effects to goshawk habitat anticipated under any alternative.

Cumulative Effects

Alternatives A through D

Cumulative effect considerations are discussed under the Wildlife Effect Section. goshawk forage over large areas; therefore, anticipated cumulative effects include possible exposure herbicides and disturbance from on-going land uses on other ownerships, as well as continued disturbance associated with use of National Forest System lands. However, preferred nest habitat would be unaffected and only a small amount of dispersal and foraging habitat would be affected (<1% of the forest) by treatment. As a result, and considering that PDFs that restrict herbicide use and application and this species foraging behavior effectively reduce the possibility of a bird being exposed to toxic levels of herbicides, none of the alternatives would measurably contribute to any other past, current or reasonably foreseeable future activity that may be impacting this species and there are no significant cumulative effects anticipated.

Summary of Effects and Determination for Northern Goshawk

Alternatives A through D

Potential exists for the northern goshawk to be adversely affected by proposed treatments, though preferred forested habitat would be unaffected and this species would not be exposed to toxic levels of herbicides. As a result, effects would be short term and of limited extent. Also, there are no adverse effects related to reproduction or recruitment. Consequently, there would be **no effects** to local populations and distribution, and use of the Forest by this species would remain unchanged.

Pileated Woodpecker and Cavity Excavators

These species utilize similar habitat and all prefer or require snags and dead and downed woody debris, although preferred habitat varies; therefore, they are evaluated together. Suitable habitat for all species occurs largely within forested stands, although some species such as the mountain bluebird utilize openings or savannas. Also, while forested stands are preferred, some species such as the pileated woodpecker will forage in stands with as little as 10 percent forested cover (Samson 2006). Consequently, suitable habitat for the pileated woodpecker as well as many other cavity excavators could occur within treatment areas.

Direct Effects

Alternatives A through D

There are no direct effects to nests or young which have not fledged because all species nest in cavities. It is possible that adults could be disturbed for a short period during nesting, but it is unlikely they would leave the nest cavity long enough to result in mortality. Also, foraging birds disturbed would move into unaffected suitable habitat. Considering the small amount of suitable habitat affected, any disturbance related effects would be minor and of limited extent.

The diet of some species includes vegetative material (e.g. seeds); nevertheless, all species utilize insects as their primary food source. Some species (e.g. Lewis' woodpecker, northern flicker, mountain bluebird) may feed on the ground or in low shrubs that may have been affected by treatment; however, most insects utilized by these species occur within dead wood, under bark, or are taken from areas that would not be exposed to herbicides.

Additionally use of typical application rates and implementation of PDFs that restrict use of high and moderate risk herbicides, prevent aerial application from occurring over predominately forested habitat, and prevent broadcast application along streams and riparian corridors, further reduce the potential for adverse effects from herbicide exposure. Collectively for these reasons and considering that most preferred forested habitat would be unaffected, it is not expected that the pileated woodpecker or any cavity excavator would be exposed to toxic levels of herbicide under any alternative.

Early Detection Rapid Response

Alternatives A through D

Future treatments to new invasive plant infestations could occur within suitable habitat for the pileated woodpecker and other cavity nesting species; although treatment method would vary (See Alternative Comparison above). If this occurs, additional disturbance (all alternatives) and herbicide exposure (Alternatives B, C and D only) could occur. Future herbicide treatments would use the same herbicides and comply with the same PDFs and management restrictions as currently proposed treatments, or if necessary in a new NEPA document. Consequently, effects from future treatment under EDRR are the same as those described for current infestations and it is unlikely that adverse effects would occur under any alternative.

Indirect Effects

Alternatives A through D

Some species utilize insects associated with shrubs or herbaceous vegetation that could be affected by invasive plants; however, these communities make up a minor component of the habitat for cavity nesting species. Overall, invasive plants do not adversely affect habitat for these species. As a result indirect effects to habitat are minor under all alternatives.

Cumulative Effects

Alternatives A through D

Proposed treatments may result in short-term disturbance during treatment; although suitable habitat for these species would remain unchanged and there are no long-term adverse effects to the pileated woodpecker or any cavity excavating species anticipated. Short-term impacts to these species may occur; and would be of limited (localized) extent, though none of the alternatives add to any other past, present or reasonably foreseeable future activity that may be impacting these species and there are no significant cumulative effects anticipated.

Summary of Effects and Determination for Cavity Excavating Species

Alternatives A through D

Potential exists for the pileated woodpecker and other cavity excavating species to be adversely affected by proposed treatments; although preferred forested habitat (e.g. snags) would be unaffected and no long-term effects are anticipated.

Aerial spraying would not occur over forest canopy. Most of the acres to be aerial sprayed are in more open areas. The above ground location of cavity nests is above the point where broadcast herbicides would be applied. The down wood used for nesting is not usually located along roads, which is where much of the treatments are located. As a result, there are **no effects to local populations and distribution** and use of the forest by these species would remain unchanged.

American Marten

Pine marten prefer mature and old growth forest with multiple canopy layers and large amounts of snags and downed woody debris. As a result, preferred habitat is largely unaffected by invasive plants or proposed treatments. However, some sites have canopy gaps large enough for invasive plants to become established, and of the 174,956 acres of forestwide suitable habitat 941 acres contain invasive plants.

There is no suitable marten habitat proposed for aerial spraying and less than 10 acres occur within riparian areas. As a result there is little difference between alternatives in terms of treatment; although less than 20 percent of existing infestations would be treated under Alternative A.

Direct Effects of Treatments

Alternatives A through D

Direct effects from invasive plant treatments are discussed under the Wildlife Effect Section. Invasive plant treatment sites do not occur within preferred marten habitat because marten are closely associated with heavily forested areas and tend to avoid areas that lack overhead cover. However, invasive plant infestations that occur along disturbed roadsides or forested areas used during foraging and dispersal by this species could be directly affected by proposed treatments.

Effects of treatments are discussed under the Wildlife Effect Section. However due the small and scattered nature of treatment areas, any animal disturbed would move into unaffected habitat. As a result any effects would be short term and localized.

Herbicides

Alternatives A through D

Treatments are not proposed in preferred habitat; therefore, potential for exposure to herbicides is low. However, an individual could move through an area that has been sprayed and come into direct contact with herbicides or ingest contaminated prey. At typical application rates there are no herbicides that exceeded the toxicity index for an acute exposure to carnivorous mammal and only triclopyr could result in possible chronic effects if broadcast sprayed. However, with implementation of PDF F-1 triclopyr is restricted to selective treatment only. Potential for exposure of marten to herbicides is further reduced by the fact that marten prefer forested areas that are less likely to contain invasive plants, that less than 1 percent of the forestwide suitable habitat is proposed for treatment and that they forage over large areas and would not consume all of their diet from contaminated prey. As result there are no adverse effects from herbicide exposure anticipated under any alternative.

Early Detection Rapid Response

Alternatives A through D

Future treatments to new invasive plant infestations could occur within suitable habitat marten habitat, although treatment method would vary (See Alternative Comparison above). If this occurs, additional disturbance (all alternatives) and herbicide exposure (Alternatives B, C and D only) could occur. However, future herbicide treatments would use the same herbicides and comply with the same PDFs and management restrictions as currently proposed treatments, or if necessary in a new NEPA document. Consequently, effects from future treatment under EDRR are the same as those described for current infestations and no long-term adverse effect would occur under any alternative.

Indirect Effects

Alternative A

Alternative A treats fewer acres of existing invasive plant infestation Forestwide, restricts chemical control to only three herbicides (See Chapter 2) and would not use herbicides to more effectively control future infestations. Collectively for these reasons, invasive plants would continue to increase. This could result in a localized decrease in habitat for some prey; however, because preferred closed canopy habitat would not likely become infested with invasive plants, any effects to marten habitat would be minor.

Alternatives B through D

All alternatives would reduce existing and control new infestations within suitable marten habitat. Closed canopy forest is not affected by invasive plants; therefore, there would be little change in preferred marten habitat under any alternative. Alternatives B through D would control or contain invasive plants within foraging and dispersal habitat. Effects to marten would be the maintenance of native plant diversity and habitat for prey species within the affected watersheds.

Cumulative Effects

Alternatives A through D

Anticipated cumulative effects to wildlife are discussed under the Wildlife Effect Section and include possible exposure to herbicides and on-going land uses on other ownerships and continued disturbance associated with use of National Forest System lands. The proposed use of herbicides on and off National Forest System lands could result in additive doses of herbicides to marten. Although for this to occur, the two exposures would have to occur approximately at the same time. This is unlikely since the herbicides proposed are rapidly eliminated and do not significantly bio-accumulate (R6 2005 FEIS). Also, the application rates and extent considered in this EIS are unlikely to result in additive doses beyond those evaluated for chronic and acute exposures in the USDA Forest Service risk assessments.

The risk of exposure to herbicide is further reduced by the fact that preferred closed canopy marten habitat is less likely to be affected by invasive plants. marten could be adversely affected by other activities on National Forest System lands as well as other ownerships; though due to the small amount of suitable habitat proposed for treatment (< 1% of the Forest), and considering that suitable habitat on other lands would not likely be treated with herbicides, none of the alternatives would contribute to any other past current or reasonably foreseeable future activity that may be impacting these species and there are no significant cumulative effects anticipated.

Summary of Effects and Determination to Marten

Alternatives A through D

Potential for adverse effects to marten exists under all alternatives; though based on the analysis described above and the following rationale, effects would be short-term. Also, there are no adverse effects related to reproduction or recruitment of local populations**.** **Distribution and use of the Forest by pine marten would remain unchanged.**

- Over 99% of the forestwide pine marten habitat would be unaffected under all alternatives and it is unlikely that an animal would occur within a treatment site
- Use of typical application rates and implementation of PDFs that restrict use of high and moderate risk herbicides would effectively reduce any potential adverse effects associated with herbicide exposure.

3.3.8 Effects to Other Species of Interest

Landbirds/Focal Species

Landbirds, focal species, and priority and unique habitats of local interest were identified in the Affected Environment Section of this analysis (Also See Table 33). Potential effects vary greatly by species. For species that utilize primarily closed canopy forests there would be few if any adverse effects because these areas are generally not infested with invasive plants and would less likely be proposed for treatment. Also, potential effects to cavity nesting species were described above. As a result the evaluation presented here will focus on species that occupy habitats at risk from invasive plant infestations including openings and early successional habitat, as well as priority and unique habitats at risk such as dry forest, riparian woodland and mountain meadow, and steppe shrublands.

Direct Effects

Alternatives A through D

General effects of treatment methods were described under the Wildlife Effect Section. Any species occupying a site during treatment would be disturbed from equipment or human activity on the site. For species that nest in trees effects would be limited largely to short-term disturbance, whereas nest and egg mortality could occur for species that nest on the ground or in low growing shrubs. Treatment areas are small and widely scattered and considering the small acreage of potentially suitable habitat proposed for treatment, potential risks of mortality would be low and of limited extent (i.e. localized).

The diet of many species includes herbaceous material; nevertheless, all species forage on insects and effects from herbicide exposure are evaluated under the insectivorous bird scenario. At typical application rates only NPE surfactant and triclopyr if broadcast sprayed exceeded acute (100% of the daily diet consists of contaminated forage) toxicity thresholds (see Appendix P of R6 2005 FEIS) for small insectivorous birds. Implementation of PDFs would limit the use of triclopyr to spot spray and selective methods only (F-1). NPE would only be applied at levels well below the typical application rate (F-4).

Risks of herbicide exposure would be greater for species with small territories, if most of their territory occurred within a treatment area; however treatment areas are widely scattered. Foliage would intercept much of the herbicide applied, reducing the likelihood that a bird would consume its entire diet of contaminated insects. So while the possibility exists, considering the small amount of any community proposed for treatment and considering that many areas proposed for broadcast treatment would not provide preferred habitat, the likelihood that a bird’s entire territory would occur within a treatment unit, and that it would be exposed to toxic levels of herbicides is low.

Alternative A

Alternative A would pose the least risk from herbicide exposure and disturbance during treatment due to the fewer number of acres treated and considering EDRR treatments are limited to manual methods.

Alternative B

Under Alternative B a total of 22,842 acres would be treated, including 875 acres of aerial spraying and 3,105 acres of riparian habitat that could be broadcast sprayed. This alternative would treat the largest acreage, and because treatment involves aerial application of herbicides as well as broadcast application of herbicides within riparian habitat, the potential for herbicide exposure to landbirds in general, as well as riparian focal species would be greatest under this alternative. All but 32 acres of the areas proposed for aerial application would occur on sites infested with yellow starthistle. This species can form near monotypic stands; therefore, it is unlikely that these areas would be utilized for foraging, reducing the potential for adverse effects from herbicide exposure.

Alternative C

Treatments proposed under Alternative C and the associated effects (described above) would be similar to Alternative B, except that herbicide application within riparian areas would be restricted to spot spray and selective techniques only. As a result, potential risks of herbicide exposure are reduced for riparian dependent species. Also because this alternative controls invasive plants as well as reduces the potential for exposure to riparian focal species, this alternative best meets the conservation strategy identified for riparian woodland and shrub habitat identified in Altman (2006).

Alternative D

Treatments proposed under Alternative D and the associated effects would be similar to Alternative B, except that no aerial application of herbicides would occur. These sites would be treated using bio-control methods; therefore, potential for herbicide exposure would be reduced for species that utilize the steep and relatively rugged areas on this acreage. These areas are largely infested with yellow starthistle; therefore, they do not provide preferred foraging habitat.

Early Detection Rapid Response

Alternatives A through D

Future treatments to new invasive plant infestations could occur within suitable landbird habitat susceptible to invasive plants, although treatment method would vary (See Alternative Comparison above). If this occurs, additional disturbance mortality (all alternatives) or herbicide exposure (Alternatives B, C and D only) could occur. However, future herbicide treatments would use the same herbicides and comply with the same PDFs and management restrictions as currently proposed treatments, or if necessary in a new NEPA document. Consequently, effects from future treatment under EDRR are the same as those described for current infestations, and it is unlikely that adverse effects would occur under any alternative.

Indirect Effects

Alternative A

This alternative would reduce 23 percent of existing invasive plant infestations; therefore, treatment effectiveness is low. Some areas currently infested would go untreated, and because EDRR is limited to manual treatments only, it is likely future areas would become established on many sites. Collectively for these reasons, invasive plants would continue to spread and native plant diversity and suitable habitat for landbirds would be reduced on sites susceptible to invasive plants.

Alternatives B through D

The effectiveness of some treatments would vary somewhat because approximately the same acreage of existing infestations would be treated; therefore, control of existing infestations would be similar. Additionally, all treatments include the use of EDRR, so some control of future infestations would occur under all alternatives. As a result, all alternatives would result in the long-term maintenance of priority and unique habitat susceptible to invasive plant infestations, as well as maintain native plant diversity and migratory bird habitat across the Forest.

Cumulative Effects

Alternatives A through D

Anticipated cumulative effects are discussed under the Wildlife Effect Section. Because of the small home range for most species during the breeding season when invasive plant treatments would occur, it is unlikely that the same birds affected by treatment, would be exposed to herbicide application or other sources of disturbance on other ownerships. Although additional effects could occur from other land uses on NFS lands such as opening maintenance/burning or grazing or timber harvest. While all alternatives would result in some level of risk from possible herbicide exposure, short-term disturbance, or nest mortality, due to the small amount of any vegetative community proposed for treatment, as well as the widespread nature of treatment sites, any adverse effects are of limited extent. Also habitat for most species would be unaffected. As a result, and considering that the proposed treatments would reduce impacts to native plant diversity and suitable landbird habitat, none of the proposed alternatives would measurably contribute to any other past, present or reasonably foreseeable future activity that may be impacting these species and there are no significant cumulative effects anticipated.

Summary of Effects and Determination for Landbirds, Focal Species and Priority or Unique Habitats

Mesic mixed conifer, subalpine forest, aspen and alpine communities are generally not threatened by invasive plants, and there would be little change in these communities or the species that depend on them under any alternative. However, dry forest, riparian woodland shrub, mountain meadow, and steppe shrublands are being adversely affected by invasive plants. The following determinations pertain to these habitats and their associated species, as well as landbirds occupying other vegetative communities proposed for treatment.

Alternative A

Treatments proposed under this alternative could adversely affect landbirds and focal species of the affected communities; however, potential effects would be localized and there are no changes to populations or diversity anticipated. Not all areas currently infested with invasive plants would be treated, and future treatments are not approved; therefore, invasive plant populations would continue to reduce native plant diversity and landbird habitat. Forestwide distribution and use for affected landbirds and focal species would be relatively un-changed over the long term; however, there would be a reduction in habitat for these species within affected watersheds.

Alternatives B through D

Potential exists for landbirds and focal species that occupy communities susceptible to invasive plants to be adversely affected by proposed treatments based on the analysis presented above; although the likelihood of adverse effects is low. As a result, and considering the small acreage proposed for treatment, there are no adverse effects to populations of landbirds or focal species anticipated. Additionally, these alternatives would restore areas currently affected by invasive plants and prevent the spread of future infestations. Consequently, implementation of these alternatives would result in the long-term maintenance and improvement of the dry forest, riparian woodland shrub, mountain meadow and steppe shrublands communities, as well as forest and nonforested landbird habitat that are susceptible to invasive plants.

3.4 Soil and Water

3.4.1 Introduction

The effect of invasive plant treatments on soil and water is a primary public issue. Specifically, there is concern that herbicide treatment may have the potential to adversely affect soils, water quality, and aquatic ecosystems.

While other types of treatments are analyzed, the primary focus of this section is the effect of herbicide treatments on soil and water resources. Project Design Features were developed to minimize the effects of invasive plant treatments on these resources. Predictions on risk to subsurface and surface water resources used the SERA risk assessments in the context of modeling with local soil and rainfall conditions. Risk was evaluated using the Groundwater Loading Effects of Agricultural Management Systems (GLEAMS) modeling for each of the ten herbicides permitted for use in the Wallowa-Whitman Forest Plan as amended by the R6 2005 ROD.

Impacts related to soils were evaluated based on soil drainage characteristics, the ability of soils to bind herbicides, and the relative impact on soil organisms.

Special consideration was given to areas that have high leaching potential and high potential rainfall runoff such as clay soils. Appendix D lists the inventoried invasive plant sites located on well drained soils, clays, and shallow water tables.

Project Area

The project area for direct and indirect effects for water resources is the Wallowa-Whitman National Forest and lands administered by the Forest (approximately 2.39 million acres). Cumulative effects analysis is on the basis of all 5th field watersheds within Wallowa-Whitman National Forest System lands. Approximately 38 percent of the total area of these watersheds is National Forest System lands.

The project area for soils is the weed infested sites currently under consideration for treatment. Invasive plants currently occur on approximately 22,842 acres of the Wallowa-Whitman National Forest.

Methodology for Analysis

This analysis is tiered to the 2005 R6 Invasive Plant FEIS 2005. A primary focus of the site-specific analysis was developing Project Design Features to insure compliance with standards introduced by Region 6 as well as Wallowa-Whitman National Forest Plan standards and guidelines. Information used to develop criteria to minimize effects from treatment included properties of herbicides from SERA risk assessments, properties of soils in relation to herbicide properties, proximity of treatment sites to streams, stream/road connectivity and acres of proposed treatment for each 5th field watershed. To compare alternatives, the acres treated by nonherbicide and herbicide methods were compared within each alternative. For each 5th field watershed, the number of acres of aerial treatment, broadcast treatment (both boom and hand broadcast) versus hand and spot treatment within the RHCA was compared by alternative.

Herbicide degradation in the environment is tied strongly to soils. The analysis focuses on herbicide application since this is the highest risk of the Proposed Actions. Main topics compared across the alternatives are (1) the risks to soil biology, (2) soil and water interactions and (3) vegetation cover and soil erosion.

The FS contracts with Syracuse Environmental Research Associates, Inc. (SERA) to conduct human health and ecological risk assessments for herbicides that may be proposed for use on National Forest System lands. The information contained in this analysis relies on these Risk Assessments. Herbicide effects to stream aquatic resources were analyzed in risk assessments for each of the 10 herbicides included in the Proposed Action. The risk assessments considered worst-case scenarios including accidental exposures and application at maximum reported rates.

The R6 2005 FEIS added a margin of safety to the SERA Risk Assessments by lowering acceptable thresholds of herbicide exposure to account for increased protection needed for federally listed species (US EPA 2004). Although the risk assessments have limitations (see R6 2005 FEIS pages 3-95 through 3-97), they represent the best science available.

The GLEAMS model (Groundwater Loading Effects of Agricultural Management Systems), which is a model that examines the fate of herbicides in various soils under a variety of environmental conditions. This is a well validated model for herbicide transport and represents the best science available at this time. This model was used for all the Forest Service SERA risk assessments.

The SERA Risk Assessment analysis takes the herbicide concentration provided by GLEAMS and uses them in a dilution model for a stream or pond to get the water contamination rates for specific scenarios.

The Risk Assessment model assumes broadcast treatment along a small perennial stream. The model ran a 10 acre square field as well as a treatment area modeled as 50 feet wide and 1.6 miles long (10 acres). The herbicide concentration was very similar for both scenarios. Modeling 10 acres along a stream would over estimate herbicide in streams on the Forest as no broadcast is proposed within 100 feet of a perennial or flowing intermittent stream or 50 feet of a dry intermittent stream (Table 7, and Table 8). However, many treatment areas are larger than 10 acres. In steeper areas, the model may underestimate the herbicide delivery as it assumes a 10 percent slope, although much of the Forest has a steeper slope. The model also assumes even rainfall every ten days.

To model site specific treatment areas for this project, two methods based on the GLEAMS model were used. The first was a modification of the spreadsheets used in the SERA risk assessments. For two roadside treatment sites the spreadsheets developed for the SERA Risk Assessments were modified for type of herbicide, herbicide application rates, soil texture and rainfall conditions found at treatment sites on Forest. These were run for the specific herbicides to be used at these sites to estimate the potential herbicide concentrations in streams after treatment. When specific treatment areas parameters were rerun in the worksheets for this project the upper limit of rain was set at 75 inches a year to model a 2 inches of precipitation in 24 hour event. While the parameters do not always accurately reflect parameters at treatment sites, using this approach is considered conservative because while in actuality the infestations are scattered and broadcast application is not allowed along streams, they are modeled as continuous broadcast next to a stream.

For two larger aerial sites the GLEAMS-Driver was used to model the site because this model allows the user to input more site specific data such as slopes and treatment acres in addition to the herbicide application rate, soil type and rainfall.

For aerial application the model AGDISP was also used to model direct drift from aerial application of herbicide into streams for the worst case scenario allowed under the PDFs of this project.

Past monitoring studies of herbicide use in forested areas were used to create PDFs, particularly stream buffers, near water resources to protect streams from adverse effects from treatments.

3.4.2 Affected Environment

Climate

Elevations range from 875 feet in Hells Canyon, to 9,845 feet in the Eagle Cap Wilderness. Precipitation on the Forest ranges from approximately 8 inches at low elevations to over 80 inches at the highest elevations. Sites infested with invasive plants grow in areas where the precipitations range from 8 to 70 inches, with most sites receiving between 12 and 44 inches of annual precipitation.

Geology

The geology of the Blue Mountains is complex. It consists of older (preTriasic) oceanic volcanic and sedimentary rocks scraped off against what was the continental margin about 200 million years ago. In the Wallowa Mountains a granitic pluton intruded these older rocks about 150 million years ago. Recent volcanism layered the valleys with ash and mud flows in the Eocene (roughly 20-30 m.y.a.), followed by basalt lava flows (Columbia River basalts) in the Miocene (from 2-22 m.y.a.) (Thayer and Brown 1966a, 1966b).

The older rocks are faulted, folded and in some areas metamorphosed. Many of the river valleys within the mountains were created by glaciations. The larger valleys including the valley where the town of La Grande is found was created by faulting.

Hells Canyon was created when a lake upstream of what is now Hells Canyon cut through a spillway and overtime created the canyon (Alt and Hyndman 1978).

Existing Condition for Soils

The Wallowa-Whitman National Forest has complex soils that developed on lower elevation Columbian basalt flows or steep sided, classic dome shaped granitic mountains such as the Blue Mountains and the Wallowa Mountains. Roughly 80 percent of the forest occurs on igneous rock. The geology has strong influences on topography and vegetation that dictate soil formation. Soils are supplemented from volcanic ash that leads to siltloam topsoils.

The geology controls much of the larger scale topography of the Wallowa-Whitman National Forest. Steep topography occurs along the Snake River gorge and along glacial carved mountains. The Snake River gorge has low elevation and thus dryland vegetation. Soils are limited on these steep areas by erosion and dry conditions. Shallow topography on the basalt flows also support dryland vegetation, though with increasing forest species as elevation increases. Mesic forest occurs on north aspects and on upper elevation basalt flows and on mountain slopes.

Most of the Forest soils derived from volcanic, sedimentary or metasedimentary rocks have fine to medium textures. The pyroclastic rocks found in the southern part of the Forest are also fine textured. Granitic rocks such as the granodiorite found in the central Wallowa Mountains, on the Elkhorn Ridge and in the Seven Devil Mountains of Idaho are coarser textured. Volcanic ash, deposited as a result of volcanic eruptions on Mount Mazama and Glacier Peak more than 6000 years ago, still influences soils of the Forest. This ash, which is capable of absorbing and holding large quantities of water, has contributed positively to the productivity of most sites where it is found (USDA Forest Service 1990).

Weeds spread quickly onto dryland forest and grassland soils with the highest rates of spread into disturbed areas.

Where soils are poor native vegetation has a difficult time competing with fast growing invasive weeds (Sutherland 2004). Poor soil conditions also occur on dry southfacing slopes with shallow soils and low available moisture. Disturbed areas have the highest invasive potential with impaired soils that favor opportunistic vegetation. Weed spread is typically highest along roads, within old agricultural fields such as on the mid-level benches and river terraces in Hells Canyon. Weed spread is also common within grazing allotments, past burns, and within timber harvest areas.

Weed treatments are limited by soils where slopes are steep, or by soil texture. Steep rugged areas in Hells Canyon are difficult to access and therefore limit lower risk herbicide treatment methods such as spot spraying.

Soil buildup of herbicide is more common with clay soils whereas soil leaching of herbicide into groundwater is prone to well drained sandy soils. Soils within the project that may have buildup or runoff issues due to high clays include basalt derived soils and old landslide deposits. Soils with high infiltration rates include sandy loam and sand textured soils along drainages or bottomlands.

Soil Conditions within Treatment Areas

Currently, weeds are mapped on the Wallowa-Whitman National Forest for 22,842 acres, approximately 1 percent of the total Forest acreage. The majority of infested sites identified for treatment under this analysis are along roads, quarries, trails and recreation sites. Many of the weed infestations occur where old homesteads and ranches exist along the Imnaha River and Snake River in Hells Canyon. These areas have the highest disturbed soil conditions along with the greatest exposure to traffic, which promotes the introduction and spread of invasive plants.

Soils have reduced properties in these areas as a result of soil displacement, and/or altered soil structure and porosity as a result of compacted mineral soil. In general, conditions affecting vegetative growth such as available moisture holding capacities and soil porosity are likely to have been altered with the loss of mineral organics and forest floor litter/duff layers. As many invasive plants prefer disturbed sites, this creates conditions in which invasive plant species are able to out-compete native species.

Infested sites not along roads can include burned areas and streamside areas that act as a corridor for movement of plants downstream. Burned areas lack plant cover, generally include disturbances from heavy equipment creating fire breaks, and can have changed soil properties due to soil heating, as well as higher nutrient levels for opportunistic vegetation to exploit. Where streams have acted as a corridor for movement of invasive plants downstream, soils are fairly undisturbed, though less developed from recent deposition.

Treatment areas not along roads can include areas burned by fires and areas where streams have acted as a corridor for movement of plants downstream. Where streams have acted as a corridor for movement of invasive plants downstream, soils are fairly undisturbed.

Effect of Invasive Plants on Soils

Invasive plants can affect soils by changing soil properties such as pH, nutrient cycling and microbe composition or activity. The alteration of nutrient availability below ground can shift conditions to favor invasive plants. The long-term effects of these changes are not known.

Soil Biology - Invasive plants may invade disturbed areas and lead to long term changes in the plant/soil community. The ability of nonnatives to move into a site may be from an absence of soil pathogens conditioned to the invading species (Callaway et al. 2004). Also, the presence of nonnative plants can lead to changes in the mycorrhizal fungus community that native species depend on (ibid). These species mediated changes can alter the below ground nutrient regime to favor the invader (Huenneke 1990, Vinton and Burke 1995, Norton et al. 2004), and could increase the difficulty of re-establishing native vegetation after the invasive plants are removed.

Plant and soil communities more resistant to invasive plants are where water and nutrients are scarce (Bashkin et al. 2003, Herron et al. 2001). Within dry shrubland and grassland systems where biotic crusts are abundant, cheatgrass growth can be limited (Gelbard and Belnap 2003). Gundale et al. (2008) showed how cheatgrass was more abundant where soil nitrogen and water availability was higher. Cheatgrass ringed ponderosa pine and Douglas-fir in an open woodland, but was sparse in the dry grassland interspaces. Similarly, more complete use of soil and water resources by plants and soil can lower invasive potential (Levine and D'Antonio 1999). Pokorney et al. (2005) refines this to state an invasive species can have less potential where plant communities have similar species.

In contrast, where soils are productive with large nutrient pools, invasive weeds are exceptional at exploiting resources. This is the case for "strong invaders" such spotted knapweed and cheatgrass (Ortega and Pearson 2005). Invasive plants directly limit or augment nutrient availability by out-competing native species for limited soil resources. Weeds have high nutrient uptake rates and can deplete soil nutrients to very low levels, especially in cases where weed species germinate prior to native species and exploit nutrient and water resources before native species are actively growing (Olson 1999). Once more, Bashkin et al. (2003) found that in the arid environment of Escalante National Park, invasion by weeds was tied to areas with high available nutrients nitrogen and phosphorus. Thus, the more productive soils on the benchlands and footslopes of Hells Canyon may have the greatest incursion of invasive plants given the combination of more productive soils and past disturbance. Similar results were found with cheatgrass along tree fringes (Gundale et al. 2008).

Once established, weeds can influence the soil nutrient environment to favor their re-establishment. Cheatgrass, an annual grass, can alter nutrient cycles away from conditions to which native species have adapted (Norton et al. 2004). Specific changes to soil nutrient regimes are associated with large spotted knapweed infestations (Lejeune and Seastedt 2001).

Some invasive plants are allelopathic to other plants, and produce secondary compounds that directly impact the soil microbial community (Bais et al 2003). These changes will affect the soil food web and nutrient cycling, and may have impacts on the native plant community. Spotted knapweed displaces native vegetation by exuding the phytotoxin, catekin, from its roots (ibid). Similarly, Burke et al. (1998) showed the influence of different plant groups on available mineral nutrients. With weed invasions, a shift occurs from perennial grasses to forbs and/or annual grasses, with an accompanying shift in the timing and amount of nutrients (Burke et al. 1998, Hooper and Vitousek 1998).

Soil and Groundwater – The rate and volume of water infiltration can be reduced on weed infested sites due to reduced cover (DiTomaso 2000, Olson 1999a). Significantly greater surface water runoff, indicating less infiltration, was measured from spotted knapweed dominated sites compared to adjacent native grass dominated sites (Lacey et al. 1989). These changes may occur as a site shifts from bunchgrass dominated vegetation to individual stemmed forb vegetation as found with spotted knapweed (Lacey et al. 1989). Compaction present in many weed infested sites also reduces infiltration rates.

Vegetative Cover and Soil Erosion- Total vegetative cover can be reduced on weed infested sites where strong invaders out compete native vegetation.

The presence of strong invaders such as spotted knapweed can lower the prevalence of native perennial forbs and grasses (Ortega and Pearson 2005). In heavily invested sites by single stemmed invasives, this shift in plant function al type leads to more exposed mineral soil on the surface with higher evaporation (Lacey et al. 1989, Burke et al. 2005, Olson 1999).

Soil water stored deeper in the soil profile may also be depleted more rapidly on sites where vegetative cover provided by weeds is dense and associated transpiration rates are high (Olson 1999).

Weed infested soil has been shown to be more susceptible to erosion than soil occupied by native grass species (Lacey et al. 1989). Soil erosion in a simulated rainfall test more than doubled in spotted knapweed-dominated rangeland areas when compared to natural bunchgrass/forb grasslands (Lacey et al 1989). In the Wallowa-Whitman National Forest, the highest potential for soil erosion would occur on disturbed sites such as old homesteads with old cultivated lands, or where heavy grazing has occurred.

The mid elevation benches and river terraces in Hells Canyon National Recreation Area has a high amount of historic disturbance. The historic disturbance has left residual impacts that have higher bare soil and plant groups that offer less erosion protection. The ecology plots within the Hells Canyon area indicate dry grasslands in good condition range from 3-15 percent bare ground (Johnson and Swanson 2005). Increase of exotic annual grasses and forbs is accompanied by increases in bare soil from 15 to more than 25 percent (Ibid). The main difference between annual and perennial grasslands is the reduction in groundcover associated with single stemmed annual grasses, much like the transition from perennial bunchgrasses to more forbs. Vegetative groundcover protects soils from wind and water erosion along with raindrop splash effects (Elliot 1999). A certain level of bare soil exists in the moderate condition perennial bunchgrass communities since not all interspaces are vegetated. Also, remnant soil compaction from past cultivation and heavy grazing can reduce infiltration thereby increasing erosive overland runoff.

Existing Condition for Water Resources

Water quality and riparian condition are the two elements potentially affected by invasive plant treatments. The 22,842 acres of invasive plants that are inventoried are scattered across the Forest in 53 5th field watersheds. Of these, 6,345 acres (28 %) are within PACFISH/INFISH defined Riparian Habitat Conservation Areas (RHCAs).

Water Quality

Water quality standards are established to protect beneficial uses of the State's waters. Beneficial uses in Oregon are assigned by basin in the Oregon Administrative Rules for Water Quality (DEQ 2010).

When a water quality standard is established, the first step is to identify the beneficial uses sensitive to the parameter. Then criteria are established based on the levels needed to protect the sensitive beneficial uses. Table 38 displays beneficial uses by basin for Oregon and Idaho.

Table 38-Beneficial uses by basin for Oregon and Idaho

Beneficial Use	Oregon				Idaho
River Basin	Snake	Grande Ronde	Powder/Burnt	John Day	Not identified by basin
Public domestic	X	X	X	X	X
Private domestic	X	X	X	X	X
Industrial	X	X	X	X	---
Irrigation	X	X	X	X	X
Livestock	X	X	X	X	X
Aquatic	X	X	X	X	X
Wildlife	X	X	X	X	X
Fishing	X	X	X	X	X
Boating	X	X	X	X	---
Recreation	X	X	X	X	X
Aesthetic	X	X	X	X	X
Hydropower	X	---	---	---	---
Navigation	X	---	---	---	---

Section 303d of the Clean Water Act requires that states develop a list of waterbodies that do not meet standards and submit the list for approval to the US Environmental Protection Agency (EPA). Oregon developed its most current 303(d) list in 2004/2006 and Idaho developed their list in 2002. These water quality limited streams and the parameters they are listed for are shown in Table 39.

Temperature is the most widespread water quality impairment followed by sediment. High temperatures coinciding with low rainfall and low stream flow during the summer months cause stream water temperatures within the area to increase to high levels. South-facing aspects and lower elevations tend to create drier and hotter conditions, which serve to further elevate temperatures under these conditions.

Table 39-Water quality impaired streams within the Wallowa-Whitman National Forest on the Oregon or Idaho 303(d) list that have invasive plant sites within 100 feet of the stream

Stream	Parameter 1	Parameter 2	Acres of Infestation within 100 feet of listed segment of stream
Auburn Creek	Temperature		11.5
Bear Creek	Temperature		0.9
Chesnimnus Creek	Temperature		5.7
Crazyman Creek	Temperature		5.8
Crow Creek	Temperature		0.5
Dry Creek	Temperature		11.2
Freezeout Creek	Temperature		1.0
Grande Ronde River	Temperature		7.6
Granite Creek	Temperature		17.0
Gumboot Creek	Temperature		43.3
Imnaha River	Temperature		68.7
Joseph Creek	Temperature		0.3
Little Sheep Creek	Temperature		0.7
Minam River	Temperature		3.0
Mud Creek	Temperature		8.1
Pine Creek	Temperature		0.1
Sawmill Creek	Temperature		31.3
Wallupa Creek	Temperature		4.1
Wildcat Creek	Temperature		10.4
Snake River	Temperature	Mercury	17.2
Total treatment acres along 303d listed segments of streams			**248.5**

*Acres of invasive plants proposed for treatment to contain, control or eradicate the target species

By direction of the Clean Water Act, where water quality is limited, state agencies develop Total Maximum Daily Load (TMDL) plans to improve water quality and to support the beneficial uses of water. For water quality limited streams on National Forest System lands, the USDA Forest Service provides information, analysis, and site-specific planning efforts to support state processes to protect and restore water quality.

Two TMDLs have been completed for streams partially located on the Forest. The TMDLs were developed on a subbasin level, not for individual streams. They are for the Snake River-Hells Canyon Subbasin and the Upper Grande Ronde River Sub-Basin.

For the Snake River both Oregon and Idaho worked on the document using the larger 303d list from Idaho. Within this subbasin, all designated beneficial uses and the following listed pollutants have been addressed by the TMDL: bacteria, nutrients, nuisance algae, dissolved oxygen, pesticides, pH, sediment, temperature, and total dissolved gas. The document recommends that the segment addressed by this TMDL be delisted for bacteria and pH. The mercury TMDL has been postponed due to a lack of water column data.

State of Oregon completed the Upper Grande Ronde River Sub-Basin Total Maximum Daily Load and Water Quality Management Plan (WQMP) in December 1999. The document established water quality goals for the streams of the Upper Grande Ronde. The TMDL analysis assigned pollutant loads for water temperature and the WQMP established water quality goals to meet the TMDL, and removes streams from impairment listing (303d). No TMDL for sediment was developed in the Upper Grande Ronde Sub-basin. The state determined that, "the load allocations provided to address temperature, pH, and dissolved oxygen standard violations, coupled with ongoing efforts by the U.S. Forest Service (USFS) to reduce loads from roads and other sources, will be adequate to address sedimentation and turbidity concerns in the Upper Grande Ronde Sub-Basin." To insure that sediment standards are met, long-term monitoring is ongoing.

State of Oregon is currently working on the Lower Grande Ronde River Sub-Basin Total Maximum Daily Load TMDL) and Water Quality Management Plan (WQMP). The document will establish water quality goals for the streams of the Lower Grande Ronde.

Geology and stream type play an important role in determining sediment sources, and the fate of sediment entering streams. The majority of perennial and intermittent streams across the Forest, have moderate to high gradients, therefore they tend to transport rather than store sediment. In general, these stream types are not susceptible to fine sediment accumulations. Lower gradient (less than 2 percent) response reaches occur in the main valleys of larger streams. Low gradient meadow systems in the higher elevations are also areas of sediment accumulation.

Bacteria may be a concern in localized areas with heavy recreation use and heavy grazing pressure. The ability of water to hold oxygen decreases with increased water temperature, altitude, or dissolved solids (TDS). Dissolved oxygen (DO) can be lowered by high stream temperatures, bacteria blooms, and decaying vegetation in water, although no streams on the Forest are listed for low DO.

Effect of Invasive Plants on Water Quality

Stable banks tend to provide more shade which helps reduce water temperature. While invasive plants may provide some shade they are replacing native forbs and grasses that are better bank stabilizers and promote narrower-deeper channels. Such channels have healthier temperature gradients than wide, shallow streams.

There are 77.5 acres of Japanese knotweed along the Snake River (55 acres within RHCAs), and has poor bank holding capacity, which leads to more bank erosion and sedimentation of streams in high winter flows (USDA Forest Service, 2005a). While knotweed may provide some shade, native streamside hardwoods are much taller and provide more dense shade, so knotweed dominated areas may be associated with higher water temperatures than areas with native forest communities. While the known extent of knotweed 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).

Purple loosestrife is an aggressive invasive plant species that out competes native vegetation and forms a monoculture. It grows quickly and spreads by roots, stem fragments or seeds (ibid). On smaller streams purple loosestrife can increase fine sediment deposition, smothering spawning gravels and decreasing channel capacity (R6 2005 FEIS).

While the other invasive plant species found on the Forest are primarily upland species, they can colonize a range of sites and are present within many RHCAs.

One of the more prevalent species on the Forest and within RHCAs is knapweed. Diffuse and spotted knapweed is found along many streams in the Forest. Lacey et al. (1989) reported higher runoff and sediment yield on sites dominated by knapweed versus sites dominated by native grasses.

Without treatment, all of these species are expected to continue to spread. Where they spread, banks could become less stable, leading to changes in suspended sediment and substrate character and embeddedness.

Channel Morphology and Riparian Condition

Riparian shrubs are lacking on many Forest streams. There is over utilization of riparian vegetation in some areas by domestic livestock and wildlife. Large wood is lacking in many streams on the Wallowa-Whitman National Forest, particularly where roads parallel streams. However, in recent years degraded riparian areas have been improved to provide for riparian-dependent resources. These improvements have resulted from better control and administration of livestock use in riparian areas, reduced timber harvest in forested riparian areas, and more roads being closed or obliterated.

Native riparian vegetation plays a key role in forming aquatic habitat for fish and other aquatic species. Roots help stabilize stream banks, preventing accelerated bank erosion and providing for the formation of undercut banks, important cover for juvenile and adult fish. Riparian vegetation also provides large and small wood to streams, adding to habitat complexity and providing cover and food sources for aquatic organisms. Aquatic ecosystems have evolved with certain vegetation types; invasive plants do not necessarily provide similar habitat. Japanese knotweed has poor bank holding capacity, which leads to more bank erosion and sedimentation of streams in high winter flows (USDA Forest Service 2005a). Knotweeds tolerate a wide variety of substrates from cobbles to fine soils (Tu and Sol, 2004).

Lakes and Reservoirs

There are many lakes and small waterbodies on the Forest. Phillips Lake and Wallowa Lake are the largest at 1,748 acres and 1,687 acres respectively. The smallest waterbodies are less than an acre. Lakes are popular for recreation, and so are at risk from invasive plants brought in by visitors. They are also at risk from invasive plants such as knotweeds that colonize areas downstream of the original infestation along streams.

There are 13 acres identified at five sites for treatment within 100 feet of lakes, reservoirs and ponds (Table 40). All invasive plants identified are upland species with infestations starting along roads in recreation areas.

Table 40-Invasive Plant Acres within 100 feet of lakes and reservoirs

Waterbody Name	Waterbody size (Acres)	Invasive Plant Species Found	Acres Infested
Goose Lake	2.40	hoarycress whitetop, Canadian thistle, sulphur cinquefoil, medusa head*	6.10
Phillips Lake	1,748.00	diffuse knapweed	0.70
Le Grande Reservoir	35.20	Canadian thistle	2.50
Balm Creek Reservoir	88.00	diffuse knapweed, hoarycress whitetop*	0.50
Clear Creek Reservoir	38.30	Canadian thistle	3.10
Total			**12.90**

*Overlapping infestations at the same site

Municipal Watersheds and Domestic Water Supplies

The legally designated municipal water supplies in the project area are the Baker Municipal Watershed and the La Grande Municipal Watershed (although the city is not currently drawing water from this watershed). No invasive plant treatment sites are within the Baker Watershed, therefore no treatments of any kind are proposed. No chemical treatments are proposed within the La Grande Watershed. Biological controls are being used to treat the less than three acres of Canada thistle mapped within the La Grande Municipal Watershed.

Several other communities rely on the Forest for municipal water. For instance, the Community of Sumpter obtains its water from the McCully Fork of the Powder River, Granite from a spring located on Forest System land, and Union utilizes water from Catherine Creek. In addition, Wallowa and Joseph receive all or part of their domestic water supplies from streams originating on National Forest System land. The City of Halfway possesses a special use permit for use of Leep Springs as a domestic source, although it currently is not using this supply (USDA Forest Service 1990). McCully Fork has invasive plant sites identified for Scotch thistle, diffuse knapweed, Dalmatian toadflax, and St Johnswort. These sites are along the roads paralleling the stream. See Appendix D for a more complete listing of cities and towns that receive municipal water supplies from Wallowa-Whitman National Forest System lands.

There are also wells and springs used for domestic water at campgrounds and private water rights on isolated springs on the Forest. The National Forest has 1,462 identified water uses in its most recent water uses inventory. The inventory includes 14 Forest Service campgrounds and 2 picnic areas with piped-in water. Two uses for irrigation (pastures) have been identified. The remaining 1,431 uses are associated with stock watering (USDA Forest Service 1990). The listing of municipal water supply sources for campgrounds and picnic areas are listed in Appendix D. This project adheres to all of the above protection measures and adds site specific design criteria to further protect water quality, meeting the requirements of the Clean Water Act. No herbicide use is proposed within municipal watersheds.

Infestations by Watershed

Most of the 5th field watersheds have less than 1 percent of the Forest land identified as infested with invasive plants (Table 41). The watersheds with the largest infestations are the Middle Imnaha River with almost 7 percent infested, Snake River/Temperance Creek with 1.9 percent infested and South Fork Burnt River with 1.7 percent infested.

Table 41-Infested acres proposed for treatment by watershed

Fifth Filed Watershed Name	Watershed HUC Number	Watershed Acres	Infested Acres Proposed for Treatment	Percent Watershed Treated	Infested Acres in RHCAs* Proposed for Treatment
Bear Creek	1706010504	46,300	400	0.86%	115
Big Creek	1705020307	54,896	92	0.17%	51
Birch Creek	1707010306	182,206	6	<0.01%	0
Burnt River-Auburn Creek	1705020205	60,006	295	0.49%	164
Burnt River-Big Creek	1705020204	94,102	20	0.02%	1
Burnt River-Burnt River Canyon	1705020206	54,081	63	0.12%	4
Camp Creek	1705020203	51,954	275	0.53%	65
Chesnimnus Creek	1706010604	122,765	398	0.32%	66
Eagle Creek	1705020310	123,643	846	0.68%	164
Grande Ronde River-Beaver Creek	1706010403	131,649	338	0.26%	91
Grande Ronde River-Five Points Creek	1706010404	87,632	49	0.06%	6
Grande Ronde River-Indian Creek	1706010409	96,033	26	0.03%	13
Grande Ronde River-Mud Creek	1706010602	154,202	653	0.42%	49
Granite Creek	1707020202	94,513	411	0.43%	156
Ladd Creek	1706010406	59,542	53	0.09%	34
Little Malheur River	1705011612	86,434	3	<0.01%	0
Lostine River	1706010502	58,035	142	0.24%	28
Lower Big Sheep Creek	1706010204	129,726	182	0.14%	125
Lower Catherine Creek	1706010407	83,128	419	0.50%	42
Lower Imnaha River	1706010205	147,024	436	0.30%	156
Lower Joseph Creek	1706010606	104,789	450	0.43%	75
Lower Powder River	1705020311	61,488	16	0.03%	0
Lower Wallowa River	1706010506	110,422	198	0.18%	85
McKay Creek	1707010305	127,200	62	0.05%	0
Meadow Creek	1706010402	116,100	459	0.40%	225

Fifth Filed Watershed Name	Watershed HUC Number	Watershed Acres	Infested Acres Proposed for Treatment	Percent Watershed Treated	Infested Acres in RHCAs* Proposed for Treatment
Middle Imnaha River	1706010202	87,983	5,879	6.68%	1,250
Middle Wallowa River	1706010503	85,060	9	0.01%	4
Minam River	1706010505	152,910	115	0.08%	60
North Fork Burnt River	1705020201	124,147	1,171	0.94%	229
North Powder River	1705020305	74,553	144	0.19%	38
Pine Creek	1705020106	193,640	794	0.41%	339
Powder River-Baldock Slough	1705020303	72,489	50	0.07%	22
Powder River-Rock Creek	1705020304	120,776	75	0.06%	25
Powder River-Ruckles Creek	1705020308	166,729	1,327	0.80%	497
Powder River-Sutton Creek	1705020302	115,886	274	0.24%	92
Powder River-Wolf Creek	1705020306	109,371	58	0.05%	11
Snake River-Cherry Creek	1706010301	88,100	333	0.38%	117
Snake River-Granite Creek	1706010101	127,510	100	0.08%	25
Snake River-Indian Creek	1705020107	117,761	50	0.04%	7
Snake River-Temperance Creek	1706010102	115,290	2,142	1.86%	740
Snake River-Wolf Creek	1706010103	103,723	365	0.35%	116
South Fork Burnt River	1705020202	75,183	1,281	1.70%	75
South Willow Creek	1705011901	65,950	49	0.07%	4
Upper Big Sheep Creek	1706010203	89,359	341	0.38%	174
Upper Camas Creek	1707020205	104,623	32	0.03%	0
Upper Catherine Creek	1706010405	116,931	19	0.02%	4
Upper Grande Ronde River	1706010401	133,776	330	0.25%	187
Upper Imnaha River	1706010201	90,349	686	0.76%	332
Upper Joseph Creek	1706010605	125,191	421	0.34%	120
Upper North Fork John Day River	1707020201	71,525	30	0.04%	2
Upper Powder River	1705020301	105,509	461	0.44%	154

Fifth Filed Watershed Name	Watershed HUC Number	Watershed Acres	Infested Acres Proposed for Treatment	Percent Watershed Treated	Infested Acres in RHCAs* Proposed for Treatment
Upper Wallowa River	1706010501	157,943	7	<0.01%	6
Willow Creek	1706010408	53,565	5	0.01%	0
Totals		**5,483,703**	**22,840**	**0.42%**	**6,345**

*Total for watershed differs by 2 acres from proposed action table due to rounding differences in GIS. RHCA number includes chemical treatment, biocontrol and mechanical or hand treatments.

Invasive Plants within RHCAs

All of the invasive plants listed in treatment areas are found within RHCAs as well as in uplands. Most the invasive plant species found within the RHCAs originate from disturbed sites. Perennial bugloss at 1,256 acres, diffuse knapweed at 1,214 acres and Canada thistle at 1,155 acres are most prevalent with the RHCA.

Both Canada thistle and diffuse knapweed are commonly found in open disturbed areas along roads or in areas frequented by cattle. Perennial bugloss was originally planted at an old homestead and has since spread through the valley along the Imnaha River. Once established any of these species can begin to invade undisturbed sites. Many other species found within the RHCAs are of concern. In particular medusa head, leafy spurge and yellow star thistle are aggressive spreaders. White top forms a monoculture and may spread rapidly under moist conditions (Botany Section).

Of the 6,345 acres infested with invasive plants within PACFISH/INFISH Riparian Habitat Conservation Areas (RHCAs) only Japanese knotweed and purple loosestrife are specifically riparian species. There are approximately 77 acres of Japanese knotweed (54 acres within RHCAs) and 2.5 acres of purple loosestrife (0.4 acres within RHCAs) found along the Snake River and tributaries to the river.

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 (U.Gergia 2005).

Purple loosestrife is on the Nature Conservancy's list of worst invasive plant species (Steinn and Flack, eds 1996). Purple loosestrife, nicknamed the purple plague, is another aggressive invasive plant species that out competes native vegetation and forms a monoculture. It grows quickly and spreads by roots, stem fragments or seeds (ibid). On smaller streams purple loosestrife can increase fine sediment deposition, smother spawning gravels and decrease channel capacity (USDA Forest Service 2005a).

3.4.3 Environmental Consequences

Introduction

With the exception of aerial spraying herbicides, all alternatives, including the No Action Alternative, allow similar methods of treating invasive plants. Alternative B has the most aggressive management using herbicides. Alternative C omits broadcast spraying in RHCAs. Alternative D omits aerial herbicide application. In addition, all the action alternatives include an early detection rapid response (EDRR) process to address new or unknown infestations over the next 10 to 15 years. Project Design Features such as riparian buffers, frequency of application limitations, and herbicide limitations specific to soil type, lower the risk of chemical contamination to RHCAs. These protective measures would work equally well for EDRR sites that would be identified in the future. It is important to acknowledge that aerial and ground broadcast methods have higher risk for unknown variables such as wind drift and rainfall intensity. No herbicide application would occur within municipal watersheds or on domestic water supplies under any alternative. Water contamination risk from herbicide drift, runoff or leaching is low based on evaluation of herbicide application in the Risk Assessments and added herbicide restrictions.

No long term impacts to soils are expected at the Forest scale, although some adverse effects from these actions are unavoidable. Adverse impacts include local effects on some groups of micro-organisms that may be temporarily sensitive to picloram (Tordon), sulfometuron methyl (Oust), and triclopyr (Garlon, Access).

The following sections discuss the general effects of manual, mechanical and herbicide treatments on soil and water resources. Specific differences in alternatives are detailed after the general discussion.

Soils

The following table summarizes the herbicides available for treatment with regard to soil.

Table 42-Herbicide Properties

Herbicide	Toxicity to Soil Microbes	Potential Mobility[1]	Water Solubility[1]	Degradation path and half life[2]	Activation Mechanism[2]
Chlorsulfuron	Low	High Very high in clay soils	Very High	Hydrolysis 37-168 days	Acetolactate synthesis inhibitor (Selective: controls broadleaves and some grasses)
Clopyralid	Low	Very high especially in sandy soils	High	Soil microbes 14 to 29 days	Plant growth regulator (Very selective to broadleaves; post emergent)
Glyphosate	Low	Low	Very High	Soil microbes 30 to 60 days	Inhibits 3 amino acids and protein synthesis (Nonselective; quickly absorbed by leaves with rapid movement through plant; no root absorption)
Imazapic	No info	Medium (Lower with increased organic Matter)	Very High	Soil microbes 113 days	Acetolactate synthesis inhibitor (Uptake by roots & leaves; active in soil as pre-emergent)
Imazapyr	Slight at high application rates.	Medium (low Organic Matter and high pH raise mobility)	Very High	Soil microbes 30 to 365 days	Acetolactate synthesis inhibitor (Uptake by roots & leaves; active in soil as pre-emergent)
Metsulfuron methyl	At high application rates short-term decrease for a few days but reversed quickly.	Very High	High	Slow microbial degradation at high pH, fast at low pH Up to 120 days	Acetolactate synthesis inhibitor (Potent herbicide; uptake by roots & leaves)

Herbicide	Toxicity to Soil Microbes	Potential Mobility[1]	Water Solubility[1]	Degradation path and half life[2]	Activation Mechanism[2]
Picloram	Toxic to some soil organisms, even at low levels.	Very High	Very High	Slow microbial 90 days	Plant growth regulator (Selective: rate and season dependant; pre-emergent and soil active)
Sethoxydim	Low	Medium (Organic Matter decreases)	Very High	Rapid microbial 5 to 25	Inhibits acetyl co-enzyme (ACE) (Systemic that is absorbed rapidly by foliage and roots.
Sulfometuron methyl	Toxic to soil organisms. Soil residues may alter composition of soil microorganisms	High	Medium	Soil microbes 10 to 100 days	Acetolactate synthesis inhibitor (Nonselective pre and post emergent - uptake by roots & leaves. Potent herbicide)
Triclopyr	Inhibits algae at low rates Toxic to fungi at high rates.	Very High	Medium	Soil microbes 46 days	Plant growth regulator (Absorbed thru roots, foliage and green bark)

1 Mobility and water solubility categories are general breakdowns and not a definitive classification taken from the R6 2005 FEIS
2 Deschutes, Ochoco and Crooked River National Grasslands Invasive Plant EIS Soils Report, (Sussmann 2006)
Data compiled from the R6 2005 RODand The Nature Conservancy Weed Control Methods Handbook (Tu et al. 2001)

Vegetation Cover and Erosion

The treatment of sites with herbicides could also indirectly affect soil productivity in the short term by changing the vegetative cover on the surface and the annual input of organic matter into the soil. These effects would occur on heavily infested sites with invasive plants that are moving toward monocultures, including those with hawkweed and whitetop.

Chemically treated plants would die and become incorporated into the soil as organic matter during the first years following treatment. Annual input in subsequent years would be contingent on the amount of regrowth of nontarget plants. If native populations were less than 30 percent vegetative canopy cover, native or naturalized species would be reseeded under all action alternatives. The 30 percent threshold canopy cover is based on recommendations from the Montana State Extension Service (Goodwin et al. 2002).

Herbicides would impact plant canopy cover greatest where broadcast spraying is planned. The overall risk for soil erosion is low, although erosion risk would increase on moderately steep slopes with fine textured soils. Erosion risk would be short term, within 1 to 2 years. Monoculture stands of target weeds such as whitetop and meadow hawkweed would have the highest mortality rates and thus have the greatest bare soil available to erosive waterflows and wind. Other target weeds such as the knapweeds, medusahead, and starthistle may also have monoculture stands.

Rugged steep slopes such as in Hells Canyon are not expected to have high erosion risk. Observations by The Nature Conservancy on aerial sprayed lands adjacent to the Wallowa-Whitman National Forest indicate dry grasslands on rugged steep slopes rebound readily after herbicide treatment (Talsma et al. 2006, unpublished). Possibly, the lack of disturbance on the steep slopes creates a higher level of residual grassland for regrowth after treatment. In contrast, the moderate slope areas would have the greatest erosion potential since these areas have past disturbance coupled with finer soil texture and enough slope to drive erosive overland water flows.

Erosion hazard was evaluated for the broadcast spraying sites greater than 50 acres where erosion potential would be highest (Table 43). Physiographic data on slope, slope length, soils, vegetation type along with the type of herbicide treatment and target invasive was combined to model erosion risk. The Water Erosion Prediction Model (USDA Forest Service 2007) was used to generate data on soil erosion in tons/acre, using local climate information and the site physiographic data. The WEPP model has limitations with an error rate of +/- 50 percent; however, this model does provide a great context for erosion that integrates hillslope processes and local climate. The gross values are sufficient given the large forestwide scale for this EIS.

Erosion risk would be short term from herbicide treatment and generally less than 1 ton/acre using a 2 year storm event, such as a summer thunderstorm. These results assume that at least 50 percent of the ground cover would remain following spraying. Where large monotypic infestations occur, erosion may be up to 4 tons/acre, assuming groundcover is reduced to 30 percent. These estimates are based on the an average of 25 percent reduction in plant cover for most of the target weeds after treatment, and up to 55 percent for monotypic stands such as whitetop and meadow hawkweed (Dawson 2007, personal communication).

Erosion potential where annual grasses are treated may be slightly higher since the groundcover would be less effective at slowing erosive overland waterflows given the very fine plant litter.

Of the sites evaluated, most had moderate risk for soil erosion after herbicide treatment (Table 43). These included hillside areas adjacent to old ranches or road corridors. Higher risk was associated with common crupina and whitetop on moderate to steep slope near ranches in addition to diffuse knapweed along roads with steep cutslopes.

Scotch thistle has low risk soil erosion since it occurs in smaller aggregations and therefore less groundcover would be lost.

Table 43-Potential surface erosion for 2 year storm with groundcover at 10, 30 and 50 percent

NXWD_TAG	Acres	Noxious Weed	Veg-type	Slope	Erosion Hazard	Notes
6160400092	5808	common bugloss (*Anchusa arvensis)*	Dry Forest	0 to 50 %	Moderate	Hillside
6160700061	914	medusahead (*Taeniatherum caput-medusae)*	Dry Forest	30 to 60 %	Moderate	Hillside
6160400075	677	Canada thistle (*Cirsium arvense)*	Moist Forest	60 to 90 %	Moderate	Road corridor
6160200301	284	common crupina (*Crupina vulgaris)*	Dry NonForest	60 to 90 %	High	Hillside
6160400295	340	hoarycress, whitetop (*Cardaria draba)*	Dry NonForest	0 to 30 %	High	Old ranch/hillside
6160400046	254	Scotch thistle (*Onopordum acanthium)*	Dry NonForest	15 to 50 %	Low	Footslope, low elevation
6160400007	232	spotted knapweed (*Centaurea maculosa)*	Moist NonForest	0 to 15 %	Moderate	Road corridor
6160500003	187	Diffuse knapweed (*Centaurea diffusa)*	Moist Forest	30 to 60 %	Moderate	Road corridor
6160500026	161	Diffuse knapweed (*Centaurea diffusa)*	Moist Forest	60 to 90 %	High	Road corridor
6160400319	154	Scotch thistle (*Onopordum acanthium)*	Dry Forest	30 to 60 %	Moderate	Hillside-converging drainage/incised gorge
6160700160	78	Dalmation toadflax (*Linaria dalmatica)*	Moist NonForest	10 to 90 %	High	Road/hillside on toeslope fan
6160600183	134	Diffuse knapweed (*Centaurea diffusa)*	Dry Forest	30 to 60 %	Moderate	Road corridor
6160600191	103	Canada thistle (*Cirsium arvense)*	Moist Forest	30 to 60 %	Moderate	Road corridor
6160900096	95	Hoarycress, whitetop (*Cardaria draba)*	Moist Forest	30 to 60 %	Moderate	Road corridor
6160700156	90	Canada thistle (*Cirsium arvense)*	Moist Forest	0 to 30 %	Moderate	Road/hillside
6160100006	88	Canada thistle (*Cirsium arvense)*	Dry Forest	30 to 60 %	Moderate	Road corridor

6160500004	87	Diffuse knapweed (*Centaurea diffusa)*	Moist Forest	30 to 60 %	Moderate	Road corridor
6160600015	85	Diffuse knapweed (*Centaurea diffusa)*	Moist Forest	0 to 30 %	Moderate	Road corridor
6160700010	75	Diffuse knapweed (*Centaurea diffusa)*	Moist Forest	30 to 60 %	Moderate	Road/hillside
6160400314	15	Scotch thistle (*Onopordum acanthium)*	Dry NonForest	60 to 90 %	Low	Hillside/trailside
6160100085	60	Sulphur cinquefoil (*Potentilla recta)*	Dry Forest	30 to 60 %	Moderate	Hillside/Roadside
6160200025	58	Scotch thistle (*Onopordum acanthium)*	Dry NonForest	60 to 90 %	Low	Road corridor
6160100125	54	Houndstongue (*Cynoglossum officinale)*	Dry Forest	30 to 60 %	Moderate	Road corridor

Summary of Soil Concerns with Specific Herbicides and Project Design Features

Clopyralid has high potential mobility in sandy soils. To minimize movement of clopyralid through soils into groundwater, clopyralid would not be used on high-porosity soils (more than 20 percent coarse fragments or coarser texture than loamy sand) (Herbicide Label Advisory).

Since Chlorsulfuron does not adhere to clay particles, chlorsulfuron would be avoided on soils with high clay content (finer than loam) to limit herbicide movement (Herbicide Label Advisory).

Picloram and sulfometuron methyl have high persistence in soil and groundwater. To avoid soil buildup and contamination of groundwater, herbicide frequency is limited to once every year at any specific site for sulfometuron methyl (SERA 2004) and once every two years for picloram (SERA 2003).

Picloram has very high mobility and longer persistence, and thus has risk for contaminating groundwater (SERA 2003). To avoid this threat, picloram would not be used on coarse-textured soils with a high water table.

After herbicide treatment, a greater than 70 percent reduction in existing live basal plant cover indicates active restoration is needed (Goodwin et al. 2002). Restoration measures listed in Erickson et al. (2003) are recommended.

Risk for replacement of a target invasive weed with another invasive would be evaluated prior to broadcast herbicide treatment in accordance with long term site planning (Standards 3 & 12, W-W LRMP as amended by the R6 2005 ROD).

Historically disturbed areas such as old ranches and homestead areas have shifted plant/soil ecology. Therefore, emphasize long term site planning for these sites (Standards 3 & 12, W-W LRMP as amended by the R6 2005 ROD) using active restoration measures listed in Erickson et al (2005).

General Effects of Manual and Mechanical Treatment

Manual and mechanical treatments are proposed under all alternatives. The overall impacts of these activities are low. Manuel methods would decrease ground cover temporarily leading to incremental effects from erosion or slight decreases in soil moisture from groundcover reductions. Mechanical methods would not lead to adverse effects on soils since soil organic matter would be supplemented from cut vegetative material and off road vehicle use would be limited.

Mechanical treatment would include mowing or use of foaming or steaming machines on and off roads. Compaction of soil is avoided by restricting all vehicles to the road prism except for ATVs. ATVs have low tire pressure and thus would not have measurable impacts on soils when used judiciously.

General Effect of Biological Control

Biological control can be defined as the use of natural enemies to reduce the damage caused by invasive plant populations. The primary effect from biological controls is standing dead plants.

General Effects of Cultural Treatments

The cultural treatments descriptions and effects are the same as those described under 'cultural treatments' in Section 3.4.3 above. No effects to groundwater are expected due to cultural treatments. Typically, fertilizers would remain high in the soil horizons and quickly be utilized by plants on site. Cultural treatments would tend to have a positive effect on vegetative cover by seeding or planting additional native plants and/or stimulating existing native plants.

General Effects of Herbicides on Soils

Herbicide treatments would have some effect on soil biology, though effects would be transitory based on the herbicide type and frequency applied. Also, soil biology may be changed by shifting plant composition to favor grasses. Adverse effects would be minimized by adjusting herbicide use to avoid soil buildup and leaching to groundwater (also see Hydrology section). In general, most of the proposed herbicides are highly mobile and therefore buildup is not a concern. For immobile herbicides such as picloram (tordon) and glyophosate (Rodeo, Roundup), spraying frequency restrictions alleviate risk for soil buildup. Soil erosion from loss of vegetative cover is only a concern for monocultural stands of weeds.

The highest erosion concern is associated with steep roadside treatment of knapweeds and broadcast treatment of common crupina and whitetop monocultures on disturbed areas with moderate slope. Erosion risk is for 1-2 years while desired species revegetate.

Herbicide Effects to Soil Biology

Overall, the proposed herbicide types and application rates are low enough to facilitate decay by soil microbes. The proposed herbicide usage would have a low risk for soils since the bulk of treatments focus on roads and rock quarries where soils are unproductive and soil communities are uniform. Adverse effects may occur where diverse native grasslands are treated with nonselective herbicides and broadcast methods. These impacts are related to the short term loss of nontarget broadleaf forbs that support diverse soil communities. Soil attributes at greatest risk from chemicals include damage to soil organisms and erosion from removal of ground cover that affects the soil growing environment (also see native plant community discussion in the botany section).

Herbicide persistence in soil is largely controlled by biologic decay. Most of the proposed chemicals are decayed primarily by soil microbes. Only Chlorsulfuron is primarily degraded through hydrolysis. In the short term, chemicals can adversely affect microbial growth for 1 day to 1 week depending on the chemical used (see Table 42). Results from field and laboratory testing are mixed since soil conditions are highly variable. In general, herbicides are decayed and therefore effects are reduced when microbial metabolic rates highest. These conditions are when adequate warmth, moisture and microbial substrate are abundant such as during spring.

The low application rates and type of herbicides proposed in general have a low impact on soil organisms. However, Picloram (Tordon) is known to affect soil organisms at the approved application rates (SERA 2004). At high rates, sulfometuron methyl (Oust) and triclopyr (Garlon, Access) can affect soil microbes. Sulfometuron methyl can inhibit soil microbial growth. Tryclopyr may adversely affect some fungi and algae. Effects are short term and transitory since effects decrease with time.

Functional groups of microbes that have similar metabolic pathways as the target weeds would be most sensitive to the herbicides. However, collective adverse effects of the proposed herbicides on soil microbes are hard to predict, given the diversity of the soil community and varying resistance to the particular herbicides. For example, some laboratory studies found glyphosate adversely impacted several types of microbes, although populations rebounded quickly (Tu et al. 2001). Similarly, Busse et al (2001) found no long-term impact on microbial communities when using glyphosate on ponderosa pine plantations.

Ultimately, soil microbes degrade herbicide by using the herbicides as growth substrate, cometabolizing, polymerizating, accumulating or altering the chemical structure by influencing the pH of the soil environment (Bollag and Liu 1990). The residency times shown in Table 41 are a gross collective function of average soil types, application timing and frequency, and finally the unique chemical structure. Of the herbicides, Imazapr has the longest half-life at 1 year, while Sethoxydim has a comparatively rapid half life from 5 to 25 days. As stated above, favorable microbial growth conditions will speed herbicide degradation.

Of the ten herbicides proposed for use, picloram and sulfometuron methyl pose risks to soil microorganisms and are most persistent in the soil.

To protect soil organisms and therefore protect soil productivity, sulfometuron methyl would only be used once a year at any specific site to avoid accumulating herbicides in the soils. Picloram could only be used once every two years to protect soil productivity and avoid accumulation in the soils of this persistent herbicide.

The other herbicides have a small to no effect on soil microorganisms at normal application rates and could potentially be used three times on the same area in one year. More than likely, if an area was broadcast sprayed once, subsequent treatments would consist of spot spraying to treat missed areas, to treat areas where seeds have germinated since the last spraying, or to treat the small areas where invasives were damaged but are resprouting.

Soil and Groundwater

The persistence of herbicides is affected by the herbicide solubility and absorbance in soil. Herbicides with high water solubility may have a low risk for buildup in soil, but may have a higher risk for leaching into groundwater. Herbicides will persist in finer textured soils such as clay loams compared to very well drained sandy soils. These sandy soils can transmit highly mobile herbicides to shallow groundwater. Herbicide persistence in soil also varies according to specific degradation rates. For example, clopyralid has at least three times faster degradation rate than picloram (Table 42).

The primary herbicide routes in soil are leaching, hydrolysis, and adsorption/desorption onto soil particles, and biological degradation. Soil characteristics affect the herbicide residency time through drainage and adsorptive capacities. Highly drained soils have greater propensity to transfer herbicides to groundwater stores. Organic rich soils and finer texture soils have higher adsorption potential for holding herbicides. Herbicides will vary in the degradation potential based on their chemical structure and the biologic potential of the soil.

General characteristics for the proposed herbicides are displayed in Table 42. Many of the proposed herbicides are highly soluble in water (Table 42). Solubility is often taken as an indicator of the mobility of the chemical in soils. However, glyphosate, while having a high solubility, also binds tightly with soil particles and thereby has low mobility. Herbicides with high mobility potential and long half-lives have a greater potential for leaching into near surface ground water.

Herbicide properties displayed in Table 42 were used to form Project Design Features to minimize adverse effects from the use of herbicides to soil. A coarse filter analysis was done to identify sites where soil characteristics would not be appropriate for application of picloram, clopyralid and sulfometuron methyl, and chlorsulfuron herbicides (see PDFs H4-H7 in Table 6). Sites were characterized with soil data from the recently completed portions of the Terrestrial Ecosystem Unit Inventory, as of June 2008. This survey covers roughly two-thirds of the identified treatment sites and does not extend into the remote Hells Canyon Area. Herbicides picloram and sulfometuron methyl were eliminated from treatment options where sites had a high risk for leaching. Clopyralid has slightly less risk for leaching, and thus was only eliminated where soils had extremely well drained conditions. Chlorsulfuron was eliminated for fine grained, clay soils, where runoff and wind translocation risk is high. Affected sites are listed in Appendix D. This project adheres to all of the above protection measures and adds site specific design criteria to further protect water quality, meeting the requirements of the Clean Water Act.

Comparison of Alternatives

Tradeoffs exist amongst the No Action Alternative and the action alternatives. The No Action Alternative continues the more conservative approach to treating invasive weeds. Advantages are more restricted herbicide use because of less acres being treated to limit nontarget effects on soil biology; however, there is increasing impacts to native plant communities as these invasive species spread. The action alternatives have much more aggressive means for slowing the spread of invasives (see botany section), but have short-term increased reliance on herbicides (Table 44). Project design features would lower the risk of herbicide impacts to soils by limiting the use of certain herbicides, application rates, and/or application methods so that known risks are avoided or minimized. Given the low potential for adverse impacts at the site scale, the limited extent of treatment, and the layers of caution provided by the PDFs, the project is unlikely to have more than a negligible impact on soils. Aerial applications associated with Alternative B and C have the greatest risk for herbicide drift to nontarget vegetation and thus soil biology.

Table 44-Acres proposed for treatment by location and method by alternative

Treatment Methods	Alternative A No Action[1]	Alternative B Proposed Action	Alternative C No Broadcast in Riparian Habitat Conservation Areas	Alternative D No Aerial Herbicide
Chemical Methods				
		Upland Areas		
Ground-based broadcast and spot treatments[2]	2,577	13,556	13,556	13,556
Aerial treatments	0	875	875	0
		Riparian Habitat Conservation Areas		
Ground-based broadcast treatment	1,932[3]	3,104	0	3,104
Spot spray/selective treatment (including wicking and wiping)	663[3]	3,241	6,345	3,241

Treatment Methods	Alternative A No Action¹	Alternative B Proposed Action	Alternative C No Broadcast in Riparian Habitat Conservation Areas	Alternative D No Aerial Herbicide
NonChemical Methods				
Upland Areas and Riparian Habitat Conservation Areas				
bio-control only	See note below	1,955	1,955	2,797
manual only[6]	0	111	111	111
Total Acres	**5,172**	**22,842**	**22,842**	**22,809**

1 A designation of chemical treatment could be changed to manual, mechanical or biological treatment if, at the time of treatment, one of these alternative methods would be effective. A site initially treated with chemicals may be treated with manual or mechanical methods during follow-up treatments.
2 Whether each site will be broadcast or spot treated will be determined locally before each field season so the acres to be broadcast treated and the acres to be spot treated are not known at this time. Determination of where broadcast versus spot treatments will occur depends on access to site, size of site, and density of weed coverage.
3 No action alternative includes '92 Environmental Assessment for the Management of Noxious Weeds and the '94 Environmental Assessment for Management of Noxious Weeds and Forest Plan Amendment #4.
4 Acres proposed in aerial application that could be treated with ground based methods although likely to be less effective or more costly than those proposed in Alternative B. Approximately 33 acres would not treated due to inaccessibility and no other means of control i.e. biocontrol agents.
5 Riparian Habitat Conservation Areas (RHCA) are: 300' of perennial stream and 100' of intermittent stream–as designated under PACFISH, INFISH
6 Manual only sites will not be treated with herbicides because the desired weed management goal can be effectively achieved using manual methods. Such sites are typically very small or having widely scattered weeds or are in sensitive areas like a campground along a stream or a combination of these factors.
Biocontrol note: the '94 EA approved the use of biocontrol agents, however, all sites were analyzed for chemical treatments to attain highest amount of flexibility and greater invasive plant species control. The forest has also released APHIS and state of Oregon approved biocontrol agents on approximately 2,500 acres for the control of invasive weeds (Yates 2007).

Alternative A – No Action

Direct and Indirect Effects to Soils

Manual, Mechanical, Cultural and Biological treatments would continue under the existing decisions from the *Wallowa-Whitman National Forest Environmental Assessment for the Treatment of Noxious Weeds* (USDA Forest Service 1994). Manual treatment (weed pulling) may occur along any roadsides. These treatments would continue but the acreage treated is limited by the high cost per acre. Under this alternative less than 23 percent of known sites would be treated with herbicide, leaving a heavy reliance on manual treatments. Repeated manual treatments may be effective for controlling or containing small populations of certain plants and may pose less risk to nontarget vegetation compared to herbicide treatments. However, associated labor, time and cost may make manual treatments less practical and effective, especially when treating large infestations of invasive plants.

Alternative A, the No Action Alternative, would continue the use of glyphosate, picloram and triclopyr on up to 5,172 acres a year on 124 sites. There could be a short-term (1 to 2 years) reduction in soil cover for the areas treated. This localized reduction in cover would increase treated areas vulnerability to soil erosion on moderate sloped areas. The effects would be minimal given the poor quality of groundcover provided by the invasive species proposed for treatment. These effects would last approximately one season until vegetation re-establishes.

The No Action Alternative treats only invasive plant sites identified at the time of the project, and does not leave a mechanism to treat new inventoried sites, or future inventoried sites.

Therefore, it is expected that invasive plants would continue to spread, increasing the number of acres negatively affected by invasive plants.

Adverse tradeoffs with Alternative A, in this case the risk of nontreatment, would be highest for noxious weeds that establish monoculture stands within native communities. Tradeoffs are weighed by comparing spread rate versus the impact from treatment (D'Antonio et al. 2004), especially in regards to affecting nontarget plant species where a target weed species may be replaced by another invasive weed such as cheatgrass (see Ortega 2005).

Though most of the current infestations are associated with disturbed areas such as old homesteads or along road corridors, the very high spread rates realized in the past ten years suggests that many of the intact native plant communities are vulnerable to noxious weed spread (see Botany report). Whitetop and meadow hawkweed have particularly widespread invasibility that extends into the timberlands where current plant/soil regime could be shifted to greater forb dominance. For dry grasslands, the annual grasses cheatgrass and medusahead have high invasive potential; in particular, medusahead favors heavy clay soils found on Hells Canyon river terraces (Talsma 2006 personal communication). More ubiquitous is the risk for the knapweeds and starthistle (*Centaurea sp.)* spreading into dry grassland leading to plant/soil changes. Tyser and Key (1988) documented spotted knapweed spread into relatively undisturbed grassland in Glacier National Park.

The risk for not treating highly disturbed sites is not as critical since prior disturbance has offset soil community structure to favor fast growing species as demonstrated with old field succession studies (Paschke et al. 2000). Forest standards 12 and 13 (W-W LRMP as amended by the R6 2005 ROD) would be used to establish long term strategies for controlling invasives where treatments are applied. However, these areas remain a source for noxious weeds to spread to other areas.

Cumulative Effects

This alternative is covered under previous NEPA projects. Treatments would occur on an extremely small percentage of any watersheds in the project area. Direct and indirect effects are so insignificant and temporary that treatment under No Action could not plausibly contribute to significant cumulative effects.

Alternative B – Proposed Action

Direct and Indirect Effects to Soils

Effect of mechanical and manual treatments would be very low and similar to those discussed under general effects and under Alternative A. While the relative amounts of manual and mechanical treatments vary between the alternatives, these differences would not be measurable.

Alternative B has the highest risk to soils associated with herbicide treatment, while having the most aggressive means for curtailing the negative effects of noxious weed spread on soil/communities. Alternative B and all action alternatives have measures for early detection and rapid response for unknown invasive populations. Herbicide treatments are proposed for up to 19,173 of the total 22,842 acres inhabited by invasive plants. Only 3-5 thousand acres of treatment are expected to occur in any one year due to budget constraints. Aerial and ground-based broadcast treatment has more potential to adversely affect nontarget vegetation and soils.

The tradeoffs depend on the treatment type, vegetation and slope with effects grouped according to aerial treatment, highly disturbed areas and low to moderate sloped dryland grassland and forest.

Negative effects of herbicide treatments would be transient and adversely affect soil biota for less than one year, though plant/soil community structure may be affected. Approximately 4000 acres would have high risk for changes in soils community after treatment-mostly low to moderate sloped dry grassland areas with some disturbance occurred. Risks for soil community changes after treatment are low for high trafficked areas (11,753 acres) and on steep, rugged ground. Plant/soil communities in high trafficked areas are already in a disturbed state and the steep rugged ground (3,870 of 6,771 acres) has greater resilience.

Alternative B would have short term erosion risk where large monocultures of weeds would be treated on moderately steep slopes. These include stands of whitetop, common crupina, and steep roadside knapweed occurrences. Smaller stands of treated annual grass may have slightly higher erosion risk from finer vegetation litter. Erosion risk would decline as nontarget vegetation re-establishes.

Aerial Treatments

Though considered high risk, the aerial treatments may have less adverse effects since much of the treatment occurs in steep, rugged country where remnant grassland species are available for revegetation. Monitoring of aerial treatment of starthistle in Hells Canyon steep areas found no apparent adverse effects to native grassland and only temporary decreased growth of arrowleaf balsamroot, a forb found to be sensitive to picloram treatments (Talsma et al. 2005, unpublished document, Ortega et al. 2005). The planned aerial treatments on the Wallowa-Whitman occur in similar areas including steep grassland terrain in Hells Canyon National Recreation Area. The aerial sites proposed for treatment are infested with yellow starthistle and scotch thistle. These sites occur primarily in grassland, meadow or shrub land vegetation types (88% of mapped acres). The sites tend to be isolated with steep slopes. The risk for affecting nontarget plants/soils remain within the first year for the lower sloped areas planned for treatment where residual disturbance has affected the current soils/vegetation community. The risks are associated with other invasive plants moving in after treatment such as cheatgrass and medusahead. Mitigations address these risks calling for long term site planning and assessing the current regrowth potential for active restoration. Of the two herbicides planned for aerial applications (picloram and clopyralid), clopyralid would have the least impact on nontarget species. Picloram can affect seedling conifer growth with subsequent impacts on plant functional groups and associated soil communities (SERA 2003).

Highly disturbed Areas

The proposed treatment of herbicide along high traffic areas would not adversely affect soils. These high traffic areas include road corridors or where high disturbance occurs such as trailheads, stock yards or old agricultural areas since vegetation is disturbed such as old harvest areas. Soil communities are largely uniform and disturbance oriented; therefore, impacts are not anticipated. Approximately, 11,753 acres is planned for herbicide treatment along these travelways. Herbicide application is planned at regular intervals due to the sustained risk.

Low Sloped Dryland Grassland and Forest

Where native communities are largely intact the tradeoff of risk to soils from herbicide application versus invasive weed spread is less apparent.

Habitats that may be affected are the highly invasible dry grassland. Using the Wallowa-Whitman National Forest Landtype Association mapping (Sasich 2006) and planned treatment, roughly 1,680 acres could have broadcast spraying on low to moderate sloped dry grassland or dry forest. The mixed conifer and shrubland types may not have the same level of risk due to less species rich communities.

For dry grassland communities on moderately productive soils, broadcast herbicide application has higher risks associated with the elimination of nontarget species. The herbicide treatment would target the knapweeds and star thistle, medusa head, and Scotch thistle. The impact of the treatments may lead to short term reductions in native grassland forbs (Pokorny et al. 2004) with some transitory effects on soil biota. Ortega et al (2005) showed sustained losses of arrowleaf balsaroot and other native forbs over three years of monitoring in fescue grassland in Montana. In addition, treatment can lead to invasion by other exotic species. Ortega et al. (2005) has preliminary findings with winter range restoration that suggest cheatgrass is increasing in response to spraying for spotted knapweed. To minimize this risk, the project design features specify long term site planning prior to herbicide treatment to weigh invasibility and evaluate restoration needs (also see W-W LRMP as amended by R6 2005 ROD Standards 12 and 13).

Early Detection Rapid Response

Early Detection Rapid Response (EDRR) is part of all the action alternatives. Under this approach new or currently unknown infestations may be treated using the range of methods proposed in this environmental impact statement on sites similar to those presently proposed for treatment. Project design features would constrain treatment methods according to site specific conditions to minimize impacts. However, aerial applications have added risk over ground based methods for adversely affecting nontarget plants and soil (R6 2005 ROD). Aerial application would have the greatest risk where intact low to moderate sloped dry grasslands exist.

Cumulative Effects

Most of the 10 herbicides used under this alternative would have short term transient effects on soil biota. Picloram and sulfometuron methyl have the highest risk for affecting soil organisms with repeated treatment at typical application rates. These herbicides have half-lives of 90 days and 10-100 days (see Table 42) depending on soil conditions. Project design features limit use of sulfometuron methyl to once a year, picloram to once every two years, and restrict use of these herbicides under certain conditions to minimize buildup of herbicides in the soil and thus minimize or eliminate risk for long term effects to soil productivity from use of herbicides (see Chapter 2 for detailed discussion about PDFs for each herbicide, and sites where these and other herbicides may be restricted).

All treatment methods could result in erosion from loss of target or associated vegetation; however the negative effects of herbicide treatments would be transient and adversely affect soil biota for less than one year. Approximately 4000 acres would have high risk for changes in soils community after treatment—mostly low to moderate sloped dry grassland areas with some disturbance. Risks for soil community changes after treatment are low for high trafficked areas (11,753 acres) and on steep, rugged ground. Plant/soil communities in high trafficked areas are already in a disturbed state and the steep rugged ground (3,870 of 6,771 acres) has greater resilience. No forseeable future actions are planned that would result in a cumulative effect on soils when added to this project.

Given the PDFs and the limitations on acres treated annually, there would not likely be a contribution to cumulative soil impacts under the proposed action. The impacts on soils are limited to the treatment site itself, so would not combine with other actions offsite to create any cumulative impacts.

Alternative C – No Broadcast within Riparian Conservation Habitat Areas

Direct and Indirect Effects to Soils

The effects of this alternative are the same as Alternative B except herbicide treatment in Riparian Habitat Conservation Areas (RHCA) is limited to spot treatment only. Alternative C would elimination broadcast herbicide treatment for 3,104 acres and therefore lessens risk of herbicide leaching to groundwater. For Alternative B and D, project design features address this risk by excluding highly mobile picloram and clopyralid the inventoried invasive plant sites that have sandy or excessively well-drained soils and shallow water tables.

Alternative C would be nearly as effective in reducing the negative effects of invasive weeds changing soil communities with the same amount of acreage planned for treatment as Alternative B. The spot spraying identified in Alternative C may be slightly less effective reducing spread within RHCAs. Risks to soil biota and surface erosion are similar to Alternative B.

The eliminated broadcast spraying occurs on highly disturbed areas along roads and high traffic areas, where soils communities would not be changed. This alternative carries the same risk as all action alternatives with EDRR planned.

Cumulative Effects

Cumulative effects are the same as discussed under Alternative B.

Alternative D – No Aerial Application

Direct and Indirect Effects to Soils

The effect of this alternative would be the same as for Alternative B except aerial treatment would not occur. This alternative would be less effective at addressing invasive weed impacts on soils in the rugged steep areas of Hells Canyon due to lack of access for groundbased herbicide application. Roughly, 822 acres would be added to biocontrol treatments and the balance of the 875 acres planned for aerial in Alternative B would likely be untreated. Since most of the acres of the dropped aerial treatment would be in steep areas where negative impacts on soils are not anticipated, Alternative C would not likely show improved effects on soils. Risks to soil biota and for surface erosion are similar to Alternative B. This alternative carries the same risk as all action alternatives with EDRR planned.

Cumulative Effects

Cumulative effects are the same as discussed under Alternative B.

Water Resources

Approximately 6,345 acres of invasive plants within treatment areas are in RHCAs. Of these 38 are to be treated with manual control, and 6307 acres would be treated by manual, mechanical or chemical treatment, depending on site conditions. The RHCAs would be excluded from aerial treatment and would need to be treated by groundbased methods or not at all. These acres are scattered across the Forest within 53 different 5th field watersheds. The largest acreage of invasive plants within RHCAs in a single 5th field watershed is approximately 1,273 acres within the common bugloss site, which is a 5,813 acre treatment area in Middle Imnaha River

Watershed. There are approximately 393 acres of RHCAs included within biological control areas.

General Effects of Manual and Mechanical Treatment

Mechanical treatments except for mowing would take place away from water. Mowing would occur only along established roads. Manual effects are generally cutting, digging or pulling weeds. If seeds are present the weeds are bagged and taken off site. As only small sites would be treated with manual treatments loss of soil cover would be very small. However there could be small localized areas of erosion and subsequent sediment input to the stream. These effects would be transitory and too small to measure. Pulling weeds along stream banks could also destabilize the banks in highly localized areas. These small treated areas are expected to revegetate within a season. As most of the treatments areas are previously disturbed roadways and trails, it is unlikely that the small additional ground disturbance would be a significant change from the existing condition. Modification of surface ground cover can change the timing of run-off but given the small areas of treatment, any changes would be transitory and too small to measure.

General Effect of Biological Control

Biological control can be defined as the use of natural enemies to reduce the damage caused by invasive plant populations. Biocontrol is often viewed as a progressive and an environmentally friendly method to control pest organisms because it leaves behind no chemical residues that might have harmful impacts on humans or other organisms. When successful, it can provide essentially permanent, widespread control with a very favorable cost-benefit ratio. For example, bio-control releases on yellow starthistle and diffuse knapweed have shown positive control results on Walla Walla District in the past (Mitchell 2006).

Bio-control agents previously released and established on the Forest will continue to spread to other nearby invasive sites providing a potential long-term control treatment. The primary effect from biological controls is standing dead plants. There would be small (not large enough to measure) changes to soil or water resources from any biological control considered on the Forest.

General Effects of Cultural Treatments

Cultural treatments proposed for this project include seeding and planting native species, and mulching and fertilizing. Of these, only fertilizing has the possibility of introducing foreign material into streams, water bodies or ground water. Application of fertilizer is easy to control; therefore, would not likely be inadvertently introduced into surface water bodies. There exists a remote possibility that fertilizer applied on sites with well drained to excessively well-drained soils could leach into ground water, which may result in dissolved minerals, particularly nitrogen, in the ground water. Fertilizers would be applied only on seeded areas where a general herbicide has killed most ground vegetation; therefore, the likelihood of fertilizer minerals entering the groundwater often enough to cause significant contamination are remote. That is, the likelihood of seeding large acreages of well-drained to excessively well-drained soils is considered remote.

General Effects of Herbicide Treatments

None of the alternatives have the potential to influence stream flow and channel morphology due to the small portion of any watershed that would be treated.

Treating invasive plants would improve riparian stability where invasive plants have colonized along stream channels and out-competed native species. All invasive plant treatments carry some risk that removing invasive plants could exacerbate stream instability; however, PDFs P-1, P-2, and P-3 account for these areas and prescribe mulching, seeding and planting as needed to revegetated riparian and other treated areas to minimize impacts from treatments.

A primary issue for this analysis is the potential for herbicides to enter streams and impact domestic water sources and/or aquatic organisms. This section describes how Project Design Features minimize the possibility that herbicides would enter water and impact water quality.

Based on the R6 2005 FEIS, herbicides were grouped by their potential to harm aquatic resources. The herbicides of lower concern for aquatic resources are: clopyralid, imazapic, and metsulfuron methyl. The herbicides of moderate concern for aquatic resources are: chlorsulfuron, imazapyr, sulfometuron methyl. The herbicides of greatest concern are: nonaqueous glyphosate, triclopyr, picloram, and sethoxydim. The aquatic formulations of glyphosate, triclopyr, and imazapyr may have more adverse effect effects to aquatic resources than the low concern herbicides but are licensed for use near or in water. Streamside buffers vary depending on the level of concern.

Drift, Run-off and Leaching

The routes for herbicide to contaminate water are; direct application, drift into streams from spraying, runoff from a large rain storm soon after application, and leaching through soil into shallow ground water or into a stream. This section addresses each of these delivery routes.

No direct application of herbicide to water is proposed in any alternative. No emergent plants would be treated under any alternative.

Effects from drift, runoff and leaching were considered in the herbicide risk assessments, prepared for the R6 2005 FEIS, assuming broadcast treatments occurring directly adjacent to streams. The Groundwater Loading Effects of Agricultural Management Systems (GLEAMS) model was used to estimate the amount of herbicide that may potentially reach a reference stream via runoff, drift and leaching in a 96 hour period, assuming broadcast treatments on a 50-foot strip along about 1.6 miles of perennial stream. SERA risk assessments evaluated the hazards associated with each herbicide based on the concentrations of herbicide predicted by the GLEAMS model using these parameters.

To avoid any adverse effects to streams, PDFs were developed to give added protection to streams and to minimize herbicide concentrations in streams (see PDFs F-1 -8; G, and H1-13 in section 2.2.3). The GLEAMS modeling likely overestimates the herbicide concentrations that would plausibly enter streams from this project, primarily because broadcast treatments (used in the model) are prohibited within 100 feet of all perennial streams in all alternatives. Spot treatments using herbicides of higher concern to aquatic organisms along streams would also be buffered. Hand and spot treatments are inherently far less likely to deliver herbicide to water because the herbicide is applied to individual plants, so drift, runoff and leaching are greatly minimized. Small amounts of some herbicides can trans-locate from the plant to the soil or an adjacent plant, but the concentrations of herbicide that may be delivered to streams from this mechanism is much less than GLEAMS predictions which models broadcast spraying of herbicide next to the stream with no buffer between the spraying and the stream.

Monitoring Studies

Berg's (2004) compilation of monitoring studies on herbicide treatments with various buffer widths showed that any buffer helps lower the concentration of herbicide in streams adjacent to treatment areas. In California buffers between 25 and 200 feet generally had no detectable concentrations of herbicide in monitored streams with detection limits of 1-3 mg/m3 (ibid).

In South Carolina, ground applications of the herbicides imazapyr, picloram and triclopyr had no detectable concentrations of herbicide in monitored streams with buffers of 30 meters (comparable to 100 feet) (USDA Forest Service 2003a, Appendix B). No detection limits were given.

The USGS in partnership with the Oregon Department of Transportation studied runoff of herbicides along roads (Wood 2001). The study was conducted on runoff associated with several herbicides (including sulfometuron methyl and glyphosate) along a road in western Oregon simulating rainfall at 0.33 inches an hour at 1, 7 and 14 days after treatment.

Samples were collected at the shoulder of the road and found concentrations of several hundred 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 was below detectable limits in the stream. Glyphosate was not found at the shoulder, ditch line or stream. This study indicates that the greatest risk of herbicides moving off site is from large storms soon after herbicide application. In addition, this study also indicates that sulfometuron methyl may persist in the environment as it was detectable along the shoulder of the road (but not in the stream) the entire duration (three months) of the study.

Berg reported that herbicide applied in or along dry ephemeral or intermittent stream channels may enter streams through run-off if a large post-treatment rainstorm occurred soon after treatment.

This risk is minimized if intermittent and ephemeral channels are buffered as would occur under the action alternatives (ibid.). If a large rainstorm occurs after herbicide application, sediment contaminated by herbicide could be carried into streams.

As most herbicide application occurs in the spring through the fall, during the dryer season, the probability of a large rainstorm soon after application of herbicides is low at any particular site.

Aerial Application

Wind drift is the mechanism most likely to carry herbicide to nontarget areas such as stream channels. This is primarily dependent upon the elevation of the spray nozzle, droplet size and air movement. The smaller the droplet, the longer it stays suspended and the farther it can travel.

Spray drift can be reduced by increasing droplet size since wind will move large droplets less than small droplets (Table 45). Droplet size can be increased by: (1) reducing spray pressure; (2) increasing nozzle orifice size; (3) using special drift reduction nozzles; (4) additives that increase spray viscosity and; (5) using rearward nozzle orientation in aircraft.

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

Table 45-Drift distance versus drop diameter

Droplet Diameter (microns)	Type of Droplet	Time	Lateral Distance Traveled in 10 foot height & 3 mph wind speed
5	Fog	66 minutes	3 miles
20	Very Fine Spray	4.2 minutes	1,100 feet
100	Fine Spray	10 seconds	44 feet
240	Medium Spray	6 seconds	28 feet
400	Coarse Spray	2 seconds	8.5 feet
1,000	Fine Rain	1 second	4.7 feet

Source http://www.ag.ndsu.edu/pubs/plantsci/weeds/a657w.htm #factors available in project record

Washington State Department of Ecology and Oregon Department of Forestry have monitored aerial application of herbicides in forest settings. The purpose of both studies was to look at the effectiveness of buffers protecting water quality in streams within herbicide treatment areas. The Washington study looked at many factors in addition to stream buffers that affected the concentration of herbicides in streams within treatment areas.

The Washington study collected herbicide samples at 7 sites on small streams (Rashan and Graber, 1993). Buffers were 50 feet on flowing streams and no buffers on small stream channels assumed to be dry. Peak herbicide concentrations ranged between 0.2 and 7.55 ug/l (same as 7.55 parts per trillion). Maximum 24 hour averages were between 0.13 and 3.25 ug/l.

Runoff samples collected at 4 sites 2 to 24 days after application had concentrations between 0.17 and 2.49 ug/l.

Oregon requires buffers of 60 feet for aerial application of herbicides near fish bearing streams or streams used for domestic water supplies. Two streams outside this category also received 60-foot buffers (actual on the ground buffers ranged from 60 to 100 feet).

For the Oregon study most of the samples (21 sites, and 105 post spray samples) had a detection limit of 1 ug/l. None of these samples had concentrations at detectable limits.

Five sites (25 samples) had detection limits of 0.04 to 0.5 ug/l. Most samples were still below detectable limits, but 7 of the 25 samples tested between 0.9 and 0.56 ug/l (Dent and Robben 2000).

The Washington study attributed the majority of herbicide introduction in buffered streams to swath displacement, drift and secondary contribution from overspray of small stream channels mistakenly assumed to be dry. This study recommended buffers of between 15 to 25 meters (45-75 feet) for upwind applications and 75 to 90 meters (225-270 feet) for streams downwind of applications.

The Lolo National Forest and the Bitterroot National Forest have both used drift cards and collected water quality samples in areas where aerial application of herbicides was used. Buffers of 150-300 feet were used for streams on the Lolo and 300-foot buffers were used on the Bitterroot. On the Lolo the water quality samples were all below the detection limit of 1 part per 10 billion. Of the 35 drift cards 1 showed herbicide near a stream. When herbicide was next applied to that site the buffers were adjusted and no herbicide was found on the drift cards.

On the Bitterroot water quality samples were collected at two sites herbicide treatment areas with 300 foot stream buffers in 2005. Drift cards were placed at set intervals across the buffer, between the stream and the marked line. Results from the lab indicated herbicide detection as "below detection limit" for all tested chemicals in all samples. No herbicides used in the spraying operation were detected in the water samples. All drift cards were visually scanned for droplet presence. No cards were found with visible droplets after the spray treatments. More information on the Lolo and Bitterroot studies are available in the Botany Report for this project available in the project record.

All aerial applications of herbicides will comply with EPA label restrictions and state regulations. Using the recommendations above, the following PDFs were developed to minimize potential impacts to water. E-2 requires that fueling occurs outside the RHCA where ever possible. F-5 requires that herbicide applications occur when winds are between 2 and 8 miles per hour. F-6 requires coarse droplet size to minimize drift. F-8i requires that aerial units be ground checked and water features marked and buffered before application. Buffers of 300 feet are required on perennial or wet intermittent streams and wetlands, and 100-foot buffers are required on dry channels.

Accidental Spill

Concentrations of herbicides in the water as a result of an accidental spill depend on the rate of application and the streams' ratio of surface area to volume. The persistence of the herbicide in water depends on the length of stream where the accidental spill took place, velocity of stream flow, and hydrologic characteristics of the stream channel.

The concentration of herbicides would decrease rapidly down-stream because of dilution and interactions with physical and biological properties of the stream system (Norris et al.1991).

Accidental spills are not considered within the scope of the project. Project design features would reduce the potential for spills to occur, and if an accident were to occur, minimizes the magnitude and intensity of impacts. An herbicide transportation and handling plan is a project requirement. This plan would address spill prevention and containment.

Lakes and Wetlands

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 within water dies the oxygen level within the lake can decrease.

Some invasive plants may grow in wetlands or near lakes and reservoirs. PDFs require that only spot or hand treatments occur within 100 feet of lakes or wetlands. A large rain event after treatment could carry herbicide into water resulting in minor amounts of herbicide contacting surface water. Different herbicides degrade at different rates, therefore the length of time herbicide is available for transport at any site depends on the herbicide used, application rates, local weather, and soil types. See Table 42 – Herbicide Properties for more details. Only small acreages of treatment have been identified at any site near a waterbody. Only upland species have been identified at these sites.

To minimize risk to wetlands no more than 10 acres or half of a wetland would be treated in any 30-day period. There is no treatment of emergent vegetation proposed under any alternative; therefore the wetland would be dry at time of treatment.

The design features for wetlands limit the area treated at one time for two reasons:

1. To lower the amount of herbicide near the water body at one time and give time for the herbicide to degrade. Many of the herbicides degrade quickly in soils high in organics.

2. Treating only half a wetland at a time provides refugia for aquatic organisms in other parts of the wetland.

Small, unmapped ponds found during implementation planning would have the same PDFs on herbicide use within 100 feet of the pond.

Municipal Watersheds and Domestic Water Supplies

No herbicide application is proposed within municipal watersheds under any alternative. Biological control is being used for Canada thistle within the La Grande Municipal Watershed.

Other water supplies such as wells or springs at campgrounds would be buffered from herbicide application to protect water quality. *PDF H-11- Herbicide use would not occur within 100 feet of wells or 200 feet of spring developments.* The alternatives are designed to meet water quality standards and Forest Plan guidance on municipal watersheds.

Comparison of Alternatives

See Table 44 to compare treatment methods and acres proposed for treatment for each alternative. Chapter 2 of the EIS offers a more detailed alternative comparison (Tables 12 and 13).

Alternative A – No Action

Direct and Indirect Effects

In the No Action Alternative management of invasive plants would be applied using decisions made from the *Wallowa-Whitman National Forest 1994 Environmental Assessment for the Treatment of Noxious Weeds*. Since the incorporation of the regional guidelines into all Region 6 Forest Plans, the No Action Alternative is now limited to three herbicides (glyphosate, triclopyr and picloram with restrictions) for use on approved sites (5,172 acres) approximately 23 percent of known sites. Biocontrol agents have been released on approximately 2,500 acres in the past.

Broadcast application could take place on up to 1,932 acres within RHCAs under this alternative and could be used for spot application on up to 663 acres. Only three herbicides are available for use under this alternative. Picloram, a high risk herbicide for aquatic resources, is still preferred in many situations because it is a selective herbicide which kills only certain plants and has a residual effect to suppress reestablishment of target invasive species. Triclopyr is selective for woody and broadleaf vegetation. Glyphosate, the third choice, is nonspecific and kills all vegetation. However, glyphosate is less mobile than picloram or triclopyr and therefore less likely to move from the applied site into water.

There would be heavy reliance on manual treatments to treat any new invasive plant sites. Past monitoring of these treatment methods (by the forest) indicates limited success using these methods (Yates 2006). Manual treatments near streams could increase sediment input to streams. However, due to expenses associated with manual treatments, most sites would not be treated under this alternative allowing invasive plants to continue to spread. This would increase the number of acres negatively affected by invasive plants. These effects are described above in the Affected Environment section of this report.

Invasive plants would continue to grow on sites where treatment is currently not authorized by a NEPA analysis, approximately 17,670 acres, (77%) of known infested acres. Invasive plants are often less effective for stream bank stabilization than deeper rooted native plant species. Most invasive plants also provide less stream-shading than native hardwoods and conifers.

Cumulative Effect

This alternative is covered by Decisions from the 1994 EA. Treatments would occur on an extremely small percentage of any watersheds in the project area. Direct and indirect effects are so small (not able to measure) and temporary that treatment under No Action does not contribute to significant cumulative effects.

Alternative B – Proposed Action

Direct and Indirect Effects

Up to 6,345 acres of treatment could take place in RHCAs including 6,307 acres proposed for chemical treatment and 38 acres proposed for manual treatment.

Almost 50 percent could be broadcast sprayed with the other 50 percent treated by spot or hand methods. In reality, most of these areas have only discontinuous infestations of invasive plants estimated at 25 percent of the treatment area.

None of the treatments are extensive enough under any alternative to effect peak flows, low flows or water yield. Methods used for treatment would have negligible effect on water infiltration into soil and associated surface runoff. Only the bugloss site in the Middle Imnaha Watershed has more than 2 percent of the watershed proposed for treatment and most have less than 1 percent of the watershed proposed for treatment (Table 52). This amount of vegetation change is too small to show effects to flows from treatment. The common bugloss site, which would treat up to 1,500 acres scattered across the 5,813-acre site, would use types of herbicides that target broadleaf plants, leaving the majority of the area vegetated with grasses. Therefore, even the large common bugloss site would show no changes in flow.

Generally, small areas would be treated along streams. The majority of the sites (41%) are less than 1 acre (Table 52). Slightly over 1 percent range from 100 to 500 acres and 0.2 percent of the sites (4 sites total) are greater than 500 acres. As most invasive plants provide little shade, removal of these plants is unlikely to have any measurable effect to stream temperature.

As these methods target individual plants, the risk from spot or hand application of herbicides to native riparian vegetation is small. Where taller native shrubs replace the shorter invasive plants, shading of streams would contribute to reduced temperatures on some streams. Where passive restoration occurred native vegetation would slowly become reestablished. Where restoration is applied, reestablishment of native vegetation could occur more quickly, within a few years.

Manual and Mechanical

Only 111 acres of manual treatments over 145 sites are planned with this project. This includes 38 acres of manual treatment over 94 sites within RHCAs. The largest manual treatment sites are 2.6 acres of treatment of scotch thistle along the East Fork Fence Creek, 1.8 acres of medusahead on Spring Creek and 1.7 acres of hoarycress white top on an unnamed stream in the Lower Imnaha Watershed. As the sites are scattered across the Forest only localized effects would be expected, lasting only one season until vegetation reestablished.

Where manual methods remove invasive plants near streams there could be minor loss of ground cover and soil disturbance leading to erosion and a minor localized increase in fine sediments particularly if vegetation is removed from stream banks. This increase would only last a season or two until vegetation became re-established and is not considered significant. Many treatment sites are small and would reseed naturally with existing native vegetation. Where restoration is applied, sites lacking native vegetation seed source to ensure revegetation occurs and erosion would be controlled. Mechanical treatment is primarily mowing and would occur along roads. This would have negligible effect on stream functioning.

NonAerial Treatment

Project design features minimize the chance of herbicides reaching streams through drift, runoff, or leaching into soils. Buffer widths vary depending on label requirements, aquatic risk ranking (established in the R6 2005 FEIS) and application method. For example within 100 feet of perennial streams no broadcast treatments would occur. PDFs and label requirements prohibit use of the more mobile herbicides on shallow soils. This would protect groundwater, particularly in areas where shallow soils cover fractured bedrock.

Boom or hand broadcast treatments within RHCAs have different buffer widths depending on each herbicide’s risk to aquatic organisms. Within 100 feet of streams no broadcast would occur. Herbicides considered high risk to aquatic organisms would not be applied using any method within 15 feet of ditches that feed streams, or 50 to 100 feet from intermittent streams, even when ditches or intermittent streams are dry. These buffers are considered adequate to minimize herbicide concentrations in water because, buffer studies in forested areas (Berg 2005) show that buffers greater than 25 feet commonly lower herbicide concentrations below any threshold of concern and often below detectable limits.

Glyphosate and imazapyr are the only herbicides used for spot spraying up to water’s edge along perennial channels. Glyphosate is highly water soluble but because it adheres tightly to soils is unlikely to be carried into a stream unless the soil particle is carried into the stream. This is unlikely to happen during the late spring or summer when herbicides would be applied because there is less rain in the summer and more vegetation growth to hold soil particles in place. If glyphosate is carried into a stream by runoff, it preferentially stays with the soil over partitioning into water. Imazapyr is only moderately water soluble and forest field studies have not found it very mobile in soils (SERA 1999)

Herbicides entering surface water through surface runoff are also expected to be minimal, since targeted spot spraying techniques or hand application techniques would be used to apply herbicide within 100 feet of surface water. This would minimize the amount of herbicide reaching the ground surface as well as minimize the potential for herbicide drift. No herbicides considered high risk to aquatic resources would be broadcast within 100 feet of streams and none would be spot sprayed within 50 feet of streams (Table 7 and Table 8). Further, PDF H-13 restricts treatments above bankfull, within the aquatic influence zone to not exceed 10 acres along any 1.6 mile of a stream, per 6th-field HUC and treatments between water's edge to bankfull width will be limited to 2 acres for every 1.6 miles of stream length per 6th field HUC.

Some streams within road corridors have treatment areas that parallel both the road and the stream with many continuous acres of treatment within the aquatic influence zone. In reality these areas have invasive plants scattered among other vegetation along the stream. To model a worst case scenario a few of these areas with the highest proposed treatment acres were modeled for site specific soil types and rainfall with the SERA worksheet. In addition, two hypothetical treatment areas were modeled for 75 inches of rain fall to simulate a 2-inches-in-24-hours storm. These hypothetical sites were modeled with sandy soil and clay soil; the soil types most likely to allow runoff into the stream. Only aquatic glyphosate and aquatic imazapyr were modeled with the high rainfall and sandy soil as clopyralid is not allowed for use on sandy soil according to project design features.

Site-specific Herbicide Modeling

Some streams within road corridors have treatment areas that parallel both the road and the stream with many continuous acres of treatment within the aquatic influence zone. In reality these areas have invasive plants scattered among other vegetation along the stream. To model a worst case scenario a few of these areas were modeled for site specific soil types and rainfall with the SERA spreadsheet.

Gumboot Creek and an unnamed tributary have 99 acres within treatment areas within 100 feet of the streams. The treatment area is along 6.5 miles of Road S39 which is entirely within the RHCA and much of the time within 100 feet of the stream. The invasive plants within these areas are spotted knapweed and Canada thistle. In reality less than 25 percent of the treatment area is infested with the invasive species, which is approximately 25 acres scattered over about 6.5 miles. Broadcast spraying could occur in the outer part of the RHCA but only spot and hand treatments could occur within 100 feet of the stream.

North Pine Creek and tributaries have approximately 110 acres within treatment areas within 100 feet of the streams. With an average infestation of 25 percent of the site there would be about 27 acres of actual infestation along approximately 12.5 miles of road. The treatment areas are along Road S39 and parallel North Pine Creek. The invasive plants to be treated include hoary cress whitetop, diffuse knapweed, and Canada thistle and St. Johns wort. Part of the St. Johnswort would be treated with biocontrol.

The two sites discussed were chosen for site specific modeling using the SERA worksheet. These sites were chosen because they have the most treatment within the RHCA and because they have higher rainfall than many of the sites at lower elevation. The amount of herbicide that runs off is highly dependent on rainfall and soil type. All the broadcast sites along streams are also along roads. Roads are highly disturbed areas with compacted soils and tend to have higher runoff than undisturbed sites. Herbicides were run with the soil type where they would have the most runoff. The herbicides chosen to model were the two allowed for spot spraying up to water's edge and clopyralid, a highly effective herbicide for the species to be treated.

The application scenario analyzed in each SERA worksheet assumed the following site conditions and application methods for herbicide application:

- Herbicide was evenly-applied by broadcast application right up to the water's edge.
- Herbicide was applied to a site with a 10 percent slope
- The stream that the herbicide values are predicted for has a flow of 1.8 cubic feet per second (cfs). This equates to a stream approximately 6.6 feet wide and 1 foot deep.
- The application block is 10 acres in size and configured in a rectangle that is 50 feet wide by 8,672 feet long along the stream and all herbicides are assumed to drain from the block to a single location and emptying into the water body at that point.

These site conditions cannot be changed. The variables that can be changed are rainfall, soil and herbicide amount used per acre. For these sites typical application rates were used, the rainfall at the highest elevation along the stream and the hypothetical streams used a rainfall which would give 2 inches of precipitation within 24 hours, which is a large storm for this area. As the treatments are not continuous but are scattered along miles of road, the model would be considered conservative and would overestimate potential herbicide concentrations.

The result of this analysis (Table 46) indicates all Hazard Quotient (HQ) values were well below 1; therefore, no levels of concern were exceeded for sensitive fish under these scenarios. The R6 2005 FEIS notes that as HQ increases above 1, the margins of safety decrease.

Table 46-Potential herbicide concentrations in water for different precipitation ranges and soil types

Herbicide/ location	Annual Precipitation (inches)/ (Modeled Precipitation)	Peak Water Contamination Rate (mg/L per lb/acre)	Maximum Concentratio n in water (dose) (mg/L)	Toxicity Index for Listed Fish (mg/L)	Hazard Quotients (sensitive fish)
Glyphosate (2 lbs/acre)					
North Pine Creek	40	0.038	0.076	0.5	0.15
Gumboot Creek	50	0.056	0.112	0.5	0.23
Hypothetical creek-sand	(75)	0.099	0.198	0.5	0.40
Hypothetical creek-clay	(75)	0.036	0.072	0.5	0.14
Imazapyr (0.45 lbs/acre)					
North Pine Creek	40	0.0004	0.00019	0.135	0.0014
Gumboot Creek	50	.0006	0.00028	0.135	0.0021
Hypothetical creek-sand	(75)	.00023	0.00010	0.135	0.00077
Hypothetical creek-clay	(75)	.00096	0.00043	0.135	0.0032
Clopyralid (0.35 lbs/acre)					
North Pine Creek	40	0.0096	0.0034	5.15	0.00065
Gumboot Creek	50	0.0106	0.0037	5.15	0.00072
Hypothetical creek-sand	(75)	0.031	Not used on sandy soils	Under	PDFs
Hypothetical creek-clay	(75)	0.0105	0.0037	5.15	0.00074

Common bugloss along the Imnaha River

The largest treatment area is 5,813 acres for common bugloss along the Imnaha River. This area is a mixture of private and Forest System land with most Forest controlled land in the uplands. The private property owner would aerial spray common bugloss on infested areas within the 5,500 acres of private land, probably using metsulfuron methyl. As metsulfuron methyl is not allowed for aerial spraying on Forest System land in Region 6, the Forest controlled area would be treated using ground based methods. Metsulfuron methyl is a highly effective herbicide and low application rates are effective (typical rate of 0.03 lbs/acre). This lowers the amount of herbicide available for movement offsite compared to less effective herbicides with higher application rates.

Estimates of acreage infested on Forest Service System land is approximately 1,500 acres. These acres are scattered across the 5,808-acre site. Herbicides for use with backpack sprayers would likely be metsulfuron methyl or chlorsulfuron + metsulfuron methyl. Up to 25 percent (375 acres) of the acres would not be treated because the infestations are on rimrock in areas too steep to access.

If bugloss is found growing below bankfull, aquatic glyphosate or aquatic imazapyr would be used. The dead plants would also be left on site contributing to ground cover. Erosion and associated sediment delivery to streams would be negligible.

Riparian Invasive Plant Species

There are 77.5 acres of Japanese knotweed within treatment areas, 54.6 within RHCAs. In reality, these sites are a mixture of invasives with less than 20 acres estimated to be infested with Japanese knotweed. There are two sites presently identified. One site is along the confluence of Somers Creek and the Snake River on the west side of the Snake. This site is on 10-50 percent slopes in a narrower part of the Canyon. The knotweeds are in a treatment site that also contains yellow star thistle and scotch thistle that is approximately 64 acres,

The other knotweed site is along Kurry Creek and the east side of the Snake River. This site is generally at less than 10 percent slope in the valley bottom. This site also contains purple loosestrife, puncture vine and yellow star thistle. The site is about 15 acres.

The knotweed sites are the only sites to be treated by stem injection. Stem injection has a higher rate of success with knotweed compared to foliar application with fewer applications needed to eradicate the plants. It would be used on knotweeds with stalks greater than 0.5 inches thick. The smaller stalks are too small for injection and would be spot sprayed or wiped with herbicide.

Where stem injection is used there would be no chance of drift. Small amounts of herbicide could be translocated to the soil from the plant roots and potentially affect nontarget plants. Glyphosate preferentially attaches to soil and is unlikely to enter water in appreciable amounts.

About 2.5 acres of purple loosestrife are found at two small treatment sites along the Snake River. It is estimated that there is 0.6 acres within the treatment areas infested at this time. Biocontrols have been tried but have not been effective at these sites. Glyphosate would be the herbicide of choice either spot sprayed or by cutting the stems and painting them with herbicide. As stated above glyphosate preferentially attaches to soil particles and in this low rainfall area is unlikely to enter water in appreciable amounts.

Domestic Water Supplies

None of the herbicides proposed for use in any alternative are on the Oregon State Water Quality Criteria Summary Tables 33A-C (criterion not to be exceeded in waters of the State in order to protect aquatic life and human health). Hexachlorobenzene (HCB) is found as a contaminant in picloram and clopyralid and is listed on Table 33A, EPA Number 88. HCB is a persistent carcinogen and it bio-accumulates, however the amount of HCB in the herbicides is very low.

The R6 2005 FEIS considered plausible direct, acute, and chronic exposures to any herbicides proposed for this project. Risks from two hypothetical acute contamination scenarios to drinking water sources were evaluated: runoff or leaching from an adjacent application into a stream and a 200-gallon spill into a 0.25-acre pond. Both of these scenarios evaluated much higher levels of contamination than proposed treatments in wellhead protection areas would produce.

One scenario resulted in exposures over a threshold of concern: a small child drinking water directly from the pond shortly after the 200-gallon spill into the pond. For an adult drinking from a pond contaminated by leaching from and adjacent treated area over a lifetime, none of the estimated exposures for any of the herbicides or the impurity HCB was above a threshold of concern. The cancer risk from HCB in picloram or clopyralid would be at least 5 orders of magnitude less than the general threshold of 1 chance in 1 million for all chronic contamination drinking water scenarios. The acute and chronic exposures involved in the analysis scenarios are unlikely to actually occur[9].

The PDFs add layers of caution that minimize or eliminate exposures – for instance, herbicide transportation and handling safety requirements minimize the chance that spills will occur, and spill planning ahead of time would set the stage for rapid clean up.

Water sources, including those in campgrounds, recreational homes, and individual special use permit would be protected by *PDF-H-11, which requires that herbicide use would not occur within 100 feet of wells or 200 feet of spring developments*.

Coordination with municipal watershed managers would occur per water quality standards in the Forest Plan: *"Use fertilizers and pesticides (chemical or biological) within the watersheds only in emergency situations, and then only following close coordination with the City."* No herbicide use is proposed in the La Grande or Baker municipal watersheds.

Roaded Areas

There are 693 miles of road within treatment areas. Of these, 297 miles (43%) are within RHCAs and proposed for chemical treatments. Roads and their associated ditchlines are often connected to streams and during storm events can carry herbicide to streams; however, much of the Wallowa-Whitman National Forest System roads comply with regional road standards in that drainage structures are in place that divert runoff away from streams. Still, some roads with connected ditchlines are within RHCAs. Under this alternative, broadcast application of herbicides (both boom and hand) are allowed within the outer part of the RHCA. To minimize risk to aquatic resources, *PDF H-2 requires that no high aquatic risk herbicides would be broadcast along roads that have a high risk of delivery to water (generally roads in RHCAs)*.

Therefore, for the 297 miles of road identified within RHCAs, picloram, nonaquatic triclopyr (Garlon 4), nonaquatic glyphosate, and sethoxidim would not be used. Though the probability of a large rain storm happening after application is low at any particular site, this additional

[9] See 3.7 human health section of Chatper 3 for more information.

protection measure would ensure that high risk herbicides are not delivered to streams in concentrations that exceed levels of concern.

Aerial application

Aerial application is proposed for 875 acres with 609 acres in the Hells Canyon Natural Resource Area and 266 acres in the La Grande District. The 83 acres within RHCAs would not be aerial sprayed but would be treated with other groundbased methods or left untreated.

Yellow starthistle-La Grande District - Yellow star thistle (266 acres) in eleven separate polygons ranging in size from 75 acres to less than 5 acres, would be treated in the La Grande District in the Lower Catherine Creek watershed. This area is just above private near the Forest boundary. One hundred and ninety-one acres are shown as grasslands and meadows and 75 acres as forested. The rainfall is between 28-44 inches with most of the site receiving between 32-36 inches of rain a year.

Scotch thistle-Hells Canyon - There are about 32 acres of scotch thistle in 3 scattered sites along the Snake River proposed for aerial spray. The rainfall averages 14-18 inches a year at these sites.

Yellow starthistle-Hells Canyon - There are 658 acres of yellow starthistle in the HCNR in sites on the west side of the Snake River. There are 17 sites ranging in size from less than an acre near Experiment Creek to almost 250 acres near Lookout Creek. The average rainfall varies between 12 and 20 inches depending on elevation.

Picloram and clopyralid would be the most effective herbicides for the sites described above. To protect water quality, no aerial application would occur within RHCAs and all perennial streams would be buffered by 300 feet from herbicide application. Intermittent channels would be buffered by 100 feet from herbicide application. This would lower the risk from direct drift into water.

The GLEAMS-Driver was used to model herbicide concentrations in water at two sites. The modeled sites are the 75 acres of treatment on Boswell Creek in the La Grande District and the 259 acre site near Lookout Creek in Hells Canyon. The La Grande and Hells Canyon sites were modeled with the steeper slopes found at the sites and a very small stream with a flow of only 0.3 cfs. The average rainfall used for all the sites was the highest rainfall for the area (Table 47). GLEAMS-Driver program operates as an interface for conducting GLEAMS runs and using the results of these runs to estimate exposures levels of herbicides to both adjacent fields and bodies of water (Durkin and Knisel, 2007) GLEAMS-Driver User Guide. This model allows exposure assessments based on site-specific parameters such as weather patterns, soil types, and physical characteristics of the site such as acres, slope and cover percent. See the GLEAMS-Driver User Guide for more details. The modeled parameters are in Table 47 that follows.

Table 47-Parameters used for model by location

Site Characteristics	Location	
	La Grande	Hells Canyon
treatment acres	75	249
site acres	75	249
precipitation	40	18
type of site	agricultural field	agricultural field
application rate	0.25/0.35	0.25/0.35
surface type	meadow	meadow
initial cover	60%	40%
soil type	loam	loam
soil depth inches	16	12
slope	50%	55%
stream flow rate	0.3 cfs	0.3cfs
stream width meters	2	2

*higher application rate due to herbicide loss in field above treatment area along river

Results of the GLEAMS-Driver model

Both sites were under a Hazard Quotient (HQ) of one for clopyralid and are well below thresholds of concern for fish. For picloram, the Hells Canyon site had a HQ greater than one at the maximum concentration but was under one for the lower modeled concentration (Table 48). Neither the La Grande nor the Hells Canyon site has listed fish directly adjacent to the treatment area. For the Hells Canyon site, listed fish are found approximately 1.5 miles downstream in the Snake River. It is expected that the herbicide concentration would be lower downstream due to dilution. Untreated areas would help dilute herbicide in the stream by an unknown amount.

Table 48-GLEAMS-Driver Model results for aerial sites

Herbicide/ location	Annual Precipitation (inches)/ (Modeled Precipitation)	Range of Concentration in water (dose) (mg/L)	Toxicity Index for Listed Fish (mg/L)	Range Hazard Quotients for Listed Fish
Clopyralid (0.35 lbs/acre)				
LaGrande	40	0.012-0.904	5	0.002-0.18
Hells Canyon	18	0.005-0.137	5	0.001-0.03
Picloram (0.25lbs/acre)				
La Grande	40	0.018-0.029	0.04	0.45-0.73
Hells Canyon	18	0.026-0.05	0.04	0.65-1.25

AGDISP (AGricultural DISPersal) Model

Given the soil protection provided by nontarget vegetation, erosion and associated sediment delivery to streams would be minor and short-term (1 to 2 years). Of more concern from aerial application is water contamination from drift.

AGDISP was first developed by NASA, improved by the USDA Forest Service and implemented by the Spray Drift Task Force and the U.S. Environmental Protection Agency into a regulatory version (Teske et al.2003). Harold Thistle, an expert on the use of this model, collaborated with this project to set-up the parameters for the model.

Site specific conditions for aerial application of the Wallowa-Whitman National Forest were modeled. In general, for aerial application at these sites, the helicopter would be flown at 10 to 25 feet off the ground when spraying grasslands. However, there are sections of the treatment areas with some tree cover and steeper slopes. For safety reasons the pilot may need to fly higher when near trees. The higher release heights are a concern as more drift could occur with a higher release height.

Spray application height, wind speed and droplet size are the three most significant factors impacting drift distance and the potential to affect nontarget areas. To model worst case scenarios, cross wind speed and droplet size were kept at the highest wind speed allowed (8mph) and a coarse spray droplet size (500 µm) commonly used for aerial application of herbicides and the smallest droplet size allowed in this project (PDF F-6). Three release heights were modeled for the largest aerial site. See Appendix F for more details on aerial modeling.

The first run was for open grassland with a spray height of 25 feet and the following runs were with a spray height of 35 and 50 feet respectively with the other conditions remaining the same.

Conditions

- Eight mile an hour cross-winds toward the stream
- Median droplet size is approximately 500 microns
- Release height 25, 35 and 50 feet off the ground

Results

As expected, drift became greater as the release height increased. For a small stream (flow rate of 0.7cfs) directly downwind of the spray area, with a 300 foot buffer from the last swath, with no interception from vegetation (ground cover 1 foot tall) the amount of deposition to the stream is in the parts per billion and under any threshold of concern.

Table 49-Concentrations of herbicide in a small stream with a 300-foot buffer

Spray Height with 300-foot Buffer	Concentrations of Clopyralid (ppb)	Concentrations of Picloram (ppb)
25 feet	1.5	0.9
35 feet	5.1	3.2
50 feet	19.1	11.9

However, the purpose of this project is to treat invasive terrestrial plants, and avoid herbicides getting in streams or other sensitive areas.

Therefore, to minimize offsite deposition to sensitive areas such as streams or nontarget vegetation, species of local interest (SOLIs), or other sensitive areas, under the worst case scenario conditions the following design features would be used to lower drift

To minimize drift off site two options could be used: (1) List conditions where an increased buffer width is required (Table 51), (2) Low drift technology (i.e. nozzle design and/or additives that maximize deposition to the intended target and minimize drift into nontarget and sensitive areas) as directed in PDFs. This lowers the amount of herbicide that could potentially drift into water by less than half at the 50-foot release height (Table 50).

Table 50-Concentrations of herbicide with additional buffer widths

Release Height with Additional Buffer Widths	Size of Additional Buffer Widths	Concentrations of Clopyralid (ppb)	Concentrations of Picloram (ppb)
25 feet	0 feet	1.5	0.9
35 feet	60 feet	3.0	1.8
50 feet	120 feet	7.3	4.5

Either method would increase the effectiveness of the buffer for sensitive areas and streams. Drift cards would be used to track the effectiveness of the buffers.

Table 51-Additions to buffer widths under specified conditions (PDF-8)

	25 foot release height at 7-8 mph	35 foot release height at 7-8 mph	50 feet release height at 7-8 mph
Buffer width	Designated buffer	Add 1 swath widths to buffer	Add 2 swath widths to buffer
Buffer width	Designated buffer	Add 2 swath widths to buffer	Add 3 swath widths to buffer

Use low drift technology i.e. nozzle design and/or additives that ensure little to no drift into stream buffers or sensitive areas as directed in PDFs.

Water contamination from aerial herbicide drift is a large concern. The following Project Design Features are included to address this concern by minimizing risk for aerial herbicide drift and contamination to waterways:

- E-2 requires that aircraft fueling occurs outside RHCAs.
- F-5 requires that herbicide applications occur when winds are between 2 and 8 miles per hour.
- F-6 requires coarse droplet size to minimize drift.
- F-8f and Table 7, Table 8, and Table 9 - Buffers of 300 feet are required on perennial or wet intermittent streams and wetlands, and 100-foot buffers are required on dry channels.
- F-8i requires that aerial units be ground checked and water features marked and buffered before application.
- F-8n and Table 10 - Additional buffers or drift reduction methods are required in winds over 5 mph with flight heights over 30 feet. (Also shown in Table 50 above).

Based on buffer effectiveness documented by Rashin and Graber (1993) and Dent and Robben (2000) concentrations of herbicides reaching streams are expected to be well below concentrations of concern to beneficial uses. Spray cards would be used to track the effectiveness of the stream buffers.

Lakes, Wetlands and Floodplains

There are approximately 13 acres of treatment proposed within 100 feet of lakes or reservoirs on the Forest. The invasive plants to be treated are diffuse knapweed, Canada thistle, medusa head, sulphur cinquefoil and hoarycress white top. Treatments are proposed near five waterbodies, generally at campgrounds near lakes or reservoirs.

Most of these treatment acres are at Goose Lake which has approximately 6.1 acres of chemical treatment of a variety of species proposed around the 2.4 acre lake. As it is estimated that at most treatment sites the infestation is presently 25 percent infested, this is approximately 1.5 acres of actual treatment. *PDF H-8 requires that no more than half the perimeter or 50 percent of the vegetative cover or 10 contiguous acres around a lake or pond would be treated with herbicides in any 30-day period.* This is to reduce exposure to herbicides for organisms by providing some untreated areas as refugia. Buffers listed in Table 6 minimize the potential for herbicides to move into surface water. Given these PDFs, treatments are unlikely to affect functioning of wetlands around waterbodies or to contribute to significant adverse effect on beneficial uses.

The most effective herbicides for the species listed above are clopyralid, picloram, metsulfuron methyl, chlorsulfuron and glyphosate (best in the fall).

Within 100 feet of the lake, no broadcast applications would occur. Picloram and chlorsulfuron could only be spot sprayed to within 50 feet of the lake. Clopyralid (considered low aquatic risk) could be spot sprayed to within 15 feet of the high water mark of the lake. Aquatic glyphosate and aquatic imazapyr could be spot sprayed up to the edge of the water. These specific protection measures would make adverse effect to beneficial uses of the lake unlikely. To control the infestation the treatments would continue over several years, with fewer acres needing treatment each year.

Early Detection Rapid Response

Early Detection Rapid Response (EDRR) is part of all the action alternatives. Under this approach new or currently unknown infestations may be treated using the range of ground based methods analyzed in the Wallowa-Whitman Invasive Plant FEIS, on sites similar to those presently proposed for treatment. PDFs limit types of treatments and types of herbicides by aquatic risk within RHCAs and would minimize the risk of treating these new or undiscovered infestations.

Aerial application of herbicides would not occur under EDRR. If treatment sites or types of treatment were not within the range of ground based methods discussed above, then additional analysis would occur under another NEPA document. Examples would be use of different herbicides than the ten discussed in this document or treatment of emergent vegetation.

Clean Water Act Findings

No adverse impacts to water quality or beneficial uses are predicted from this project. While there is some potential for herbicide molecules to reach surface water and impact aquatic organisms, the extent of treatment is very low and the risks have been minimized or eliminated by buffers and PDFs (see Chapter 2 for details). There would be no measurable changes to water resources from implementation of this project.

Cumulative Effects

See Chapter 3.1 for the basis for cumulative effects analysis. Under all alternatives, the low amount of acres treated annually that are scattered across watersheds on the forest, limits the extent to which there could be a contribution to cumulative effects from this project. The PDFs and buffers described in Chapter 2 reduce the potential for impacts from this project to combine with other actions and cause a cumulative impact by controls on the extent, rate, location and type of herbicide to be applied. The SERA risk assessments and monitoring studies provide a scientific basis for the PDFs and buffers. In addition, the nature of the infestations themselves limits the potential for adverse cumulative impacts.

Most watersheds have less than 1 percent of the watershed with potential chemical treatment areas. Two watersheds have more than 1 percent of the watershed infested: Middle Imnaha River and the Snake River/Temperance Creek Watershed. Most of the treatment in the Middle Imnaha River is the common bugloss site that could be treated the same year the private land would be treated. Thus, this watershed has the greatest likelihood of cumulative impact from treatment under the action alternatives.

Table 52-Watersheds with largest percent of proposed treatments

Watershed	Proposed Treatment					
Name	Biocontrol Acres	Chemical Acres	Manual Acres	Total Acres	% Watershed Treated	% Watershed Chemically Treated
Middle Imnaha River	0.0	5877	2.0	5879	6.7	6.7
Snake River/Temperance Creek	34.4	1905.0	1.3	2142	1.9	1.8
South Fork Burnt River	917.5	357.0	6.6	1281	1.7	0.5
Powder River/Ruckles Creek	1.6	1320.7	4.7	1327	0.8	0.8
North Fork Burnt River	161.5	1009.5	0.0	1171	0.9	0.8
Upper Imnaha River	0.0	686.0	0.0	686	0.8	0.8
Bear Creek	72.8	325.6	1.6	400	0.9	0.7
Eagle Creek	12.5	824.3	9.2	846	0.7	0.7
Burnt River/Auburn Creek	0.0	295.0	0.0	295	0.5	0.5

If the whole acreage at the common bugloss site was treated in one year, over 12% of the watershed would be treated. However it is estimated by Forest personnel that less than 1500 acres scattered across the larger treatment area would be treated at the bugloss site on Forest land. If the 1500 acres was doubled to take private land into account 3.4% of the watershed would be treated. Private landowners would use metsulfuron methyl aerially as their first choice to treat acres infested with bugloss.

The Forest would use metsulfuron methyl with ground based methods as the first choice of treatment. This is a highly effective herbicide with low application rates and a low toxicity to fish.

Given the low application rates (typical rate of 0.03 lbs/acre), low toxicity value and scattered nature of the treatments, it is unlikely to have cumulative effects to the watershed

For the Snake River/Temperance Creek Watershed the treatment acres include hand treatment along the Snake River as well as aerial treatment in the uplands. PDFs were developed to minimize risk of herbicide application to water at treatment sites. Given the PDFs as well as the scattered distribution of the treatments and the low rainfall available to transport herbicide off site, it is unlikely that treatments would have a cumulative effect for this watershed.

In addition, aerial spray of picloram has the potential to exceed a threshold of concern for aquatic organisms and contribute to downstream cumulative effects. However, the potential for harmful exposure would be of short duration and would be diluted within a day of application. No aerial spray of picloram would occur within 300 feet of perennial streams, lakes, or wetlands or within 100 feet of dry intermittent drainages. Previous monitoring studies (see above) provide evidence that these buffers are likely to keep herbicide from entering surface waters from aerial spraying under this project. In addition, treatments would be coordinated with adjacent landowners so cumulative effects from aerial spray of picloram are unlikely to actually occur. There is no potential for this project to exceed water quality standards when the PDFs and buffers are properly implemented. Based on the half-life of the proposed chemicals being used, PDFs restricting those with longer half-lives to only one application in a calendar year, the time between treatments, intensity of treatments, and typical herbicide application rates, residue concentrations of herbicides would be extremely small to not detectable.

The amount of erosion predicted would not result in measurable sediment or changes to water quality that could combine with other projects and cause cumulative effects.

Alternative C – No Broadcast within Riparian Habitat Conservation Areas

The direct, indirect and cumulative effects from treatments under this alternative are the same as for Alternative B except for the 3,104 acres within the RHCAs available for broadcast of herbicides.

Spot spraying is more targeted to specific plants; therefore, there would be less chance of herbicide in contact with soil and available for runoff into streams than Alternative B. There could be less nontarget vegetation removed so more groundcover would be available in these areas lowering the already low potential for sediment delivery to streams. However, nonherbicide methods tend to have more potential for minor erosion from pulling roots out of the soil. Overall, there is no difference between Alternative B and C relative to impact on water resources. Alternative C would not adversely impact beneficial uses and would meet water quality standards.

Alternative D – No Aerial Application

The direct, indirect and cumulative effects from treatment under this alternative are the same as for Alternative B except for 875 acres proposed for aerial application. Some of these acres would be treated by other methods depending on accessibility, safety and cost constraints. Under this alternative there would be lower risk of herbicide contaminating water due to drift from aerial treatment. It would avoid aerial spray with picloram: the one risk assessment scenario that resulted in a potential for herbicide exposure over a threshold of concern to fish. While the likelihood of picloram reaching surface waters is low in Alternative B, it is eliminated in this alternative. However, there is no difference between Alternative B and D relative to overall impact on water resources. Alternative D would not adversely impact beneficial uses and would meet water quality standards.

3.5 Aquatic Organisms and Habitat

3.5.1 Introduction

Invasive plants are displacing native plants, and have the potential to destabilize streams, reducing the quality of fish and wildlife habitat and degrading natural areas in the Wallowa-Whitman National Forest.

Invasive plants found growing adjacent to or within aquatic influence areas can invade, occupy, and dominate riparian areas and indirectly impact aquatic ecosystems and fish habitat.

Invasive plants can change stand structure and alter future inputs of wood and leaves that provide the basic foundation of the aquatic ecosystem food webs. Native vegetation growth may change as a result of infestation, and the type and quality of litter fall, and quality of organic matter may decline, which can alter or degrade habitat for aquatic organisms.

Under the Proposed Action, infested areas would be treated with an initial prescription and retreated in subsequent years until the site was restored with desirable vegetation. Herbicide treatments would be part of the initial prescription for most sites; however, use of herbicides would be expected to decline in subsequent entries as a result of effective treatment. Ongoing inventories would confirm the location of specific invasive plants and effectiveness of past treatments. Treatment prescriptions would be strict enough to ensure that adverse effects are minimized, while flexible enough to adapt to changing conditions over time.

The FEIS has been prepared to consider the site-specific environmental consequences of treating invasive plants over the next 5 to 15 years (until invasive plant objectives are met or until changed conditions or new information warrants the need for a new decision). This EIS is tiered to a broader scale analysis--the *Pacific Northwest Region Invasive Plant Program – Preventing and Managing Invasive Plants* (USDA 2005a).

The R6 2005 FEIS culminated in a Record of Decision (R6 2005 ROD) (USDA 2005b,), which added management direction relative to invasive plants to the Wallowa-Whitman National Forest Plan. The management direction applied to the broader Forest invasive plant program, establishing goals, objectives and standards for public education and coordination, prevention of the spread of invasive plants during land uses and activities, reducing reliance on herbicides over time, and treatment and restoration.

Methodology for Analysis

This analysis is tiered to the R6 2005 ROD and uses the GLEAMS model for evaluating the impacts of management decisions. The analysis methodology and modeling is described in section 3.4.1 of the Soil and Water section.

3.5.2 Affected Environment

Watershed Condition

The project analysis includes the Wallowa-Whitman National Forest. Table 53 displays the relative distribution of the invasive plants proposed for treatment at the 5th field watershed scale. The Middle Imnaha River watershed has the greatest proportion of infested acres being proposed for treatment (about 6.7 percent).

Table 53-5th field watersheds proposed for treatment in the Wallowa-Whitman National Forest

5th Field Watershed Name***	HUC	Acres	Treatment Acres	Percent Watershed Proposed for Treatment	Acres Proposed for Treatment in RHCAs*	Threatened Endangered and Sensitive Fish Present**
BEAR CREEK	1706010504	46,300	400	0.86	115	SRC, SRS, BT
BIG CREEK	1705020307	54,896	92	0.17	51	NF
BIRCH CREEK	1707010306	182,205	6	0.00	0	MCC, MCS
BURNT RIVER/AUBURN CREEK	1705020205	60,006	295	0.49	164	NF
BURNT RIVER/BIG CREEK	1705020204	94,102	20	0.02	1	NF
BURNT RIVER/CANYON	1705020206	54,081	63	0.12	4	NF
CAMP CREEK	1705020203	51,954	275	0.53	65	NF
CHESNIMNUS CREEK	1706010604	122,764	398	0.32	66	SRS
EAGLE CREEK	1705020310	123,643	846	0.68	164	NF
GRANDE RONDE RIVER/BEAVER CREEK	1706010403	131,648	338	0.26	91	SRC, SRS, BT
GRANDE RONDE RIVER/FIVE POINTS CREEK	1706010404	87,632	49	0.06	6	SRC, SRS
GRANDE RONDE RIVER/INDIAN CREEK	1706010409	96,033	26	0.03	13	SRC, SRS
GRANDE RONDE RIVER/MUD CREEK	1706010602	154,202	653	0.42	49	SRC, SRS
GRANITE CREEK	1707020202	94,513	411	0.43	156	MCC, MCS, RT, BT
LADD CREEK	1706010406	83,953	53	0.06	34	SRS
LITTLE MALHEUR RIVER	1705011612	86,434	3	0.00	0	NF
LOSTINE RIVER	1706010502	58,035	142	0.24	28	SRC, SRS, BT
LOWER BIG SHEEP CREEK	1706010204	129,726	182	0.14	125	SRC, SRS, BT
LOWER CATHERINE CREEK	1706010407	83,128	419	0.50	42	SRC, SRS, BT

5th Field Watershed Name***	HUC	Acres	Treatment Acres	Percent Watershed Proposed for Treatment	Acres Proposed for Treatment in RHCAs*	Threatened Endangered and Sensitive Fish Present**
LOWER IMNAHA RIVER	1706010205	147,024	436	0.30	156	SRC, SRS, BT
LOWER JOSEPH CREEK	1706010606	104,789	450	0.43	75	SRS
LOWER POWDER RIVER	1705020311	61,488	16	0.03	0	NF
LOWER WALLOWA RIVER	1706010506	110,421	198	0.18	85	SRC, SRS, BT
MCKAY CREEK	1707010305	127,200	62	0.05	0	NF
MEADOW CREEK	1706010402	116,100	459	0.40	225	SRC, SRS
MIDDLE IMNAHA RIVER	1706010202	87,982	5879	6.68	1250	SRC, SRS, BT
MIDDLE WALLOWA RIVER	1706010503	85,060	9	0.01	4	SRC, SRS
MINAM RIVER	1706010505	152,909	115	0.08	60	SRC, SRS, BT
NORTH FORK BURNT RIVER	1705020201	124,147	1171	0.94	229	NF
NORTH POWDER RIVER	1705020305	74,553	144	0.19	38	BT
PINE CREEK	1705020106	193,640	794	0.41	339	BT
POWDER RIVER/BALDOCK SLOUGH	1705020303	72,489	50	0.07	22	NF
POWDER RIVER/ROCK CREEK	1705020304	120,776	75	0.06	25	BT
POWDER RIVER/RUCKLES CREEK	1705020308	166,729	1327	0.80	497	NF
POWDER RIVER/SUTTON CREEK	1705020302	115,885	274	0.24	92	NF
POWDER RIVER/WOLF CREEK	1705020306	109,371	58	0.05	11	NF
SNAKE RIVER/CHERRY CREEK	1706010301	88,100	333	0.38	117	SRC, SRS, BT
SNAKE RIVER/GRANITE CREEK	1706010101	127,509	100	0.08	25	SRC, SRS, BT, WCT
SNAKE RIVER/INDIAN CREEK	1705020107	117,760	50	0.04	7	BT
SNAKE	1706010102	115,289	2142	1.86	740	SRC, SRS, BT

5th Field Watershed Name***	HUC	Acres	Treatment Acres	Percent Watershed Proposed for Treatment	Acres Proposed for Treatment in RHCAs*	Threatened Endangered and Sensitive Fish Present**
RIVER/TEMPERANCE CREEK						
SNAKE RIVER/WOLF CREEK	1706010103	103723	365	0.35	116	SRC, SRS
SOUTH FORK BURNT RIVER	1705020202	75,183	1281	1.70	75	NF
SOUTH WILLOW CREEK	1705011901	65,950	49	0.07	4	NF
UPPER BIG SHEEP CREEK	1706010203	89,358	341	0.38	174	SRC, SRS, BT
UPPER CAMAS CREEK	1707020205	104,623	32	0.03	0	MCC, MCS, RT
UPPER CATHERINE CREEK	1706010405	9,2520	19	0.02	4	SRC, SRS, BT
UPPER GRANDE RONDE RIVER	1706010401	133,776	330	0.25	187	SRC, SRS, BT
UPPER IMNAHA RIVER	1706010201	90,349	686	0.76	332	SRC, SRS, BT
UPPER JOSEPH CREEK	1706010605	125,191	421	0.34	120	SRS
UPPER NORTH FORK JOHN DAY RIVER	1707020201	71,525	30	0.04	2	MCC, MCS, BT, RT
UPPER POWDER RIVER	1705020301	105,509	461	0.44	154	BT
UPPER WALLOWA RIVER	1706010501	157,943	7	0.00	6	SRC, SRS, BT
WILLOW CREEK	1706010408	53,565	5	0.01	0	SRS
Grand Total			**22,840**		6345	

*Riparian Habitat Conservation Areas (RHCA) are based on designated PACFISH buffers as delineated in GIS. Total for watershed differs by 3 acres from proposed action table due to rounding differences in GIS. RHCA number includes chemical treatment, biocontrol and mechanical or hand treatments.

**SRC=Snake River Chinook, MCC=Middle Columbia Chinook, SRS=Snake River Steelhead, MCS=Middle Columbia Steelhead, BT= Bull Trout, RT=Redband Trout, WCT=Westslope Cutthroat Trout, MS=Margined Sculpin NF=No TES Fish Present ***Watersheds are displayed even if only a portion occurs on the W-WNF

Threatened, Endangered and Sensitive Fish Species and Habitat

This section discusses Threatened, Endangered and Sensitive[10] fish species and their habitat on the Wallowa-Whitman National Forest.

The Wallowa-Whitman National Forest Federally Listed fish species as well as fish species listed on the Region 6 Sensitive Species list are found in Table 54 and Table 55. Steelhead, Chinook, and chum, are under the jurisdiction of NOAA Fisheries, and bull trout under US Fish and Wildlife Service.

Table 54-Threatened, Endangered and Proposed fish species and critical habitat

Species		Status	Listing Status	Critical Habitat
Steelhead (*Oncorhynchus mykiss)*	Snake River Basin DPS	Threatened	Listed on 8/18/97; (62 FR 43937) Status Reaffirmed 6/28/05; (70 FR 37160)	09/02/05; 70 FR 52630
	Middle Columbia River DPS	Threatened	Listed on 3/25/99; (64 FR 14517) Status Reaffirmed 6/28/05; (70 FR 37160)	09/02/05; 70 FR 52630
Chinook Salmon (O*ncorynchus tshawytscha*)	Snake River Spring/Summer Run ESU	Threatened	Listed on 4/22/92; (57 FR 14653) Status Reaffirmed 6/28/05; (70 FR 37160)	10/25/99; 64 FR 57399
	Snake River Fall Run ESU	Threatened	Listed on 6/3/92; (57 FR 23458) Status Reaffirmed 6/28/05; (70 FR 37160)	12/28/93; 58 FR 68543
Bull Trout (*Salvelinus confluentus)*	Columbia River DPS	Threatened	Listed on 6/10/98; (63 FR 31647)	10/06/04; 69 FR 59996
Bliss Rapid Snail (*Taylorconcha serpenticola)*		Threatened	Listed on 12/14/92; (57 FR 59244)	None

[10] The Regional Forester's sensitive species list was updated in 2008, however the cover letter attached to the new list stated: “Projects initiated prior to the date of this letter may use the updated RFSS list transmitted in this letter or the RFSS list that was in effect when the project was initiated.(RF Linda Goodman, January 2008)” Changes to the sensitive species list will be reviewed during implementation and new sensitive species will be treated as species of local interest for the purposes of appling PDFs, however the analysis in this section was not updated to reflect the new lists.

Table 55-Sensitive fish species

Species	Designation
Redband Trout (*Oncorynchus mykiss gairdneri*)	Sensitive/MIS
Westslope Cutthroat Trout (*Oncorhynchus clarkii lewisi)*	Sensitive/MIS

MIS = Management Indicator Species - The Wallowa-Whitman Forest Plan specifies the use of Management Indicator Species (MIS) to evaluate the effects of proposed management activities upon fish and wildlife habitat (USDA 1990). The basic concept of Management Indicator Species is the selection of certain species found in specific habitat types to represent the habitat needs of a larger group of species requiring similar habitats.

For purposes of addressing federally listed fish species under the jurisdiction of NOAA Fisheries within the context of their status and life history, only brief summaries from various sources are presented in this document. Additional information related to brief life history information and status of populations at the ESU or DPS scale can be found in the following sources:

- Regional Invasive Plant EIS Fisheries Biological Assessment, Environmental Baseline,
- NMFS Federal Register documents (http://www.nwr.noaa.gov/ESA-Salmon-Listings/Salmon-Populations/Index.cfm),

Snake River (SR) spring/summer run Chinook salmon (Threatened)

Listing History

The Snake River spring/summer chinook salmon Evolutionarily Significant Unit (ESU) extends into the Wallowa-Whitman and Umatilla National Forests in Oregon. The Snake River spring/summer chinook salmon ESU, listed as threatened on April 22, 1992 (57 FR 14653), includes all natural-origin populations in the Tucannon, Grande Ronde, Imnaha, and Salmon Rivers. This ESU includes production areas that are characterized by spring-timed returns, summer-timed returns, and combinations from the two adult timing patterns. Runs classified as spring chinook are counted at Bonneville Dam beginning in early March and ending the first week of June; runs classified as summer chinook return to the Columbia River from June through August. Returning fish hold in deep mainstem and tributary pools until late summer, when they emigrate up into tributary areas and spawn. In general, spring type chinook tend to spawn in higher elevation reaches of major Snake River tributaries in mid- through late August, and summer run Snake River chinook spawn approximately one month later than spring-run fish.

Recovery planning for Snake River spring/summer chinook is ongoing, and recovery planning status can be reviewed online at: http://research.nwfsc.noaa.gov/trt/trt_columbia.htm

Critical Habitat

Critical habitat was designated for Snake River spring/summer chinook salmon on December 28, 1993 (58 FR 68543). Critical habitat is designated to include river and tributary reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams) to Snake River spring/summer chinook salmon in the Snake River basin. Migratory habitat in the Columbia River mainstem from the mouth to the Snake River confluence is also included. Essential habitat consists of four components: spawning and juvenile rearing, juvenile migration, areas for growth and development to adulthood, and adult migration corridors. Essential features of migration corridors are further defined as: substrate, water quality, water quantity, water velocity, cover/shelter, food (juveniles only), riparian vegetation, space, and safe passage conditions.

Life History

The Snake River spring/summer chinook ESU includes current runs to the Tucannon River, the Grand Ronde River system, the Imnaha River and the Salmon River (Matthews and Waples 1991).

Spring and summer chinook from the Snake River basin exhibit stream type life history characteristics (Healey, 1983). Most SR spring/summer chinook salmon enter individual subbasins from May through September. Eggs are deposited in late summer and early fall, incubate over the following winter and hatch in late winter/early spring of the following year. Juvenile SR spring/summer chinook salmon emerge from spawning gravels from February through June (Peery and Bjornn 1991). Typically, after rearing in their nursery streams for about 1 year, smolts begin migrating seaward in April and May (Bugert et al. 1990, Cannamela, 1992). Depending on the tributary and the specific habitat conditions, juveniles may migrate extensively from natal reaches into alternative summer rearing and/or overwintering areas.

After reaching the mouth of the Columbia River, spring/summer chinook salmon probably inhabit nearshore areas before beginning their northeast Pacific Ocean migration. Snake River spring/summer chinook return from the ocean to spawn primarily as 4 and 5 year old fish, after 2 to 3 years in the ocean. A small fraction of the fish return as 3-year-old 'jacks', heavily predominated by males.

Many of the Snake River tributaries used by spring and summer chinook runs exhibit two major features: extensive meanders through high elevation meadowlands and relatively steep lower sections joining the drainages to the mainstem Salmon (Matthews and Waples, 1991). The combination of relatively high summer temperatures and the upland meadow habitat creates the potential for high juvenile salmonid productivity. Historically, the Salmon River system may have supported more than 40 percent of the total return of spring and summer chinook to the Columbia system (e.g., Fulton 1968)

Action Area Information

Imnaha sub-basin, approximately 70 percent of which is within Wallowa-Whitman National Forest, has 5 major streams that contain more than five miles of anadromous fish habitat inside the National Forest land, including Imnaha River, Big Sheep Cr., Grouse Cr., Horse Cr., and Lightning Cr. Imnaha River holds roughly 45 miles of anadromous fish habitat inside National Forest System land.

Lower Grande Ronde River sub-basin, approximately 25 percent of which is within Wallowa-Whitman National Forest has 12 major streams that contain anadromous fish habitat inside the W-W National Forest land, including Grande Ronde River, Butte Cr., Joseph Cr., Elk Cr., Swamp Cr., Davis Cr., Cottonwood Cr., Peavine Cr., Mud Cr., McAllister Cr., Tope Cr., and Wildcat Cr. Joseph Cr. holds roughly 26 miles of anadromous fish habitat inside Wallowa-Whitman National Forest land.

Lower Snake/Asotin sub-basin (with only 70 percent as part of the ESU area, approximately 20 percent of which is within Wallowa-Whitman National Forest) holds roughly 12 miles of anadromous fish habitat inside Wallowa-Whitman National Forest land.

Hells Canyon, approximately 70 percent of which is within Wallowa-Whitman National Forest, has 1 major stream, Snake River, which contains more than five miles of anadromous fish habitat inside the National Forest land. Snake River holds roughly 53 miles of anadromous fish habitat inside National Forest System land.

Upper Grande Ronde River sub-basin, approximately 30 percent of which is within Wallowa-Whitman National Forest has 13 major streams that contain anadromous fish habitat inside the National Forest land, including Grande Ronde River, Meadow Creek, Burnt Corral Creek, McCoy Creek, Fly Creek, NF Cathrine Creek, Indian Creek, Spring Creek, Five Points Creek, Sheep Creek, Clear Creek, Beaver Creek and Limber Jim Creek. Grande Ronde River holds roughly 22 miles of anadromous fish habitat inside Wallowa-Whitman National Forest System land.

Wallowa River sub-basin, approximately 50 percent of which is within Wallowa-Whitman National Forest, has 4 major streams that contain more than five miles of anadromous fish habitat inside the National Forest land, including Minam River, Little Minam River, Lostine River, and Bear Cr. Minam River holds roughly 33 miles of anadromous fish habitat inside National Forest System land.

Snake River (SR) fall-run Chinook salmon (Threatened)

Listing History

The Snake River fall Chinook ESU extends into the Wallowa-Whitman and Umatilla National Forests. The Snake River fall chinook salmon ESU, listed as threatened on April 22, 1992, (57 FR 14653), includes all natural populations of fall chinook salmon in the mainstem Snake River below Hells Canyon Dam, and the Tucannon, Palouse (to Palouse Falls), Grande Ronde, Imnaha, Salmon, and Clearwater Rivers. Fall chinook from the Lyons Ferry Hatchery are included in the ESU but are not listed. Recovery planning for Snake River fall chinook is ongoing, and recovery planning status can be reviewed online at: http://research.nwfsc.noaa.gov/trt/trt_columbia.htm

Critical Habitat

Critical habitat was designated for Snake River fall chinook salmon on December 28, 1993, (58 FR 68543). Critical habitat for the listed ESU is designated to include river reaches presently or historically accessible (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams) to Snake River fall chinook salmon in the Columbia River from its mouth upstream to the confluence of the Columbia and Snake Rivers; all Snake River reaches from the confluence of the Columbia River, upstream to Hells Canyon Dam; the Palouse River from its confluence with the Snake River upstream to Palouse Falls; the Clearwater River from its confluence with the Snake River upstream to its confluence with Lolo Creek; the North Fork Clearwater River from its confluence with the Clearwater River upstream to Dworshak Dam.

Essential habitat consists of four components: spawning and juvenile rearing, juvenile migration, areas for growth and development to adulthood, and adult migration corridors. Essential features of migration corridors are further defined as: substrate, water quality, water quantity, water velocity, cover/shelter, food (juveniles only), riparian vegetation, space, and safe passage conditions.

Life History

Snake River fall chinook spawn above Lower Granite Dam in the mainstem Snake River, and in the lower reaches of major tributaries entering below Hells Canyon Dam. Adult fall chinook enter the Columbia River in July and August. The Snake River component of the fall chinook run migrates past the Lower Snake river mainstem dams in September and October. Spawning occurs from October through November. Juveniles emerge from the gravels in March and April of the following year. Downstream migration generally begins within several weeks of emergence (Becker, 1970, Allen and Meekin, 1973), and juveniles rear in backwaters and shallow water areas through mid-summer before smolting and migrating to the ocean—thus they exhibit an ocean-type juvenile history. Once in the ocean, they spend 1 to 4 years (though usually 3 years) before beginning their spawning migration. Fall returns in the Snake River system are typically dominated by 4-year-old fish.

Fall chinook returns to the Snake River generally declined through the first half of this century (Irving and Bjornn 1991). In spite of the declines, the Snake River basin remained the largest single natural production area for fall chinook in the Columbia drainage into the early 1960s (Fulton 1968). Spawning and rearing habitat for Snake River fall chinook was significantly reduced by the construction of a series of Snake River mainstem dams. Historically, the primary spawning fall chinook spawning areas were located on the upper mainstem Snake River.

Currently, natural spawning is limited to the area from the upper end of Lower Granite Reservoir to Hells Canyon dam and the lower reaches of the Imnaha, Grande Ronde, Clearwater and Tucannon Rivers.

Action Area Information

Imnaha sub-basin, approximately 70 percent of which is within Wallowa-Whitman National Forest, has 5 major streams that contain more than five miles of anadromous fish habitat inside the National Forest land, including Imnaha River, Big Sheep Cr., Grouse Cr., Horse Cr., and Lightning Cr. Imnaha River holds roughly 45 miles of anadromous fish habitat inside National Forest System land.

Lower Grande Ronde River sub-basin, approximately 25 percent of which is within Wallowa-Whitman National Forest has 12 major streams that contain anadromous fish habitat inside the W-W National Forest land, including Grande Ronde River, Butte Cr., Joseph Cr., Elk Cr., Swamp Cr., Davis Cr., Cottonwood Cr., Peavine Cr., Mud Cr., McAllister Cr., Tope Cr., and Wildcat Cr. Joseph Cr. holds roughly 26 miles of anadromous fish habitat inside Wallowa-Whitman National Forest System land.

Lower Snake/Asotin sub-basin (with only 70 percent as part of the ESU area, approximately 20 percent of which is within Wallowa-Whitman National Forest) holds roughly 12 miles of anadromous fish habitat inside Wallowa-Whitman National Forest System land.

Hells Canyon, approximately 70 percent of which is within Wallowa-Whitman National Forest, has 1 major stream, Snake River, which contains more than five miles of anadromous fish habitat inside the National Forest land. Snake River holds roughly 53 miles of anadromous fish habitat inside National Forest System land.

Middle Columbia River (MCR) steelhead (Threatened)

Listing History

Wallowa-Whitman, Umatilla, Malheur, Ochoco, Mt. Hood, and Wenatchee National Forests are located within the Middle Columbia River Steelhead ESU in Oregon and Washington. The Middle Columbia River steelhead ESU was listed as threatened on March 25, 1999 (64 FR

14517). The Middle Columbia River ESU encompasses Columbia River basin and tributaries upstream from and exclusive of the Wind River in Washington and the Hood River in Oregon, to and including the Yakima River in Washington. Recovery planning for Middle Columbia River steelhead is ongoing, and recovery planning status can be reviewed online at: http://research.nwfsc.noaa.gov/trt/trt_columbia.htm

Critical Habitat

Critical habitat was designated for Middle Columbia River steelhead on September 2, 2005 (70 FR 52630). NMFS designates critical habitat based on physical and biological features that are essential to the listed species. Essential features of designated critical habitat are: (1) substrate, (2) water quality, (3) water quantity, (4)water temperature, (5) water velocity, (6) cover/shelter, (7) food for juveniles, (8) riparian vegetation, (9) space, and (10) safe passage conditions (50 CFR 226.212). The three freshwater primary constituent elements of critical habitat are:

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 Wallowa-Whitman National Forest includes the stream channels in each designated reach, and a lateral extent as defined by the ordinary high water line (Sept. 2, 2005; 70 FR 52629). The primary constituent elements essential for conservation of listed ESUs are those sites and habitat components that support one or more fish life stages, including freshwater spawning sites, freshwater rearing sites, and freshwater migration corridors.

The main 5th field watersheds on Wallowa-Whitman National Forest with designated critical habitat are the Granite Creek, McKay Creek, Upper Camas Creek, and Upper North Fork John Day River watersheds.

Life History

Major drainages in this ESU are the Deschutes, John Day, Umatilla, Walla-Walla, Yakima, and Klickitat river systems. Almost all steelhead populations within this ESU are summer-run fish, the exceptions being winter-run components returning to the Klickitat and Fifteen Mile Creek watersheds. A balance between 1- and 2-year-old smolt emigrants characterizes most of the populations within this ESU. Adults return after 1 or 2 years at sea.

Most fish in this ESU smolt at two years and spend one to two years in salt water before re-entering fresh water, where they may remain up to a year before spawning. Age-2-ocean steelhead dominate the summer steelhead run in the Klickitat River, whereas most other rivers with summer steelhead produce about equal numbers of both age-1- and 2-ocean fish. Juvenile life stages (i.e., eggs, alevins, fry, and parr) inhabit freshwater/riverine areas throughout the range of the ESU. Parr usually undergo a smolt transformation as 2-year-olds, at which time they migrate to the ocean. Subadults and adults forage in coastal and offshore waters of the North Pacific prior to returning to spawn in their natal streams. A nonanadromous form of *O. mykiss* (redband trout) co-occurs with the anadromous form in this ESU, and juvenile life stages of the two forms can be very difficult to differentiate. In addition, hatchery steelhead are also distributed within the range of this ESU.

Recent estimates of the proportion of natural spawners of hatchery origin range from low (Yakima, Walla Walla, and John Day Rivers) to moderate (Umatilla and Deschutes Rivers). Most hatchery production in this ESU is derived primarily from within-basin stocks.

Action Area Information

North Fork John Day Sub-basin, approximately 10 percent of which is within Wallowa-Whitman National Forest, has 11 major streams that contain more than five miles of anadromous fish habitat inside the National Forest land, including NF John Day River, Wilson Cr., Skookum Cr., Mallory Cr., Camas Cr., Granite Cr., Clear Cr., Olive Cr., Lake Cr., Crane Cr., and Big Cr. NF John Day River holds roughly 10 miles of anadromous fish habitat inside Wallowa-Whitman Forest System land.

Snake River Basin (SRB) Steelhead (Threatened)

Listing History

Wallowa-Whitman and Umatilla National Forests are located within the Snake River Basin Steelhead ESU inside Oregon and Washington. The Snake River steelhead ESU, listed as threatened on August 18, 1997 (62 FR 43937), includes all natural-origin populations of steelhead in the Snake River basin of southeast Washington, northeast Oregon, and Idaho. None of the hatchery stocks in the Snake River basin are listed, but several are included in the ESU. Recovery planning for Snake River steelhead is ongoing, and recovery planning status can be reviewed online at: http://research.nwfsc.noaa.gov/trt/trt_columbia.htm

Critical Habitat

Critical habitat was designated for Snake River steelhead on September 2, 2005 (70 FR 52630). NMFS designates critical habitat based on physical and biological features that are essential to the listed species. Essential features of designated critical habitat are: (1) substrate, (2) water quality, (3) water quantity, (4)water temperature, (5) water velocity, (6) cover/shelter, (7) food for juveniles, (8) riparian vegetation, (9) space, and (10) safe passage conditions (50 CFR 226.212). The three freshwater primary constituent elements of critical habitat are:

- 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 Wallowa-Whitman National Forest includes the stream channels in each designated reach, and a lateral extent as defined by the ordinary high water line

(Sept. 2, 2005; 70 FR 52629). The primary constituent elements essential for conservation of listed ESUs are those sites and habitat components that support one or more fish life stages, including freshwater spawning sites, freshwater rearing sites, and freshwater migration corridors.

The 5th field watersheds on Wallowa-Whitman National Forest with designated critical habitat are the Bear Creek, Chesnimnus Creek, Grande Ronde River – Beaver Creek, Grande Ronde River – Five Points Creek, Grande Ronde River – Grossman Creek, Grande Ronde River – Indian Creek, Grande Ronde River – Mud Creek, Ladd Creek, Lostine Creek, Lower Big Sheep Creek, Lower Catherine Creek, Lower Imnaha River, Lower Joseph Creek, Lower Wallowa River, Meadow Creek, Middle Imnaha River, Minam River, Rapid River, Snake River – Cherry Creek, Snake River – Granite Creek, Snake River – Temperance Creek, Snake River – Wolf Creek, Upper Big Sheep Creek, Upper Catherine Creek, Upper Grande Ronde River, Upper Imnaha River, Upper Joseph Creek and Upper Wallowa River watersheds.

Life History

The Snake River historically supported more than 55 percent of total natural-origin production of steelhead in the Columbia River Basin.

It now has approximately 63 percent of the basin's natural production potential (Mealy, 1997). The Snake River steelhead ESU is distributed throughout the Snake River drainage system, including tributaries in southwest Washington, eastern Oregon and north/central Idaho (NMFS, 1997a).

Snake River steelhead migrate a substantial distance from the ocean (up to 1,500 km) and use high elevation tributaries (typically 1,000-2,000 m above sea level) for spawning and juvenile rearing. Snake River steelhead occupy habitat that is considerably warmer and drier (on an annual basis) than other steelhead ESUs. Snake River basin steelhead are generally classified as summer run, based on their adult run timing patterns. Summer steelhead enter the Columbia River from late June to October. After holding over the winter, summer steelhead spawn during the following spring (March to May). Managers classify up-river summer steelhead runs into two groups based primarily on ocean age and adult size upon return to the Columbia River. A-run steelhead are predominately age-1 ocean fish while B-run steelhead are larger, predominated by age-2 ocean fish.

With one exception (the Tucannon River production area), the tributary habitat used by Snake River steelhead ESU is above Lower Granite Dam. Major groupings of populations and/or subpopulations can be found in (1) the Grande Ronde River system; (2) the Imnaha River drainage; (3) the Clearwater River drainages; (4) the South Fork Salmon River; (5) the smaller mainstem tributaries before the confluence of the mainstem; (6) the Middle Fork salmon production areas, (7) the Lemhi and Pahsimeroi valley production areas and (8) upper Salmon River tributaries.

The A-run populations are found in the tributaries to the lower Clearwater River, the upper Salmon River and its tributaries, the lower Salmon River and its tributaries, the Grand Ronde River, Imnaha River, and possibly the Snake River's mainstem tributaries below Hells Canyon Dam. B-run steelhead occupy four major subbasins, including two on the Clearwater River (Lochsa and Selway) and two on the Salmon River (Middle Fork and South Fork); areas that are for the most part not occupied by A-run steelhead. Some natural B-run steelhead are also produced in parts of the mainstem Clearwater and its major tributaries. There are alternative escapement objectives of 10,000 (Columbia River Fisheries Management Plan) and 31,400

(Idaho) for B-run steelhead. B-run steelhead, therefore, represent at least 1/3 and as much as 3/5 of the production capacity of the ESU.

B-run steelhead are distinguished from the A-run component by their unique life history characteristics. B-run steelhead were traditionally distinguished as larger fish with a later run timing. The recent review by the U.S. v. Oregon Technical Advisory Committee (TAC), a group that monitors adult salmon and steelhead escapement in the Snake River Basin, indicated that different populations of steelhead do have different size structures, with populations dominated by larger fish (i.e., greater than 77.5 cm) occurring in the traditionally defined B-run basins. Larger fish occur in other populations throughout the basin, but at much lower rates. Evidence suggests that fish returning to the Middle Fork Salmon River and Little Salmon River have a more equal distribution of large and small fish. B-run steelhead also are generally older. A-run steelhead are predominately 1-ocean fish, whereas most B-run steelhead generally spend 2 or more years in the ocean before spawning. The differences in ocean age are primarily responsible for the differences in the size of A- and B-run steelhead. However, B-run steelhead are also thought to be larger at any given age than A-run fish.

This may be due, at least in part, to the fact that B-run steelhead leave the ocean later in the year than A-run steelhead and thus have an extra month or more of ocean residence when growth rates are thought to be greatest.

Action Area Information

Imnaha sub-basin, approximately 70 percent of which is within Wallowa-Whitman National Forest, has 5 major streams that contain more than five miles of anadromous fish habitat inside the National Forest land, including Imnaha River, Big Sheep Cr., Grouse Cr., Horse Cr., and Lightning Cr. Imnaha River holds roughly 45 miles of anadromous fish habitat inside National Forest System lands.

Lower Grande Ronde River sub-basin, approximately 25 percent of which is within Wallowa-Whitman National Forest has 12 major streams that contain anadromous fish habitat inside the National Forest land, including Grande Ronde River, Butte Cr., Joseph Cr., Elk Cr., Swamp Cr., Davis Cr., Cottonwood Cr., Peavine Cr., Mud Cr., McAllister Cr., Tope Cr., and Wildcat Cr. Joseph Cr. Holds roughly 26 miles of anadromous fish habitat inside Wallowa-Whitman National Forest System land.

Lower Snake/Asotin sub-basin (with only 70 percent as part of the ESU area, approximately 30 percent of which is within Umatilla National Forest) has 1 major stream that contains anadromous fish habitat inside the National Forest land. Snake River holds roughly 12 miles of anadromous fish habitat on Wallowa-Whitman National Forest System land.

Hells Canyon sub-basin, approximately 70 percent of which is within Wallowa-Whitman National Forest, has 1 stream, Snake River, which contains more than five miles of anadromous fish habitat inside the National Forest System land; Snake River holds roughly 53 miles of anadromous fish habitat inside National Forest System land.

Upper Grande Ronde River sub-basin, approximately 30 percent of which is within Wallowa-Whitman National Forest, has 13 major streams that contain more than five miles of anadromous fish habitat inside National Forest System land, including Grande Ronde River, Meadow Cr., Burnt Corral Cr., McCoy Cr., Fly Cr., NF Cathrine Cr., SF Cathrine Cr., Indian Cr., Five Points Cr., Sheep Cr., Clear Cr., Beaver Cr. and Limber Jim Cr. Grande Ronde River holds roughly 22 miles of anadromous fish habitat inside Wallowa-Whitman National Forest System land.

Wallowa River sub-basin, approximately 50 percent of which is within Wallowa-Whitman National Forest, has 4 major streams that contain more than five miles of anadromous fish habitat inside the National Forest System land, including Minam River, Little Minam River, Lostine River, and Bear Cr. Minam River holding roughly 33 miles of anadromous fish habitat inside National Forest System land.

Columbia River Bull Trout

This section is taken directly out of the R6 2005 FEIS Fish Biological Assessment (BA) (USDA Forest Service 2005c) so as not to recreate information.

The FWS BOs for the FS LRMPs as amended by the NWFP and the FS LRMPs as amended by the PACFISH and INFISH provided a general description of the status of bull trout in the NWFP (USDI, 1998 and USDI, 2004). The draft Bull Trout Recovery Plan provides information on the distribution and abundance of bull trout in all Distinct Population Segments (DPS) in the conterminous United States, and offers the most recent status information for the species by recovery unit (USDI, 2002). Of the 23 recovery units for bull trout, 16 extend into National Forest System lands. Chapters 2, 5 to 14, and 20 to 24 of the Draft Recovery Plans describe the current distribution and abundance of the recovery units considered in this BA. Reasons for decline for each recovery unit are identified within the draft Bull Trout Recovery Plan.

Detailed accounts of life history, taxonomy and behavior can be found in the final rule listing the Columbia River and Klamath River populations of bull trout as threatened (USFWS, 1998b), and in the determination of threatened status for bull trout in the conterminous United States (USFWS, 1999a) for Coastal-Puget Sound, and the Status of Oregon's bull trout; distribution, life history, limiting factors, management considerations, and status (Buchanan et al., 1997).

The FWS has draft recovery plans for the Columbia River and Klamath River DPSs (USFWS 2002a) and the Coastal-Puget Sound DPS (USFWS 2004a). Through these efforts, the FWS has converted bull trout subpopulations into "core areas." Core areas represent a combination of habitat that provides all elements for the long-term security of bull trout and the presence of bull trout inhabiting core habitat. Thus, core areas form the basis on which to gauge recovery within a recovery unit. Thus, a core area, by definition, is considered habitat occupied by bull trout and serves as a biologically discrete unit upon which to base bull trout recovery. Within core areas, groups of bull trout or local populations which spawn in various tributaries are generally characterized by relatively small amounts of genetic diversity within a tributary, but high levels of genetic divergence between tributaries (Chapter 1, recovery plan). Individual local populations may come and go or expand and contract over time, but the focus of the draft recovery plan is maintaining all existing core areas.

Critical Habitat

Critical habitat was designated by the FWS for the Columbia River DPS bull trout on October 6, 2004 (69 FR 59996) (USFWS 2004b). Lands not designated as critical habitat for Columbia River Basin bull trout include those that do not meet the requirement of needing special management or protection and are excluded due to the exercise of the Secretary of Interior's Authority under section 4(b)(2) of the ESA.

On September 21, 2004, the FWS designated 2,812 km (1,748 mi) of streams and 24,781 ha (61,235 ac) of lakes in Oregon, Idaho, and Washington as critical habitat for bull trout. Within the Columbia River Basin, 1,136 km (706 mi) of streams in Oregon and 1,186 km (737 mi) of streams in Washington were designated as critical habitat (USFWS 2004b).

The FWS determined that PACFISH, INFISH, the Interior Columbia Basin Ecosystem Management Project (ICBMP) strategy, and the Northwest Forest Plan (NWFP) Aquatic Conservation Strategy (ACS) provide conservation, adequate protection and special management for the PCEs essential for bull trout. Protection is at least comparable to designating critical habitat. As a result, those lands are not being designated critical habitat as they do not meet the statutory definition. In many specific ways these plans are superior to a designation in that they require enhancement and restoration of habitat, acts not required by the designation.

Life History and Habitat Description

Biology

Bull trout exhibit both resident and migratory life-history strategies (Rieman and McIntyre 1993). Resident bull trout complete their entire life cycle in the tributary (or nearby) streams in which they spawn and rear.

Migratory bull trout spawn in tributary streams where juvenile fish rear one to four years before migrating to either a lake (adfluvial form), river (fluvial form) (Fraley and Shepard1989, Goetz 1989), or in certain coastal areas, to saltwater (anadromous) (Cavender 1978; McPhail and Baxter 1996; WDFW et al., 1997). Resident and migratory life-history forms may be found together but it is unknown if they represent a single population or separate populations (Rieman and McIntyre 1993). Either form may give rise to offspring exhibiting either resident or migratory behavior (Rieman and McIntyre 1993). The multiple life-history strategies found in bull trout populations represent important diversity (both spatial and genetic) that help protect these populations from environmental stochasticity.

The size and age of bull trout at maturity depends upon the life-history strategy and habitat limitations. Resident fish tend to be smaller than migratory fish at maturity and produce fewer eggs (Fraley and Shepard 1989; Goetz, 1989). Resident adults usually range from 150 to 300 millimeters (6 to 12 inches) total length (TL). Migratory adults however, having lived for several years in larger rivers or lakes and feeding on other fish, grow to a much larger size and commonly reach 600 millimeters (24 inches) TL or more (Pratt 1985; Goetz 1989).

The largest verified bull trout was a 14.6-kilogram (32-pound) adfluvial fish caught in Lake Pend Oreille, Idaho, in 1949 (Simpson and Wallace 1982). Size differs little between life-history forms during their first years of life in headwater streams, but diverges as migratory fish move into larger and more productive waters (Rieman and McIntyre 1993).

Ratliff (1992) reported that bull trout under 100 mm (4 inches) in length were generally only found in the vicinity of spawning areas, and that fish over 100 mm were found downstream in larger channels and reservoirs in the Metolius River Basin. Juvenile migrants in the Umatilla River were primarily 100-200 mm long (4 to 8 inches) in the spring and 200-300 mm long (8 to 12 inches) in October (Buchanan et al., 1997). The age at migration for juveniles is variable. Ratliff (1992) reported that most juveniles reached a size to migrate downstream at age 2, with some at ages 1 and 3 years. Pratt (1992) had similar findings for age-at-migration of juvenile bull trout from tributaries of the Flathead River. The seasonal timing of juvenile downstream migration appears similarly variable.

Bull trout normally reach sexual maturity in 4 to 7 years and may live longer than 12 years. The species is iteroparous (i.e., can spawn multiple times in their lifetime) and adults may spawn each year or in alternate years (Batt 1996). Repeat-spawning frequency and post-spawning mortality are not well documented (Leathe and Graham 1982; Fraley and Shepard 1989; Pratt 1992; Rieman and McIntyre 1996) but post-spawn survival rates are believed to be high.

Bull trout typically spawn from late August to November during periods of decreasing water temperatures (below 9 degrees Celsius/48 degrees Fahrenheit). Redds are often constructed in stream reaches fed by springs or near other sources of cold groundwater (Goetz 1989; Pratt 1992; Rieman and McIntyre 1996). Migratory bull trout frequently begin spawning migrations as early as April and have been known to move upstream as far as 250 kilometers (km) (155 miles) to spawning grounds in Montana (Fraley and Shepard 1989; Swanberg 1997). In Idaho, bull trout moved 109 km (67.5 miles) from Arrowrock Reservoir to spawning areas in the headwaters of the Boise River (Flatter 1998). In the Blackfoot River, Montana, bull trout began spring spawning migrations in response to increasing temperatures (Swanberg, 1997). Depending on water temperature, egg incubation is normally 100 to 145 days (Pratt 1992), and after hatching, juveniles remain in the substrate. Time from egg deposition to emergence of fry may surpass 220 days. Fry normally emerge from early April through May, depending on water temperatures and increasing stream flows (Pratt 1992; Ratliff and Howell 1992).

Bull trout are opportunistic feeders, with food habits primarily a function of size and life-history strategy.

Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macro-zooplankton, and small fish (Boag 1987; Goetz 1989; Donald and Alger 1993). Adult migratory bull trout feed on various fish species (Leathe and Graham 1982; Fraley and Shepard 1989; Brown 1992; Donald and Alger 1993). In coastal areas of western Washington, bull trout feed on Pacific herring (*Clupea pallasi*), Pacific sand lance (*Ammodytes hexapterus*), and surf smelt (*Hypomesus pretiosus*) in the ocean (WDFW et al., 1997).

Habitat Affinities

Bull trout have more specific habitat requirements than most other salmonids (Rieman and McIntyre 1993). Habitat components that influence the species' distribution and abundance include water temperature, cover, channel form and stability, valley form, spawning and rearing substrate, and availability of migratory corridors (Fraley and Shepard, 1989; Goetz 1989; Hoelscher and Bjornn 1989; Sedell and Everest 1991; Howell and Buchanan 1992; Pratt 1992; Rieman and McIntyre 1993, 1995; Rich 1996; Watson and Hillman 1997).

Watson and Hillman (1997) concluded that watersheds must have specific physical characteristics to provide the habitat requirements necessary for bull trout to successfully spawn and rear and that these specific characteristics are not necessarily present throughout these watersheds. Because bull trout exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993), individuals of this species should not be expected to simultaneously occupy all available habitats (Rieman et al., 1997).

Bull trout are found primarily in cold streams, although individual fish are found in larger, warmer river systems throughout the Columbia River Basin (Fraley and Shepard 1989; Rieman and McIntyre 1993, 1995; Buchanan et al. 1997; Rieman et al., 1997). Water temperature above 15 degrees Celsius (59 degrees Fahrenheit) is believed to limit bull trout distribution, a limitation that may partially explain the patchy distribution within a watershed (Fraley and Shepard 1989; Rieman and McIntyre 1995).

Spawning areas are often associated with cold-water springs, groundwater infiltration, and the streams with the coldest summer water temperatures in a given watershed (Pratt 1992; Rieman and McIntyre 1993; Rieman et al., 1997; Baxter et al., 1999). Water temperatures during spawning generally range from 5 to 9 degrees Celsius (41 to 48 degrees Fahrenheit) (Goetz 1989). The requirement for cold water during egg incubation has generally limited the spawning distribution of bull trout to high elevations in areas where the summer climate is warm. Rieman and McIntyre (1995) found in the Boise River Basin that no juvenile bull trout were present in streams below 1613 m (5000 feet). Similarly, in the Sprague River Basin of south-central Oregon, Ziller (1992) found in four streams with bull trout that "numbers of bull trout increased and numbers of other trout species decreased as elevation increased. In those streams, bull trout were only found at elevations above 1774 m [5500 feet]."

All life-history stages of bull trout are associated with complex forms of cover, including large woody debris, undercut banks, boulders, and pools (Fraley and Shepard 1989; Goetz 1989; Hoelscher and Bjornn 1989; Sedell and Everest 1991; Pratt 1992; Thomas 1992; Rich 1996; Sexauer and James 1997; Watson and Hillman 1997). Jakober (1995) observed bull trout overwintering in deep beaver ponds or pools containing large woody debris in the Bitterroot River drainage, Montana, and suggested that, because of the need to avoid anchor ice in order to survive, suitable winter habitat may be more restricted than summer habitat. Maintaining bull trout habitat requires stability of stream channels and of flow (Rieman and McIntyre 1993). Juvenile and adult bull trout frequently inhabit side channels, stream margins, and pools with suitable cover (Sexauer and James 1997).

These areas are sensitive to activities that directly or indirectly affect stream channel stability and alter natural flow patterns. For example, altered stream flow in the fall may disrupt bull trout during the spawning period, and channel instability may decrease survival of eggs and young juveniles in the gravel from winter through spring (Fraley and Shepard 1989; Pratt 1992; Pratt and Huston 1993).

Preferred bull trout spawning habitat consists of low-gradient stream reaches with loose, clean gravel (Fraley and Shepard 1989). In the Swan River, Montana, abundance of bull trout redds was positively correlated with the extent of bounded alluvial valley reaches, which are likely areas of groundwater to surface water exchange (Baxter et al., 1999). Survival of bull trout embryos planted in stream areas of groundwater upwelling used by bull trout for spawning were significantly higher than embryos planted in areas of surface-water recharge not used by bull trout for spawning (Baxter and McPhail 1999). Pratt (1992) indicated that increases in fine sediment reduce egg survival and emergence.

Migratory corridors link seasonal habitats for all bull trout life-history forms. For example, in Montana, migratory bull trout make extensive migrations in the Flathead River system (Fraley and Shepard 1989), and resident bull trout in tributaries of the Bitterroot River move downstream to overwinter in tributary pools (Jakober 1995). The ability to migrate is important to the persistence of bull trout (Rieman and McIntyre 1993; M. Gilpin, in litt., 1997; Rieman et al., 1997). Migrations facilitate gene flow among local populations when individuals from different local populations interbreed, or stray, to nonnatal streams. Local bull trout populations that are extirpated by catastrophic events may also become re-established by migrants.

Action Area Information

Bull trout are found in the following fifth field and sixth field watersheds on the Wallowa-Whitman National Forest:

- Bear Creek (Upper Bear Creek and Lower Bear Creek),

- Grande Ronde River – Beaver Creek (Grande Ronde River Coleman Ridge and Lower Beaver Creek),
- Grande Ronde River – Five Points Creek (Grande Ronde River – Wright Slough and Grande Ronde River – Haywire Canyon),
- Grande Ronde River – Grossman Creek (Grande Ronde River – Slickman Creek, Grande Ronde River – Bear Creek and Grande Ronde River – Clear Creek),
- Grande Ronde River – Indian Creek (Grande Ronde River – Arnolds Loup Res, Lower Indian Creek and Upper Indian Creek),
- Grande Ronde River – Mud Creek (Grande Ronde River – Mile 50),
- Granite Creek (Lower Granite Creek, Upper Granite Creek and Clear Creek),
- Lostine River (Lostine R – Silver Creek and Lostine R – Lake Creek),
- Lower Big Sheep Creek (Big Sheep Creek – Lower Little Sheep Creek, Middle Little Sheep Creek and Upper Little Sheep Creek),
- Lower Catherine Creek (Catherine Creek – Hamilton Rd, Catherine Creek – Conley L and Catherine Creek – McAllister Slough),
- Lower Imnaha River (Imnaha R – Thorn Creek, Imnaha R – Fence Creek and Imnaha R – Bear Creek),
- Lower Wallowa River (Wallowa R – Fisher Creek, Wallowa R – Water Canyon and Dear Creek),
- Middle Imnaha River (Imnaha R – Deer Creek, Imnaha R – Chalk Creek and Imnaha R – Summit Creek),
- Minam River (Lower Minam R, Minam R – Trout Creek, Minam R – Chaparral Creek, Little Minam, North Minam, Minam R – China Gap Creek and Upper Minam),
- North Powder River (Upper Anothony R and Upper North Powder R),
- Pine Creek (Lake Fork Creek, Clear Creek, Upper Pine Creek and East Pine Creek),
- Powder River – Rock Creek (Muddy Creek, Lower Salmon Creek and Upper Salmon Creek),
- Rapid River (Lower Rapid R, West Fork Rapid R, Rapid R – Copper Creek and Upper Rapid River),
- Snake River(SR) – Cherry Creek (SR – Corral Creek, SR – Cache Creek and SR – Jim Creek)
- Snake River – Granite Creek (Sheep Creek, SR – Sluice Bar, Granite Creek and SR – Butte Creek),
- Snake River – Indian Creek (SR – Hells Canyon Dam, SR – McGraw Creek, Indian Creek, SR – Homestead Creek and SR – Oxbow Dam),
- Snake River – Temperance Creek (Getta Creek, SR – Sommers Creek, SR – Big Canyon Dam, SR – Kurry Creek, SR – Corral Creek, SR – Salt Creek and SR – Sand Creek),
- Snake River – Wolf Creek (SR – Dug Bar, SR – Dry Creek and SR – Eureka Bar),
- Upper Big Sheep Creek (Big Sheep Creek – Steer Creek, Big Sheep Creek –Marr Creek, Big Sheep Creek –Carroll Creek, Big Sheep Creek –Tyee Creek, Upper Big Sheep Creek and Lick Creek),
- Upper Catherine Creek (Catherine Creek – Brinker Creek, NF Catherine Creek, SF Catherine Creek and Catherine Creek – Milk Creek),

- Upper Grande Ronde River (Grande Ronde River – Warm Springs Creek, Lower Fly Creek, Limber Jim Creek, Little Fly Creek, Grande Ronde River –Meadowbrook Creek, Chicken Creek and Grande Ronde River –Tanner Gulch),
- Upper Imnaha River (Imnaha R – Crazyman Creek, Imnaha River – Dry Creek, NF Imnaha River, SF Imnaha River and Imnaha River – Rock Creek),
- Upper North Fork John Day River (Trail Creek, NFJDR – Baldy Creek, NFJDR – Crane Creek and NFJD River – Onion Creek),
- Upper Powder River (Cracker Creek and Deer Creek),
- Upper Wallowa River (Wallowa River – Wallawa Lake and Hurricane Creek).

Snake River Sockeye Salmon (Endangered)

Listing History

The Wallowa-Whitman National Forest is not contained within the Snake River sockeye ESU, which is located in Southwest Idaho. However, the Snake River sockeye salmon does use Columbia River and Snake River within Oregon and Washington as a migration corridor to get to and leave from their ESU area in Idaho. The only extant population of the anadromous form of Snake River sockeye is the Redfish Lake population.

The Snake River sockeye salmon ESU was listed as endangered on November 20, 1991, (56 FR 58619) and includes populations of sockeye salmon from the Snake River basin, Idaho (extant populations occur in the Salmon River subbasin). Under NOAA Fisheries' interim policy on artificial propagation (58 FR 17573), the progeny of fish from a listed population that are propagated artificially are considered part of the listed species and are protected under ESA. Thus, although not specifically designated in the 1991 listing, Snake River sockeye salmon produced in the captive broodstock program are included in the listed ESU.

Critical Habitat

Designated critical habitat (58 FR 68543, December 28, 1993) extends from the mouth of the Columbia River upstream to the Snake River confluence, up the Snake River to the Salmon River confluence, and up the Salmon River mainstem and tributaries to the five lakes still accessible (Stanley, Redfish, Yellow Belly, Pettit, and Alturas), and includes the lakes and their inlet creeks. Essential habitat consists of four components: spawning and juvenile rearing, juvenile migration, areas for growth and development to adulthood, and adult migration corridors. Essential features of migration corridors are further defined as: substrate, water quality, water quantity, water velocity, cover/shelter, food (juveniles only), riparian vegetation, space, and safe passage conditions. Adult Snake River sockeye salmon enter the Columbia River in late spring and early summer and reach the spawning lakes in late summer and early fall. Smolts begin emigration in April, and are present in the Columbia River estuary through the early summer months.

The critical habitat designation identifies those physical and biological features of the habitat that are essential to the conservation of the species and that may require special management consideration or protections. Essential feature of the juvenile mitigation corridors include adequate: 1) substrate; 2) water quality; 3) water quantity; 4) water temperature; 5) water velocity; 6) cover/shelter 7) food; 8) riparian vegetation; 9) space; and safe passage conditions. The adult migration corridors are the same areas included in the juvenile migration corridors. Essential features would include those in juvenile migration corridors, excluding adequate food.

Riparian Zones (Aquatic Influence Zones)

In the Columbia River Basin, critical habitat includes the water, waterway bottom, and the adjacent riparian zone. Biophysical characteristics and processes that create riparian zones vary considerably throughout the range of listed Snake River salmon. Critical habitat designation (58 FR 68545, December 28, 1993) references the interagency Forests Ecosystem Management Assessment Team (FEMAT) report (1993) stating riparian zones consist of "areas where the vegetation complex and microclimate conditions are products of the combined presence and influence of perennial as well as intermittent water associated high water table, and soils that exhibit some wetness characteristics".

Life History

Sockeye salmon occur in two forms: the anadromous sockeye and the nonanadromous kokanee. Kokanee originated as residual sockeye that did not emigrate to the ocean or undergo smoltification (Meehan and Bjornn 1991). Kokanee spend their entire lives in the lake environment, although some can produce anadromous offspring. In the case of Snake River sockeye, adults typically enter fresh water during June and July. Arrival at Redfish Lake, which now supports the only remaining run of Snake River sockeye salmon, peaks in August, and spawning occurs primarily in October (Bjornn et al. 1968). Eggs hatch in the spring between 80 and 140 days after spawning. Fry remain in the gravel for 3 to 5 weeks, emerge from April through May, and move immediately into the lake. Once there, juveniles feed on plankton for 1 to 3 years before they migrate to the ocean (Bell 1986). Migrants leave Redfish Lake during late April through May (Bjornn et al. 1968) and travel almost 900 miles to the Pacific Ocean. Smolts reaching the ocean remain inshore or within the influence of the Columbia River plume during the early summer months. Later, they migrate through the northeast Pacific Ocean (Hart 1973, Hartt and Dell 1986). Snake River sockeye salmon spend 2 to 3 years in the Pacific Ocean and return in their fourth or fifth year of life.

Population Trends

In the 2003 status review update, NOAA Fisheries modified previous approaches to ESU risk assessment to incorporate VSP criteria (McElhany et al., 2000): abundance, growth rate/productivity, spatial structure, and diversity. The current condition (NOAA Fisheries, 2003) of SR sockeye is summarized below:

Abundance:

- Sixteen naturally produced adults in the last decade
- Captive broodstock program initiated in 1991 has provided temporary rescue from extinction

Productivity:

- Return of 257 hatchery adults in 2000, while hatchery returns in 2000 and 2001 averaged about 25
- Natural population trends are not encouraging

Spatial Structure:

- Historically occurred in 4 lakes within the Stanley Basin, and up to 3 additional lakes across Snake River drainage

- Redfish Lake is the only extant population

Diversity:
- Residual-type sockeye in Redfish Lake
- Possible remnant gene pools in Stanley and Petit Lakes

Escapement of sockeye salmon to the Snake River has declined dramatically in the last several decades, primarily because the construction of hydropower dams made it difficult for sockeye salmon to have access to traditional spawning areas (Gustafson et al.1997). Adult counts at Ice Harbor Dam declined from 3,170 in 1965 to zero in 1990 (ODFW and WDFW 1999). The Idaho Department of Fish and Game (IDFG) counted adults at a weir in Redfish Lake Creek from 1954 through 1966; adult counts dropped from 4,361 in 1955 to fewer than 500 after 1957 (Bjornn et al. 1968). A total of 16 wild sockeye salmon returned to Redfish Lake between 1991 and 1999. During 1999, seven hatchery-produced, age-3 adults returned to the Sawtooth Hatchery. Three of these adults were released to spawn naturally, and four were taken into the IDFG captive broodstock program. In 2000, 257 hatchery-produced, age-4 sockeye salmon returned to the Stanley basin (weirs at the Sawtooth Hatchery and Redfish Lake Creek). Adults numbering 243 were handled and redistributed to Redfish (120), Alturas (52), and Pettit (28) lakes, with the remaining 43 adults incorporated into the IDFG captive broodstock program. In 2001, 36 adult sockeye were counted at Lower Granite Dam (FPC, 2002).

Low numbers of adult Snake River sockeye salmon preclude a quantitative analysis of the status of this ESU. However, NOAA Fisheries considers the status of this ESU to be dire under any criteria because only16 wild and 264 hatchery-produced adult sockeye returned to the Stanley basin between 1990 and 2000, and although 257 hatchery adults returned in 2000, only 26 hatchery adults returned in 2001 and 22 in 2002.

Sockeye survival from smolt to adult has declined by an estimated 74-81 percent since the early 1960s, correlated with hydropower development. NOAA Fisheries has not estimated the risk of absolute extinction for the Snake River sockeye salmon (though the estimates were made for the other listed species, see below) because this ESU is currently at extremely low abundances and maintained through a captive broodstock program (McClure et al. 2000).

Threats
Snake River sockeye salmon have declined dramatically as a result of fishery management policy, overharvest, hydropower-caused mortality, and irrigation water withdrawals.

Distribution within the Project Area
The only extant population of anadromous Snake River sockeye salmon is the Redfish Lake population. Migratory habitat in the Snake River is within the project area: although the project area for this BA is outside the Snake River Sockeye ESU. Sockeye salmon pass Bonneville Dam from June 1 to July 31, and Lower Granite Dam from June 25 to August 30, on their almost 900-mile migration to spawning grounds of the upper Salmon River.

Bliss Rapids Snail
A Bliss Rapids snail population occurs about 7 miles downstream from Hells Canyon Dam (USDA Forest Service 2005c), which is within the Wallowa-Whitman National Forest.

Detailed accounts of the taxonomy, life history and behavior of the Bliss Rapids snail can be found in the final rule designating the species as threatened (U.S. Fish and Wildlife Service, 1992) and in the final recovery plan (U.S. Fish and Wildlife Service 1995).

Life History and Habitat Description

The Bliss Rapids snail (*Taylorconcha serpenticola*) is a “living fossil; a relic from ancient lakes.” The Bliss Rapids snail is a survivor of the Pliocene (Blancan) Lake Idaho, which covered much of southern Idaho (Taylor 1988). The species is considered an annual species with an average longevity of one year. Bliss Rapids snail experience a die-off of older adults during the late winter-early spring season following reproduction.

The Bliss Rapids snail was first collected live and recognized as a new taxon in 1959 (Taylor 1982), but has not yet been described in the literature. This snail is 2.0-2.5 mm (0.8-.10 in) long, with three whorls, and is roughly ovoid in shape. There are two color variants or morphs in the Bliss Rapids snail, the colorless or “pale” form and the orange-red or “orange” form. The pale morph is slightly smaller with rounded whorls and more melanin pigment on the body (Frest and Johannes 1992). This snail occurs on stable, cobble-boulder substratum only in flowing waters in the free-flowing reaches of mainstem Snake River and also in a few spring alcove habitats in the Hagerman Valley. The species does not burrow in sediments and normally avoids surfaces with attached plants. Known river populations (or colonies) of the Bliss Rapids snail occurs only in areas associated with spring influences or rapids edge environments and tend to flank shorelines. They are found at varying depths if dissolved oxygen and temperature requirements persist and are found in shallow (<1.0 cm (0.4 in) permanent cold springs (Frest and Johannes, 1992). The species is considered moderately photophobic and resides on the lateral sides and undersides of rocks during daylight (Bowler 1990). The snail will migrate to graze on aufwuchs (or perilithon) on the uppermost surfaces of rocks nocturnally. The species can be locally quite abundant, and it is especially abundant on smooth rock surfaces with common encrusting red algae.

Reproduction in the Bliss Rapids snail varies according to habitat; occurring October-February in mainstem Snake River colonies and February-May in large-spring colonies. Egg laying occurs within two months of reproduction and eggs appear to hatch within one month. Adult snails exhibit a strong seasonal die-off after reproduction. Turnover appears more pronounced in mainstem river colonies, possibly due to environmental stress (Frest and Johannes 1992).

Ecologically, this species requires cold, clean, well-oxygenated flowing water of low turbidity. The species prefer gravel to boulder size substratum. It has an affinity to habitat usually associated with spring or spring-like river habitats. For example, the Bliss Rapids snail can be found in small, shallow springs or large, deep spring outflows. In the mainstem river, they are found in areas of the river not subject to daily or seasonal fluctuations. It does not tolerate whitewater areas with rapid flow.

Action Area Information

The Bliss Rapids snail occurs in the Snake River where it flows through the Wallowa-Whitman National Forest. Collections made in September 2004 by Dr. Hershler of the Smithsonian, an expert in spring snail identification, have tentatively identified Bliss Rapids snail occurrence in the mainstem of the Snake River from Hells Canyon Dam downstream to the confluence of the Snake and Salmon Rivers (USDA Forest Service 2005c.).The Wallowa-Whitman National Forest includes Hells Canyon Dam and the Snake River downstream for 35 miles. Dr. Hershler found about 30 colonies in the mainstem of the Snake River, but none in the tributaries within Hells

Canyon, including the Imnaha River (USDA Forest Service 2005c). Status and threats are as described above for the species.

Redband Trout (Sensitive)

Inland redband trout are the same species as steelhead (*O. mykiss*) and juveniles cannot be distinguished phenotypicaly. Isolated populations of *O. mykiss* above longstanding natural passage barriers (and barring hatchery introductions) may be reasonably assumed to be resident redbands.

Redband trout are sensitive to changes in water quality and habitat. Redband trout of interior Oregon basins are believed to be best adapted to cold (less than 21° C), clean water, but a few Great Basin populations possess a hereditary basis to function at high temperatures (Behnke 1992). Adult redband trout are generally associated with pool habitats, although various life stages require a wide array of habitats for rearing, hiding, feeding, and resting. Pool habitat is important refugia during low water periods.

Spawning success decreases as fine sediment increases. The quantity and quality of pool and interstitial habitat also decrease as fine sediment increases. Other important habitat features include healthy riparian vegetation, undercut banks, and LWD (large woody debris).

Spawning occurs during the spring, generally from March to June. Redds tend to be located where velocity, depth and bottom configuration induce water flow through the stream substrate, generally in gravels at the tailouts of pools. Water temperatures influence emergence of fry, which is typically from June through July.

Action Area Information

Redband trout are widely distributed across Oregon east of the Cascade Mountains. According to the Wallowa-Whitman Forest GIS data, redband trout are found within the analysis area in the Granite Creek, Upper Camas Creek and North Fork John Day River watersheds, but are assumed to be much more widely distributed

Westslope Cutthroat Trout (Sensitive)

Westslope cutthroat trout inhabit small mountain streams, main rivers, and large natural lakes. They require cool, clean, well-oxygenated water and prefer large pools and slow velocity areas. Juveniles of migratory populations may spend 1-4 years in their natal streams, and then move (usually in spring or early summer, and/or in fall in some systems) to a main river or lake where they remain until they spawn (Spahr et al. 1991, Rieman and McIntyre 1995). Many fry disperse downstream after emergence (Rieman and McIntyre 1995). Juveniles tend to overwinter in interstitial spaces in the substrate. Larger individuals congregate in pools in winter.

Westslope cutthroat trout spawn in small tributary streams on clean gravel substrate where mean water depth is 17-20 cm and mean water velocity is 0.3-0.4 m/sec. They tend to spawn in natal stream (see McIntyre and Rieman 1995). Adfluvial populations live in large lakes in the upper Columbia drainage and spawn in lake tributaries. Fluvial populations live and grow in rivers and spawn in tributaries. Resident populations complete the entire life history in tributaries. All three life-history forms may occur in a single basin (McIntyre and Rieman 1995). Migrants may spawn in the lower reaches of the same streams used by resident fishes. Maturing adfluvial fishes move into the vicinity of tributaries in fall and winter and remain there until they begin to migrate upstream in spring. Of migratory spawners, some remain in tributaries during summer months but most return to the main river or lake soon after spawning (Behnke 1992).

Westslope cutthroat trout are native to the upper Missouri River drainage in Montana, extreme northwestern Wyoming, and southern Alberta; the Salmon, Clearwater, and Spokane (including the Coeur d'Alene and St. Joe drainages) river drainages in Idaho; and the Clark Fork and Kootenai river drainages in Idaho, Montana, and British Columbia (Spahr et al. 1991); also westward to the Cascade Mountains as disjunct populations, for example, in the Lake Chelan drainage in Washington, the John Day River drainage in Oregon (where limited hybridization with redband trout apparently has occurred), and elsewhere in mid-Columbia tributaries (Behnke 1992), including the Methow, Entiat, and Wenatchee river Basins in Washington (McIntyre and Rieman 1995).

Action Area Information

According to Wallowa-Whitman Forest GIS data, westslope cutthroat trout occur within the analysis area in the Rapid River and Snake River – Granite Creek watersheds.

Proximity of Streams to Infestations

Many of the infested sites are on or near roads that cross either perennial or intermittent streams on Wallowa-Whitman National Forest. A width of 100 feet from the stream up into the riparian area was used to identify sites that may be located immediately adjacent to a stream (i.e., up to bankfull) with listed fish. There are a total of 167 sites identified that include areas within 100 feet of streams with ESA listed fish (Table 56).

Many mainstem rivers, such as Grande Ronde River and Imnaha River serve as migration corridors to pacific salmon and bull trout. Tributaries to these mainstem rivers provide spawning and rearing habitat. For fall Chinook, juveniles will not typically be found in freshwater on Wallowa-Whitman National Forest because they migrate to salt water immediately upon emergence. Most of the spawning and rearing for bull trout occurs in the headwaters, and typically in the lower reaches only adults can be found.

Spring chinook salmon may occasionally utilize some of these stream reaches for spawning. Steelhead and Chinook share a majority of the rivers, while other fish are limited on habitat based on their ability to access tributaries or quality of habitat available.

Table 56-Infested sights within 100 feet of listed fish

Fifth Field Watershed Name	Stream Name	Site ID	Acres	Listed Fish Species* present within Stream
Bear Creek	Little Bear Creek	415	21.79	BT
	Bear Creek	1372	1.89	SRC, SRS, BT
		1425	0.13	SRC, SRS, BT
		1424	0.34	SRC, SRS, BT
		1426	0.07	SRC, SRS, BT
Chesnimnus Creek	Chesnimnus Creek	1198	5.07	SRS
		1193	0.03	SRS
		759	1.97	SRS
		1087	0.20	SRS
		1083	0.02	SRS
		1082	0.10	SRS
	Unnamed Trib to South Fork Chesnimnus Creek	759	0.11	SRS

Fifth Field Watershed Name	Stream Name	Site ID	Acres	Listed Fish Species* present within Stream
	Devils Run Creek	1068	0.51	SRS
	West Fork Peavine Creek	302	3.15	SRS
Grande Ronde River/Beaver Creek	Beaver Creek	1153	0.38	SRS
	Grande Ronde River	428	5.49	SRC, SRS, BT
		1415	6.34	SRC, SRS, BT
		1144	0.43	SRC, SRS, BT
	South Fork Spring Creek	1234	0.89	SRS
		1177	0.01	SRS
		1326	0.06	SRS
		1236	0.09	SRS
		429	0.76	SRS
		1235	0.02	SRS
	Spring Creek	429	0.74	SRS
Grande Ronde River/Indian Creek	North Fork Clark Creek	1135	3.20	SRS
Grande Ronde River/Mud Creek	Mud Creek	1501	8.36	SRS
		1468	0.14	SRS
		1073	0.01	SRS
	Wildcat Creek	1070	9.12	SRS
Granite Creek	Olive Creek	1452	0.51	MCS, RT
		1179	1.82	MCS, RT
	Beaver Creek	1419	2.31	MCS
		1420	5.02	MCS
	Bull Run Creek	745	0.65	RT
		1364	26.85	MCS, RT
		1453	2.38	MCS, RT
		1454	0.67	MCS, RT
	Granite Creek	1453	4.69	MCS, RT
		1365	3.76	MCS, RT
		1191	2.22	MCS, RT
	Boulder Creek	1453	0.19	MCS, RT
Lostine Creek	Lostine Creek	1397	0.02	SRC, SRS, RT
		1227	0.08	SRC, SRS, RT
Lower Big Sheep Creek	Little Sheep Creek	1205	0.05	SRS, BT
	Unnamed Trib to Little Sheep Creek	839	1.16	BT
		1196	0.01	BT
	Unnamed Trib to Little Sheep Creek	1090	13.64	SRS
		1499	44.87	SRS
	Unnamed Trib to Little Sheep Creek	1500	2.59	SRS
	Canal Creek	1071	0.45	SRS
Lower Imnaha River	Horse Creek	1225	0.54	SRC, SRS
	Cow Creek	1219	1.06	SRC, SRS
		1220	0.32	SRC, SRS
	Lightning Creek	1219	6.67	SRC, SRS
	Imnaha River	1222	0.05	SRC, SRS, BT
		1221	0.10	SRC, SRS, BT
		1010	0.01	SRC, SRS, BT
		1004	0.04	SRC, SRS, BT

Fifth Field Watershed Name	Stream Name	Site ID	Acres	Listed Fish Species* present within Stream
		1219	1.58	SRC, SRS, BT
		1394	5.06	SRC, SRS, BT
		1095	3.11	SRC, SRS, BT
Lower Joseph Creek	Horse Creek	1527	0.01	SRS
		1104	0.50	SRS
		1103	0.35	SRS
		1523	0.41	SRS
Lower Wallowa River	Deer Creek	414	3.01	SRS, BT
		418	2.17	SRS, BT
	Sage Creek	418	13.52	SRS
Meadow Creek	Burnt Corral Creek	1376	13.61	SRS
	Meadow Creek	1578	0.06	SRS
		763	2.34	SRS
	McCoy Creek	425	0.07	SRS
		423	1.57	SRS
	Unnamed Trib to Meadow Creek	455	0.84	SRS
Middle Imnaha River	Freezeout Creek	1568	0.43	SRS
Minam River	Minam River	1127	0.26	SRC, SRS, BT
		1126	5.53	SRC, SRS, BT
		1124	6.09	SRC, SRS, BT
		1123	1.16	SRC, SRS, BT
	Little Minam River	1429	0.01	SRC, SRS
North Powder River	Anthony Creek	743	1.07	BT
	North Fork Anthony Creek	852	0.80	BT
Pine Creek	East Pine Creek	1491	2.89	BT
	East Fork Pine Creek	1479	2.02	BT
		1386	2.96	BT
	Pine Creek	1479	14.63	BT
		1450	3.10	BT
	Middle Fork Pine Creek	1450	0.01	BT
Snake River/Cherry Creek	Snake River	937	0.05	SRC, SRS, BT
	Cook Creek	1096	0.39	SRS
	Cache Creek	1101	0.51	SRS
		1517	0.27	SRS
		1264	0.41	SRS
		1098	0.43	SRS
		1512	1.12	SRS
Snake River/Granite Creek	Hells Canyon Creek	1217	0.92	SRS
	Bernard Creek	1540	0.76	SRS
Snake River/Temperance Creek	Snake River	1348	0.38	SRC, SRS, BT
		942	0.12	SRC, SRS, BT
		1303	0.01	SRC, SRS, BT
	Temperance Creek	927	1.93	SRS
	Salt Creek	1538	0.67	BT
	Kirkwood Creek	975	0.31	SRS
		1547	0.10	SRS
		1307	12.74	SRS

Fifth Field Watershed Name	Stream Name	Site ID	Acres	Listed Fish Species* present within Stream
		1371	0.03	SRS
	Kurry Creek	989	0.81	BT
		1310	0.25	BT
		1546	0.95	BT
		1544	1.04	BT
	West Creek	1254	0.63	SRS, BT
		1321	0.63	SRS, BT
	Somers Creek	1535	20.11	SRS, BT
Snake River/Wolf Creek	Imnaha River	1095	0.64	SRC, SRS, BT
	Snake River	1095	0.004	SRC, SRS, BT
		1298	0.13	SRC, SRS, BT
Upper Big Sheep Creek	Lick Creek	1370	3.26	SRC, SRS, BT
		1369	2.24	SRC, SRS, BT
	Big Sheep Creek	839	1.13	SRC, SRS, BT
		1489	0.06	SRC, SRS, BT
		1507	0.55	SRC, SRS, BT
		1506	9.40	SRC, SRS, BT
		1505	2.70	SRC, SRS, BT
		1504	6.26	SRC, SRS, BT
		1502	7.39	SRC, SRS, BT
	Squaw Creek	1503	12.64	SRS
Upper Catherine Creek	South Fork Catherine Creek	1141	0.77	SRC, SRS, BT
		1575	0.60	SRC, SRS, BT
	Pole Creek	1574	0.05	SRS, BT
Upper Grande Ronde River	Sheep Creek	1380	2.79	SRC, SRS
	West Chicken Creek	1374	0.09	SRC, SRS
	Grande Ronde River	1572	0.08	SRC, SRS
		1137	61.66	SRC, SRS, BT
		768	0.07	SRC, SRS, BT
		1417	0.69	SRC, SRS, BT
	Limber Jim Creek	1240	0.05	SRC, SRS, BT
	Fly Creek	1377	0.32	SRS, BT
Upper Imnaha River	Imnaha River	1109	0.01	SRC, SRS, BT
		1370	14.05	SRC, SRS, BT
		1108	0.21	SRC, SRS, BT
		1209	0.13	SRC, SRS, BT
		1106	0.05	SRC, SRS, BT
		1206	12.66	SRC, SRS, BT
		1105	0.13	SRC, SRS, BT
		1207	0.28	SRC, SRS, BT
	Skookum Creek	1370	0.55	SRS
	Dry Creek	1370	6.19	SRS
	North Fork Imnaha River	1476	0.02	BT
	Gumboot Creek	1206	32.29	SRS
	Mahogany Creek	1206	0.49	SRS
	Crazyman Creek	1206	4.39	SRC, SRS
Upper Joseph Creek	Elk Creek	759	1.99	SRS
	Unnamed Trib to	1066	0.95	SRS

Fifth Field Watershed Name	Stream Name	Site ID	Acres	Listed Fish Species* present within Stream
	Elk Creek			
	Little Elk Creek	1075	1.11	SRS
	Swamp Creek	1511	0.73	SRS
	Sumac Creek	1203	0.01	SRS
		1202	37.51	SRS
	Cougar Creek	1192	0.03	SRS
		1510	0.59	SRS
		1089	0.42	SRS
		1088	0.20	SRS
Upper Powder River	Lake Creek	1392	0.29	BT
Upper Wallowa River	Hurricane Creek	1232	0.02	BT
		1230	0.93	BT
		1229	0.58	BT
		1373	0.53	BT

*SNS = Snake River Steelhead, SNC = Snake River Chinook Salmon, MCS = Middle Columbia Steelhead, MCC = Middle Columbia Chinook Salmon, BT = Bull Trout

3.5.3 Environmental Consequences

Fish and other aquatic organisms have the potential to be adversely affected by contact with concentrations of herbicide that exceed levels of concern in water. For example, herbicides applied near a stream could inadvertently contact aquatic invertebrates that rely on terrestrial plants to fulfill their life cycle and thus reduce the availability of food for fish. Herbicides can alter the structure and biological processes of both terrestrial and aquatic ecosystems; these effects of herbicides may have more profound influences on communities of fish and other aquatic organisms than direct lethal or sublethal toxic effects (Norris et al. 1991). Herbicides used for aquatic invasive plant control have been shown to affect aquatic ecosystem components, however concentration of herbicides coming in contact with water following land-base treatments are unlikely to be great enough to cause such changes (ibid). Since this project does not include treatment of invasive plants, effects from aquatic invasive plant control are not a concern.

Sublethal effects can include changes in behaviors or body functions that are not directly lethal to the aquatic species, but could have consequences to reproduction, juvenile to adult survival, or other important components to health and fitness of the species. Or, sublethal effects could result from effects to habitat or food supply.

Residues in food from direct spraying are not likely to occur since herbicides would not be applied to emergent aquatic vegetation. Drift from herbicides used on terrestrial vegetation may affect aquatic vegetation at low concentrations, however they show little tendency to bioaccumulate and are likely to be rapidly excreted by organisms as exposure decreases (ibid). Therefore, while the herbicides considered for use in this project may kill individual aquatic plants, aquatic habitats and the food chain would not be adversely impacted because the amount of herbicide that could be delivered is relatively low in comparison with levels of concern from SERA Assessments and the duration to which any nontarget organism (including aquatic plants) would be exposed is very short-lived and impacts to aquatic plants would be very localized.

The application rate and method, along with the behavior of the herbicide in the environment, influence the amount and length of time an herbicide persists in water, sediment, or food sources. Once in contact, the herbicide must be taken up by the organism and moved to the site of biochemical action where the chemical must be present in an active form at a concentration high enough to cause a biological effect (ibid).

Herbicides vary in their environmental activity and physical form. Some may be oil- or water-soluble molecules dissolved in liquids, or attached to granules for dry application to soil surface. Herbicides may move from their location of application through leaching (dissolved in water as it moves through soil), volatilization (moving through air as a dissolved gas), or adsorption (attached by molecular electrical charges to soil particles that are moved by wind or water).

In soil and water, herbicides may persist or decompose by sunlight, microorganisms, or other environmental factors. Soil properties, rainfall patterns, slope, and vegetative cover greatly influence the likelihood that an herbicide will move off-site, once applied.

In combination with other site and biological factors, these characteristics influence both the probability of meeting site-specific goals for invasive plant control, and the potential of impacting nontarget components of the environment.

The effects from the use of any herbicide depends on the toxic properties (hazards) of that herbicide, the level of exposure to that herbicide at any given time, and the duration of that exposure. Risk to aquatic organisms can be reduced by choosing herbicides with lower potential for toxic effects when exposure may occur. Exposure of federally listed fish to herbicides can be greatly reduced or increased depending on site-specific implementation techniques and timing used in herbicide application projects. Exposure can be reduced by such methods as streamside buffer zones, timing applications to avoid sensitive seasons, varying application methods used, and combining herbicide treatments with nonherbicide treatments to reduce overall use. Project Design Features included in the Proposed Action are expected to minimize potential exposures to federally listed fish.

The hazards associated with each herbicide active and inert ingredients, impurity or metabolite was determined by a thorough review of available toxicological studies. For a background discussion of all toxicological tests and endpoints considered in Forest Service Risk Assessments, refer to SERA 2001.

Herbicides are not pure compounds and they contain the active ingredient, impurities, adjuvants, inert ingredients, and may also contain surfactants. The effects of inert ingredients, adjuvants, impurities, and surfactants to wildlife (includes fish) are discussed first, followed by a discussion of the effects of the active ingredients.

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 will receive. 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 (Norris et al. 1991). Persistence of the herbicide is the predominant factor affecting its presence in the soil. 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 (Norris et al. 1991).

Effects of Active Ingredients in Herbicide to Aquatic Organisms

The most sensitive effect from the most sensitive species tested was used to determine the toxicity indices for each herbicide. Quantitative estimates of dose from each exposure scenario were compared to the corresponding toxicity index to determine the potential for adverse effect. Doses below the toxicity indices resulted in discountable effects. Table 57 lists the toxicity indices for fish used for the R6 2005 FEIS BA (USDA Forest Service 2005c). Values in **bold** are the values used to assess risk to fish from acute exposures.

Indices represent the most sensitive endpoint from the most sensitive species for which adequate data are available. Numbers in bold indicate the toxicity index used in calculating the hazard quotient for exposures to listed fish. Generally, the lowest toxicity index available for the species most sensitive to effects was used. Measured chronic data (NOEC) was used when they were lower than 1/20th of an acute LC50 because they account for at least some sublethal effects, and doses that are protective in chronic exposures are more certain to be protective in acute exposures.

Table 57-Toxicity Indices for Listed Fish

Herbicide	Duration	Endpoint	Dose	Species	Effect Noted at LOAEL
Chlorsulfuron	Acute	NOEC	**2 mg/L** (1/20th of LC50)	Brown trout	LC50 at 40 mg/L
	Chronic	NOEC1	3.2 mg/L	Brown trout	rainbow trout length affected at 66mg/L
Clopyralid	Acute	NOEC	**5 mg/L** (1/20th of LC50)	Rainbow trout	LC50 at 103 mg/L
	Chronic				none available
Glyphosate (no surfactant)	Acute	NOEC	**0.5 mg/L** (1/20th/LC50)	Rainbow trout	LC50 at 10 mg/L
	Chronic	NOEC	2.57 mg/L2	Rainbow trout	Life-cycle study in minnows; LOAEL not given
Glyphosate with POEA surfactant	Acute	NOEC	**0.065 mg/L** (1/20th of LC50)	Rainbow trout	LC50 at 1.3 mg/L for fingerlings (surfactant formulation)
	Chronic	NOEC	0.36 mg/L	salmonids	estimated from full life-cycle study of minnows (surfactant formulation)
Imazapic	Acute	NOEC	**100 mg/L**	all fish	at 100 mg/L, no statistically sig. mortality
	Chronic	NOEC	100 mg/L	fathead minnow	No treatment related effects to hatch or growth
Imazapyr	Acute	NOEC	**5 mg/L** (1/20th LC50)	trout, catfish, bluegill	LC50 at 110-180 mg/L for North American species
	Chronic	NOEC	43.1 mg/L	Rainbow	"nearly significant" effects on early life stages at 92.4 mg/L
Metsulfuron methyl	Acute	NOEC	10 mg/L	Rainbow	lethargy, erratic swimming at 100 mg/L
	Chronic	NOEC	**4.5 mg/L**	Rainbow	standard length effects

Herbicide	Duration	Endpoint	Dose	Species	Effect Noted at LOAEL
					at 8 mg/L
Picloram	Acute	NOEC	**0.04 mg/L** (1/20th LC50)	Cutthroat trout	LC50 at 0.80 mg/L
	Chronic	NOEC	0.55 mg/L	Rainbow trout	body weight and length of fry reduced at 0.88 mg/L
Sethoxydim	Acute	NOEC	**0.06 mg/L** (1/20th LC50)	Rainbow trout	LC50 of Poast at 1.2 mg/L
	Chronic	NOEC			none available
Sulfometuron methyl	Acute	NOEC	7.3 mg/L	Fathead minnow	No signs of toxicity at highest doses tested
	Chronic	NOEC	**1.17 mg/L**	Fathead minnow	No effects on hatch, survival or growth at highest doses tested
Triclopyr acid	Acute	NOEC	**0.26 mg/L** (1/20th LC50)	Chum salmon	LC50 at 5.3 mg/L3
	Chronic	NOEC	104 mg/L	Fathead minnow	Reduced survival of embryo/larval stages at 140 mg/L
Triclopyr BEE	Acute		**0.012 mg/L**	Bluegill sunfish	LC50 at 0.25 mg/L
	Chronic4	NOEC	104 mg/L	Fathead minnow	Reduced survival of embryo/larval stages at 140 mg/L
NPE Surfactants	Acute5	NOEC	0.2 mg/L (1/20th LC50)	fathead minnow, rainbow trout	LC50 at 4.0 mg/L
	Chronic6	NOEC	1.0 mg/L	trout	no LOEL given

1 Chronic value for brown trout (sensitive sp.) was estimated using relative potency in acute and chronic values for rainbow trout, and the acute value for brown trout.
2 Estimated from minnow chronic NOEC using the relative potency factor method (SERA Glyphosate 2003).
3 Using Wan et al. (1989) value for lethal dose.
4 Chronic and subchronic data for triclopyr are limited to triclopyr TEA. No data is available for triclopyr BEE.
5 Exposure includes small percentage of NP and NP1-2E (Bakke, 2003).
6 Chronic exposure is from degredates NP1EC and NP2EC, because NPE breaks down rapidly and NPECs are more persistent (Bakke, 2003).
NOEC = No Observable Effect Concentration
LOEAL – Lowest Observed Adverse Effect Level

Results of the exposure scenarios as applied to listed fish on the Wallowa-Whitman National Forest are displayed below in Table 58. The R6 2005 FEIS Fish BA displayed the results by placing stars (*) and diamonds (♦) where there was an exceedence in the level of concern (LOC). For purposes of this BE the table of stars and diamonds has been modified to show the hazard quotients (HQ) value in order to exemplify the magnitude of difference between typical and high application rates, and aquatic and nonaquatic formulations. Where there is a "—" and no number means that there was no exceedence in level of concern (LOC). The LOC exceedence occurs when the HQ value exceeds 1. Exceedences in LOC indicate occasions where the expected exposure concentration (EEC) is greater than the no observable effect concentration (NOEC) value used for that aquatic species group, which may lead to an indirect effect to listed aquatic species if conditions were similar to what was modeled in the SERA risk assessments. To calculate a HQ, simply take the ratio of EEC/NOEC values. Toxicity indices used in the R6 2005 FEIS for aquatic organisms are NOEC values, refer to table above. Two types of indirect effects are possible, those toxic to the listed aquatic species, and those mediated by toxic effects to an ecosystem component that is part of the Primary Constituent Elements (PCE) or associated essential habitat features.

Table 58-Hazard quotient values for acute exposure estimates for sensitive aquatic organisms broadcast spray scenarios

Aquatic Species Group Application Rate	Chlorsulfuron	Clopyralid	Glyphosate w/o surfactant*	Glyphosate with surfactant	Imazapic	Imazapyr*	Metsulfuron Methyl	Picloram	Sethoxydim	Sulfometuron Methyl	Triclopyr TEA*	Triclopyr BEE	NPE surfactant
Fish High	--	--	6	43	--	--	--	5	3	--	15	125	--
Typical	--	--	2	12	--	--	--	2	2.5	--	1.5	13	--
Aquatic invertebrates High	--	--	--	2.5	--	--	--	--	--	--	--	1.8	--
Typical	--	--	--	--	--	--	--	--	--	--	--	--	--
Algae High	5	--	--	3.1	--	5	--	--	--	3	9.5	214	--
Typical	--	--	--	--	--	2	--	--	--	--	--	21	--
Aquatic macrophytes High	10 64	--	--	--	1.4	8	9	2	--	36	9.5	214	--
Typical	23 4	--	--	--	--	3	2	--		4		21	

'--' Predicted concentrations less than or equal to the estimated or measured 'no observable effect concentration' at both typical and high application rates.
'*' Aquatic formulations analyzed in the R6 2005 FEIS

The exposure scenarios do not account for factors such as timing of application, animal behavior and feeding strategies, animal presence within a treatment area, or other relevant factors such as site-specific conditions. However, the SERA risk assessments represent a worst-case scenario that is a good benchmark for assessing true concerns with actual application. Results of triclopyr exposures take into account the strict limitations on use identified in the forest plan standards, which makes the exposure scenarios implausible or impossible.

Table 58 displays the results of exposure if all "worst-case" conditions reflected in the scenario occur, which is highly unlikely for Wallowa-Whitman National Forest. The PDFs minimize or eliminate the potential for such worst case scenarios to actually occur. Site-specific modeling was done to approximate the worst case on the ground from aerial and broadcast spraying prpposed in the alternatives.

In Appendix E, the Chronic and Acute Exposures section focuses on the probability and magnitude of acute exposures from herbicide treatments based on results from the SERA risk assessments. It also contains a summary of herbicide characteristics in soil in order to gain a better understanding of the probability of adverse effects to aquatic organisms should the herbicide come in contact with water.

Effects of Surfactants

Appendix 3c of the SERA 2003 risk assessment summarizes the available ecological information from all of the Material Safety Data Sheets (MSDs) for the formulations that are labeled for forestry applications. It is apparent that these formulations fall into relatively clear groups. The most toxic formulations appear to be Credit Systemic, Credit, Glyfos, Glyphosate, glyphosate Original, Prosecutor Plus Tracker, Razor SPI, Razor, Roundup Original, Roundup Pro Concentrate, and Roundup UltraMax (®).

It may be presumed that these formulations contain the most toxic surfactants. Other formulations such as Aqua Neat, Aquamaster, Debit TMF, Eagre, Foresters' NonSelective Herbicide, Glyphosate VMF, and Roundup Custom (®) are much less acutely toxic.

For the SERA 2003 risk assessment, the uncertainties involving the presence or absence of a surfactant and the possibly differing effects of using various surfactants cannot be resolved with certainty. The R6 2005 FEIS addresses this uncertainty through Standard #18.

Effects of the Alternatives

Alternative A – No Action

Direct and Indirect Effects

Manual, mechanical, cultural and biological treatments would continue under the management direction of existing decisions. Under this alternative less than 23 percent of known sites would be treated with herbicide, leaving a heavy reliance on manual treatments, which in many cases is cost prohibitive. Repeated manual treatments may effectively control small, isolated populations of certain plants, however associated labor, time and cost may make manual treatments less practical and effective, especially when treating large infestations.

The decision made in the EA from1994 allows use of glyphosate and picloram and triclopyr on up to 5,172 acres per year on 124 sites. Picloram is a high risk herbicide for aquatic resources but is preferred in many situations because it is a selective herbicide that represses reestablishment of target invasive species. Glyphosate is nonspecific and kills all vegetation.

According to the soil and water analysis for this EIS, there could be a short-term reduction in soil cover for the areas treated. This localized reduction in cover would increase treated areas vulnerability to soil erosion. The effects would be minimal given the small amount of land treated, especially within Aquatic Influence Zones, and the scattered nature of the treatments. These effects would last approximately one season until vegetation became re-established. Most invasive plants provide less stream-shading than native hardwoods and conifers and less bank stabilization than deeper rooted native vegetation.

Invasive plants would continue to grow on sites where treatment is currently not authorized by a NEPA analysis. There is no mechanism in Alternative A that allows for Early Detection Rapid Response (EDRR). No broadcast application takes place within RHCAs under the No Action Alternative so there is little chance of herbicide drift into streams.

Cumulative Effects

This alternative is covered under the The 1994 Wallowa-Whitman Management of Noxious Weeds Environmental Assessment (USDA Forest Service 1994a). Treatments would occur on an extremely small percentage of any watersheds in the project area. Direct and indirect effects are so insignificant and temporary that treatment under No Action could not plausibly contribute to significant cumulative effects.

Summary of Effects of the Action Alternatives

All of the action alternatives pose some risk to the aquatic environment from the use of herbicides. The R6 2005 FEIS and Fisheries Biological Assessment analyzed the risk of herbicide use to aquatic plants, algae, macroinvertebrates and fish, including listed species. The analysis relied on SERA Risk Assessments (1997a, 1997b, 1999a, 1999b, 2001a, 2001c, 2003a, 2003b, 2003c, 2003d, 2003e, 2003f) to determine effects to fish and other aquatic organisms if herbicide is delivered to streams and other water bodies.

The Project Design Features (PDFs) listed in Chapter 2 were developed to avoid scenarios of concern to fish species of local interest considering the R6 2005 FEIS analysis and local conditions. These restrictions go beyond label requirements by limiting the amount and type of herbicide that may be used adjacent to waterbodies or along roads with high potential to deliver herbicide to streams and other water bodies. The only herbicides proposed for use where there is a likelihood of indirect delivery to water are aquatic formulations of glyphosate, imazapyr, and triclopyr. Refer to Tables 7, 8, and 9 for buffers and acceptable use of herbicides adjacent to waterbodies. For example, spot applications within 15 feet of streams are limited to the aquatic formulations of glyphosate and imazapyr.

Herbicides can disappear from treated water by dilution, adsorption to bottom sediments, volatilization, and absorption by plants and animals or by dissipation. Dissipation refers to the breaking down of an herbicide into simpler chemical compounds. Herbicides can dissipate by photolysis (broken down by light), hydrolysis, microbial degradation, or metabolism by plants and animals. Both dissipation and disappearance are important considerations to the fate of herbicides in the environment because even if dissipation is slow, disappearance due to processes such as adsorption to bottom sediments makes a herbicide biologically unavailable. For example, glyphosate is not applied directly to water for weed control, but when it does enter the water it is bound tightly to dissolved and suspended particles and to bottom sediments and becomes inactive, posing a very low risk to fish, the aquatic food web, and critical habitat.

The likelihood that fish or other aquatic organisms may be impacted under the worst-case scenarios analyzed for the Proposed Action is very low in most cases. Any use of herbicide in Aquatic Influence Zones or along roads with high potential to deliver herbicides is associated with some risk; however the degree of risk is low given the Project Design Features for the Proposed Action. The use of aerial treatment methods utilizing picloram does increase risk of exposure for listed fish species. Although listed fish and critical habitat are more than 1.5 miles downstream of the proposed treatment sites, the dilution factor is unknown; therefore the exposure concentration is unknown.

Adverse effects to fish under the worst case scenarios for broadcast and spot treatments are not likely to occur because any herbicide or sediment that came in contact with water, regardless of the amount, would be quickly washed downstream and diluted. Based on the R6 2005 FEIS, the potential to reach levels of concern for invertebrates and aquatic plants is expected to be low and herbicides coming in contact with water as a result of the Proposed Action would more than likely be insignificant. Therefore, impacts to the aquatic food web are not likely and therefore, indirect effects to fish are discountable.

Project Design Features minimize and avoid concentrations of herbicide exceeding a level of concern coming in contact with fish and other aquatic organisms because:

- Established buffers along perennial and intermittent streams greatly reduce the potential for drift of herbicide to surface waters;
- No broadcasting of herbicides are allowed along roads that have a high potential for herbicide delivery, thereby significantly reducing the potential amount of herbicides delivered to streams via road-side ditches;
- Broadcast spray of triclopyr is prohibited, thereby greatly reducing risk of triclopyr coming in contact with surface waters;
- With the eliminated potential for concern for increased risk to aquatic species, the potential for effects to the aquatic food web is greatly reduced.

The potential for herbicides to enter streams in concentrations that are near or exceed thresholds of concern for federally listed fish and impacting aquatic ecosystems is very low for broadcast and spot treatments. Therefore, the degree of risk for these treatment methods is low and discountable. However, aerial treatment may result in some degree of risk. Site specific conditions were modeled using risk assessment worksheets and the GLEAMS model (see water section for details). These worksheets indicate most of the treatments proposed have very low potential to adversely affect fish and aquatic organisms.

Effects of Nonherbicide Treatment Methods

All invasive plant treatments can result in some erosion, stream sedimentation, and disturbance to aquatic organisms if carried out over a large enough area. Sedimentation can cover eggs or spawning gravels, reduce prey availability, and harm fish gills. Soil can also become compacted and prevent the establishment of native vegetative cover. All invasive plant treatments can reduce insect biomass, which would result in a decrease in the supply of food for fish and other aquatic organism. Reductions in cover, shade, and sources of food from riparian vegetation could result from herbicide deposition in a streamside zone (Norris et al. 1991).

Riparian vegetation affects habitat structure in several important ways. Roots of riparian vegetation hold soil, which stabilizes banks, prevents addition of soil run-off to water bodies with subsequent increases in turbidity or filling substrate interstices, and helps to create overhanging banks. Riparian and emergent aquatic vegetation can provide hiding cover or refuge for fish and other aquatic organisms where native plants have been replaced.

Direct and indirect effects of manual and mechanical treatments were analyzed in the R6 2005 FEIS (Appendix J). Public scoping issues about these treatments were not raised. Manual treatments, such as lopping or shearing, cause an input of organic material (dead roots) into the soil. As the roots are broken down in the soil food web, nutrients will be released. Rainfall may cause these nutrients to be lost to surface runoff or to groundwater. Bare soils combined with high nutrient levels provide ideal conditions for the establishment of many invasive species. In lower intensity infestations, nontarget vegetation could provide erosion control as well as a seed source for establishing native vegetation. In areas with larger amounts of bare soil, PDFs require restoration activities to reestablish native vegetation. The intent is to re-establish competitive local, native vegetation post-treatment in areas of bare ground.

The presence of people or crews with hand-held tools along streambanks could lead to localized, sediment/turbidity to fish habitat because of trampling, soil sloughing due to stepping on banks and removal of invasive plant roots. However, amounts of potential localized sediment/turbidity would be negligible because the invasive plant populations on the Wallowa-Whitman National Forest are not extensive enough to result in significant sediment/turbidity and emergent vegetation will not be treated. Effective invasive plant treatment and restoration of treated sites would improve the function of riparian areas and lead to improved fish habitat conditions.

These treatments would benefit aquatic ecosystems to the extent they effectively restore riparian habitats, especially habitats adjacent to fish bearing streams. The impacts of invasive plants on these habitats can last decades, while the impacts of treatment tend to be short term. Passive and active restoration would accelerate native vegetative recovery in treated sites.

Removal of plant roots along a streambank will cause some ground disturbance and may introduce small amounts of sediment to streams. For example, weed wrenching of scotch broom may loosen soil and cause minor amounts of erosion for approximately one season until vegetation was reestablished. These minor amounts of erosion would add negligible amounts of sediment. Manual, mechanical, and restoration treatments include activities such as hand pulling, mowing, brushing, seeding, and planting. Manual treatments within 100 feet of streams with listed species would occur along Bear Creek (0.86 acres), Imnaha River (0.67 acres), Horse Creek (0.38 acres) and Joseph Creek (0.7 acres). The amount of sediment created by these nonherbicide treatments is anticipated to be insignificant because the methods of treatments do not include ground disturbing activities by heavy equipment and the treatment areas are so small. Ground disturbing activities by hand pulling and planting will cover a relatively small area and any sediment created at these sites would be quickly dispersed in the large volume of water.

Significant ground disturbance would not occur in any alternative. While the relative amounts of manual and mechanical treatments vary, the differences in terms of effects from such treatments are negligible. Other mechanical treatments, such as the use of motorized hand tools, are expected to have effects similar to manual treatments.

Aquatic species have specific needs in terms of water temperature. Increasing water temperature may decrease the dissolved oxygen in water which may affect metabolism and food requirements. Many factors influence water temperature including shade, discharge, channel morphology, air temperature, topography, stream aspect, and interactions with ground water. Shade is the factor that has the potential to be impacted by nonherbicide treatments.

Manual, mechanical, and restoration treatments of some invasive plant species (such as knotweed) may decrease riparian vegetative shading in some areas, thereby increasing the amount of solar radiation striking the water. This may result in a warming effect but many other factors in addition to shade affect water temperature. A significant amount of vegetation would need to be removed to change water temperature in the stream, and shade would have to be provided only by the invasive plant removed.

The only known treatment sites that may remove invasive vegetation directly adjacent to water are along Bear Creek (0.86 acres), Imnaha River (0.67 acres), Horse Creek (0.38 acres) and Joseph Creek (0.7 acres). The amount of vegetation that will be removed at these sites is not enough to measurably impact stream temperature and therefore listed fish will not be exposed to the effects of increased stream temperature from treatments at either site.

Analysis of Higher Risk Scenario 1

The following streams contain at least ten acres of estimated treatment within the Aquatic Influence Zones. In most cases, the existing treatment sites were found to be small and scattered throughout the watersheds. The PDFs and buffers appear to sufficiently reduce risks to a low level, even if all these treatments were to occur simultaneously (unlikely). Refer to Table 49 for a complete listing of federally listed fish. Results from the risk assessments far overestimate the amount of herbicide likely to enter surface waters for proposed treatments because actual treatments will not broadcast spray 10 acres immediately adjacent to streams and the Proposed Action contains PDFs that restrict application methods and rates near water. For more information about how risks are abated see the PDFs outlined in Chapter 2.

Little Bear Creek - Approximately 22 acres of treatment lie with the aquatic influence zone of Little Bear Creek. Many roads along this creek are associated with high risk for delivery of herbicide to streams, with specific PDFs applying. Federally listed fish within the Little Bear Creek subwatershed include Snake River Steelhead, Snake River Chinook Salmon and Bull Trout, however, only bull trout is present at the actual site proposed for herbicide treatment.

Grande Ronde River - Approximately 12 acres of treatment lie within the aquatic influence zone. One small section of road along this river is associated with high risk for delivery of herbicides to streams. Federally listed fish include Snake River Steelhead, Snake River Chinook Salmon and Bull Trout.

Bull Run Creek - Approximately 31 acres of treatment lie within the aquatic influence zone. Many roads along this creek are associated with high risk for delivery of herbicides to streams, with specific PDFs applying. Federally listed fish include Middle Columbia Steelhead.

Granite Creek - Approximately 11 acres of treatment lie within the aquatic influence zone. Three roads along this creek are associated with high risk for delivery of herbicides to streams, with specific PDFs applying. Federally listed fish include Middle Columbia Steelhead.

Unnamed Tributary to Little Sheep Creek - Approximately 59 acres of treatment lie within the aquatic influence zone. Two roads along this creek are associated with high risk for delivery of herbicides to streams, with specific PDFs applying. Federally listed fish include Snake River Steelhead.

Imnaha River - Approximately 38 acres of treatment lie within the aquatic influence zone. Many roads within this watershed are associated with high risk for delivery of herbicides to streams, with specific PDFs applying. Federally listed fish include Snake River Steelhead, Snake River Chinook Salmon and Bull Trout.

Sage Creek - Approximately 14 acres of treatment lie within the aquatic influence zone. One road along this creek is associated with high risk for delivery of herbicides to streams, with specific PDFs applying. Federally listed fish include Snake River Steelhead.

Burnt Corral Creek - Approximately 14 acres of treatment lie within the aquatic influence zone. Two roads along this creek are associated with high risk for delivery of herbicides to streams, with specific PDFs applying. Federally listed fish include Snake River Steelhead.

Minam River - Approximately 13 acres of treatment lie within the aquatic influence zone. No roads along this river are associated with high risk for delivery of herbicides to streams.

Federally listed fish include Snake River Steelhead, Snake River Chinook Salmon and Bull Trout.

Pine Creek - Approximately 15 acres of treatment lie within the aquatic influence zone. One small segment of road along this stream is associated with high risk for delivery of herbicides to streams, with specific PDFs applying. Federally listed fish include Bull Trout.

Kirkwood Creek - Approximately 13 acres of treatment lie within the aquatic influence zone. One road along this creek is associated with high risk for delivery of herbicides to streams, with specific PDFs applying. Federally listed fish include Snake River Chinook Salmon.

Somers Creek - Approximately 20 acres of treatment lie within the aquatic influence zone. No roads along this creek are associated with high risk for delivery of herbicides to streams. Federally listed fish include Snake River Steelhead and Bull Trout.

Big Sheep Creek - Approximately 28 acres of treatment lie within the aquatic influence zone. Two roads along this creek are associated with high risk for delivery of herbicides to streams, with specific PDFs applying. Federally listed fish include Snake River Steelhead, Snake River Chinook Salmon and Bull Trout.

Squaw Creek – Approximately 13 acres of treatment lie within the aquatic influence zone. No roads along this creek are associated with high risk for delivery of herbicides to streams. Federally listed fish include Snake River Steelhead.

Grande Ronde River - Approximately 63 acres of treatment lie within the aquatic influence zone. Many roads within this watershed are associated with high risk for delivery of herbicides to streams, with specific PDFs applying. Federally listed fish include Snake River Steelhead, Snake River Chinook Salmon and Bull Trout.

Gumboot Creek - Approximately 32 acres of treatment lie within the aquatic influence zone. One road along this creek is associated with high risk for delivery of herbicides to streams, with specific PDFs applying. Federally listed fish include Snake River Steelhead.

Sumac Creek - Approximately 38 acres of treatment lie within the aquatic influence zone. One road along this creek is associated with high risk for delivery of herbicides to streams, with specific PDFs applying. Federally listed fish include Snake River Steelhead.

Analysis of Higher Risk Scenario 2

Aerial application is proposed in several 6th field watersheds;

Snake River - Cache Creek - Approximately 78 acres are estimated for treatment within this watershed, however none of these acres are within the aquatic influence zone.

Specific PDFs apply to aerial treatments, including no application within 300 feet of fish-bearing streams. This watershed includes Snake River steelhead, Snake River Chinook salmon and bull trout.

Cook Creek - Approximately 25 acres are estimated for treatment within this watershed. Specific PDFs apply to aerial treatments, including no application with 300 feet of fish-bearing streams. This watershed includes Snake River steelhead, Snake River Chinook salmon and bull trout.

Imnaha River - Thorn Creek - Approximately 58 acres are estimated for treatment within this watershed, however, none of these acres are within the aquatic influence zone. Each treatment site is more than a mile from the nearest fish-bearing stream. Specific PDFs apply to aerial treatments, including no application with 300 feet of fish-bearing streams. This watershed includes Snake River steelhead, Snake River Chinook salmon and bull trout.

Snake River - Dug Bar - Approximately 28 acres are estimated for treatment within this watershed, however, none of these acres are within the aquatic influence zone. Specific PDFs apply to aerial treatments, including no application with 300 feet of fish-bearing streams. This watershed includes Snake River steelhead, Snake River Chinook salmon and bull trout.

Snake River -Dry Creek - Approximately 13 acres are estimated for treatment within this watershed, however, none of these acres are within the aquatic influence zone. Both treatment sites are more than a mile from the nearest fish-bearing stream. Specific PDFs apply to aerial treatments, including no application with 300 feet of fish-bearing streams. This watershed includes Snake River steelhead, Snake River Chinook salmon and bull trout.

Catherine Creek - Conley Lake - Approximately 266 acres are estimated for treatment within this watershed, however, none of these acres are within the aquatic influence zone. Each treatment site is more than a mile from the nearest fish-bearing stream. Specific PDFs apply to aerial treatments, including no application with 300 feet of fish-bearing streams. This watershed includes Snake River steelhead, Snake River Chinook salmon and bull trout.

Effects of Herbicide Treatments

Treatment of bankside vegetation with aquatic formulations of glyphosate and imazapyr may lead to some minor amounts of herbicide droplets coming in contact with water. Fish may be exposed to these minor amounts of herbicide in smaller streams, especially when treatment needs to take place during spawning activities. The need to treat during spawning or accidentally stepping on a redd is limited in spatial and temporal extent. 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 is a probability for herbicide to come in contact with water in proximity to ESA fish, the magnitude of the effect from the amount of herbicide ESA fish are exposed to is low. The magnitude of effect from disturbance to breeding/spawning and/or accidentally stepping on a redd is also low, since no emergent vegetation is proposed for treatment.

Restrictions on method, type, and location serve to limit the potential amount of herbicides that may come in contact with water where fish or other aquatic organisms are present, even if an unexpected storm occurred shortly after treatment. The amount of herbicide that would be available for runoff, leaching and/or drift is necessarily limited by restrictions on broadcast use. Spot and hand/select treatments do not have high potential to deliver herbicide because the treatments are directed at target vegetation and herbicide is quickly taken up by the plant.

The likelihood of meeting or exceeding levels of concern for fish using nonaerial methods is low because: herbicide use in the aquatic influence zone is limited to typical application rates, application methods are restricted to spot or hand/select, buffers are required for broadcast applications and other methods, Project Design Features would apply, and the low potential for herbicides proposed for use near water to move through soils.

The presence of people or crews with spot spray or hand/select tools along streambanks could lead to localized, sediment/turbidity to fish habitat because of trampling and soil sloughing due to stepping on banks. However, amounts of potential localized sediment/turbidity would be negligible because the invasive plant populations on the Wallowa-Whitman National Forest are not extensive enough to result in significant sediment/turbidity. Effective invasive plant treatment and restoration of treated sites would improve the function of riparian areas and lead to improved fish habitat conditions.

The amount of sediment created by herbicide treatments is anticipated to be insignificant because the methods of treatments do not include ground disturbing activities by heavy equipment.

There is a possibility that some minor bank erosion may occur in locations where invasive plants have taken over a streambank, especially in smaller streams. For example, killing knapweed with an herbicide would devegetate a portion of the streambank and result in a loss of roots that help to hold soil particles together. This may expose streambanks at higher flows and result in some erosion. The total spatial extent of heavy infestations along streambanks within the action area is low. The amount of sediment released into any particular stream reach would depend on how extensive a particular invasive plant patch is and how close the invasive plant is to the actual wetted perimeter of the channel. Exposed streambanks are expected to revegetate during the spring/summer following treatment. In addition, site restoration and revegetation methods preclude erosion as a result of herbicide treatment. It is expected that most patches would be relatively small and any erosion negligible.

Site Specific Modeling

As described in the section on water resources, the GLEAMS-Driver was used to model herbicide concentrations in water at two sites; the 75 acre site on Boswell Creek in the La Grande District, and the 249 acre site near Lookout Creek in Hells Canyon. The La Grande and Hells Canyon sites were modeled with the steeper slopes found at the sites and a very small stream with a flow of only 0.3 cfs. The average rainfall used for all the sites was the highest rainfall for the area. Both sites were under a Hazard Quotient (HQ) of 1 for clopyralid and are well below thresholds of concern for fish.

For picloram, both the La Grande site and the Hells Canyon site had a HQ of over 1 at the maximum concentration but were below one at the minimum modeled concentration (See Table 16 in Hydrology Report). Neither site has listed fish directly adjacent to the treatment area but both treatment areas have listed fish downstream.Untreated areas would help dilute the concentrations of herbicide in the stream, but by how much is unknown.

Two nonaerial sites were also chosen for modeling using the SERA worksheet. These sites have the most treatment within the RHCA and have higher rainfall than many of the sites at lower elevation, thus they represent a worst case of all known sites. For these sites typical application rates were used, the rainfall at the highest elevation along the stream and the hypothetical streams used a rainfall which would give 2 inches of precipitation within 24 hours, which is a large storm for this area. As the treatments are not continuous but are scattered along miles of road, the model would be considered conservative and would overestimate potential herbicide concentrations. This analysis demonstrates that there is little risk to fish from herbicide exposure under this project.

Effects Determinations for Threatened and Endangered Species

This section discusses compliance with the threatened and endangered species act and summarizes the Biological Assessment submitted for consultation with NMFS and the USFWS. Effects from the action alternatives are expected to vary because of proximity to water, species occurrence, life stage present, and herbicide properties. Some treatments completely outside of the aquatic influence zone with no mechanism for herbicide delivery fall under a “no effect” determination. However, spot treatments up to the water’s edge and along intermittent streams have the potential to deliver aquatic glyphosate and aquatic imazapyr to water. These treatments are not likely to adversely affect fish and their habitat because treatments have been designed to minimize introduction of herbicide into aquatic habitats as well as avoid substantial amounts of sedimentation. Toxic levels of herbicides are unlikely to enter streams or lakes due to the ability to alter application methods and distance from water, timing, active ingredients and formulations, and other project design features. Effects to immediate streamside cover cannot be avoided and there may be small droplets of aquatic glyphosate and aquatic imazapyr coming in contact with water. For example, treatment of riparian species growing along the streambank (above ordinary high water) may result in insignificant amounts of aquatic glyphosate and aquatic imazapyr in water 24 hours after treatment. Any treatment method, could introduce minor amounts of sediment and/or herbicide into adjoining waters as result of spot/hand applications, manual/mechanical plant removal, stream bank trampling, and planting. Effects from these activities are expected to be insignificant and therefore, discountable.

Aerial treatments proposed within Hells Canyon may include picloram. Modeling with GLEAMS-Driver indicates the use of picloram at the maximum concentration may reach a hazard quotient (HQ) greater than 1. Therefore, the project may have adverse effects to steelhead, salmon and bull trout populations directly downstream of the treatment site. While neither of the proposed aerial picloram sites have listed fish directly adjacent to the treatment area, both treatment areas have listed fish downstream. Alternatives B and C are therefore considered LAA for listed aquatic species. No aerial spray of picloram would occur within 300 feet of perennial streams on National Forest System land.

Table 59-Effects determination for herbicide treatment, nonherbicide treatment and EDRR

Species	Status	Alternative A	Alternative B	Alternative C	Alternative D
Snake River Basin Steelhead	Threatened	MA-NLAA	MA-LAA	MA-LAA	MA-NLAA
Middle Columbia River Steelhead	Threatened	MA-NLAA	MA-LAA	MA-LAA	MA-NLAA
Snake River Spring/Summer Run Chinook Salmon	Threatened	MA-NLAA	MA-LAA	MA-LAA	MA-NLAA
Snake River Fall Run Chinook Salmon	Threatened	MA-NLAA	MA-LAA	MA-LAA	MA-NLAA
Columbia River Bull Trout	Threatened	MA-NLAA	MA-LAA	MA-LAA	MA-NLAA
Snake River Sockeye Salmon	Endangered	MA-NLAA	MA-LAA	MA-LAA	MA-NLAA
Bliss Rapids Snail	Threatened	MA-NLAA	MA-NLAA	MA-NLAA	MA-NLAA
Redband Trout	Sensitive	MII	MII	MII	MII
Westslope Cutthroat Trout	Sensitive	MII	MII	MII	MII

NE=No Effect; MA-NLAA = May Affect, Not Likely to Adversely Affect; MA-LAA = May Affect, Likely to Adversely Affect
NI = No Impact; MII = May adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing; LRLV = likely to result in a loss of viability in the planning area, or in a trend toward federal listing.

Rationale for Determination

- Assumptions used for analyzing the worst case situations on W-W National Forest are beyond the Proposed Action (PDFs and buffers) and ground conditions on W-W National Forest, thus grossly overestimating potential exposures.
- Invasive plant treatments (herbicide and nonherbicide) and site preparation for revegetation can result in insignificant amounts of localized sediment due to trampling and removal of plant roots.
- Some herbicides could be introduced into the water indirectly from spot-spray and may impact aquatic plants at the immediate site. However, it is unlikely that a significant amount of aquatic plants would be adversely affected to the degree of impacting an entire food chain in the aquatic ecosystem and indirectly harming a fish.
- Within the aquatic influence zone, aquatic formulations of glyphosate or imazapyr would be spot sprayed on plants, and could be indirectly delivered to water. However, spot applications reduce the potential to reach any expected exposure concentration of concern.
- Invasive plant treatments could temporarily reduce streamside vegetation (albeit nonnative and low quality) that provides cover for fish. However, it is unlikely that removal of invasive plants providing cover along streams containing federally listed fish would lead to significant losses of cover. Removal would be localized (plants surrounding target plant) and overhead story would still provide cover via shade and future input of woody material.
- The potential for nonaquatic formulations of herbicide coming in contact with water is very low under the Proposed Action.
- Biological controls will not influence any of the pathways for effects to federally listed fish or their habitat.
- Project design features significantly reduce the potential for herbicides coming in contact with water where there are federally listed fish present. If any were to come in contact with water the amounts would be far below levels of concern and potentially not at detectable levels.
- Localized effects from invasive plant treatments will be insignificant and discountable, yet still allow for restoration of important native riparian habitat.
- Water flow in streams quickly dilutes herbicide, reducing the potential for herbicide exposure, and dissipates any sedimentation as a result of invasive plant treatments and revegetation.
- Transitory water quality impact, if any, would be limited to the point of contact with water and not an entire stream reach.
- No emergent vegetation is proposed for treatment.
- EDRR does not include aerial herbicide application.
- Exposure of Bliss rapids snail to herbicide or sediment is likely to be very localized and occur in a short pulse, due to the large volume and rapid flow of their habitat which would rapidly dilute herbicide and move sediment.
- Aerial treatments proposed within Hells Canyon may include picloram. Modeling with GLEAMS-Driver indicates the use of picloram at the maximum concentration may reach a

hazard quotient (HQ) greater than 1. Although herbicide concentrations would dilute downstream, it is unknown how much. Therefore, unless aerial treatments are restricted to clopyralid, or picloram is used at its lowest concentration, Alternatives B and C may have adverse effects to steelhead, salmon and bull trout populations directly downstream of the treatment site.

Designated Critical Habitat

Invasive plant treatment would have many beneficial effects on critical habitat for federally listed fish species. In the long-term, treatment of invasive weeds on the Wallowa-Whitman National Forest would increase native vegetation growth and successional patterns leading to cover and food. Thus, it improves essential habitat features for federally listed fish species. Potential downstream effects to critical habitat for listed fish are not likely given the PDFs that limit the potential for herbicide concentrations coming in contact with water where fish are present. Information here complements the analysis provided for nonherbicide treatment methods.

In 1996, NMFS developed a methodology for making ESA determinations for individual or grouped activities at the watershed scale, termed the "Habitat Approach". A Matrix of Pathways and Indicators (MPI) was recommended under the Habitat Approach to assist with analyzing effects to listed species. The MPI has been used by the Wallowa-Whitman National Forest in previous years to analyze project effects on listed fish species. When using the MPI, project effects to the Pathways (significant pathways by which actions can have potential effects on anadromous salmonids and their habitats) and Indicators (numeric ratings or narrative descriptors for each Pathway) are used to determine whether Proposed Actions would damage habitat or retard the progress of habitat recovering towards properly functioning condition. These effects are analyzed at the sixth field watershed level

The Sept. 2, 2005 designated critical habitat Primary Constituent Elements (PCEs) pertinent for analysis on the Wallowa-Whitman National Forest's freshwater habitats include spawning sites, rearing sites, and migration corridors. The Habitat Approach Matrix of Pathways (MPI) has numerous habitat-associated Indicators that closely "cross-walk" with the PCEs of the Sept 2, 2005 designated critical habitat. Table 60 displays a "cross-walk" between the MPI Indicators and PCEs used to assess effects on designated critical habitat.

Table 60-MPI for Primary Constituent Elements Crosswalk

Primary Constituent Elements	Matrix of Pathways and Indicators
Spawning Habitat, as defined by water quality, water quantity, substrate	**Water Quality:** Temperature, Suspended Sediment, Substrate, Chemical Contaminants and Nutrients Flow/Hydrology: Change in Peak/Base flows Habitat Elements: Substrate/Embeddedness
Rearing as defined by adequate water quantity and floodplain connectivity	**Channel Conditions and Dynamics:** Floodplain connectivity **Flow/Hydrology:** Change in Peak/Base flow
Rearing as defined by adequate water quality and forage	**Water Quality:** Temperature, Substrate **Habitat Elements:** Large Woody Debris, Pool Frequency and Quality, Off-channel Habitat
Rearing as defined by adequate natural cover	**Habitat Elements:** Large Woody Debris, Pool Frequency and Quality, Large Pools, Off-channel Habitat
Migration as defined by habitat free of artificial obstructions, and adequate water quality, water quantity, and natural cover	**Habitat Access:** Physical Barriers **Water Quality:** Temperature **Flow/Hydrology:** Change in Peak/Base flow **Habitat Elements:** Large Woody Debris, Pool Frequency and Quality, Large Pools

The following is an analysis of the effects on Primary Constituent Elements of the Sept. 2, 2005 designated critical habitat, as determined via analysis of MPI indicators. Please refer to the hydrology analysis for effects on Riparian Condition and Water Quality, Lakes, Wetlands and Floodplains.

Habitat Indicator Effects

Pathway: Water Quality

Indicator: Temperature

PCE Crosswalk: Spawning, Rearing, Migration habitat PCEs

Stream temperature is controlled by many variables at each site. These include topographic shading, stream orientation, channel morphology, discharge, air temperature, and interactions with ground water, none of which would be influenced by invasive plant treatments. Treatment of invasive plants using integrated methods, specifically herbicides, along small streams may increase solar radiation at a localized level (i.e. on a small portion of a stream) if invasive plants are the only source of shade. Where invasive plants provide the only source of shade on small streams, removing 100 percent of the shade producing cover can change forest floor microclimates and water temperature at the localized level. However, the precise effects to water temperature from treating invasive plants would depend on the size of the stream, how close to the stream a treatment site is, how much is treated along the stream, and what vegetation is currently available to shade the stream. Removal of invasive plants from the banks of small, intermittent streams would not affect temperature because they are dry during the hottest time of the year, relative size of the infestation is small within context of the watershed, and more than likely there is overstory canopy present. Conditions would have to mimic post wildfire in order to impact stream temperatures.

On larger perennial streams, a significant amount of vegetation would need to be removed to change water temperature and shade would have to be provided only by the invasive plant removed—a situation that is not likely on the Wallowa-Whitman National Forest.

One reason treatment of invasive plants is being proposed is to recover vegetation structure and, in time, provide more stream shade with the establishment of native coniferous and deciduous trees. The PDFs prohibit broadcast applications within 100 feet of wet perennial and intermittent waterbodies, and along roads that have a high likelihood of transporting herbicides to streams to prevent any potential adverse affects to stream channels or water quality conditions. This PDF will protect overhanging vegetation and smaller trees that are currently providing shade closest to the stream and other waterbodies. The treatment of invasive plants outside of the 100-foot buffer should have no affect on stream temperature because it is unlikely that vegetation growing 100 feet from the stream is providing enough shade to influence water temperature.

The US Environmental Protection Agency under the Clean Water Act (CWA) of 1972 requires States to set water quality standards to support the beneficial uses of water. The Act also requires states to identify the status of all waters and prioritize water bodies whose water quality is limited or impaired.

For water quality limited streams on National Forest System lands, the Forest Service provides information, analysis, and site-specific planning efforts to support state processes to protect and restore water quality. The Regional Pacific Northwest Region Invasive Plan EIS and the

Wallowa-Whitman National Forest Plan both include standards and guidelines and other management measures designed to protect and improve water quality.

This project adheres to all of the above protection measures and adds site specific design criteria to further protect water quality, meeting the requirements of the Clean Water Act.

There are 20 streams in the Wallowa-Whitman Invasive Plants treatment area on the 303d list. All are listed for temperature. This project will have no effect on temperature for the 20 streams on the 303d list.

Pathway: Water Quality

Indicator: Sediment/Turbidity

PCE Crosswalk: Spawning habitat PCEs

Herbicide treatment methods that would be utilized within the Aquatic Influence Zone include spot-spray and hand applications. These treatment types are unlikely to produce sediment because very little ground disturbance would take place. Manual and mechanical treatments are also unlikely to contribute sediment. Manual labor such as hand pulling may result in localized soil disturbance, but increases of sediment to streams would likely be undetectable. Not all vegetation in a treated area would be pulled or removed, so some ground cover plants would remain. Not all sediment from pulling weeds along roads would reach a stream because many relief culverts intercept ditch flow and drain it on to the forest floor away from streams. Handpulling is very labor intensive and costly. Thus, few acres per year could be treated using this technique across a watershed. When compared to the total acres within a watershed, project-related soil disturbance from handpulling would be negligible. Utilizing a combination of manual, mechanical and herbicide treatments, rather than manual alone, would limit the potential for excessive trampling of streambanks.

Pathway: Water Quality

Indicator: Chemical Contaminants/Nutrients

PCE Crosswalk: Spawning habitat PCEs

The most likely route for herbicide delivery to water is potential runoff from a large rain storm soon after application, especially from treated roadside ditches as well as drift from aerial spraying. Project Design Features were designed to control drift and overspray of headwater streams, including no fueling within RHCAs, herbicide applications when winds are between 2 and 8 miles per hour, requiring coarse droplet size to minimize drift and aerial units must be ground checked and water features marked and buffered before application. Buffers of 300 feet are required on perennial or wet intermittent streams and wetlands, and 100-foot buffers are required on dry channels. Based on buffer effectiveness documented by Rashin and Graber (1993) and Dent and Robben (2000) concentration of herbicides reaching streams is expected to be well below concentrations of concern to beneficial uses.

Boom or hand 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 2005) show that buffers greater than 25 feet commonly lower herbicide concentrations below any threshold of concern and often below detectable limits.

Glyphosate and imazapyr are the only herbicides used for spot spraying at the water's edge along perennial channels. Glyphosate is highly water soluble, but because it adheres tightly to soils is unlikely to be carried into a stream unless the soil particle is carried into the stream.

This is unlikely to happen during the late spring or summer when herbicides would be applied because there is less rain in the summer and more vegetation growth to hold soil particles in place. Imazapyr is only moderately water soluble and forest field studies have not found it very mobile in soils.

Herbicides entering surface water through surface runoff are also expected to be minimal, since targeted spot spraying techniques would be used to apply herbicide within 100 feet of surface water. This would minimize the amount of herbicide reaching the ground surface as well as minimize the potential for herbicide drift. No herbicides considered high risk to aquatic resources would be broadcast within 100 feet of streams and none would be spot sprayed within 50 feet of streams. Aerial treatments are proposed more than 1.5 miles upstream of critical habitat. However, since modeling indicated an HQ value higher than 1 at the Hells Canyon site with the use of picloram, and it is unknown what the dilution factor would be by the time it reaches critical habitat, the project may negatively impact critical habitat.

Pathway: Channel Condition & Dynamics

Indicator: Floodplain Connectivity

PCE Crosswalk: Rearing habitat PCE

Some invasive plant treatments can have positive effects on floodplains and streambanks when infestations of invasive plants on valley bottom areas are removed. Valley-bottom infestations often encroach on floodplains where road-related and recreational activities have led to the establishment of invasive plant populations. Removal of such infestations is expected to benefit aquatic and terrestrial communities in the long term by increasing floodplain area available for nutrient, sediment and large wood storage, and flood flow refugia. There is no risk of negatively impacting channel condition and dynamics as a result of treating invasive plants.

Pathway: Habitat Access

Indicator: Physical Barriers

PCE Crosswalk: Migration habitat PCE

Invasive plant treatments will not create physical barriers or otherwise degrade access to aquatic habitat.

Pathway: Habitat Elements

Indicator: Substrate/Sediment

PCE Crosswalk: Spawning, Rearing habitat PCEs

Invasive plant treatments are not expected to affect substrate composition. All PDFs that minimize sediment would be implemented, such as no heavy equipment within riparian areas. These practices would reduce, but not eliminate sediment. Some sediment may enter stream channels as a result of extensive manual labor and could result in exposed soils. The amount of sediment that enters a stream is expected to be small, infrequent, of short duration, and at a localized level. Localized increases in fine sediment in gravels or along channel margins may be seen at the immediate treatment site. However, substrate quality would not decrease over time because treatment of invasive plants would not result in a chronic sediment source. Diffuse and spotted knapweed are found along many streams in the Forest.

Lacey et al. (1989) reported higher runoff and sediment yield on sites dominated by knapweed versus sites dominated by native grasses. Therefore, treatment of invasive plants and the subsequent reestablishment of native vegetation would provide long-term benefit to sediment levels in aquatic habitat.

Pathway: Habitat Elements

Indicator: Large Woody Debris, and Pool Area, Quality and Frequency

PCE Crosswalk: Spawning habitat PCE

Treatment of invasive plants would not impact pool area, quality and frequency. Treatment of invasive plants in RHCAs would not impact current wood debris in streams. The PDF that establishes a 100 ft buffer for broadcast applications provides protection to the recruitment of conifer seedlings within riparian areas which will sustain channel and habitat features in the future. Controlling invasive plants would allow for reestablishment of native vegetation, allowing riparian stands over time to develop larger recruitment trees, increasing the size and quantity of inchannel debris. The use of spot-spray applications of aquatic glyphosate and aquatic imazapyr may result in some minor nontarget vegetation impact because of drift. However, the amount necessary to drift into the entire riparian area and kill trees is not possible with spot-spray applications.

Pathway: Flow/Hydrology

Indicator: Change in Peak/Base Flows

PCE Crosswalk: Spawning, Rearing, Migration habitat PCEs

None of the treatments are extensive enough under any alternative to effect peak flows, low flows or water yield. Methods used for treatment would have negligible effect on water infiltration into soil and associated surface runoff. No 5th field watershed has more than 7 percent proposed for treatment and most have less than one percent. This amount is much too small an area to show effects to flows from treatment.

Critical Habitat

Under existing Forest Service standards and guidelines, projects implemented under the Proposed Action cannot have a negative impact, in the long term, on riparian-dependent resources or ecological processes in RHCAs at the watershed scale. Each project must maintain or restore the physical and biological processes required by riparian dependent-resources at the watershed scale or broader to comply with PACFISH and INFISH.

The potential, site-specific effects from implementation of the action alternatives on critical habitat was evaluated when addressing effects to Riparian Condition and Water Quality, Lakes, Wetland, and Floodplains (in Hydrology section).

The implementation of PDFs in the Proposed Action will reduce adverse affects to listed species' habitats during herbicide and nonherbicide treatment methods to a minimum, as discussed below and throughout this FEIS.

Water Quality Indicators: Changes in water temperature resulting from herbicide use to control invasive plants would be negligible to nonexistent. Invasive plants provide little to no shade to streams, and the risk for adverse affects to native vegetation is low with backpack or hand operated sprayers. Removal of solid vegetation stands by herbicide treatment may result in short-term, insignificant increases in surface erosion that will diminish as vegetation re-establishes treated areas. No large-scale changes in land cover conversions or stand structure (e.g. timber to grass) will result from chemical invasive plant control as proposed in this project. Herbicide treatment of invasive plants by broadcast and spot spraying is expected to result in a low risk of water contamination because of standards in the R6 2005 FEIS, with additional PDFs in the Proposed Action. Site-specific soil characteristics, proximity to surface water and local water table depth were used to determine herbicide formulation, size of buffers, and application method and timing. Only those herbicides registered for aquatic use are allowed near streams or surface water with limitation on application and timing. However, the use of picloram in aerial treatments may result in concentrations of herbicide that may affect listed species and their critical habitat.

Habitat Access Indicators: Implementation of the Proposed Action would not create physical barriers to listed aquatic species.

Habitat Element Indicators: Implementation of the Proposed Action would not significantly affect substrate, large woody debris, pool quality, off-channel habitat, and refugia at the watershed scale. Large trees that provide shade and large wood would not be impacted by the use of herbicides as proposed under the Proposed Action.

Channel Condition Indicators: Implementation of the Proposed Action would result in reduction of invasive plants within riparian areas and along streambanks. Any impacts to streambank stability are expected to be localized, of low intensity and duration, and not significantly affecting fish habitat. Reduction of invasive plants along streambanks and riparian areas will benefit native plant species and result in improved streambank stability and riparian condition in the long-term.

Flow/Hydrology Indicators: Implementation of the Proposed Action is expected to result in no measurable effect to peak/base flow or water yield of watersheds.

Watershed Condition Indicators: No new roads or watershed scale disturbances are expected to result from the use of herbicides to treat invasive plants.

Reduction of invasive plants in riparian areas, wetlands, and streams and subsequent increases in desirable vegetation will result in improved watershed conditions. The effect determination for proposed critical habitat of Columbia River Bull Trout, Snake River Spring/Summer Run Chinook Salmon, Snake River Fall Run Chinook Salmon, Snake River Basin Steelhead, and Middle Columbia River Steelhead is **"may affect, likely to adversely affect" for Alternatives B and C, and "may affect, not likely to adversely affect"** for Alternatives A and D. These determinations are based on potential effects to the primary constituent elements, including the following:

- Although, invasive plant treatment projects may be conducted in close proximity to designated critical habitat, the potential to impact most of the PCEs at significant levels is very low. However, the use of picloram in aerial treatments in Alternatives B and C may increase the chemical contamination of waters within designated critical habitat.
- Invasive plant treatment projects are not expected to create sediment that may adversely affect embeddedness and availability of suitable substrate in localized areas.

Invasive plant treatments are not expected to create significant amounts of sediment leading to direct or indirect adverse effects to habitat. Any increase in sediment would be localized given that herbicides would be used as opposed to heavy machinery. Manual and mechanical removal is not expected to create measurable amounts of sediment. Invasive plant treatments conducted in critical habitat would help to restore or maintain the native riparian vegetation that is essential to maintaining the primary constituent elements of the critical habitat in the long-term.

Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance essential fish habitat (EFH) for those species regulated under a Federal fisheries management plan.

Essential Fish Habitat is defined in the Act as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” Essential Fish Habitat includes all freshwater streams accessible to anadromous fish (Chinook, coho, and pink salmon), marine waters, and inter-tidal habitats. The objective of this EFH assessment is to determine whether or not the Proposed Action “may adversely affect” designated EFH for relevant commercially, federally-managed fisheries species within the Proposed Action area.

Wallowa-Whitman National Forest may incorporate an EFH assessment into the analysis for this EIS pursuant to 40 CFR section 1500. NEPA and ESA documents prepared by the Wallowa-Whitman National Forest 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.

Pursuant to the MSA the Pacific Fisheries Management Council (PFMC) has designated EFH for federally managed fisheries within the waters of Washington, Oregon, and California. Designated EFH for groundfish and coastal pelagic species encompasses all waters from the mean high water line, and upriver extent of saltwater intrusion in river mouths, along the coasts of Washington, Oregon and California, seaward to the boundary of the U.S. exclusive economic zone (370.4 km) (PFMC, 2004, 1998).

Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable artificial barriers (as identified by the PFMC, 2003), and longstanding, naturally-impassable barriers (i.e., natural waterfalls in existence for several hundred years) (PFMC, 2003).

In estuarine and marine areas, designated salmon EFH extends from the nearshore and tidal submerged environments within state territorial waters out to the full extent of the exclusive economic zone (370.4 km) offshore of Washington, Oregon, and California north of Point Conception to the Canadian border (PFMC, 2003).

Detailed descriptions and identifications of EFH are contained in the fishery management plans for groundfish (PFMC 2004), coastal pelagic species (PFMC 1998), and Pacific salmon (PFMC, 2003).

The geographic extent of EFH on Wallowa-Whitman National Forest is specifically defined as all currently viable waters and most of the habitat historically accessible to Chinook salmon within the watersheds identified in Table 10. 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.

The MSA defines adverse effects as any impact, which reduces the quality and/or quantity of Essential Fish Habitat. Nonherbicide treatment methods would have very localized effects to soil at the project scale. Herbicide treatment methods may result in insignificant amounts of herbicides coming in contact with water as a result of drift and runoff from roadside ditches. Effects from both nonherbicide and herbicide treatment methods would not impact those waters necessary for spawning, breeding, feeding, or growth to maturity because there is no treatment of emergent or submerged invasive plants and the predicted amount of herbicide coming in contact with water is well below levels of concern. As discussed above in the Effects Analysis section Chinook salmon may be adversely affected because:

- The quantity of EFH will not be reduced
- The quality of EFH may be degraded from aerial application of picloram

Conservation measures and management alternatives are listed in the Pacific Coast Salmonid Plan that help conserve and enhance salmon EFH. These measures should be applied unless more specific or different measures based on the best and most current scientific information are developed prior to, or during, the EFH consultation process and communicated to the appropriate agency. The PDFs in the Proposed Action are more detailed measures and should supersede those listed in the Pacific Coast Salmonid Plan. However, there may be conservation measures that are different and complement the PDFs.

As described in detail in the Effects Analysis section of this BE, the exclusion of heavy machinery from the Proposed Action will not result in impacts to sediment and cover. The use of nonherbicide methods as described in the Proposed Action is not expected to reduce the quality and/or quantity of EFH. The alternatives may adversely affect EFH for Pacific salmon species listed in Table 61 but are expected to improve long-term essential fish habitat conditions in locations currently infested with invasive plants.

Table 61-Potential effects to commercially important fish species under the proposed action

Species	Magnuson-Stevens EFH Determination
Snake River Spring/Summer Run Chinook Salmon	Adverse Effect
Snake River Fall Run Chinook Salmon	Adverse Effect

Cumulative Effects of the Alternatives

Under the Endangered Species Act, cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur within the action area of the Federal action subject to consultations (50 CFR 402.02). The "reasonably certain to occur" clause is a key factor in assessing and applying cumulative effects and indicates, for example, actions that are permitted, imminent, have an obligation of venture, or have initiated contracts (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 1998). Past and present impacts of nonFederal actions are part of the environmental baseline.

Chapter 3.1 described the basis for cumulative effects analysis, and detailed resource sections above further discuss the reasons that there is unlikely to be a contribution to significant cumulative impacts on fish or aquatic organisms from any of the alternatives under this project. The aerial use of picloram under the action alternatives has the potential to result in adverse effects to fish, including species listed under the Federal ESA. Given the large percentage of sites where picloram may be effective and picloram's potential to impact aquatic habitat, cumulative impacts from use of this herbicide on and off Forest cannot be ruled out and is the reason there is a finidng of likely to adversely affect fish. Aerial treatments proposed within Hells Canyon may include picloram.

Modeling with GLEAMS-Driver indicates the use of picloram at the maximum concentration may reach a hazard quotient (HQ) greater than 1. Otherwise, the herbicide use under all the action alternatives has little potential to contribute to cumulative effects regardless of what else is happening. Alternative C reduces acres broadcasted near dry streams, but the effect of broadcasting even under a worst case scenario (broadcast next to a live stream) is not over a threshold of concern for fish (see table 58).

Given the way animals including fish metabolize the herbicides proposed under this project, chronic, lingering impacts are unlikely (R6 2005 FEIS). This alternative is unlikely to contribute to cumulative adverse effects to aquatic resources given the PDFs and buffers associated with the project that minimize the potential for direct and indirect, and thus cumulative effects.

Two watersheds have more than 1 percent of the watershed within chemical treatment areas. They are the Middle Imnaha River and the Snake River/Temperance Creek Watershed. Most of the treatment in the Middle Imnaha River is the common bugloss site that would be treated the same year the private land would be treated.

If the whole acreage at the common bugloss site was treated in one year, over 12 percent of the watershed would be treated. However it is estimated by Forest personnel that less than 1500 acres scattered across the larger treatment area would be treated at the bugloss site on Forest land. If the 1500 acres was doubled to take private land into account 3.4 percent of the watershed would be treated. Private landowners would use metsulfuron methyl aerially as their first choice to treat acres infested with bugloss. The Forest would use metsulfuron methyl with ground based methods as the first choice of treatment. This is a highly effective herbicide with low application rates and a low toxicity to fish. Given the low application rates (typical rate of 0.03 lbs/acre), low toxicity value and scattered nature of the treatments, it is unlikely to have cumulative effects to the watershed

For the Snake River/Temperance Creek Watershed the treatment acres include hand treatment along the Snake River as well as aerial treatment in the uplands. PDFs were developed to minimize risk of herbicide application to water at treatment sites. Given the PDFs as well as the scattered distribution of the treatments and the low rainfall available to transport herbicide off site, it is unlikely that treatments would have a cumulative effect for this watershed (Thornton 2007).

Changes to fish habitat from loss of target and/or nontarget vegetation, erosion and sediment, and loss of shade are predicted to be so minor that no cumulative effects are possible.

3.6 Recreation Resources

3.6.1 Introduction

This report will describe the affected environment and analyze the effects of the proposed project and alternatives on the recreation resource and congressionally designated areas. The analysis will evaluate the impacts of invasive plant treatment methods on recreation relating to the general forest area, developed recreation sites and trails. Congressionally designated areas include wild and scenic rivers (WSR), wilderness, and national recreation areas (NRA). The effects on the outstandingly remarkable values, water quality and free flowing characteristics of designated and eligible wild and scenic rivers, and the effects on wilderness character will be evaluated; effects on recreation resource values of the NRA will be addressed. Invasive plant treatment methods are described in detail in Chapter 2and displayed in Table 44.

Recreational activities are influenced by and have influence on the rate and degree of invasive plant spread. Recreationists move in and out of the forest setting, inadvertently transporting seeds and propagating plant parts. Heavy use areas such as trailheads, parking lots and portions of riparian areas can be denuded of their native vegetation from dispersed use, creating prime environment for invasive plants to become established. Recreation users can also unknowingly spread invasive plant seeds and propagating parts across and between landscapes. The most likely vectors of invasive plant spread are roads, trails and riparian corridors (R6 2005 FEIS).

Invasive plants can detract from the desirability of using recreation sites and participating in certain recreational activities. For example, stiff plant stalks, thorns, sharp bristles, and allergies created by invasive plants can prevent humans from walking, sitting, setting up camp, and finding a place to fish or tie up a raft (R6 2005 FEIS).

According to the National Visitor Use Monitoring (NVUM) study, recreation use on the Wallowa-Whitman National Forest for fiscal year 2003 was estimated at 565,681 visits (USDA Forest Service 2004a). The top primary activities according to the NVUM study conducted on the Wallowa-Whitman were viewing wildlife, viewing natural features, hike/walking, relaxing, driving for pleasure and hunting. Overall use on the forest is considered light to moderate. Big game hunting is very popular forestwide. Recreation use associated with hunting such as off-highway vehicle (OHV) use, dispersed camping, wilderness and back country access using pack stock all increase substantially during the big game hunting seasons.

3.6.2 Affected Environment

Congressionally Designated Areas

National Recreation Areas (NRA)

There are approximately 7,350 acres of invasive plants identified within the Hells Canyon National Recreation Area (HCNRA), not including wilderness or WSR corridor acres. Invasive weeds are found primarily along forest roads within the HCNRA, near popular destination sites such as Pittsburg Landing, dispersed sites and along trails.

Dispersed recreation sites are typically along roads and have developed due to repeated use by recreationists. These site types are not usually inventoried, signed, or have any other use controls associated with them other than access. Repeated use by recreationists can create the conditions that favor invasive plant establishment and spread. Overall incidence of summer dispersed camping is low to moderate. Dispersed camping during the hunting season would be considered high with camps occurring along many roads. Many hunter campsites have been used by the same hunting group year after year.

The Wallowa-Whitman National Forest HCNRA Comprehensive Management Plan closed the HCNRA yearlong to motorized vehicles except where specifically provided for on designated roads and in certain areas. All other areas in the HCNRA contain travel restrictions or are closed yearlong. Motorized driving in these areas is limited to a 300-foot corridor on each side of designated open routes for dispersed camping. Some of these areas further prohibit motorized access with seasonal road closures during the fall big-game hunting seasons to reduce wildlife disturbance, provide nonmotorized hunting, and protect fragile soils (USDA Forest Service 2003c). Invasive plant spread associated with motorized use would be limited to roads open to such use.

Nonmotorized trail types include pack and saddle trails and hiking trails. Pack and saddle trails and the feed, straw and disturbance associated with such use can facilitate the establishment and spread of invasive plants. Mountain bikes are commonly used on trails outside wilderness. Mountain bikes can be vectors of invasive plant spread.

There is an infestation of common bugloss that begins near Winston Creek and extends downstream to High Camp Creek along the Imnaha WSR. This invasive plant area includes approximately 5,813 acres and encompasses 12.5 miles of the Imnaha WSR river corridor. Private lands adjacent to this site are also infested. The level of infestation within these areas is variable with the most heavily infested areas occurring in the river bottoms and meadows and decreasing in elevational gain along the terraced areas.

Wilderness

There are four designated Wilderness areas on the Wallowa-Whitman National Forest; Hells Canyon, Eagle Cap, Monument Rock, and the Baldy Creek Unit of North Fork John Day. Invasive weeds are present in Hells Canyon, Eagle Cap and Monument Rock Wilderness in varying degrees. There are no weeds present in the North Fork John Day Baldy Creek Unit at this time. Invasive plants within wilderness are typically found at trailheads, along trails, riparian areas and near popular dispersed camping sites. Invasive plant infestations within wilderness are minor compared to the general forest acres. Infestations outside wilderness boundaries have the potential to spread into wilderness and damage and degrade wilderness values.

Invasive plants have adverse effects on wilderness character. They disrupt natural processes. Invasive plants frequently alter natural plant communities, interact in unknown ways with native wildlife species, and alter ecological processes such as plant community dynamics and disturbance processes such as fire. This potential change in ecological condition can threaten the natural integrity of the wilderness and the values for which it was designated. The presence of invasive weeds is typically a result of human use. Weed infestations are typically associated with human activities such as grazing, pack stock use, trails; activities that create disturbed conditions that allow weeds to establish.

The R6 2005 FEIS identified wilderness as an area of special concern and it is in the highest priority treatment category. The Wallowa-Whitman LRMP as amended by the R6 2005 ROD approves herbicide use as a potential tool in designated wilderness throughout the region.

The R6 2005 ROD also amended all forest plans in the region to require use of certified weed-free feed for all pack and saddle stock used on National Forest System lands. As of January 2007, certified weed-free feed or pelletized feed is required in all wilderness and wilderness trailheads on National Forest System lands in the Pacific Northwest Region. This will help prevent further introduction of invasive weeds into the wilderness through stock feed. This requirement is being phased in to allow recreationists time to adjust to the change and due to lack of available weed-free hay certification programs in Washington and a limited program in Oregon.

Hells Canyon Wilderness Area

Hells Canyon Wilderness (HCW) located in parts of Oregon and Idaho was classified wilderness with the establishment of the Hells Canyon National Recreation Area in 1975. Additional acres were added as part of the Oregon Wilderness Act of 1984 resulting in a total of 214,994 wilderness acres. The Hells Canyon National Recreation Area Comprehensive Management Plan (CMP) provides direction for management of the Hells Canyon Wilderness area.

HCW is a diverse area with elevations that range from 1,400 to 9300 ft. It is characterized by steep rugged terrain with slopes in excess of 60 percent. The dominant vegetation is native bunchgrasses and shrubs with timbered drainages. The Snake River WSR corridor extends approximately ¼ mile inland to the wilderness boundary. From here the terrain rises sharply in elevation and consists of numerous rock rims. Mid slope, approximately 3000 ft., the country levels out into grassland benches. This is where the majority of historic ranching is evident. The slope continues rising sharply from this point to the canyon ridgetop. The area offers year round recreational opportunities at the lower elevations, however access is limited. The majority of use is located within the adjacent Wild and Scenic Snake River corridor.

The Oregon side of HCW consists of over 200 miles of trail. The trails follow the topography of the land and the majority of the trails were originally established during the homestead era. Due to limited visitation the majority of these trails are not maintained. The area offers limited access which is logistically challenging. There are no mountain lakes or sub alpine vegetation that draws the typical wilderness visitor. The majority of use occurs during fall hunting season. There is also spring time use since the area opens up prior to other alpine wilderness areas. Spring use consists of trailhead camps with day trips into the wilderness; and an occasional pack trip traveling throughout a section of the wilderness. It is common to spend a week in HCW and not encounter other visitors.

There are approximately 795 acres of invasive plant infestations identified within the Hells Canyon Wilderness. The largest concentrations of invasive plants identified within the wilderness are located near Lookout Creek and Lone Pine Creek, approximately 10 miles downstream from Pittsburg Landing. These infestation sites consist of several large blocks which occur on very steep terrain. Invasive plants are also located along Forest Trails # 1727, 1774, 1706, 1734, 1707, 1735, 1726, 1751 and 1778.

Eagle Cap Wilderness

The Eagle Cap Wilderness is the most heavily used wilderness in northeastern Oregon. There are over 47 trailheads and 500 miles of trail.

There are approximately 182 acres of invasive plants identified within the Eagle Cap wilderness. Invasive plant sites are primarily located along the Minam River and Forest Trails # 1673, 1901 and 1653.

Monument Rock Wilderness Area

The Monument Rock Wilderness is the smallest wilderness on the forest. There are two acres of invasive plants identified within this wilderness. These acres are located near the Table Rock Trailhead. Invasive weed sites have been identified north of the wilderness boundary, outside the wilderness.

Table 62-Wilderness areas and acres of invasive plants

Wilderness Name and Acres		Acres of Invasive Plants
Hells Canyon	214,994	795
Eagle Cap	350,461	182
Monument Rock	7,030	2
Total Acres	586,779	979

Wild and Scenic Rivers

Segments of the Eagle Creek, Imnaha, Joseph Creek, Lostine River, Minam River, North Powder River and Snake River have been designated as part of the National Wild and Scenic River System (national system). Big Sheep Creek, East Eagle Creek, Swamp Creek and the Upper Grande Ronde River are identified as eligible rivers and streams. The river management corridor typically extends one quarter mile from the riverbank on each side of the designated segment or official and eligible rivers. The presence of invasive species along the river corridor can detract from the aesthetic and recreational opportunities, and impact the values for which the river has been designated. Acres in national system and eligible river corridors that occur in wilderness would be subject to laws, standards and project design features pertaining to wilderness. The following table lists each river that has been impacted by invasive plants and the outstandingly remarkable values for which it was designated.

Table 63-Wild and Scenic Rivers on the W-W National Forest and their outstandingly remarkable values

Wild and Scenic Rivers on the Wallowa-Whitman National Forest				
River Name	**Wild (mi.)**	**Scenic (mi.)**	**Recreation (mi.)**	**Outstandingly Remarkable Values**
Eagle Creek	4.0	6.0	17.0	Scenery, Recreation, Geology/Paleontology, Fisheries, Historic Cultural Resources
Grande Ronde River	17.4		1.5	Scenery, Recreation, Fisheries, Wildlife
Imnaha River	15.0	4.0	58	Scenery, Recreation, Fisheries, Wildlife, Historic/Prehistoric, Vegetation/botanical, and Traditional values/Lifestyle adaptation
Joseph Creek	8.6			Scenery, Recreation, Geologic, Fish And Water Quality, Wildlife, Cultural Resources
Lostine River	5.0	11.0		Scenery, Recreation, Fisheries, Wildlife, Vegetation/Botany
Minam River	39.0			Scenery, Recreation, Geology, Fisheries, and Wildlife
Snake River	32.5	34.4		Scenery, Recreation, Historic/Prehistoric Cultural Resources, Botanical, Wildlife, Geology
North Fork John Day	4.0			Scenery, Recreation, Fisheries, Wildlife, Cultural Resources
Big Sheep (Eligible)	9.5		38.5	Recreation, fisheries, Cultural/Prehistoric
East Eagle Creek (Eligible)	9.0	2.0	4.5	Scenery, Recreation, Fisheries, Hydrological, Geological, Cultural/Historic
Swamp Creek (Eligible)	8.5		9.5	Fisheries, Wildlife, Cultural/Historic
Upper Grande Ronde (Eligible)	11.0		19.0	Recreation, Fisheries, Wildlife, Cultural/Historic

Snake WSR

The Snake River is designated as Wild from Hells Canyon Dam to Upper Pittsburg Landing, approximately 32.5 miles. The Wild segment lies within the Hells Canyon Wilderness area from its beginning at Hells Canyon Dam until approximately Willow Creek Rapids. At that point the wilderness area lies west of the river corridor and the Wild segment of the Snake River continues in the HCNRA until Upper Pittsburg Landing. Invasive plant sites within the Wild segment are minor within the wilderness area.

From Willow Creek Rapids to Upper Pittsburg Landing, invasive plant sites are more extensive and associated with access sites and ranches. There are approximately 489 acres of invasive plants identified within the wild segment.

The Snake River is designated as Scenic for an additional 34.4 miles downstream from Upper Pittsburg Landing to just above Cougar Rapids. There are approximately 291 acres of invasive plants identified within the Scenic segment of the river. The largest infestation sites are near Dug Bar, Pittsburg Landing and the confluence with the Salmon River.

Use on the river is heavy during the summer season with jet boats, rafters and kayakers running the river. River use is managed under a permit system on both the wild and scenic sections.

Fishing is very popular. Use in the fall is associated with boat-in hunting and would be considered moderate.

Eagle Creek WSR

Eagle Creek has Wild, Scenic and Recreation designations on the W-W National Forest. The Wild segment is within the Eagle Cap Wilderness area. Use along this segment is typically by foot or horseback along several trails that access the area. There are no invasive plants identified in the Wild segment of the river. The Recreation section follows Forest Road 7700 from the wilderness boundary to Martin Bridge. The last 1.5 miles of river from FR 7735 to the forest boundary is also classified as Recreation. Use along both these segments consists of dispersed camping along the road during summer, with use increasing during big game hunting season. There are approximately 71 acres of invasive plants identified within the recreation segments of the river. The invasive plants are predominantly associated with the road right of way within the managed river corridor.

The Scenic section is un-roaded except for Forest Road 7015 and 7735 near Martin Bridge. The Scenic section runs from Martin Bridge to Forest Road 7735 near Eagle Forks Campground. There are approximately 64 acres in invasive plants identified within the Scenic segment. These acres are predominantly associated with the road right of way within the managed river corridor.

Imnaha WSR

The Imnaha River is designated Wild, Recreation and Scenic along its entire length; from the headwaters in the Eagle Cap Wilderness to its confluence with the Snake River. The area is known for its scenery, water quality, and wide variety of recreation opportunities—fishing, camping, hiking, mountain biking, hunting, sightseeing, scenery, and provision of critical habitat for threatened chinook salmon and bull trout.

The Wild segment is located in the Eagle Cap Wilderness and is accessible by pack stock or foot along the Trail #1816. There are no invasive plants identified within this segment.

The Recreation segment begins outside the wilderness at Indian Crossing Campground and continues for 58 miles to just above the confluence with the Snake River. From Crazyman Creek, downstream to Cow Creek Bridge, the river bed and bank are primarily on private land.

Invasive plant sites have been identified along FR 3960 and Forest Road 3955 within the river corridor until Crazyman Creek. These plant sites are associated with the road right of way.

There is a large infestation of common bugloss (5,813 acres) that begins near Winston Creek and extends downstream to High Camp Creek along the Imnaha River within the recreation WSR corridor and extending into the HCNRA.

Approximately 870 acres of the 5808 acre site are within the designated WSR corridor. Recreational use on this stretch of river is primarily sightseeing from along County Road 727. The remaining acres in the Recreation segment are relatively small and associated with access and developments.

The Scenic segment begins at Cow Creek Bridge and continues for approximately 4 miles to the confluence with the Snake River. Approximately 22 acres of invasive plants have been identified, primarily within the riparian area of the river.

Joseph Creek WSR

Joseph Creek is designated as Wild for approximately 8.6 miles, from Joseph Creek Ranch to the forest boundary. The area is steep and fairly inaccessible. Recreational opportunities include kayaking, mountain biking, hiking, horseback riding, and big game hunting.

There are 46 acres of invasive plants identified within the corridor. These acres are part of a larger invasive plant population area that overlaps the river corridor boundary. The Joseph Canyon Viewpoint is near the invasive plant site.

Lostine WSR

The Lostine River is designated Wild in the headwaters area of the Eagle Cap Wilderness. There are no invasive plants identified within the wild segment. The Recreation segment is also located partially in the Eagle Cap Wilderness except for the Forest Road 8250 road corridor that has been excluded from wilderness designation. Approximately 30 acres of invasive plant have been identified within the recreation river corridor. These acres of invasive plants are associated with the Forest Road 8250 road corridor.

Minam WSR

The Minam River is designated as Wild from its headwaters at Eagle Cap Lake to the Eagle Cap Wilderness boundary. The area is heavily used for hunting, fishing, backpacking, horse packing, and other recreational activities. There are 89 acres of invasive plants identified within the corridor and they are primarily associated with Trail #1673.

East Eagle Creek (Eligible)

East Eagle Creek has been allocated into Wild, Scenic and Recreation segments in the Wallowa-Whitman Land and Resource Management Plan (forest plan). There are 12 acres total of invasive plants identified within the eligible river corridor. The wild segment is within the Eagle Cap Wilderness. There is one acre of invasive plants identified on the edge of the wilderness boundary, eight acres in the Recreation segment and three acres in the Scenic segment. These acres are located along the right of way of Forest Road 7745.

Big Sheep Creek (Eligible)

Big Sheep Creek has been allocated into a Recreation river for 38.5 miles and Wild for 9.5 miles in the forest plan. The wild segment lies within the Eagle Cap Wilderness. The recreation segment begins at the wilderness boundary and ends at its confluence with the Imnaha River. The river provides high quality recreation opportunities year-round along its middle and upper reaches. There are no invasive plants within the wild segment of the river. There are approximately 130 acres of invasive weeds along the Recreation segment. These acres are primarily associated with Forest Road 3940, Forest Trails # 1800 and 1819, Forest Highway 39 and riparian areas.

Swamp Creek (Eligible)

Swamp Creek has been allocated into a Recreation river for 9.5 miles from the forest boundary to Swamp Creek Cow Camp at Forest Trail #1658 in the forest plan. The next 8.5 miles are allocated as Wild from Forest Trail #1658 downstream to its confluence with Joseph Creek. There are 2 acres of invasive weeds in the recreation segment associated with Forest Highway 46. There are 11 acres of invasive weeds in the wild segment. These acres are associated with Forest Trail #1678.

Upper Grande Ronde (Eligible)

The Upper Grande Ronde is allocated as a Wild river beginning at its headwaters and downstream 11 miles and Recreation from that point downstream an additional 19 miles to the forest boundary in the forest plan. The river provides a wide variety of recreational opportunities and is a popular destination area. Use along the river during the fall big game hunting season is considered very high. There are no invasive weeds in the wild segment. There are 148 acres of invasive weeds within the recreation segment. These acres are primarily associated with the road right of way along Forest Highway 51.

Table 64-Wild and Scenic Rivers, designation, and acres of invasive plants

Acres of Invasive Plants by River and Designation				
River Name	**Wild**	**Scenic**	**Recreation**	**Total Acres of Invasive Plants**
Eagle Creek	0	64	71	135
Imnaha River	0	22	870	892
Joseph Creek	46	NA	NA	46
Lostine River	0	NA	30	30
Minam River	**88	NA	NA	88
Snake River	**490	290	NA	780
Big Sheep (Eligible)	0	NA	130	130
East Eagle Creek (Eligible)	**1	3	8	12
Swamp Creek (Eligible)	11	NA	2	13
Upper Grande Ronde (Eligible)	0	NA	148	148
Grand Totals	**636**	**379**	**1259**	**2274**

NA indicates that the designation doesn't apply to the river. ** Denotes that portions of the wild segment lie within wilderness. Acres in WSR corridors that occur in wilderness would be subject to laws, standards and project design features pertaining to wilderness.

Developed Recreation Sites

Invasive plants are found in 76 out of 126 developed recreation facilities on the Wallowa-Whitman National Forest. Invasive plants have been identified within the managed use area of these sites. These sites include campgrounds, trailheads, winter sports areas, cabin rentals, interpretive sites and organizational camps. Many of the invasive plant sites are small. They range from less than one acre to approximately 7 acres.

Use in developed campgrounds, trailheads, and rental cabins would be considered light to moderate during the summer season. Use increases significantly during Memorial Day, July 4th and Labor Day weekends and would be considered relatively heavy. Use of developed sites typically drops off after Labor Day. Light use of developed campgrounds does occur in conjunction with hunting season. Use of trail heads increases with hunters packing into wilderness and back country areas.

The following table shows developed recreation sites by ranger district, site name and acres to be treated by treatment type.

Table 65-Ranger District, Developed Recreation Site Name, and Acres of Proposed Treatments

Ranger District and Site Name		Acres of Invasive Plants
Baker	Anthony Lakes Alpine Ski Area	3.0
	Baker Valley Overlook	0.6
	Blue Springs Snow Park	1.0
	Deer Creek Campground	2.7
	Forest Practices Interpretive Site	1.3
	Gold Center Spring Day Use Area	1.5
	Grand Ronde Snow Park	0.7
	Marble Creek Picnic Area	3.2
	Mason Dam Boat Launch	0.7
	Mason Dam Picnic Area	4.5
	Mason Dam Viewpoint	1.2
	McCully Forks Campground	5.1
	Mud Lake Campground	3.0
	Powder River Trailhead	3.6
	Southwest Shore Campground	0.6
	Van Patten Lake Trailhead	0.3
Total		**33.0**
Eagle Cap	Bear Wallow Trailhead	1.3
	Boundary Campground	0.4
	Cougar Ridge Trailhead	1.3
	Irondyke Forest Campground	0.6
	Pole Bridge Picnic Area	0.1
Total		**3.7**
Hells Canyon NRA	Blackhorse Campground	0.4
	Buck Creek NRA Trailhead	0.4
	Buckhorn Tower/Overlook	2.6
	Cache Creek Ranch Interpretive Site	1.1
	Circle C Ranch Admin. Site	3.5
	Copper Creek Private Resort	2.1
	Coverdale Campground	0.5
	Cow Creek Trailhead	0.5
	Dug Bar Boat Launch/Trailhead	4.3
	Evergreen Campground	0.6
	Gumboot Creek Fish Interpretive Site	1.4
	Hat Point Day Use Area	7.3
	Hells Canyon Creek Boat Launch	5.0
	Hidden Campground	0.4
	Imnaha River Fish Weir	1.3
	Indian Crossing Trailhead	3.1
	Kirkwood Ranch Interpretive Site	1.3
	Lake Fork Campground	4.5
	Lake Fork Creek Trailhead	1.1
	Lick Creek Campground	3.4
	Mountain Chief Mine Tunnel	0.3
	North Pine Roadside Rest Stop	1.3
	Ollokot Campground	0.7
	P.O. Saddle Trailhead	0.3
	Pittsburg Campground	2.0

Ranger District and Site Name		Acres of Invasive Plants
	Pittsburg Landing	1.8
	Pittsburg Rock Art Interpretive Site	5.3
	Sacajawea Camp	5.7
	Snake River Trailhead	6.5
	Upper Crazyman Trailhead	0.5
	Upper Pittsburg Landing	0.2
Total		**69.4**
La Grande	Bird Track Interpretive Trailhead	6.0
	Bird Track Springs Campground	0.1
	Blue Springs Recreation Residences	0.1
	Catherine Summit Snow Park	0.1
	Frog Heaven Forest Camp	5.2
	Main Eagle Trailhead	1.1
	Moss Springs Guard Station	0.1
	North Fork Catherine Group Camp	0.2
	Park Saddle Trailhead	1.0
	River Campground	0.3
	Sand Pass Trailhead	0.1
	Spool Cart Campground	2.2
	Spring Creek Bunny Hill	1.0
Total		**17.5**
Pine	Halfway Picnic Area	3.6
	Martin Bridge Trailhead	0.6
	McBride Campground	0.7
	Tamarack Campground	0.5
Total		**5.4**
Unity	Antlers Guard Station	3.9
	Blue Springs Snow Park	0.4
	Long Creek Forest Camp	2.0
	Mammoth Spring Campground	1.4
Total		**7.7**
Wallowa-Valley	Chico Trailhead	0.8
	Salt Creek Summit Snow Park	0.5
	Tenderfoot Trailhead	0.2
Total		**1.5**
Grand Totals		**138.2**

General Forest Area

The general forest area, for the sake of this writing, is considered all areas not within a developed recreation site boundary, designated wilderness and wild and scenic river corridors. The majority of invasive plant sites within the general forest area occur along roads.

Roads and trails are considered to be high spread potential areas and high priority for treatment. The forest currently has one of the largest road systems in the Forest Service with 9,291 miles of inventoried roads. Recreational access to the forest is the predominant use of the transportation system. Driving for pleasure is a primary use of the forest (USDA Forest Service 2004a).

There are approximately 1752 miles of nonmotorized trails on the forest and approximately 220 miles of designated OHV/motorcycle trail on the Forest. Forest roads are open to OHV use with the exception of paved roads and double lane gravel roads.

Nonmotorized trail types include pack and saddle trails, hiking trails and cross-country ski trails. Pack and saddle trails and the feed, straw and disturbance associated with such use can facilitate the establishment and spread of invasive plants. Cross-country ski trails receive little use during the snow-free season. Mountain bikes are commonly used on trails outside wilderness. Mountain bikes can be vectors of invasive plant spread.

Motorized trails include off-highway vehicles (OHV) motorcycle and snowmobile trails. OHV trails and “cross country” use can create the conditions that are favorable for invasive plant establishment and subsequent spread by vehicle use (Lacey et al. 1997). Snowmobile trails are typically on roads that are not plowed during winter seasons. Use of OHVs on the forest is moderate with use increasing forestwide during big game hunting season.

Dispersed recreation sites are typically along roads and have developed due to repeated use by recreationists. These site types are not usually inventoried, signed, or have any other use controls associated with them other than access. Repeated use by recreationists can create the conditions that favor invasive plant establishment and spread. Overall incidence of summer dispersed camping is moderate, and is associated with OHV riding and river use. Dispersed camping during the hunting season would be considered high with camps occurring along many roads. Many hunter campsites have been used by the same hunting group year after year.

Big game hunting is a major use of the general forest area during the fall months. Dispersed camping, and OHV use for accessing remote hunting areas, scouting for game, and game retrieval increase substantially during big game hunting season.

Mushroom and berry picking and gathering of other forest products for consumptive and nonconsumptive use is a popular activity throughout the forest. These activities are typically associated with roads for access reasons; however the activity usually occurs outside the immediate road right of way.

Approximately 12,101 acres of invasive plants have been identified in the general forest area. The general forest acres are derived from the total acres proposed for treatment (22,842 acres) minus the acres within the boundaries of congressionally designated areas and developed recreation sites. The following table summarizes acres of invasive plant treatments by recreation area.

Table 66-Acres of invasive plants by recreation area

Recreation Area	Acres of Invasive Plants
Wilderness	979
WSR	2,274
HCNRA	7,350
Developed Recreation	138
General Forest Area	12,101
Grand Total	**22,842**

3.6.3 Environmental Consequences

Effects to Recreation for Alternative A - No Action Alternative

Under this alternative, approximately 5,172 acres of invasive plants forestwide would continue to be treated as authorized under existing decision documents (USDA Forest Service 1992, 1994a, 2003c). This document allows for limited use of herbicides and has proven ineffective in controlling the spread of invasive plants (see Botany Report). New infestations of invasive plants can be treated using mechanical and manual methods under this alternative; however, mechanical and manual methods have also proven to be ineffective in controlling the spread of invasive plants.

This alternative does not allow for early detection rapid response as a treatment strategy for newly identified invasive plant infestations. The absence of this treatment strategy would increase the potential for new invasive plant infestations to establish and spread.

Effects Common to Recreation for all Action Alternatives

Direct and Indirect Effects

Visitors may notice invasive plant treatments when traveling through the forest by car, OHV, foot, pack stock or water craft. How noticeable the treatment is depends on the size of the invasive plant site being treated and the type of treatment being used.

Chemical application methods vary from individual plant application to broadcast spraying. Wicking and stem injection treat individual plants and only target plants would be affected. Spot spraying would target individual plants but overspray may affect adjacent vegetation. Broadcast spraying would treat an area and all plants within the site would be affected. Broadcast application could include hand spreading and spraying from vehicle mounted tanks. Individual plant application would use less chemical agent overall. Visitors that are concerned about exposure to herbicides may be more accepting of individual plant application methods, especially in high use areas and areas for gathering berries and mushrooms. Chemical treatments would leave dead vegetation that would be noticeable for several days to several weeks. Individual plant treatments would be less noticeable than broadcast treatments overall. These effects would be of short duration, typically one growing season. Some effective treatments of perennial or biennial plants are in the fall when plants are brown and cured. In many cases these treatments show no visual impact.

Physical treatments include manual and hand mechanical treatments. Manual treatments may show signs of disturbed earth from digging or grubbing out root systems. Hand mechanical treatments may leave evidence of cut vegetation due to mowing, weed whipping, roadside brushing.

These effects are commonly seen by the visitor on and off the forest and are not expected to detract from their overall recreation experience in the general forest areas (not wilderness or WSR). These effects would be of short duration, typically one growing season.

Biocontrol measures would not be noticeable to the casual forest visitor. Introduced biocontrol agents are typically insects that target certain plant and their life cycles. This method of control is used to reduce high densities of invasive plant population. It is a long term method of treatment that does not eradicate the invasive plant, but instead keeps the population in check so that native species can compete.

Eradicating invasive plants can make areas more desirable for recreation. Invasive plants that have characteristics such as thorns, bristles, stiff plant stalks and chemical irritants would be treated, making areas more inviting to recreationists. Recreationists may appreciate a more natural landscape with intact native vegetation.

Early Detection Rapid Response (EDRR) is a treatment strategy that allows managers to rapidly respond to new or expanding invasive plant sites. The treatment decision process (Chapter 2, Figure 12) provides a decision process for determining treatment methods for invasive plant sites. Areas treated under EDRR would be subject to all regional and forest standards. Effects to recreation would be similar to those described above and within the categories described below.

All sites and areas that are treated with herbicides would be posted to inform forest visitors what herbicide was used, when it was applied and how long the herbicide would persist in the area before breaking down. Visitors would be able to make informed decisions concerning their comfort level with recreating in an area where herbicides have been recently applied.

People may decide not to recreate in areas where herbicides have been applied. The greatest impact to visitors would be if they were not aware that herbicides had been applied in their destination recreation area. The Wallowa Whitman LRMP as amended by Standard 23 of the R6 2005 ROD provides for public notification through various media, but it is impossible to contact all potential visitors prior to them arriving on the forest. Posting signs at key access points would alert visitors to the presence of herbicides; however notification upon arrival may disrupt a visitor's plans and activities. Similar recreational opportunities exist across the forest so a visitor would be able to find a substitute place to recreate. This may provide an opportunity for forest visitors to explore new areas.

Effects on Congressionally Designated Areas

Alternative A - No Action

Approximately 1,188 acres of invasive plants within the HCNRA that are currently approved for treatment would continue to receive treatment, leaving approximately 6,162 acres treated using hand treatment methods only or not treated at all.

Under this alternative, approximately 270 acres within wilderness currently approved for treatments would continue to receive treatments. Invasive plants have spread substantially beyond these sites. Without treatment of new invasive plant sites, populations that have become established within wilderness would continue to spread. By not aggressively treating weeds, wilderness character would remain "untrammeled" and free from human manipulation; however, the spread of invasive plants frequently changes the character of the ecosystem such that they damage the apparent naturalness and natural integrity of the wilderness.

Approximately 1,057 acres within WSR corridors would continue to be treated under this alternative. Invasive plants have spread beyond these sites. Invasive plants can detract from the outstandingly remarkable values for which the WSRs were designated. These include scenery, recreation, fisheries, wildlife, botanical, ecological, cultural and geological values. Refer to their respective reports for detailed descriptions of impacts invasive plants have on these resources.

Alternative B - Proposed Action

National Recreation Areas – Hells Canyon NRA

Approximately 7,350 acres of known invasive plants are proposed to be treated within the HCNRA (not including wilderness or WSR acres). These acres occur along roads, rangelands, dispersed camping areas as well as forest and grass lands. Approximately 7083 acres would be treated with ground-based application of herbicides. Additionally, 166 acres would be treated with herbicides using aerial application methods. There are 44 acres proposed for biocontrol and 57 acres proposed to be treated using manual methods.

The forest visitor is most likely to encounter invasive plant treatments while traveling through an area on roads. They may notice dead vegetation, signs informing visitors that an area has been treated with herbicides or people with equipment applying herbicides.

Visitors gathering mushrooms, berries and other forest products may be displaced to areas where herbicides have not been applied. Refer to the *Pacific Northwest Region Final Environmental Impact Statement, Preventing and Managing Invasive Weeds*, (USDA Forest Service 2005) for discussion of human health and safety regarding exposure to herbicides.

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. Trails # 1732, 1744 and 1754 would be closed temporarily during the aerial operations. The area and trails would be closed to public access only during the aerial application operations. This impact would be short term. Effects of ground based herbicide application and other treatment methods would be similar to those described as common to recreation for all action alternatives.

Table 67-Acres of proposed treatments in HCNRA

Hells Canyon NRA Acres of Proposed Treatments				
Biocontrol	Chemical	Chemical Aerial	Manual	Total
44	7083	166	57	7350

Wilderness

To best preserve the wilderness resource, alternatives will be evaluated for their potential effects on the four qualities of wilderness character: Untrammeled, natural, undeveloped, and outstanding opportunities for solitude or a primitive and unconfined type of recreation. The untrammeled quality is the extent to which wilderness ecosystems remain free from modern human manipulation. Natural integrity is the extent to which long-term ecological processes are intact and operating. The undeveloped quality is a measure of how natural the environment appears and how free it is from any structures or developments. The outstanding opportunities for solitude or a primitive and unconfined type of recreation are subjective values defined as isolation from the sights, sounds and presence of others, and the developments and activities of people. Primitive recreation opportunities are those that allow the recreationists to use backcountry skills, knowledge and abilities that do not rely on developed facilities, mechanical transport or motorized equipment.

Invasive Plant Treatment and Transport Methods in Wilderness

Approximately 874 acres of 979 acres are proposed to be treated with herbicides in wilderness. Of the 874 acres of herbicide treatment, 526 acres are proposed for aerial application and 348 acres are proposed for ground-based herbicide application. The remaining treatments proposed are 100 acres of biocontrol and 5 acres of manual treatment. The following table shows the acres of treatment by treatment type for each wilderness.

Table 68-Acres of proposed treatment by wilderness

Wilderness Name and Acres		Acres of Proposed Treatments				
		Biocontrol	Chemical	Chemical Aerial	Manual	Total
Hells Canyon	214,994	0	265	526	4	795
Eagle Cap	350,461	100	81	0	1	182
Monument Rock	7,030	0	2	0	0	2
Total Acres	586,779	100	348	526	5	979

Use of herbicides is estimated to be 80 percent effective in reducing invasive plants with one treatment application (see Botany Report). Treatment is most effective when herbicides are applied during the active growing season of the plant, typically May through July. Areas may be treated one to two times per year during the growing season to meet the objective to effectively control, contain or eliminate the invasive species at that site. Where continued disturbance occurs such as at trailheads and popular campsites annual treatments may be necessary to prevent the re-establishment of invasive plants and subsequent spread.

Aerial Application of Herbicide in Hells Canyon Wilderness

Minimum Requirement Analysis is a documented process that the Forest Service uses to assess the appropriateness of all actions affecting wilderness. This concept is intended to minimize impacts on wilderness values and resources. Decision makers may authorize generally prohibited activities or uses listed in Section 4(c) of the Wilderness Act if they are deemed necessary to meet the minimum requirements for the administration of the area as wilderness and where those methods are determined to be the 'minimum tool' for the project.

A Minimum Tool Analysis has been completed for invasive plants treatment in Hells Canyon Wilderness and is included in Appendix A. Aerial application of herbicides by helicopter was identified as the minimum tool necessary to treat 526 acres of yellow star thistle (*Centaurea solstitialis L.* – CESO3) on 10 different sites. All other invasive plant sites in Hells Canyon, Eagle Cap and Monument Rock wildernesses would be treated using ground-based herbicide application methods or hand treatment methods.

Split by the Snake River, the Hells Canyon Wilderness straddles the Idaho and Oregon state boundary. Treatment areas are within approximately 1.5 miles of the Snake River.

The noise from jet boats is audible within wilderness. There are no treatments proposed in the Idaho portion of the wilderness. Aerial application of herbicides would be accomplished using helicopters. Helicopters landings would not occur in wilderness.

Activities to support aerial treatments would occur outside wilderness. Helicopters typically fly 100 feet or less above ground level during herbicide application. Herbicide is applied at a rate of 2 gallons of herbicide/water mixture per acre. Helicopters can carry 70-80 gallons of water and herbicide mix, treating approximately 35 acres per load. Each load takes approximately 15 minutes to deliver. Given the application rate of 35 acres treated every 15 minutes, aerial application of herbicides would take approximately 3 hours and 48 minutes to deliver to 526 acres. The following table summarizes the invasive plant site, acres to be treated, estimated time to apply herbicides per site and general location of the site within wilderness. Refer to Appendix F for detailed aerial spray guidelines, herbicide drift model results, and project implementation information.

Table 69-Aerial application information for Hells Canyon Wilderness

Aerial Application Sites in Hells Canyon Wilderness			
Site ID Number	**Acres**	**Est. Appl. Time (Minutes)**	**Location/Adjacent Recreation Features**
06160400210	4	4 min.	Across Snake River from Dug Bar. East 4 acres outside wilderness boundary. Trail # 1774 follows east edge. West 4 acres in wilderness.
06160400212	11	5 min.	T28N R3W Sec. 28, between Birch Creek and Fence Gulch. No recreation features adjacent.
06160400222	9	5 min.	T28N R3W Sec. 33. Upper reaches of Dug Creek. No recreation features adjacent.
06160400088	7	4 min.	T27N R2W Sec. 15. Near Bob Creek. No recreation features adjacent.
06160400441	6	3 min.	T27N R2W Sec. 15. Near upper reaches of Bob Creek. No recreation features adjacent.
06160400442	51	22 min.	T27N R2W Sections 22, 23. Near upper reaches of Lonepine Creek. Trail #1736 within 300 meters.
06160400443	108	45 min.	T27N R2W Section 22. Along north fork of Lookout Creek. Trail #1701 runs through western edge of treatment area.
06160400444	34	15 min.	T27N R2W Section 22. Along headwaters of Lookout Creek. Trail #1701 within 300 meters.
06160400445	259	111 min.	T27N R2W Sections 21, 22, 27. Along Lookout Creek. Trail #1701 runs through western edge. Trail #1735 runs through the eastern edge of treatment area.
06160400448	37	15 min.	T27N R2W Sections 27, 34. Near Tryon Creek and Tryon Creek Ranch. Trail #1735 runs through south end. Trail #1699 junction within 300 meters.
Totals	**526 ac.**	**229 min.**	**Approximately 3 hours 48 minutes of aerial application time within wilderness.**

Ground-based Treatment Methods in Wilderness

Ground-based treatment methods that may be utilized include nonmechanical hand treatments such as hand pulling or use of hand tools for cutting, digging and grubbing. Herbicide treatments may use application methods such as wicking, stem injection, spray bottle, hand pressurized pumps, battery or solar powered pumps and propellant based systems such as those that use pressurized carbon dioxide. Power tools such as trimmers would not be used. Gas-powered, motorized pumps are not proposed as an application method in wilderness including under the EDRR strategy.

Figure 20 – Contract worker spraying invasive plants in wilderness from a horsepack-mounted spray system

Wicking, stem injection, pressurized carbon dioxide and hand pressurized pumps are nonmotorized application methods and are considered acceptable herbicide application methods within wilderness without further analysis of the Wilderness Act's prohibitions on use of motorized equipment.

Battery or solar powered pumps are considered motorized equipment. These devices are used to apply herbicides from horseback mounted spray systems. Solar panels and/or batteries to operate pumps may be evident on pack stock. These types of pumps are quiet and would not impact opportunities for solitude or a primitive and unconfined type of recreation in wilderness.

Methods to transport people and supplies to carry out invasive plant treatments include nonmechanized methods considered acceptable within wilderness including backpack and pack stock use. These types of traditional transport methods used within wilderness do not require additional analysis of the Wilderness Act's prohibitions on using mechanical transport. Use of helicopters or other mechanized methods to transport supplies and people to carry out invasive plant treatments is not proposed under any alternative or EDRR.

Biocontrol Treatments in Wilderness

Biological control agents may be introduced into wilderness to control invasive plant populations.

All biocontrol measures would be subject to the W-W LRMP as amended by the R6 2005 ROD Standard 14 - *Use only APHIS and State-approved biological control agents. Agents demonstrated to have direct negative impacts on nontarget organisms would not be released*. Biological control agents would be used in areas where access or safety reasons limit other treatment options.

Effects on Wilderness Character

Untrammeled

Treatment of invasive weed infestations within wilderness can be viewed as human manipulation. Evidence of human manipulation can detract from the "untrammeled" feel of wilderness. There will be short-term evidence of weed treatments including dead or wilting plants and areas of disturbed soils where plants have been pulled up or grubbed out. Where plants are dead or dying, some people may recognize that herbicides were sprayed. Aerial sites would be larger and more evident to visitors where they occur near trails and in viewsheds. These effects may not appear natural to the forest visitor. Hikers and pack stock users are typically traveling at a slow pace and these changes may be noticeable. Biocontrol measures would be not be noticeable to the casual visitor and would not affect the apparent naturalness of the area.

The amount of area proposed to be treated in wilderness is very small; approximately 979 acres of 586,779 acres in wilderness on the forest. Effects would be localized to the treatment areas and effects to the wilderness ecosystem are limited to these treatment areas. Regional standards and project design features are in place to protect ecological resources including nontarget botanical species, water, soils, fisheries and wildlife. Refer to the botany, hydrology, soils, fisheries and wildlife reports for details concerning the effects of invasive plants and the effects of invasive plant treatments on these resources.

Natural

Aggressive treatment of weeds in the wilderness would improve natural integrity. Invasive weed treatments would decrease establishment and expansion of invasive species in wilderness areas, and allow native vegetation and ecological processes to continue. Apparent naturalness of treated areas will improve as the evidence of invasive plants decreases and they are replaced with native vegetation.

Introduction of biological control agents to control invasive plants is considered a human intervention within wilderness. However; the biological control agents only directly affect the invasive plant host species. Invasive plants directly affect native plant communities, wildlife populations, apparent naturalness and other attributes of the ecosystem. Biological control agents are not visible to the casual visitor.

Early Detection/Rapid Response treatment strategy would allow managers to treat infestations within wilderness quickly while the infestation is still small. This strategy would reduce the opportunity for the spread of invasive plants within wilderness, protecting the natural integrity or the wilderness. In addition, treating areas while small will reduce the visual effects of treatments. Impacts to apparent naturalness would be less.

Undeveloped

No new developments, facilities, or structures are proposed by any alternatives. There would be no impact to the undeveloped quality of wilderness.

Outstanding Opportunities for Solitude or a Primitive and Unconfined Type of Recreation

Aerial application of herbicides would have short-term adverse impacts to wilderness solitude. The actual time estimated to apply the herbicides is approximately 4 hours for the 526 acres proposed. Due to additional flight time for travel between units, refueling and reloading the aircraft and working within optimal application windows, it is estimated that aerial application would impact wilderness solitude for 1-2 days per application.

Trails # 1701, 1735A, and 1774 within HCW, adjacent to aerial sites, would be closed for public safety prior to treatment. These areas would be closed to visitors for the short term, lasting until application of herbicides was completed.

Forest visitors may encounter workers applying herbicides using hand sprayers, backpack or horseback sprayers in the wilderness. The sounds from battery/solar electric pumps would be localized to the treatment area and would not disrupt entire watersheds. Visitors may also encounter workers digging, grubbing or pulling invasive plants. These encounters may affect some people's sense of remoteness and their opportunity for solitude. This effect would be short term, typically one to several days, and backcountry crews treating weeds would be small (typically 1-4 people). Duration of effects would depend on size of invasive plants site being treated. Effects on visitor's wilderness experience can be minimized through public notification and treating areas during low visitor use periods.

Some visitors may appreciate encountering people working with pack stock in the wilderness. "Packing in" is a traditional skill that many people associate with wilderness use.

Early Detection Rapid Response treatment strategy would allow managers to treat invasive plants while the infestation is still small. Treatment methods and duration would be less intrusive to the forest visitor if areas are treated when small. Less time would be necessary for workers to be in an area, reducing the opportunity for forest visitors to encounter work crews. New infestations would be treated 1-2 times per year until the invasive weeds were eliminated. Under EDRR, treatment methods would be limited to nonmechanical hand treatments and ground-based herbicide application methods as described.

Wilderness trailheads would be posted, informing visitors that herbicides have been or will be sprayed in the area. This may cause the visitor to recreate elsewhere, reducing their opportunity to engage in wilderness recreation. Invasive plant treatments overall would not detract from the opportunity for primitive recreation. Effects would be the same under Early Detection Rapid Response treatment strategy.

Wild and Scenic Rivers

The presence of invasive plants and treatments of them may impact the outstandingly remarkable values for which the rivers were designated or deemed eligible. Outstandingly remarkable values may include scenery, recreation, geology, fisheries, wildlife, botany/ecology, historic or cultural resources. Recreation is identified as an outstandingly remarkable value for all rivers in the project area except Swamp Creek. All outstandingly remarkable values are identified in Table 63. Effects of invasive plants and invasive plant treatments on resource values other than recreation are covered in their respective resource section.

Forest Plan and regional standards as well as project design features are in place for herbicide use near water to protect water quality. Refer to Chapter 3.4 of this FEIS for detailed information concerning these resources.

Visitors may notice dead vegetation due to herbicide application when floating rivers. Effects to these rivers and the outstandingly remarkable value of recreation would be similar to those effects common to recreation for all action alternatives.

Early Detection Rapid Response treatment strategy would allow managers to treat infestations within WSR corridors quickly while the infestation is still small.

This strategy would reduce the opportunity for the spread of invasive plants within WSR corridors, protecting the outstandingly remarkable values for which they were designated or deemed eligible.

Approximately 2,177 acres would be treated with herbicides in WSR corridors. The majority of these; 1,148 acres, occur in riparian areas. There are 1,029 acres proposed for herbicide treatment in upland sites, including the large bugloss site that occurs along the Imnaha River. Approximately 84 acres would be treated with biocontrol measures and 13 acres would be treated manually.

Table 70-Acres of proposed treatments by WSR name and designation

WSR		Acres of Proposed Treatments				
		Biocontrol	Chemical	Chemical Riparian	Manual	Total
Eagle Creek	Recreation	0	63	8	0	71
	Scenic	0	53	11	0	64
	Wild	0	0	0	0	0
Total		**0**	**116**	**19**	**0**	**135**
Imnaha River	Recreation	0	550	313	7	870
	Scenic	0	3	18	1	22
	Wild	0	0	0	0	0
Total		**0**	**553**	**331**	**8**	**892**
Lostine River **(Total)**	Recreation	**22**	**0**	**8**	**0**	**30**
Snake River	Scenic	20	167	98	5	290
	Wild	22	93	375	0	490
Total		**42**	**260**	**473**	**5**	**780**
Joseph Creek **(Total)**	Wild	**0**	**46**	**0**	**0**	**46**
Minam River **(Total)**	Wild	**19**	**0**	**69**	**0**	**88**
Big Sheep (Eligible) **(Total)**	Recreation	**0**	**27**	**103**	**0**	**130**
East Eagle Creek (Eligible)	Recreation	0	8	0	0	**8**
	Scenic	0	3	0	0	**3**
	Wild	1	0	0	0	**1**
Total		**1**	**11**	**0**	**0**	**12**

WSR		Acres of Proposed Treatments				
		Biocontrol	Chemical	Chemical Riparian	Manual	Total
Swamp Creek (Eligible)	Recreation	0	2	0	0	**2**
	Wild	0	0	11	0	**11**
Total		**0**	**2**	**11**	**0**	**13**
Upper Grand Ronde (Eligible) **(Total)**	Recreation	**0**	**14**	**134**	**0**	**148**
Grand Totals		**84**	**1029**	**1148**	**13**	**2274**

Alternative C - Restricted Use – No Broadcast Herbicide Application in Riparian

Under this alternative, ground-based and aerial broadcast herbicide application methods would not be used. By using methods other than broadcast spraying, less herbicide would be used overall.

Individual plants would be targeted and resulting dead vegetation would be less noticeable. Potential for impacts to nontarget plants would be reduced, reducing the effects on untrammeled and natural wilderness character qualities.

Application of herbicide to individual plants is typically more work intensive. There may be more workers in the wilderness for more days than if broadcast methods were used. Visitors may feel a loss of solitude due to the presence of workers in the wilderness.

Impacts to WSR and the outstandingly remarkable values of fisheries, botany, ecology and wildlife would be reduced by eliminating broadcast spraying in riparian areas. Potential impacts to nontarget plants, delivery of herbicides to water and subsequent impacts on fish would be reduced. Refer to the respective resource reports for details about this alternative.

By using methods other than broadcast spraying, less herbicide would be used overall. Individual plants would be targeted and resulting dead vegetation would be less noticeable to forest visitors. Impacts to recreation as an outstandingly remarkable value of WSRs would be the same as those common to recreation for all action alternatives.

Alternative D - No Aerial Application

Hells Canyon National Recreation Area

Approximately 166 acres of invasive plants within the HCNRA would not be treated using aerial application methods. These acres would be treated with herbicides using ground based methods or not at all.

Wilderness

Under this alternative, 526 acres of invasive weeds, primarily yellow star thistle would not be treated by aerial application within Hells Canyon wilderness. Due to the steep terrain and difficult access to these areas, the alternate treatment would be to release biocontrol agents near the sites with the idea that they would migrate to the host plants. Biocontrol agents are generally less effective than herbicide use. Biocontrol agents have had mixed success in the Hells Canyon area due to site conditions such as lack of moisture, soil types and recurring fire.

It is estimated that biocontrol would be much less effective in controlling spread of yellow star thistle in these areas (see Botany Report).

Apparent naturalness of wilderness would be reduced due to the use of less effective biocontrol treatments of invasive plants. The opportunity for invasive plant populations to spread from these sites is greater than with herbicide use. Native vegetation ecological processes may be impacted due to continued presence and spread of invasive plants.

Impacts to wilderness solitude would be much less than if aerial application were utilized. Visitors would not be impacted by low level flights. Release of biocontrol agents is not intrusive and would not be noticed by the casual visitor.

Wild and Scenic Rivers

There are no acres of invasive plants proposed for treatment using aerial application. This alternative would have the same effect as those described in the Proposed Action.

Effects on Developed Recreation Sites

Alternative A – No Action

Approximately 63 acres of invasive plants in 45 developed recreation sites would continue to be treated under current decision documents. New invasive plant infestations would become established and spread. Developed sites are considered high spread potential sites. Humans, the vehicles they use, pets and pack stock, associated with developed recreation sites would continue to be vectors spreading invasive plants and propagating plant parts.

Effects Common to all Action Alternatives

Many campgrounds, rental cabins, trailheads and picnic site are destination recreation sites. Recreation visitors that have made plans to use a certain facility may find that herbicides have been applied within or near the site. Recreationists may choose to recreate elsewhere due to the presence of herbicides.

Alternative B - Proposed Action

Approximately 138 acres in 76 out of 126 developed recreation sites would be treated with herbicides. If all developed recreation sites were treated at the same time, recreationists that do not want to be exposed to herbicides would have limited choices of facilities to use. This scenario is not likely as different weed species require treatments at different times of the year, program priorities and budget constraints.

Aerial application of herbicides would not have a direct impact to developed recreation sites. There are no invasive plant sites currently identified adjacent or near any developed recreation facility that would require aerial application of herbicides. The W-W LRMP as amended by the R6 2005 ROD Standard 21 prohibits aerial application of herbicides within 300 feet of a developed recreation facility.

Table 71-Acres of proposed treatment by ranger district and site name

Ranger District and Site Name		Acres of Proposed Treatments			
		Biocontrol	Chemical	Chemical Riparian	Total
Baker	Anthony Lakes Alpine Ski Area		3.0		3.0
	Baker Valley Overlook		0.6		0.6
	Blue Springs Snow Park		1.0		1.0
	Deer Creek Campground			2.7	2.7
	Forest Practices Interpretive Site			1.3	1.3
	Gold Center Spring Day Use Area		1.5		1.5
	Grand Ronde Snow Park		0.7		0.7
	Marble Creek Picnic Area		0.3	2.9	3.2
	Mason Dam Boat Launch		0.7		0.7
	Mason Dam Picnic Area		1.7	2.8	4.5
	Mason Dam Viewpoint		1.2		1.2
	McCully Forks Campground			5.1	5.1
	Mud Lake Campground		3.0		3.0
	Powder River Trailhead		1.1	2.5	3.6
	Southwest Shore Campground		0.6		0.6
	Van Patten Lake Trailhead		0.3		0.3
Total		**0**	**15.7**	**17.3**	**33.0**
Eagle Cap	Bear Wallow Trailhead		1.3		1.3
	Boundary Campground			0.4	0.4
	Cougar Ridge Trailhead		1.3		1.3
	Irondyke Forest Campground	0.6			0.6
	Pole Bridge Picnic Area			0.1	0.1
Total		**0.6**	**2.6**	**0.5**	**3.7**
Hells Canyon NRA	Blackhorse Campground			0.4	0.4
	Buck Creek NRA Trailhead		0.4		0.4
	Buckhorn Tower/Overlook		2.6		2.6
	Cache Creek		0.2	0.9	1.1

Ranger District and Site Name		Acres of Proposed Treatments			
		Biocontrol	Chemical	Chemical Riparian	Total
	Ranch Interpretive Site				
	Circle C Ranch Admin. Site		3.5		3.5
	Copper Creek Private Resort		2.1		2.1
	Coverdale Campground			0.5	0.5
	Cow Creek Trailhead			0.5	0.5
	Dug Bar Boat Launch/Trailhead	0.3	4.0		4.3
	Evergreen Campground			0.6	0.6
	Gumboot Creek Fish Interpretive Site			1.4	1.4
	Hat Point Day Use Area	6.8	0.5		7.3
	Hells Canyon Creek Boat Launch			5.0	5.0
	Hidden Campground			0.4	0.4
	Imnaha River Fish Weir			1.3	1.3
	Indian Crossing Trailhead			3.1	3.1
	Kirkwood Ranch Interpretive Site			1.3	1.3
	Lake Fork Campground			4.5	4.5
	Lake Fork Creek Trailhead			1.1	1.1
	Lick Creek Campground			3.4	3.4
	Mountain Chief Mine Tunnel			0.3	0.3
	North Pine Roadside Rest Stop			1.3	1.3
	Ollokot Campground			0.7	0.7
	P.O. Saddle Trailhead		0.3		0.3
	Pittsburg Campground		2.0		2.0
	Pittsburg Landing		1.8		1.8
	Pittsburg Rock Art Interpretive Site		5.3		5.3
	Sacajawea Camp	5.6		0.1	5.7
	Snake River Trailhead		6.5		6.5
	Upper Crazyman		0.5		0.5

Ranger District and Site Name		Acres of Proposed Treatments			
		Biocontrol	Chemical	Chemical Riparian	Total
	Trailhead				
	Upper Pittsburg Landing	0.2			0.2
Total		**12.9**	**29.7**	**26.8**	**69.4**
La Grande	Bird Track Interpretive Trailhead		6.0		6.0
	Bird Track Springs Campground		0.1		0.1
	Blue Springs Recreation Residences			0.1	0.1
	Catherine Summit Snow Park		0.1		0.1
	Frog Heaven Forest Camp	5.2			5.2
	Main Eagle Trailhead			1.1	1.1
	Moss Springs Guard Station		0.1		0.1
	North Fork Catherine Group Camp			0.2	0.2
	Park Saddle Trailhead		0.9	0.1	1.0
	River Campground			0.3	0.3
	Sand Pass Trailhead			0.1	0.1
	Spool Cart Campground			2.2	2.2
	Spring Creek Bunny Hill		1.0		1.0
Total		**5.2**	**8.2**	**4.1**	**17.5**
Pine	Halfway Picnic Area			3.6	3.6
	Martin Bridge Trailhead		0.5	0.1	0.6
	McBride Campground		0.7		0.7
	Tamarack Campground		0.3	0.2	0.5
Total			**1.5**	**3.9**	**5.4**
Unity	Antlers Guard Station			3.9	3.9
	Blue Springs Snow Park		0.4		0.4
	Long Creek Forest Camp			2.0	2.0
	Mammoth Spring Campground			1.4	1.4
Total			**0.4**	**7.3**	**7.7**
Wallowa-Valley	Chico Trailhead		0.8		0.8
	Salt Creek Summit		0.5		0.5

Ranger District and Site Name		Acres of Proposed Treatments			
		Biocontrol	Chemical	Chemical Riparian	Total
	Snow Park				
	Tenderfoot Trailhead		0.2		0.2
Total			**1.5**		**1.5**
Grand Totals		**18.7**	**59.6**	**59.9**	**138.2**

Alternative C - No Broadcast Application in Riparian Habitat Conservation Areas

This alternative would have the same effects as the Proposed Action; however, invasive plants within riparian zones would receive an individual plant type application of herbicide or an alternate treatment type. Overall, less herbicide would be used by targeting individual plants. There would be less chance for herbicide to drift to the areas commonly used by visitors such as picnic tables, campsites, water sources and bathroom facilities.

Alternative D - No Aerial Application

There are no aerial treatments are proposed in or adjacent to developed recreation sites. This alternative would have the same effect as those described in the Proposed Action.

Effects on General Forest Area

Alternative A - No Action

Of 22,842 acres of known invasive plants, only 5,172 acres would be treated. The remaining acres could be treated by manual methods. Manual treatments are less practical and effective for treating large infestations. Invasive plants would be expected to continue to spread throughout the forest.

Effects Common to all Action Alternatives

Direct and Indirect Effects

Approximately 12,101 acres of the general forest area would be treated for invasive plants. These acres occur along roads, trails, quarries, rangelands, parking areas and dispersed sites as well as forest lands. Approximately 10,352 acres would be treated with herbicides. These acres are not associated with developed recreation facilities, wilderness, wild and scenic rivers or national recreation areas.

The forest visitor is most likely to encounter invasive plant treatments while traveling through an area on a forest road. They may notice dead vegetation, signs informing visitors that an area has been treated with herbicides or people with equipment applying herbicides.

Nonmotorized trail users such as hikers and pack stock users are typically traveling at a slow pace and dead vegetation immediately adjacent to trails would be noticeable. Nonmotorized trails users may be more likely to come in contact with vegetation treated with herbicides by walking along recently treated trail areas.

Motorized trail users will also notice dead vegetation but should pass through an area faster than nonmotorized users. Motorized trail users would be less likely to come in contact with vegetation treated with herbicides as the trail tread is maintained to a width that accommodates the motorized vehicle.

Visitors gathering mushrooms, berries and other forest products may be displaced to areas where herbicides have not been applied. Refer to the Pacific Northwest Region Final Environmental Impact Statement, Preventing and Managing Invasive Weeds, 2005 for discussion of human health and safety regarding exposure to herbicides.

Trailheads would be posted alerting recreationists to the fact that herbicides have been applied to vegetation along the trail. This may cause recreationists to choose to recreate elsewhere, regardless of the trail type. All other indirect effects would be similar to those described as common to recreation for all action alternatives.

Alternative B - Proposed Action

Approximately 266 acres of aerial application of herbicide are proposed within the general forest. These areas would be closed to the public during aerial operations and posted to inform visitors that herbicides have been applied. There are no trails or facilities near these sites. The general forest area would be closed to public access only during the aerial application operations. This impact would be short term.

Other effects would be similar to those described as common to recreation for all action alternatives.

Table 72-Acres of proposed treatment by recreation area

Recreation Area	Acres of Proposed Treatment				
	Biocontrol	Chemical	Chemical Aerial	Manual	Total
HCNRA	44	7083	166	57	7350
Wilderness	100	348	526	5	979
WSR	84	2177	0	13	2274
Developed Recreation	18	120	0	0	138
General Forest Area	1709	10086	266	40	12101
Grand Totals	1955	19814	*875	115	22,842

*Note that approximately 83 acres within proposed aerial sites cannot be treated due to riparian buffer restrictions and would need alternative treatments (i.e. ground based treatments: chemical, biological, physical).

Alternative C - Restricted Use – No Broadcast Herbicide Application in Riparian

This alternative would have the same effects as the Proposed Action, however; invasive plants that are proposed for chemical treatment in riparian areas would be treated with nonbroadcast herbicide methods or an alternate treatment type.

Alternative D - No Aerial Application

This alternative would have the same effects as the Proposed Action, however; approximately 266 acres of invasive plants identified for aerial application of herbicide would receive an alternate form of broadcast herbicide application, biocontrol measures if they are available for the species involved or receive a combination of various treatment methods that would be applicable to the site. Depending on site conditions, biocontrol measures may be less effective (see Botany report).

Cumulative Effects

See Chapter 3.1 for the basis for cumulative effects analysis.

The effects to recreation associated with invasive plant treatments are short term. It is unlikely that all recreation facilities, trails, wilderness areas or WSRs would be treated at the same time. Recreationists that are displaced due to their concern about herbicide exposure can recreate in alternate facilities or other areas. Similar recreation opportunities would be available that have not been treated with herbicides. Thus, there would be no contribution to significant cumulative adverse effects from this project on recreation resources.

Compliance with the Forest Plan and Other Regulatory Direction

The alternatives analyzed comply with the management direction for recreation provided in the Wallowa-Whitman Land and Resource Management Plan and federal regulations and policies concerning the recreation resource. Specific standards from the existing Wallowa-Whitman National Forest LRMP (Forest Plan) as amended by the R6 2005 ROD that apply to invasive plants treatment can be reviewed in Appendix A.

3.7 Effects of Herbicide Use on Workers and the Public

Changes between the Draft EIS and Final EIS

Section 3.7.1 discusses Multiple Chemical Sensitivity

Section 3.7.2 has been updated to address Civil Rights and Environmental Justice (renamed and expanded from Environmental Justice and Disproportionate Effects in the Draft)

3.7.1 Introduction

This section focuses on the health effects to workers and the public if herbicide treatments are applied to invasive plants as proposed in the alternatives. The R6 2005 FEIS and its Appendix Q: Human Health Risk Assessment detailed the potential for health effects from the use of the herbicides proposed for this project. Herbicide active ingredients, metabolites, inert ingredients, and adjuvants and people with particular herbicide sensitivity were addressed. The R6 2005 ROD adopted standards to minimize herbicide exposures of concern to workers and the public based on the human health risk assessments. Herbicides are an important component of the integrated weed management methods needed to meet the purpose and need for this project.

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

Many people expressed concerns about the effects of herbicides on human health in their response to scoping. People wondered if they could be sickened by brushing up against contaminated vegetation, or by eating berries, mushrooms, fish or game that may have been exposed to herbicides. They worried that they might drink water contaminated by herbicides. People expressed concern about the health and safety of forest workers who are more likely to be exposed to herbicides. Some believe that the potential cost to human health is too high and other methods should be used to treat invasive plants. While herbicides can be associated with human health hazards, the likelihood of harmful exposures under this project is very low.

Workers and the public may be exposed to herbicides used to treat invasive plants under all alternatives in this project; however, no exposures exceeding a threshold of concern are predicted. This conclusion is based on facts about the chemistry of the herbicides considered for use, and the mechanisms by which exposures of concern might occur. Scientific risk assessments do not indicate that any person would be adversely affected in any way by these herbicides used in the manner proposed for this project. This applies to all alternatives.

Human Health Risk Assessment Methodology

The R6 2005 FEIS evaluated human health risks from herbicide and nonherbicide invasive plant treatment methods. Hazards normally encountered while working in the woods (strains, sprains, falls, etc) are possible for herbicide and nonherbicide invasive plant treatment operations. Such hazards are mitigated through worker compliance with occupational health and safety standards and are not a key issue for this project-level analysis.

The human health hazards associated with each herbicide active ingredient were also evaluated. Herbicide active ingredients can be associated with short-term effects such as nausea, headache, dizziness, eye or skin irritation, and coughing and long-term effects such as cancer; reproductive, endocrine, immunologic, neurologic effects, and genetic mutations. However, no herbicide exposures exceeding a threshold of concern are associated with the herbicides in this project given the ingredient proposed at the specified application methods and rates. This conclusion is based herbicide risk assessments prepared for the Forest Service by Syracuse Environmental Research Associates (SERA).

Forest Service/SERA risk assessments use peer-reviewed articles from the open scientific literature and current EPA documents, including Confidential Business Information. Specific methods used in preparing the Forest Service/SERA herbicide risk assessments are described in SERA, 2001. The risk assessment for the adjuvant NPE (nonylphenol polyethoxylate) was conducted and documented by David Bakke, Forest Service Pesticide-Use Specialist, consistent with the assumptions, methodologies, and protocols developed by SERA. The NPE Risk Assessment (Bakke, 2003), was peer-reviewed by SERA toxicologists and other Forest Service and independent experts; it is included in the "Forest Service/SERA herbicide risk assessments" used throughout this EIS. New chemical formulations that may be added through supplemental NEPA analysis during the life of this project would follow the same risk assessment process described in this paragraph.

The toxicological database for each herbicide was reviewed for acute, subchronic, and chronic effects in laboratory animal studies. Judgments about the potential hazards of herbicides to humans are necessarily based in large part on the results of toxicity tests on laboratory animals. Information on actual human poisoning incidents and effects on human populations supplements the laboratory animal test results, where such information is available. For a background discussion of all toxicological tests and endpoints considered in Forest Service Risk Assessments, refer to SERA, 2001. Additional SERA references are in Section 3.1.5.

Herbicide formulations may contain additional compounds besides the herbicide active ingredient; these are termed impurities or inert ingredients. Other additives, called adjuvants and surfactants, may be mixed with the diluted formulation before spraying to either enhance the herbicide activity or to modify undesirable properties of the spray mixture. Additionally, when organisms in the environment internalize chemical herbicide formulation in their physiologic systems, they may transform them into other compounds called metabolites. Of these categories of substances, only the NPE group of surfactants has been tested and data produced that identify specific and quantifiable hazards to human health (Bakke, 2004).

The following terminology describes relative toxicity of herbicides proposed for use.

Exposure Scenario: The way a person may be exposed to herbicide active ingredients or additives. How much herbicide a person may be exposed to is influenced by the application rate and method.

Threshold of Concern: A level of exposure below which the potential for adverse effects to a person is low. This level was made more conservative in the R6 2005 FEIS to add a margin of safety to the risk assessment process.

Hazard Quotient (HQ): The amount of herbicide or additives to which a person may be exposed over a specified period, divided by the estimated daily exposure level at which no adverse health effects are likely to occur. An HQ less than or equal to one indicates an extremely low level of risk; therefore, an HQ less than or equal to one is presumed to indicate a level of exposure below the threshold of concern for adverse health effects.

All alternatives are designed to limit exposures to herbicides by workers and the public to levels below a hazard quotient of 1, meaning that adverse health effects are unlikely to occur. This is done by limiting the potential for exposure so that it is below a threshold of concern, based on the risk assessment information. Even with a hazard quotient of less than 1, a person could still become sick. Some people may be particularly sensitive to individual chemicals and affected at very low doses.

People live near, spend time in, work in, drink water from, and depend on the forest and forest products from the Wallowa-Whitman National Forest. Thus, while the likelihood of harmful exposure is very low, there remains high concern about the impact of herbicide use to public and worker health.

The following information was adapted from SERA 2009, Control/Eradication Agents for the Gypsy Moth – Support Material for Response to Comments.

Some people feel that they suffer from Multiple Chemical Sensitivity (MCS), which is sometimes referred to as Idiopathic Environmental Intolerances (IEI). In general, individuals with MCS report that they experience a variety of adverse effects as a result of exposures to very low levels of environment chemicals (including herbicides) that are tolerated by individuals who do not have MCS. A distinction should be made between sensitive individuals in the general population and individuals reporting MCS. Reference doses derived by the U.S. EPA and used in Forest Service risk assessments incorporate an uncertainty factor of 10 to account for sensitive individuals, which may or may not eliminate risk that an individual may suffer symptoms. While not explicitly noted, the uncertainty factor for sensitive individuals addresses variability in tolerances within a normal population. Individuals reporting MCS assert, either explicitly or implicitly, that they are atypically sensitive.

A major problem in constructively addressing comments on MCS, however, involves the diagnosis of and remediation measures for this condition. While it is beyond the scope of the FEIS to address MCS in detail, it is worth noting that there is no current consensus on the diagnosis and cause of MCS. What appears to be an emerging view in several recent publications (e.g., Bornschein et al. 2008a, b; Das-Munshi et al. 2006, 2007; Eis et al. 2008) is encapsulated in the recent review of MCS by Das-Munshi et al. (2006), who state:

> *We conclude that persons with MCS do react to chemical challenges; however, these responses occur when they can discern differences between active and sham substances, suggesting that the mechanism of action is not specific to the chemical itself and might be related to expectations and prior beliefs.*

Das-Munshi et al. 2006, p. 1257

> *In other words, MCS is clearly a condition that exists in the human population and individuals with MCS do experience adverse effects. The above quotation, however, suggests that these individuals may be responding to a perception of hazard rather than to a specific chemical.*

While the above quotation may be a basis for suggesting that MCS is psychosomatic, other investigators are more cautious:

> *Regarding the psychological assessment it should be kept in mind that until the etiology and pathogenesis of MCS has been clarified an organic cause of the MCS associated symptoms and symptom complexes cannot be entirely ruled out*. Lacour et al. 2005, p. 149.

This cautionary note is clearly justified by incidents reported in some studies which conclude that the existence of MCS is questionable. For example, the recent double-blind study by Bornschein et al. (2008a) concludes that:

> *Patients with a clinical presentation of MCS were unable to discriminate between exposure to chemicals and clean air placeb. There were no significant differences in objective physiological and neuropsychological parameters between chemical and placebo exposures. … The results of our study suggest that a patient's attributions can be deceptive and a history of "multiple chemical sensitivities" must be questioned in the majority of cases. Other causes (e.g., cognitive sensitization, somatoform disorders, and other organic or psychiatric illnesses) always have to be considered.*

The Bornschein et al. study, however, also describes an individual who dropped out of the controlled study after four controlled exposures – two exposures to solvents and two placebo exposures. In both exposures to solvents, the individual evidenced clear adverse effects – i.e., weakness, fatigue, and difficulty concentrating. These effects were not invoked in either of the placebo exposures. The Bornschein et al. study, however, also describes an individual who dropped out of the controlled study after four controlled exposures – two exposures to solvents and two placebo exposures. In both exposures to solvents, the individual evidenced clear adverse effects – i.e., weakness, fatigue, and difficulty concentrating. These effects were not invoked in either of the placebo exposures.

In terms of this project, it is well beyond the scope and authority of the Forest Service to attempt to resolve concerns for MCS. The condition clearly exists and is the subject of serious study by the medical community.

3.7.2 Affected Environment

Infested sites are scattered and occupy less than three percent of National Forest System lands; however they transcend forest boundaries onto other privately owned land. Therefore, invasive plant treatments are implemented in partnership with the local counties, and at times other partners. Municipal watersheds, dispersed and developed recreation areas (trailheads, campgrounds, picnic areas, recreation sites, work centers, etc), and special forest product collection areas are currently near invasive plant sites. Municipal watersheds are described in Chapter 3.4. Recreation areas are described in Chapter 3.6.

Special forest products such as blackberries, huckleberries, salal, bear grass, mushrooms and herbs are gathered for personal use and commercial sale. People who harvest special forest products may have more contact with sprayed vegetation than other forest visitors. People who gather special forest products tend to be ethnically diverse. A recent unpublished study of commercial permit holders demonstrated that the largest ethnic groups involved with forest product gathering are Hispanics and Southeast Asians (Khmer, Khmer Krom, Laotian and Vietnamese).

Crews often come from the communities located near the National Forest. Herbicide applicators are required to be licensed and well-trained in safe handling and application practices.

Civil Rights and Environmental Justice

The R6 2005 FEIS found that some minority groups may be disproportionately exposed to herbicides, either because they are more likely forest workers, or they are special forest product collectors 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 nonHispanic herbicide applicators would be more likely to be exposed to herbicides than other people. Contractors for the Forest and/or County would likely apply herbicide treatments. County invasive plant control departments do not indicate that they employ any specific population group that could be disproportionately affected during invasive plant treatments.

Regardless, effects to all county or contract employees engaged in invasive plant control would be negligible due to Project Design Features and compliance with occupational health and safety standards.

People of Hispanic and Southeast Asian (Khmer, Khmer Krom, Laotian and Vietnamese) descent are minority groups that tend to gather mushrooms; however, no mushrooms are target species and Project Design Features are in place to protect fungi. Whenever herbicide treatment is going to happen, the Forest will notify tribes, plant collectors and the general public with media postings, handouts attached to permits, annual tribal contacts and on-the-ground signing. Information about invasive plant treatments would be added to existing multi-lingual mushroom gathering permit material to eliminate inadvertent exposures if appropriate. Some areas may be closed to gathering following treatment to avoid exposures. Even given plausible inadvertent exposures, the HQ values would not exceed the threshold of concern.

This project would not have an impact on anyone’s civil rights. It is the policy of the Forest Service that the Responsible Forest Service Official (FSM 1704) review proposed actions for civil rights impacts and take either of the following actions in compliance with DR 4300-4 and

1010-1 (FSM 1730.1): prepare a civil rights impact analysis and statement of its findings for any proposed policy or organizational action which may have a major civil rights impact, or document the determination that a civil rights impact analysis and a statement of findings are not needed. In order to make the determination that a Civil Rights Impact Analysis and a statement of findings were not needed, we scoped with more than 400 individuals, organizations, tribes, and other agencies as part of the NEPA process.

3.7.3 Environmental Consequences

Alternative A - No Action

The herbicides and herbicide applications approved in No Action were previously analyzed in the 1995 EA. No significant potential risks to health for workers or the public were associated with the 1995 project. See the Environmental Justice section in Chapter 3.9.4 for more discussion regarding adverse impacts from No Action.

Action Alternatives

All three action alternatives allow for the use of ten herbicides according to label requirements, LRMP standards and PDFs. As shown in Chapter 2, some herbicides are more likely to be used, based on the range of herbicides that can effectively treat existing known sites.

Table 73 that follows, shows the relative likelihood that certain herbicides may be used. Please note that in some cases, more than one herbicide may be effective, so the acreage shown is far more than would actually be treated by any one of these herbicides but provides the basis for the relative likelihood that each may be used. The analyses of effects to human health are based on 8,000 acres per year being treated over a ten to fifteen year period. This is more than double the budget estimate so is likely to be a high estimate of acres treated. Because each application of herbicide would be designed as low risk (HQ less than 1), the extent of treatment in a given year has little influence on the actual risk to human health[11]. However, the more acres treated, the greater the potential for accidental exposure, such as a worker accidentally spilling a small amount of herbicide on a bare hand. Such exposures are expected to be rare and small scale, based on past experience with similar projects (Rochelle Desser, personal communication, 2008). The herbicide risk assessments assume worst case exposure scenarios such as direct contact with herbicides by a member of the public or a worker. Even with direct contact, risks from this project would be relatively low (activity associated with an HQ less than 1 as modeled in herbicide risk assessments).

[11] Triclopyr is associated with some exposure scenarios where the HQ is greater than one for herbicide use allowed under all alternatives (based on worst case modeling in the risk assessments). Triclopyr is one of the least likely herbicides to be used and PDFs have been specifically proposed to minimize the risk of exposures over a level of concern.

Table 73-Herbicides and potential effectiveness

Active Ingredient Selected Herbicide Brand Names	Acres of known sites where this herbicide may be effective	Percentage of known sites where this herbicide may be effective
Chlorsulfuron (Telar, Glean, Corsair)	12,841	53
Clopyralid (Transline)	18,408	75
Glyphosate35 formulations, including RoundUp, Rodeo, Accord XRT, Aquamaster	15,863	65
Imazapic (Plateau)	3,325	14
Imazapyr (Arsenal, Arsenal AC, Chopper, Stalker, Habitat)	15	3
Metsulfuron methyl (Escort XP)	11,287	46
Picloram (Tordon K, Tordon 22K)	21,406	91
Sethoxydim (Poast, Poast Plus)	948	4
Sulfometuron methyl (Oust, Oust XP)	2,471	10
Triclopyr (Garlon 3A, Garlon 4, Forestry Garlon 4, Pathfinder II, Remedy, Remedy RTU, Redeem R&P)	3,671	15

Worker Exposure to Herbicides

Applicator exposure to herbicides is influenced by the application rate selected for the herbicide; the number of hours worked per day; the acres treated per hour; and variability in human dermal absorption rates. In routine broadcast and spot applications, workers may contact and internalize herbicides mainly through exposed skin, but also through the mouth, nose or lungs. Contact with herbicide formulations may irritate eyes or skin.

Appendix Q: Human Health Risk Assessment in the R6 2005 FEIS displayed risks for typical and maximum label rates under a range of conditions. Four potential exposure levels were evaluated for workers, ranging from predicted average exposure (typical application rate-typical exposure variables) to a worst-case predicted exposure (maximum application rate-maximum exposure variables).

Accidental worker exposures are most likely to involve splashing a solution of herbicides into the eyes or on the skin. Two general types of exposure were modeled: one involving direct contact with a solution of the herbicide and another associated with accidental spills of the herbicide concentrate onto the surface of the skin. For this risk assessment, two exposure scenarios are developed for each of the two types of dermal exposure, and the estimated absorbed dose for each scenario is expressed in units of mg chemical/kg body weight.

Exposure scenarios involving direct contact with herbicide solutions are characterized by immersing unprotected hands for 1 minute or wearing contaminated gloves for 1 hour. While it is unlikely that workers would immerse their hands in herbicide solutions, the contamination of gloves or other clothing is possible. For these exposure scenarios, the key element is the assumption that wearing gloves saturated with a chemical solution is equivalent to immersing the hands in a solution.

In either case, the concentration of the chemical in solution that is in contact with the surface of the skin and the resulting dermal absorption rate are essentially constant. Exposure scenarios involving chemical spills onto the skin are characterized by a spill onto the lower legs as well as a spill on to the hands. In these scenarios, it is assumed that a solution of the chemical is spilled on to a given surface area of skin and that a certain amount of the chemical adheres to the skin.

The ten herbicides proposed for use under the action alternatives, used at rates and methods consistent with PDFs, have little potential to harm a worker or a member of the public. In most cases, even when maximum rates and exposures were considered, HQ values were below the threshold of concern (HQ values ranged from 0.01 to 1).

There are two exceptions to this finding in Appendix Q of the R6 2005 FEIS: the herbicide triclopyr and the surfactant NPE. Even at typical rates, there is potential for a worker to be exposed to herbicide over a threshold of concern from spot spraying triclopyr, especially the Garlon 4 formulation. Broadcast of the surfactant NPE at typical rates may also result in worker exposure over a level of concern.

PDFs eliminate this exposure scenario by favoring use of Garlon 3A, minimizing application rates of all triclopyr formulations, and following safe work practices and label advisories. Far less than 1 percent of the Forest would be treated annually.

Public Exposure to Herbicides

The general public would not be exposed to harmful levels of any herbicides used in the implementation of this project. R6 2005 FEIS Appendix Q considered the plausible direct, acute and chronic exposures from herbicide ingredients. The Forest Service/SERA risk assessments considered acute exposures and longer-term or chronic exposures.

Acute exposures assume that a person has contact with the herbicide either during or shortly after an application. Specific scenarios estimate herbicide doses received from direct spray, from dermal contact with sprayed vegetation, or from consumption of contaminated fruit, water or fish. Direct spray scenarios assume that a naked child is completely covered with herbicide during a broadcast ground herbicide application. The assumption of 100 percent body coverage with herbicide is much greater than would plausibly happen in a real-world accidental overspray. An additional set of scenarios are included involving a young woman who is accidentally sprayed over the feet and legs. Detailed summaries of the public exposure scenarios can be found in Forest Service/SERA Risk Assessments.

Risk assessments indicate there is a potential for harm to a woman or child directly sprayed with triclopyr. There is virtually no chance of a person being directly sprayed given spot and hand/select methods considered for this project.

Exposures exceeding a level of concern also could occur if a person accidentally contacts vegetation spot-sprayed with triclopyr (Garlon 4®). Direct contact is implausible because of the high degree of operator control inherent in spot spraying. In addition, the use of Garlon 4® is further limited by the PDFs (there would be no use of Garlon 4® 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). Forest product gathering areas, campgrounds and administrative sites may be closed immediately after Garlon 3® application to prevent accidental exposures.

An analysis was also conducted to determine whether people could be sickened from eating fish, berries, or mushrooms (etc) exposed to herbicide. Several exposure scenarios for recreational and subsistence fish consumption were considered in the SERA Risk Assessments; none are near any herbicide exposure level of concern. Fish contamination is unlikely given the Project Design Features that reduce potential herbicide delivery to water.

The R6 2005 FEIS and Appendix Q disclosed exposure scenarios for both short term and chronic consumption of contaminated berries. These scenarios also approximate the effects of eating other contaminated products, such as mushrooms (Durkin and Durkin 2005)." Of the ten herbicides considered in this project, triclopyr was the single herbicide with exposure scenarios exceeding a level of concern if berries or mushrooms containing herbicide residue were consumed. To respond to this concern, PDFs limit the application methods and rate of application for triclopyr and NPE. Special forest product gathering areas may be closed to public use immediately after triclopyr application and NPE application to avoid inadvertent exposure.

Restricting the application rate, method and location of use of Garlon 4 and NPE would reduce the potential exposure in all alternatives to below a threshold of concern.

People who harvest and consume special forest products may be exposed through directly handling contaminated plant material, then chewing or eating it. Such doses would be additive, but are still unlikely to exceed a threshold of concern (see Cumulative Effects, below).

Acute longer-term or chronic exposures from direct contact or consumption of water following herbicide application were also evaluated in the R6 2005 FEIS. Risks from two hypothetical drinking water sources were evaluated: 1) a stream, contaminated with herbicide residues by runoff or leaching from an adjacent herbicide application; and 2) a pond, into which the contents of a 200-gallon tanker truck that contains herbicide solution is spilled. The only herbicide scenarios of concern would involve a person drinking from a pond contaminated by a spill of a large tank of herbicide solution.

The risk of a major accidental spill is not linked in a cause-and-effect relationship to how much treatment of invasive plants is projected for a particular herbicide; a spill is a random event. A spill could happen whenever a tank truck involved in an herbicide operation passes a body of water.

The potential risk of human health effects from large herbicide spills into drinking water are mitigated by Project Design Features that require an Herbicide Transportation and Handling Plan be developed as part of all project safety planning, with detailed spill prevention and remediation measures to be adopted.

Cumulative Effects of All Alternatives

Workers and the public may be exposed to the herbicides used to treat invasive plants under all alternatives in this project. However, exposures exceeding a threshold of concern are not likely to occur. This conclusion is based on facts about the chemistry of the herbicides considered for use and the mechanisms by which exposures of concern might occur.

The proposed use of herbicides in all alternatives could result in multiple or additive doses of the same or different herbicides to workers or the general public. People could conceivably be exposed to herbicides in more than one place on the Forest, or elsewhere. However, the herbicides proposed for use do not bioaccumulate in humans and are rapidly eliminated from the body. Thus, chronic exposures are not likely to add up in the body. In addition, the extent of treatment is limited to far less than one percent of the Forest, widely distributed. This reduces the potential for repeated exposures to any member of the general public.

Chronic (daily over a period of time) worker exposure was considered in SERA Risk Assessments; no chronic exposures reach a level of concern. Chronic public exposure was also assessed, including repeated drinking of contaminated water, repeated consumption of contaminated berries, and repeated consumption of contaminated fish. No chronic exposure scenarios were over a level of concern for the public.

A person could be exposed to herbicides by more than one scenario; for instance, a person handling, and then consuming sprayed berries. The cumulative impact of such cases may be quantitatively characterized by adding the HQs for each exposure scenario. Using glyphosate as an example, the typical levels of exposure for a woman being directly sprayed on the lower legs, staying in contact with contaminated vegetation, eating contaminated fruit, and consuming contaminated fish leads to a combined (acute) HQ of 0.012. Similarly, for all of the chronic glyphosate exposure scenarios, the addition of all possible pathways lead to HQs that are two orders of magnitude less than 1, indicating an acceptable level of cumulative risk even with multiple exposure scenarios.

Even if a herbicide with a greater hazard quotient than glyphosate was used, berry harvesting (dermal exposure) and the subsequent eating (oral exposure) would allow the body to metabolize some of the initial dose before receiving the second dose, thus reducing the cumulative dose. These factors make the risk implausible that a combined dose would exceed the threshold of concern.

The R6 FEIS considered the potential for synergistic effects of exposure to two or more chemicals: "Combinations of chemicals in low doses (less than one tenth of Rf) have rarely demonstrated synergistic effects. Review of the scientific literature on toxicological effects and toxicological interactions of agricultural chemicals indicate that exposure to a mixture of pesticides is more likely to lead to additive rather than synergistic effects (ATSDR, 2004; U.S.EPA/ORD, 2000). Based on the limited data available on chemical combinations involving the twelve herbicides considered in this EIS, it is possible, but unlikely, that synergistic effects could occur as a result of exposure to the herbicides considered in this analysis. Synergistic or additive effects, if any, are expected to be insignificant" (USFS 2005a, p. 4-3).

Herbicides are sometimes used in combination with additives such as surfactants. NPE surfactant has been associated with human health risks at certain exposure levels. NPE has estrogen-like properties, although they are much weaker (1,000 to 100,000 times weaker) than natural estrogen. NPE is widely used and present in personal care products (moisturizers, deodorants, perfumes, shampoos, and soaps) and detergents. Animal studies suggest that acute exposures at high levels may cause subclinical effects to the liver or kidneys.

The risk analysis for NPE (Bakke 2004) found that typical backpack application of herbicide containing NPE surfactant at typical exposures and a rate of 1.67 lbs/acre would add 0.1 to the cumulative HQ for these types of chemicals. For the public, values ranged between 0.00001 (eating contaminated fish) to 0.2 (consuming a pound of berries at typical exposures).

These are relatively small increases in hazard and do not significantly increase the potential for cumulative effects from use of NPE surfactant and herbicides.

Chapter 3.1 (Basis for Cumulative Effects) discusses the past, present and forseeable future actions, including chemical use, within and adjacent to watersheds surrounding the project area. The human health effects analysis assumes that chemicals are being used according to label guidance on all land ownerships.

3.8 Rangeland Resources

Changes between the Draft EIS and Final EIS

The explanation for Alternative A under Direct and Indirect Effects adds some verbiage about the rate of spread in HCNRA, based on public comment.

3.8.1 Introduction

A large proportion of the Wallowa-Whitman National Forest (85%) is appropriated into range allotments. Many of the currently documented invasive plant sites (99%) are therefore also located within these allotments. Numerous factors contribute to the establishment and spread of invasive species, one of which can be ungulate grazing and browsing. This concern is addressed in the allotment management planning process. The purpose of this project is to begin containing, controlling or eradicating invasive plant species within the direction found in the record of decision signed for the Pacific Northwest Regional Invasive Plant Program.

All action alternatives require incorporation of invasive plant prevention practices (R6 2005 ROD) in annual operating instructions and/or allotment management plans. Impacts to livestock operations will be isolated and limited in scale because most invasive plant populations are relatively small in size and represent less than 1.1% of the total grazing allotment areas forestwide.

Domestic and wild grazing animals contribute to invasive plant establishment and spread through selective eating, redistribution of invasive plant seeds in scat, skin, fur and/or hooves, and soil disturbance creating conditions favorable for seed germination. Historically, several intentional and unintentional introductions of invasive plants into native plant communities have been associated with livestock management, resulting in widespread invasions (Baker 1974; Sheley and Petroff 1999). Healthy and vigorous vegetation capable of resisting weed invasion is possible through proper grazing methods (Sheley et al. 1996).

3.8.2 Affected Environment

Presently 85 percent of the Wallowa-Whitman National Forest is appropriated into cattle grazing range allotments (1,956,536 acres, based on INFRA data located at the Wallowa-Whitman National Forest Supervisors Office). There are 151 allotments (designated active, vacant, and closed) in which 99 percent of the invasive species sites (1715 of the 1740) are located. These sites represent approximately 96 percent of the infested acres forest wide (21,957 acres of the total 22,802 infested acres forest wide). Allotment acres, and invasive weeds identified within allotments are presented in Table 74.

Table 74-Invasive weed acres presently identified within each allotment type

Allotment Use	Allotment acres	Invasive weed acres	Percent of Allotment acreage occupied by Invasive Plants	Percent of Total Forest Land base infested with Invasive Plants
Active	1,276,465	16,207	1.3	0.7
Closed	264,339	2,955	1.1	0.1
Vacant	415,732	2,795	0.7	0.1
Total	1,956,536	21,957	3.1	0.9

Common bugloss, diffuse knapweed, Canada thistle, yellow starthistle, scotch thistle and whitetop are invasive species that are most prevalent in the allotments forestwide (Table 75). The invasive weed acres are reported as gross acres infested where invasive species are often scattered within a site. The common bugloss site is one large infested site located along the Imnaha River and spread across 13 allotments. The level of infestation within Forest System land ownership boundaries is variable, with the most heavily infested areas occurring in the river bottoms and meadows and decreasing in elevational gain along the terraced areas. Bugloss is concentrated into clumps throughout the landscape with unaffected acres between the bugloss clumps. Private lands adjacent to this site are also infested with bugloss.

Diffuse knapweed and Canada thistle are commonly found on roads and other disturbed areas within allotments. Yellow starthistle sites are found in large acreages within HCNRA in hot dry grassland habitats. Some of the largest yellow starthistle infestations are located in the Canyon (closed allotment), Rhodes Creek and Lone Pine allotments west of the Snake River in HCNRA, in the Indian Creek allotment bordering private and state lands on the LaGrande District, and bordering both sides of Cottonwood creek in the Goose creek allotment on the Whitman District. Scotch thistle is commonly associated with roads, and disturbance throughout the forest with higher concentrations in the Tope Creek and Bear Gulch allotments (Wallowa Valley District) and near streams (intermittent and perennial) throughout allotments in the HCNRA. Whitetop is also commonly associated with disturbance areas, roads, and streams and other disturbed areas. Some of the higher concentrations are located in the Dodson-Haas allotment bisected by the Imnaha River and the Big Canyon vacant allotment east of the Snake River both within the HCNRA.

Dispersal vectors for diffuse knapweed, Canada thistle. yellow starthistle, scotch thistle and whitetop is primarily by wind (Miller et al. 2006, CWMA 2007), however, these seeds and seed of other invasives present in the forest allotments can also be spread via vehicles, water transport and animals (fur, hooves, and gastrointestinal ingestion and redistribution). In many instances cattle and other browsers will avoid areas invasive weeds are prevalent in large monocultures, and move to areas where there is desirable forage. In areas where invasive species are interspersed with desirable forage, it is likely that seed would either attach to fur or mud on hooves or even ingested and dispersed in feces. Some weed seeds are destroyed within the gastrointestinal tract; however, leafy spurge and spotted knapweed seeds can pass thru sheep, goats, and mule deer and some of the seeds still remain viable (Lacey et al. 1992). Leafy spurge seed was shown to be viable in feces 10 days post ingestion by mule deer. Long-lived seeds and hard seeded species of dicots and grasses consumed by grazers have been reported to survive passage thru gastrointestinal tracts of cows and grizzly bears (not know to exist on the forest) (Janzen 1984). It is suggested that land managers control movement of domestic ruminants and these animals should not be moved from infested areas to un-infested areas where viable seed is present on the stems. Another management strategy is to confine animals to a dry lot for 5 to 10 days to allow any viable weed seeds to pass to ensure no further dispersal of invasive seed is possible (Sheley and Petroff 1999).

Infestation sites range in size from one plant to numerous plants scattered over large acreages. The majority of inventoried sites are less than one acre in size and 66 percent of the sites are less than five acres in size (see Botany section). Acres of invasive species associated with forest roads including acres spreading out into areas beyond 100 feet of a road represent 20, 681 acres (91% of the presently identified acres forest wide). This does not implicitly imply that all these infested acres are caused by roads, but that a forest road exists within a calculated invasive site. Acres of invasive species within 100 feet of a road total 9,028 acres. Additionally, cattle often exhibit trailing behavior along fence lines that can result in disturbed areas for invasive species to establish. Estimates (worst case scenario) of fence lines with potential trailing impacts from cattle is suggested to be approximately 50 percent of fence lines in allotments forestwide (M. Bulthuis, personal communication). This estimate would suggest that there is approximately 2,348 additional acres where invasive species could establish. Presently, there are over 100 invasive weed sites (representing approximately 79 acres) near fences (10-foot fence line corridor) located within the allotments on the Wallowa-Whitman National Forest (Table 75).

Table 75-Invasive species acres in Wallowa-Whitman National Forest grazing allotments

Invasive Species[1]	Estimates of Total Acres infested within Allotments[2]
Common bugloss	5728.0
Diffuse knapweed	3663.4
Canada thistle	3181.0
Yellow starthistle	1957.8
Scotch thistle	1768.9
Whitetop	1402.8
Medusahead	893.8
Houndstongue	858.3
Spotted knapweed	808.2
Dalmation toadflax	606.2
St. John’s wort	405.6
Rush skeletonweed	390.2
Common crupina	284.2
Sulphur cinquefoil	166.8
Scotch broom	115.1
Leafy spurge	100.2
Knapweed species	83.7
Tansy ragwort	75.2
Yellow toadflax	47.3
Russian knapweed	26.3
Bull thistle	22.2
Clary sage	21.9
Musk thistle	21.5
Meadow hawkweek	16.2
Puncture fine	12.3
Silverleaf nightshade	10.9
Russian thistle	9.7
Senecio species	8.4
Teasel	8.1

Invasive Species[1]	Estimates of Total Acres infested within Allotments[2]
Dodder	7.2
Poison hemlock	7.1
Squarrose knapweed	6.6
Toadflax species	3.8
Field bindweed	3.3
Purple loosestrife	2.5
Dodder	2.4
Pepperweed	0.7
CYANO	0.6
Meadow knapweed	< 0.5
Total Acres[2]	**22,727**

(Wallowa-Whitman National Forest Geographical Information System (GIS) database 05/07)
1 For Scientific names see botany report
2 Multiple species can occur on a site therefore some overlap in total gross acres may occur
These acreages are gross acres where areas are delineated by the outer perimeter of the weed infestation and may contain significant areas that are not currently occupied by weeds.

Table 76-Range improvements and fencelines with potential for invasive species spread on the Wallowa-Whitman National Forest

Range Improvement	Number of improvements in active allotments	Acres of high spread potential
Water systems(spring, metal trough or tank with concrete bottom)	110 sites	110
Handling Facility	1 lot	1
Fences for Resource protection not associated with pasture boundary	160 miles	194
Fence lines	3867 miles	2,3481
Actual miles of fenceline and acres of invasive plants within 10 feet of fenceline	65 miles	79

These acreages are gross acres where areas are delineated by the outer perimeter of the weed infestation and may contain significant areas that are not currently occupied by weeds.
1 Based on 10' wide path along 50% of fencelines in active allotments

3.8.3 Environmental Consequences

Direct and Indirect Effects

This section will present the direct and indirect effects analysis for range resources. Issues presented during public scoping and effects related to range resources will be presented by alternative.

A number of comments received during the scoping process suggested that the Forest Service consider prohibiting major land-use activities on National Forests that are associated with invasive weed spread including the elimination of livestock grazing. Elimination of these multiple-use activities is outside the scope of this EIS and is inconsistent with current laws governing the management of National Forest System lands. The action being considered is whether to treat invasive species and if so to what degree.

The R6 2005 FEIS amended the existing Forest Plan, therefore, all action alternatives require incorporation of invasive plant prevention practices in annual operating instructions/plans and allotment management plans. The incorporation of these prevention practices are expected to reduce environmental impacts of cattle grazing forest wide. Ultimately, invasive plant prevention practices may result in some reduction to livestock grazing, but prevention of invasive plants is only one of several resource protection measures that reduce grazing such as range condition, stream protection, and endangered species management. For complete discussion of these practices in relation to range resources see the R6 2005 FEIS, Chapter 3. The effects analysis described in this document analyze the effects of the alternatives on grazing allotment permittees and range resources. As Project Design Features prevention standard 1 states; *adjustments suggested to protect range resources will be addressed through existing administrative mechanisms such as grazing annual operating instructions and grazing permits*. Suggestions to address invasive plants or potential introduction may include:

- Changes in livestock movement patterns that require additional labor or may reduce AUMs for certain allotments
- Alterations to season of use (length, turn-on, turn-off, etc.) and intensity of use that could reduce outputs and could include resting of pastures resulting in reduction of livestock use and output
- Passive restoration of native plant communities, which could require allotment resting for one to two seasons potentially reducing livestock use and output. In some cases fencing can be used to mitigate impacts
- Delayed reintroduction of livestock following wildfires resulting in reduced livestock use and outputs over time

An actual reduction in Animal Unit Month (AUM) attributed to invasive plant management cannot be quantified at the project scale due to unavailable data, variability between allotments, and the ongoing process of Allotment Management Plan revision.

Alternative A - No Action

This alternative is legally required and forms the basis for comparison against the action alternatives. Under this alternative, there would be no change in current management direction or in the level of ongoing management activities. Currently, approximately 5,103 acres in grazing allotments are approved for treatment under the existing 1992 and 1994 Environmental Assessment.

Invasive plants are currently damaging the ecological integrity of lands within and outside these allotments. Despite management direction in the ‘92 and ‘94 EA, invasive plants continue to increase and occupy previously uninfested areas. Invasive plants spread at a rate of 8-12 percent annually (R6 2005 FEIS) within National Forest System lands and neighboring areas, affecting all land ownerships. See existing condition section in the Botany report for estimates of invasive species growth forest wide based on current treatment effectiveness. As the current conditions change, and as invasive species continue to spread via common dispersal methods, management activities such as livestock grazing will be affected. Livestock and management actions associated with herding livestock have the potential to spread invasive species. The public could put more pressure on public land managers to implement more restrictive grazing strategies as the spread of invasive species becomes more widespread. This regional estimate for rate of spread covers the states of Washington and Oregon. In some location rate of spread may be higher. In a comment letter to the Forest, Asher characterized weed spread in HCNRA as follows: *“In 2006, in collaboration with and review by many weed experts; I calculated the weed spread for the previous 9 years in the HCNRA at 13% for the most troublesome weeds. That was with the professional, aggressive and cooperative Forest Service weed management effort (i.e.*

Alternative A). Lands in the HCNRA are at an especially high risk because of remoteness, rugged terrain, open character of the vegetation, the wide variety of vegetation types and precipitation levels" (Asher, personal communication).

Under current, allowable treatments, invasive weeds would likely continue to displace palatable native vegetation and could reduce forage on grazing allotments. Activities within allotments will continue to serve as seed dispersal vectors as these invasive species sites continue to grow. As described in the treatment effectiveness section of the botany report, loss of native plant communities may continue to occur as invasive weeds occupy and out-compete native species. Once invasive species begin to dominate these communities, a loss of species diversity, composition, and ecosystem function could occur. Invasive species would likely continue to spread into areas that are not currently infested. Established invasives would likely serve as seed sources for other areas of the Forest and nearby or adjacent other Federal, State or private lands

Toxic species such as Canada thistle and leafy spurge would continue to increase under the No Action Alternative. Most of the Canada thistle is along roadsides and grazing animals would likely avoid these areas in search of more palatable forage elsewhere. Leafy spurge is present in very small patches (~1-2-acre areas, 100 acres forestwide) located in numerous allotments forest wide. Due to the small sized patches, it is likely cattle will avoid these areas and no impacts to cattle from toxic properties from either of these two species will occur with this alternative.

This alternative will not meet the desired future condition from the R6 2005 FEIS: *"to retain healthy native plant communities that are diverse and resilient, and restore ecosystems that are being damaged, and to provide high quality habitat for native organisms throughout the forest, and assure that invasive plants do not jeopardize the ability of the forest to provide goods and services communities expect."* Invasive species would continue to spread as documented from past inventories compared to the current inventories.

Alternative B - Proposed Action

The Proposed Action addresses problems posed by invasive plants that compromise our ability to manage native ecosystems on the Forest. New management direction and tools made available for use in Region 6 will be utilized. Analysis will tier to the R6 2005 FEIS, including the use of the newly approved herbicides as described in the document. There is a need to reduce the extent of specific invasive plant infestations at identified sites, and to protect uninfested areas through early detection rapid response from future establishment.

Long-term effects of invasive weed treatments on the 124 active grazing allotments (approximately 16,200 acres) would be the retention of currently available forage, reduction in spread from existing and unknown future sites, and recovery of native vegetation in areas currently impacted by invasives. The maximum treatment rate is 8,000 acres per year and treatment sites will be prioritized at each individual district level. Livestock management activities that could be implemented on allotments with invasive plants include: change in timing and duration of grazing, change in distribution of livestock use, and requirements to only use weed free hay during potential quarantine periods. Operators may experience a slight loss of grazing opportunity however, many of the grazing strategies within allotments have deferred rotations and by focusing invasive weed treatments to the pastures during the resting phase would avoid most all potential impacts to operators.

Some herbicides have label use restrictions that will be followed with reference to livestock grazing and/or slaughtering (see Table 7 in the Range Report) post herbicide treatment and subsequent exposure. As mentioned previously, treating pastures that are currently in rest due to grazing management rotations would eliminate any potential effects. If movement of livestock is not possible and pastures or allotments require treatment while animals are present all label use restrictions will be followed in addition to PDFs that require permittee notification prior to any proposed aerial application. In addition timely notification and coordination should occur during annual operating instruction/plan meetings (R6 2005 ROD). For aerial herbicide application within allotments, permittees would be notified of proposed expected timeframes for treatment to allow the option to remove animals. No adverse effects to large mammals was found from direct spray of herbicides that could be applied aerially even at the highest expected rates (R6 2005 FEIS SERA Risk Assessment-Effects to Wildlife), and only typical application rates as described in Chapter 2 of this EIS are proposed for aerial application of herbicides. There are presently approximately 873 acres proposed for aerial application of herbicides within grazing allotments. PDFs that limit aerial applications in certain areas (i.e. proximity to streams) would decrease these proposed initial areas. Additionally, these proposed acres represent worst case scenario and actual treated areas would likely be much lower that currently mapped areas (see Botany report description of aerial sites). Most aerial sites are located in steep terrain with limited access areas where livestock generally do not prefer; however, PDFs would provide additional protection in the event stay grazing animals were present in areas.

Under the Proposed Action it is acknowledged that more chemicals would be used in the environment while effectively treating invasive species compared to the No Action Alternative.

The potential for a spill to occur during herbicide operations would be greater than under the No Action Alternative based on the additional number of acres that would be treated. Minimal to no effects are anticipated to grazers or operators due to strict adherence to label handling directions and spill containment protocols in the unlikely event of a spill.

There has been a concern that livestock grazing is a major cause of nonnative plant invasions (Belsky and Gelbard 2000) and that removal of livestock would reduce one of the causes of invasive species spread. No manipulative studies with appropriate treatments and controls have rigorously tested this hypothesis. Additionally, no known manipulative experiments of grazing effects of wild ungulates on nonnative plant species dynamics have been done (Parks et al. 2005). Scientific support is growing for the hypothesis that large herbivores facilitate the invasion and establishment of nonnative plants, however, substantial controversy exists about the specific process in time and space and the associated predictions of effects.

Under this alternative treatment of invasive species including eradication at some locations, would allow grazing activities to remain much as they are under current conditions and would meet the desired future conditions within the project area. Additional benefits to this alternative would be the reduction of potential spread of invasive species into uninfested disturbed areas such as fencelines. Also, early detection and response for any newly established invasive species would occur. Compared to the No Action Alternative the impacts, especially long-term impacts, to permittees would potentially be reduced, because native and desirable nonnative vegetation would increase. The treatment of existing and future documented sites under this alternative would positively affect range resources.

Alternative C – No Broadcast Herbicide Application in Riparian Areas

Alternative C proposes to meet the same objectives as stated in the Proposed Action, but intends to minimize impacts from chemical use in riparian areas. Specifically, this alternative does not allow broadcast herbicide treatments within riparian areas thereby reducing potential detrimental effects to aquatic and riparian ecosystems (reduced application of herbicides and less drift potential compared to Alternative B). For a full description of this alternative see Chapter 2 of the EIS and the Botany Report. This alternative would not allow broadcast as a method of herbicide treatment in approximately 2,500 riparian acres in allotments. This does not imply that all of the acres could or would be treated with broadcast methods, just that any invasive species that are presently known to occur or could occur in the future could only be treated with manual spot treatments and in accordance with all PDFs related to riparian areas listed in Chapter 2 of the EIS. Impacts to livestock and operators would be similar to those described in Alternative B. The potential for exposure of livestock and livestock managers will be slightly decreased as less chemical will be used within riparian areas.

Alternative D - No Aerial Herbicide Application

Under this alternative, most of the proposed aerial acres that would not be treated aerially would be treated with other methods however, may not be as effective at reducing invasive weeds (see Botany report for full description of alternative treatments proposed and areas not treated). It is expected that no impacts to forage availability will occur because the areas that would not be treated are generally in very steep terrain that most livestock would avoid.

By not aerially treating, the potential for exposure to livestock and livestock managers will be reduced. Other benefits of this alternative would be the same as Alternative B.

Cumulative Effects

This section discusses cumulative effects analysis for range resources.

Past management activities on the Forest in combination with the conservative approach to controlling invasive weeds has resulted in an increase in infested acres and impacts to ecosystem integrity. Various activities such as recreational use, road use, fire and its associated management activities, other management activities, grazing, and climatic events such as drought are all documented to contribute to the potential for invasive species to establish. All of these activities have contributed to the increase in invasive species establishment within the Wallowa-Whitman National Forest. Chapter 3.1 discusses the basis for the cumulative effects analysis.

Cumulative effects to grazing and range management of this project by alternative are listed in Table 77. Cumulative effects are expected to be positive for Alternatives B, C and D because more aggressive treatments combined with Early Detection Rapid Response activities and cooperative efforts with other federal, state and private landowners will reduce the potential for additional spread and loss of available forage.

Table 77-Cumulative Effects on Grazing and Range Management within the project area

Alternative	Effects on Grazing and Range Management
Alternative A No Action	Over time infested areas will continue to increase and forage plants will be reduced through displacement and reduced ecosystem health. As conditions change over time within the allotments, livestock use will likely be reduced thru additional NEPA allotment analysis to prevent the further spread of invasive species.
Alternative B Proposed Action	Some short –term limitations on livestock grazing may occur. As implementation of the proposed action occurs, it is expected that increased retention of desirable species, vegetation density, and plant vigor of desired native vegetation will increase and/or improve.
Alternative C Riparian Restrictions	Same as the Proposed Action.
Alternative D No Aerial Herbicide Application	Same as the Proposed Action.

Irreversible and Irretrievable Commitment of Resources

Implementing Alternative B, with appropriate environmental protection would not result in irreversible or irretrievable loss of range resources. Implementing Alternative A (No Action) would likely result in eventual irreversible impacts on grazing resources as weeds would continue to spread and invade in and around the proposed treatment areas. Implementing Alternatives C and D would likely result in eventual irreversible impacts on grazing resources as weeds would continue to spread and invade in and around the proposed treatment areas that are treated with methods not as effective as those proposed in Alternative B; however, at a much lower level of loss compared to Alternative A (No Action).

3.9 Project Costs and Financial Efficiency

3.9.1 Introduction

The following section documents the analysis of the effects of a proposal designed to control, contain, or eradicate invasive plants on approximately 22,842 acres of National Forest System lands administered by the Wallowa-Whitman National Forest. The impact of invasive plants is many and varied. They can poison livestock and pets, contribute to increased fire hazards, compete with desirable plants, reduce the suitability of wildlife habitats, and change the nature and composition of plant communities. A 2000 report by The Research Group estimated the cost of controlling these invaders, which impacts both private and public budgets. It is estimated that 21 of the 99 weeds listed as noxious in Oregon reduced the State’s total personal income by about $83 million. This equated to approximately 3,329 annual jobs lost to Oregon’s economy. It was estimated that these 21 species cost the citizens of Oregon a total of about $100 million per year. The effect of all 99 noxious weeds is likely significantly greater (The Research Group 2000).

3.9.2 Methodology

The analysis area is the ten counties most directly influenced by the Wallowa-Whitman National Forest, Wallowa, Union, Baker, Malheur, Umatilla, and Grant Counties in Oregon and Adams, Idaho, and Nez Perce Counties in Idaho. The time frame used for the analysis of direct, indirect, and induced economic effects is approximately 15 years.

This is the estimated period of time required to contain or control existing invasive plant populations at the anticipated rate of annual treatment.

Projected Costs

In order to compare the alternatives, implementation costs were estimated based on a uniform set of assumptions. Regardless of which alternative is selected, costs will vary from year to year based on factors such as annual budget allocations, the annual operating plan, the conditions present in the sites scheduled for treatment, opportunities for cost savings afforded by partnerships with Forest stakeholders, and the availability of external funding.

Many variables affect the cost of treatment activities, including: treatment methods (e.g., mechanical, manual, herbicide, etc.); method of herbicide application (e.g., aerial, broadcast spraying, spot application, etc.); species, and site conditions. Many of the sites to be treated are likely to require repeated entries; the phenology of individual invasive species and the effectiveness of a given treatment influence the number of entries that may be required. It is expected that in some cases, multiple treatment methods may be employed on the same site. For example, a site with multiple species may be treated with spot application of herbicide to address one species, and physical treatments, such as hand pulling to address other species. In some cases a combination of treatment options are proposed, such as manual, mechanical, and/or herbicide. On these acres, one treatment method may be utilized initially, with another method used for follow-up treatments, such as herbicide treatments applied in year one followed by manual treatments in year two.

Treatment effectiveness under Alternative A was estimated at 25 percent of acres treated based on forest management experience utilizing the current treatment strategy (Laufmann 2007). For the purposes of the economic analysis, 25 percent effectiveness was assumed in order to analyze the worst case scenario. Treatment effectiveness under the action alternatives was estimated at 80 percent of acres treated based on commercially acceptable standards.

The following assumptions were used to arrive at this cost estimate for each alternative.

- The average efficacy of the more limited suite of treatment methods available under the No Action Alternative (Alternative A) was estimated at 25 percent based on an assessment of the effectiveness of past treatment activities on the Forest.
- Average efficacy of the suite of treatment methods available for use under the action alternatives (Alternatives B, C, and D) was assumed to be 80 percent based on commercially acceptable standards.
- The weeds that survive the first round of treatments are retreated in the next and succeeding years, with the same rate of efficacy.
- Under Alternative A, the application of treatment methods on acres identified for treatment using manual, mechanical, and/or herbicide is approximated based on the three-year average. From 2003 through 2005, 31 percent of treatments utilized manual and mechanical methods and 69 percent utilized herbicide ground applications.
- Under Alternatives B, C, and D, acres identified for treatment using manual, mechanical, and/or herbicide were projected to be treated primarily with herbicides initially and as population size is decreased, manual and mechanical methods would be used. Treatment costs per acre were estimated based on an assumption of 90 percent herbicide and 10 percent manual or mechanical (see Table 78).

- Costs per acre for treatment activities are estimated using regional averages adjusted for local costs variances and are displayed in Table 78
- The costs of monitoring the effectiveness of treatments are assumed to be conducted by Forest Service personnel in the year following treatment.
- Historically, treatment costs within the Hells Canyon National Recreation Area (HRCNRA) have been higher due to the nature of the terrain to be treated. Therefore higher costs per acre for some treatment methods were used to estimate the cost of proposed treatments within the HCNRA. These cost estimates are based on the Forest Service's past experience with contracting for these services in the HCNRA and are displayed in Table 78.

Table 78-Cost per acre of invasive species treatment methods (All costs are in 2006 dollars)

Treatment Method	Cost per Acre
Manual/Mechanical Treatments (all areas)	$340
Biological Treatments (all areas)	$70
Aerial Herbicide Treatments (all areas)	$42
Ground Broadcast and Spot Herbicide Treatments (Avg.) Hells Canyon National Recreation Area Remainder of Forest	 $310 $100
Ground Spot Herbicide Treatments only Hells Canyon National Recreation Area Remainder of Forest	 $350 $125
Manual/Mechanical and/or Herbicide Treatments – Alternatives B, C, and D Hells Canyon National Recreation Area Remainder of Forest	 $313 $124
Manual/Mechanical and/or Herbicide Treatments – Alternatives A* Hells Canyon National Recreation Area Remainder of Forest	 $319 $175
Inventory and Monitoring (all areas)	$47

These costs represent estimated open market costs and do not necessarily equate to actual Forest Service expenditures. In some cases, actual Forest Service costs per acre may be lowered through the use of Forest Service crews, cooperative agreements, partnerships, and external funding. The use of these alternative approaches can only be determined on a case by case basis, taking into consideration the areas and species to be treated from year to year. It is not possible to accurately anticipate the scale of cost savings that may be achieved. Use of the costs listed above provides a "worst case" scenario that allows for a consistent, relative comparison of costs between the alternatives.

3.9.3 Affected Environment

The impact of invasive plants is many and varied. They can poison livestock and pets, contribute to increased fire hazards, compete with desirable plants, reduce the suitability of wildlife habitats, and change the nature and composition of plant communities. The cost of controlling these invaders impacts both private and public budgets. A report prepared for the Oregon Department of Agriculture by The Research Group in 2000, estimated that 21 of the 99 weeds listed as noxious in Oregon reduced the State's total personal income by about $83 million. It was estimated that these 21 species cost the citizens of Oregon a total of about $100 million per year at that time. The effect of all 99 noxious weeds was likely significantly greater (The Research Group 2000). This analysis addresses the treatment of 22,842 acres of invasive plant species on the Wallowa-Whitman National Forest. Ten species present on the Forest were included in the Oregon study.

The Wallowa-Whitman National Forest lies in the northeastern corner of Oregon and the west central edge of Idaho. The Forest is located on the east edge of the Blue Mountains and encompasses the Elkhorn and Wallowa Mountains. The Forest extends to the Hells Canyon National Recreation Area, and encompasses four wilderness areas totaling over 600,000 acres, and eleven wild and scenic rivers. The Wallowa-Whitman National Forest is the home of the deepest river gorge in the nation (Hells Canyon), the largest wilderness area in Oregon (Eagle Cap), has one of the top snowmobile areas in the nation, and hosts a portion of the Oregon Trail.

The population of the counties in the analysis area is displayed in Table 79 (US Census Bureau 2000).

Table 79-Analysis Area Population by County, 2000 Census

Location	Population
Baker County, OR	16,741
Grant County, OR	7,935
Malheur County, OR	31,615
Umatilla County, OR	70,548
Union County, OR	24,530
Wallowa County, OR	7,226
Adams County, ID	3,476
Idaho County, ID	15,511
Nez Perce County, ID	37,410
Total Analysis Area Population	**214,992**

As displayed in Table 80, the majority of analysis area residents (84.4 percent) are White, followed by Hispanic or Latino (10.1 percent), and American Indian (2.5 percent) (US Census Bureau 2000).

Table 80-Race and Ethnicity by County, 2000 Census

Location	White	Black or African Am.	Am. Indian or Alaska Native	Asian	Native Hawaiian & Other Pacific Islander	Some Other Race	Two or More Races	Hispanic or Latino*
Baker County, OR	95.7%	0.2%	1.1%	0.4%	0.0%	0.1%	1.7%	2.3%
Grant County, OR	94.6%	0.1%	1.6%	0.2%	0.0%	0.1%	1.4%	2.1%
Malheur County, OR	68.8%	1.2%	0.9%	1.9%	0.1%	0.1%	1.5%	25.6%
Umatilla County, OR	77.5%	0.8%	3.2%	0.7%	0.1%	0.2%	1.5%	16.1%
Union County, OR	93.1%	0.5%	0.8%	0.8%	0.6%	0.4%	1.4%	2.4%
Wallowa County, OR	95.7%	0.0%	0.7%	0.2%	0.0%	0.1%	1.4%	1.7%
Adams County, ID	95.5%	0.1%	1.4%	0.1%	0.0%	0.5%	0.9%	1.6%
Idaho County, ID	93.4%	0.1%	2.9%	0.2%	0.0%	0.3%	1.6%	1.6%
Nez Perce County, ID	90.6%	0.3%	5.1%	0.7%	0.1%	0.1%	1.4%	1.9%
Analysis Area	84.4%	0.6%	2.5%	0.8%	0.1%	0.2%	1.4%	10.1%

* Hispanic or Latino persons may be of any race.

Per capita incomes in the counties of the analysis area range from a low of $13,895 in Malheur County, OR to a high of $18,544 in Nez Perce County, ID. The 2000 per capita income for Oregon and Idaho were $20,940 and $17,841 respectively. The percentage of the analysis area population with incomes below poverty level is displayed by race in Table 81. Poverty levels are highest among minority populations.

Table 81-Analysis Area Population below Poverty Level by Race, 2000 Census

Race/Ethnicity	Percentage Below Poverty Level
White	12.6%
Black or African American	32.8%
American Indian & Alaska Native	24.7%
Asian	12.3%
Native Hawaiian & Other Pacific Islander	45.5%
Some Other Race	26.5%
Two or More Races	21.4%
Hispanic or Latino*	25.3%

*Those of Hispanic or Latino origin may be of any race.

Although many members of the public desire commodity uses of the National Forest, increasingly, forest users are placing a greater importance on noncommodity values such as the aesthetic, recreational, and spiritual aspects of the forest. Visual resource qualities not only attract visitors, but are appreciated by local residents as an aesthetic value that enhances the local lifestyle and culture. Likewise, the recreation opportunities afforded by the National Forest attract visitors and residents. A variety of special places such as scenic areas, scenic byways, wild and scenic rivers, wilderness areas, and research natural areas contribute to the educational, interpretive, and other recreational experiences available within the Wallowa-Whitman National Forest (USDA Forest Service 2004a). These opportunities contribute to the desirability of the area as a place to live and also attract visitors who support the local tourism industry.

Invasive species are degrading native plant communities throughout the forest. Currently, it is estimated that there are 22,842 acres of invasive plant infestations within the Wallowa-Whitman National Forest. Noxious weed infestations are of concern to both those who seek commodities and those who seek noncommodity uses. Both groups desire a healthy ecosystem. However, some members of the public believe that the use of herbicides presents an unacceptable risk to the health of nontarget native plants, wildlife, and humans. Concern has also been expressed that the use of herbicides is too costly.

Tribal Interests

The Wallowa-Whitman National Forest maintains government to government relations with numerous American Indian tribes who have treaty reserved or Executive Order rights on the Forest. These rights include fishing, hunting, gathering, and trapping. The tribes with rights on the Wallowa-Whitman National Forest include:

- Confederated Tribes of the Umatilla Indian Reservation
- Confederated Tribes of the Warm Springs
- Nez Perce Tribe

Tribal members utilize native plant species for a variety of cultural uses such as food, medicine, dress, basketry, or ceremonial purposes. Wildlife and fish are harvested for subsistence and traditional cultural uses. Invasive plants may interfere with rights granted to Native American Tribes. Invasive plants can crowd out plants traditionally gathered and can impact wildlife and fish. Additionally, the potential for human health impacts through contact with or consumption of plants and animals exposed to herbicides as a result of treatment activities are a concern. There is also a potential for treatment activities to impact traditional cultural properties or grave sites.

Jobs and Income

The jobs and income generated by businesses that provide invasive plant treatment services is another effect of invasive plants. Such businesses employ people to provide the appropriate level of service needed to meet demand. The services or output produced and the employment required to produce that level of output are the direct effects of that business on the economy. In order to produce the output included in the direct effects, the businesses providing invasive plant treatments must purchase supplies and services from other industries. The output and employment stimulated in other industries by these purchases are indirect effects. In addition to the direct and indirect effects, induced effects represent the output and employment stimulated throughout the local economy as a result of the expenditure of new household income generated by direct and indirect employment.

3.9.4 Environmental Consequences

Alternative A – No Action

The Wallowa-Whitman National Forest has been treating invasive plants under direction found in the 1992 decision implementing the Wallowa-Whitman National Forest Environmental Assessment for the Management of Noxious Weeds and Forest Plan Amendment 4 and a 1994 Wallowa-Whitman Management of Noxious Weed Environmental Analysis. This program would continue under the No Action Alternative. The 1992 EA implemented an integrated weed management program that identified containment, control, or eradication management strategies and outlined manual, mechanical, cultural, biological, and chemical treatments. This program outlined prevention and early detection management direction. Several sites were identified for treatment.

The 1994 EA incorporated the 1992 EA and identified additional weed infestations for treatment. In the two EAs, approximately 5,172 acres were identified for treatment of 21 species. Of the inventoried acres, approximately 2,368 acres are located within the HCNRA. Estimated acres by treatment method are displayed in Table 82.

Table 82-Alternative A Estimated Acres by Treatment Method

Treatment Methods	Acres
Chemical Upland Areas (broadcast and/or spot)	2,577
Chemical (aerial)	0
Chemical in RHCA (ground-based broadcast treatments)	1,932
Chemical in RHCA (spot only – includes wicking and wiping), manual, and/or mechanical	663
Bio-control only	See note below
Manual only	0
Total Acres to be Treated	**5,172**

Bio-control: The '94 EA' approved the use of biocontrol agents; however, all sites were analyzed for chemical treatments to attain the highest amount of flexibility and greater invasive species control. The forest has released APHIS and State of Oregon approved biocontrol agents on approximately 2,500 acres for the control of invasive plants (Yates 2007).

Direct and Indirect Effects of Alternative A

Under this alternative, invasive treatment activities would continue to utilize the approach authorized under the 1992 and 1994 decisions for the management of noxious weeds. Ten years of monitoring has shown a substantial increase in invasive plant populations. Though some of the initial invasive plant sites identified in these EAs were successfully contained or controlled, new sites have been identified and many existing sites have grown. This along with the identification of new species and an increase of invasive plant introductions has limited the application and effectiveness of the two EAs.

Treatments would be applied to 5,172 acres analyzed in the 1992 and 1994 decisions. Past experience with these treatment methods has resulted in a rate of effectiveness of approximately 25 to 35 percent (Laufmann 2006). This is due to the limited choice of herbicides and the limited project area that does not include the majority of current sites. The potential for spread from these areas would remain unchanged from the existing condition. Additionally, the remaining inventoried acres of invasive species would go untreated and would likely continue to spread at an estimated rate of 8 to 10 percent per year.

Those opposed to the use of herbicides due to concerns about impacts to nontarget native plant communities, wildlife, and human health would favor this alternative over the action alternatives due to the lower levels of chemical use. However, many stakeholders would perceive an adverse effect under this alternative. Those who value commodity values and uses of the Forest would see a continued decline in resource conditions and biodiversity as invasive species continue to spread. Likewise, those who place a higher worth on noncommodity resources would also see a decline in the values they seek. Forage production on Forest rangelands would be reduced, adversely impacting habitat capability to support wildlife as well as reducing forage available for domestic livestock. In a report to the Governor of Idaho Weed Summit in 1998, Jerry Asher and Carol Spurrier of the Bureau of Land Management cite numerous studies that found that populations of native wildlife species declined as habitats became dominated by nonnative plant species (Asher and Spurrier 1998). Scenic areas, scenic byways, wild and scenic rivers, wilderness areas, and research natural areas are adversely affected as invasive species spread, resulting in the loss of native species and biological diversity. These impacts may reduce the recreational and/or educational value of these areas to some visitors. In severe cases, some users may relocate their activities to other areas of the forest or to other public lands (Asher and Spurrier 1998).

Neighboring private and public lands would be adversely impacted as invasive species populations spread from the Wallowa-Whitman National Forest. Land values may be reduced and costs to control infestations for neighboring land owners or administrative agencies (federal, state, and local governments) would be increased.

American Indian Tribes with interests in the Wallowa-Whitman National Forest would be adversely impacted. Populations of native plant species used for cultural purposes such as food, medicine, dress, basketry, or ceremonial activities may be reduced as a result of the spread of invasive species. The spread of invasive species from the Forest to Tribal trust lands would adversely impact Tribal interests. In the long-term, invasive species populations may threaten traditional gathering areas. The potential for the exposure of tribal members to herbicides is lowest under this alternative. No adverse human health impacts are anticipated.

Economic Effects

Assumptions used for the development of cost estimates are described under “Methodology” above.

The undiscounted cost of implementing treatments on all proposed acres one time in one year is estimated at $1,485,190 in 2006 dollars. This estimate includes inventory and monitoring costs. It is estimated that treatments would be effective on 25 percent of treated acres. The average cost per effectively treated acre is the highest under this alternative at an estimated $820 per acre.

Discounted costs at various levels of annual treatment are provided in Table 83 below. A variety of annual treatment levels were analyzed in order to assess potential treatment levels should future budgets change. In the case of the No Action Alternative, annual treatments were estimated at 4,000 acres. At this level of treatment, the net annual equivalent cost is estimated at $279,540. Because treatments would be limited to the 5,172 acres analyzed in the 1992 and 1994 EAs, other inventoried infestations would remain untreated and would continue to spread. Therefore the existing invasive plant populations on the Forest would never be contained or controlled under this alternative. Future costs to contain or control the growing population of invasive species would continue to escalate as the scope and size of the problem continues to grow.

Table 83-Discounted costs and years to contain or control of forestwide infestations under Alternative A in 2006 dollars (Shaded line represents the projected annual treatment level)

Annual Acres Treated	Estimated Net Annual Equivalent Cost	Years to Contain or Control1 Inventoried Infestations and Total Discounted Cost Average Rate of Spread = 10 Percent of Untreated Areas and 5 Percent of Treated Areas	
		Years	Cost ($1000s)
2,500	$264,150	Would not achieve	Unlimited
3,000	$264,720	Would not achieve	Unlimited
4,000	$279,540	Would not achieve	Unlimited
5,172	$289,430	Would not achieve	Unlimited

1 For the purposes of analysis, projections assumed 25 percent effectiveness of treatments, a 10 percent rate of spread from untreated acres, and a 5 percent rate of spread from treated acres. Infestations were considered controlled when projections for remaining inventoried acres reached 0 acres.
2 Using the assumptions regarding treatment effectiveness and rate of spread described earlier under "Methodology" it was estimated that the acres approved for treatment under the 1992 and 1994 EAs would be controlled in 22 years at a total discounted cost of $4,042,285 at projected annual treatment levels. However, remaining inventoried sites would not be treated and would continue to spread. As a result, potential costs to contain or control would continue to grow until future containment action is initiated.

Some annual costs may be covered through external funding sources, which historically have averaged approximately 5 percent of the forest program. Approximately half of these acres have been funded through the use of Title II funding, which at the time of this writing had terminated as of the end of 2006. An extension was proposed in the President's budget package and has also been proposed by Congress, but has not yet been passed or signed into law. If Title II funding is not extended by Congress, this additional funding would be lost.

Without treatment, the remaining inventoried infestations (17,670 acres) would likely spread at an estimated annual rate of 8 to 12 percent (R6 2005 FEIS). At an average of 10 percent annually, within 20 years infested acres would likely exceed 110,000 acres or more than 480 percent of the currently affected acres. As the scope and size of the infestation continues to grow, future costs to contain or control invasive species would continue to escalate.

Economic benefits and costs difficult to quantify include:

- Maintenance of biodiversity on those acres successfully treated
- Loss of biodiversity on those acres not treated or on which treatments are ineffective
- Reduced forage for wildlife as well as domestic cattle grazing as a result of the spread of invasive species
- Spread to adjacent lands as discussed above
- Increased future costs to the Forest Service to treat invasive species infestations that have continued to spread unchecked

Other potential costs and benefits under this alternative are discussed in detail in specialist reports for other affected resources.

Environmental Justice

Alternative A was assessed to determine whether there would be a disproportionately adverse impact to minority or low-income populations in accordance with Executive Order 12898 (President 1994). No concerns relative to disparate impacts to minority or low income populations were identified through scoping. However, American Indian tribes may be disproportionately affected because they are dependent on native plants for cultural and traditional uses. The racial composition of work crews implementing treatment activities are expected to be generally similar to that of the analysis area population, with a potential for a slightly higher percentage of minorities. Work crews may experience injury during manual treatments or may be exposed to chemical treatments.

The National Visitor Use Monitoring survey asked visitors to categorized themselves into one of seven race/ethnicity categories. The 2004 report for the Wallowa-Whitman indicated that of Forest visitors sampled from October 2002 through September 2003, 97.4 percent were white. Approximately 0.6 percent of visitors sampled were Native American, 4.0 percent was Asian, 3.6 percent was Hispanic or Latino, and 2.1 percent was Pacific Islander (USDA Forest Service 2004a).

Native American plant areas are likely at greater risk due to the spread of invasive species under Alternative A than under other alternatives.

Native plants important for cultural uses could potentially be crowded out of some areas forcing Native American users to seek these resources in other areas of the forest or on other land ownerships. Populations of culturally important plants could be decreased to the point of being insufficient to meet demand.

Visitors from other racial or ethnic backgrounds or low income visitors seeking to supplement family incomes may also be impacted. Areas important to these visitors for mushroom gathering, berry picking, or other gathering activities could be adversely impacted by the spread of invasive species.

The potential for human exposure to herbicides is lowest under this alternative for all user groups due to the limitations on the implementation of chemical treatment activities. However, annual herbicide treatments over the last four years have averaged approximately 2,650 acres annually, including the re-treatment of some acres. Similar treatments would continue under Alternative A. These acres of treatment represent approximately 0.1 percent of the National Forest System lands administered by the Wallowa-Whitman National Forest. Herbicide application methods would be selected to not only maximize effective results, but to minimize movement offsite in soil, water, or wind.

The R6 2005 ROD amended the Wallowa-Whitman Forest Plan to incorporate standards for the implementation of herbicide treatment activities. The R6 2005 FEIS and the accompanying ROD found that the potential for adverse human health and safety impacts from herbicide use would be adequately resolved through adherence these standards. Additionally, the R6 2005 ROD amended the Wallowa-Whitman Forest Plan to incorporate requirements to ensure timely public notification and that signs are posted to inform the public and forest workers of herbicide application dates and the name of herbicides used. If requested, individuals may be notified in advance of spray dates. These measures would provide visitors who wish to avoid any potential for herbicide exposure with the information they need to do so.

Worker exposure to herbicides and risks associated with physical treatment methods would be minimized through strict adherence to health and safety requirements for all workers. Application of any herbicides to treat invasive plants would be performed or directly supervised by a State or Federally licensed applicator. Herbicide transportation and handling safety plan would be developed and implemented for all treatment activities.

Based on the above analysis, no disproportionate adverse impacts to minority or low income groups are anticipated under this alternative.

Cumulative Effects of Alternative A

Although private land owners and federal, state, and local governments administering lands adjacent to the Forest will continue invasive plant treatment activities, implementation of Alternative A would contribute to increased occurrence and spread of infestations on these lands. Untreated infestations on the Forest would lead to a long-term decline in the health and sustainability of native plant communities. The resulting decrease in biological diversity and reduction in the economic and social returns natural plant communities provide adversely impacts all stakeholders. The threat to the agricultural based economy of the region posed by invasive species would be aggravated by spread from National Forest System lands, thereby adversely impacting the continuation of the associated lifestyles and customs. Costs incurred by adjoining land ownerships to treat invasive plant infestations would likely continue to escalate as a result of the increasing likelihood and scale of the spread of these species from untreated areas of the Wallowa-Whitman National Forest. Additionally, deferring the treatment of invasive plant populations would result in increased future costs to the Forest Service and thus to tax payers to treat larger, more widespread populations that would continue to develop over time.

Alternative B – Proposed Action

Alternative B proposes to control, contain, or eradicate invasive plants on existing sites or newly discovered infestations. Various types of treatments would be used including the use of herbicides, physical, and biological methods. Treatments are proposed for existing or new infestations including new plant species that currently are not found on the Forest. The preferred treatment method would be determined using a decision matrix based on local (District) priority plant species and site location, and input from local weed managers. Species priority and treatment response is based on:

- The previous and ongoing efforts made to control the species
- The invasive nature of the species
- Newly detected infestations

Current inventory indicates there are approximately 22,842 acres of invasive plant infestations on the Forest. Of these, approximately 10,419 acres are located within the HCNRA.

The actual locations of treatments can be anywhere on the landscape, including rangelands, timber harvest areas, along roads and road rights-of-way (including decommissioned roads), along trail routes, at dispersed and developed recreation sites, and on other disturbed sites (for example: fires, flood events, and rock sources). Treatments may include seeding with desirable grass and forb species to assist site rehabilitation. Restoration treatments requiring ground disturbing activities would necessitate additional site specific analysis.

Under this alternative, invasive treatment activities would include herbicides, physical (hand pulling, hand tools, and mechanical treatments), and biological methods. Herbicides utilized would be those approved for use in the R6 2005 ROD. These include herbicide formulations containing one or more of the following ten active ingredients: chlorsulfuron, clopyralid, glyphosate, imazapic, imazapyr, metsulfuron methyl, picloram, sethoxydim, sulfometuron methyl, and triclopyr. All herbicide application methods are allowed including wicking, wiping, injection, spot, broadcast, and aerial as permitted by the product label. However, chlorsulfuron, metsulfuron methyl, and sulfometuron methyl may not be applied aerially, and triclopyr may not be applied using any broadcast method. 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.

Treatment effectiveness under this alternative would be expected to approach 80 percent or higher. As infestations are effectively treated, management would be initiated on new acres each year. Herbicides could potentially be applied to approximately 20,776 acres, or approximately 1 percent of National Forest System lands administered by the Wallowa-Whitman National Forest. High use areas would be posted in advance of herbicide application or closed. Areas of potential conflict would be marked on the ground or otherwise posted with the date of treatments, the herbicide used, and when the areas are expected to be clear of herbicide residue.

Many stakeholders would perceive beneficial effects under this alternative. Treatments of invasive species are expected to be considerably more effective than has been experienced under the existing program (No Action Alternative). Commodity values and uses of the Forest would benefit from improved resource conditions and biodiversity as invasive species are effectively treated. Likewise, users of noncommodity resources would also see an improvement in the values they seek. Forage production on Forest rangelands would be maintained and gradually increased as the occurrence of invasive species is reduced. Habitat capability to support wildlife and provide forage for domestic livestock would gradually improve following implementation of this alternative. The important native species and biological diversity within scenic areas, scenic byways, wild and scenic rivers, wilderness areas, and research natural areas would be maintained and improved as implementation progresses. The recreational and/or educational values of these areas would be maintained or improved.

Neighboring private and public lands would be benefited because the likelihood for spread of invasive species from the Wallowa-Whitman National Forest would be reduced. The potential for adverse impacts to land values as a result of infestations of invasive species would be reduced and costs to control infestations for neighboring land owners or administrative agencies (federal, state, and local governments) would likely decrease over time with the reduced potential for spread from National Forest System lands.

The potential for adverse impacts to populations of native plant species used for cultural purposes such as food, medicine, dress, basketry, or ceremonial activities as a result of the spread of invasive species would be reduced through implementation of Alternative B. The potential for spread of invasive species from the Forest to Tribal trust lands would be reduced.

The potential for the exposure of tribal members to herbicides is highest under this alternative. However, per the analysis and findings of the R6 2005 FEIS as discussed above, no adverse human health impacts are anticipated. Nonetheless, perceptions of the potential for harmful effects would likely persist for some individuals. Public notification prior to implementation of treatment activities and posting of signs with the dates of treatment and herbicides used would aid members of the public to avoid herbicide exposure.

Economic Effects

The undiscounted cost of implementing treatments on all proposed acres one time in one year is estimated at $5,601,390 in 2006 dollars. This estimate includes inventory and monitoring costs. At an estimated rate of effectiveness of 80 percent of treated acres, the average cost per effectively treated acre is an approximately $307 per acre under this alternative. The represents the lowest per acre cost of all alternatives considered.

Early detection, rapid response (EDRR) would be utilized to address new infestations of currently occurring species or new species at an estimated average cost of $260 per effectively treated acre. All treatment methods proposed and analyzed through the EIS would be utilized for EDRR with the exception of aerial spraying, which would not be allowed. Implementation of EDRR would reduce future costs and environmental impacts by eliminating or controlling new infestations before they could become established.

Economic benefits and costs difficult to quantify include maintenance and improvement of biodiversity, improved forage for wildlife and domestic cattle grazing, and prevention of spread to adjacent lands. Other potential benefits and costs under this alternative are discussed in detail in the specialist reports for other affected resources.

Environmental Justice

Alternative B was assessed to determine whether there would be a disproportionately adverse impact to minority or low-income populations in accordance with Executive Order 12898 (President 1994). Although minorities make-up a large percentage of the population within the analysis area, the percentage of minority persons is not large enough for the population of the analysis area to be consider a “minority population,” nor is the percentage of minorities in the analysis area “meaningfully greater than the minority population percentage in the general population” of the State. No concerns relative to disparate impacts to minority or low income populations were identified through scoping.

The 2004 report for National Visitor Use Monitoring Results (NVUM) for the Wallowa-Whitman estimated that approximately 566,000 people visit the Wallowa-Whitman National Forest annually, plus or minus 18.7 percent at the 80 percent confidence interval. Of the Forest visitors sampled from October 2002 through September 2003, 97.4 percent were white. Approximately 0.6 percent of visitors sampled were Native American, 4.0 percent were Asian, 3.6 percent were Hispanic or Latino, and 2.1 percent were Pacific Islander (USDA Forest Service 2004a). Of these minority groups, Native American visitors, through their gathering and use of culturally important plants, may have the greatest potential to be impacted by herbicide applications. However visitors from other racial or ethnic backgrounds or low income visitors seeking to supplement family incomes, also engage in mushroom gathering, berry picking, or other gathering activities on the Wallowa-Whitman National Forest.

The NVUM survey results indicated that of those surveyed, approximately 15.7 percent of recreation users indicated that they participate in gathering forest products, 16.1 percent engage in fishing, and 28.1 percent participate in hunting activities at some time during the year. These numbers may undercount actual forest product users as some visitors may not consider these uses as recreational, and therefore may not have participated in the survey.

Risk to Native American cultural plant gathering areas and other forest product gathering sites as a result of the spread of invasive species is lowest under Alternative B. The higher rate of effective containment, control, or eradication of invasive species anticipated under this alternative would help to protect native plant areas important to Native Americans and other visitors by reducing the encroachment of invasive species. There is concern that herbicides treatments could adversely impact nontarget, culturally important plants, or wildlife species. Treatments applied to each site would consider the minimization of exposure to nontarget species through such means as the method of herbicide application and timing. The R6 2005 FEIS and accompanying ROD found that the potential for herbicides to harm nontarget plants, plant pollinators, or terrestrial and aquatic wildlife were likely to be resolved by adherence to the standards incorporated in the Wallowa-Whitman Forest Plan through that decision. In addition, site specific project design features would be in place at the time of treatment to further reduce potential for harm to nontarget species.

The racial composition of work crews implementing treatment activities is expected to be generally similar to that of the analysis area population, with a potential for a slightly higher percentage of minorities. Work crews may experience injury during manual treatments or may be exposed to chemical treatments. Worker exposure to herbicides and risks associated with physical treatment methods would be minimized through strict adherence to health and safety requirements for all workers. Application of any herbicides to treat invasive plants would be carried out or directly supervised by a State or Federally Licensed Applicator. Herbicide transportation and handling safety plan would be developed and implemented for all treatment activities.

Based on the above analysis no disproportionate adverse impacts to minority or low income groups are anticipated under this alternative.

Cumulative Effects of Alternative B

Many factors in the public and private sectors at the local, regional, national, and even global level interact and combine to both positively and negatively impact the level of jobs and income supported within the analysis area economy. The jobs and income potentially supported through implementation of this alternative would contribute a greater amount to positively impact the cumulative effect of this dynamic and inter-related system of economic influences than would Alternative A. However, due to the complexity of economic systems, the net cumulative effect cannot be determined.

Alternative B would contribute to efforts by private land owners and federal, state, and local governments administering lands adjacent to the Forest to reduce the occurrence and spread of invasive species on these lands. Treatment of infestations on the Forest would lead to long-term improvements in the health and sustainability of native plant communities. Maintenance or improvements in biological diversity would contribute to economic and social returns provided by natural plant communities benefiting all stakeholders. The threat to the agricultural based economy of the region posed by invasive species would be reduced through implementation of this alternative, thereby promoting the continuation of the associated lifestyles and customs. Costs incurred by adjoining land ownerships to treat invasive plant infestations would likely be reduced in the long-term as a result of the reduced likelihood and scale of the spread of invasive species from National Forest System lands.

Effective treatment of invasive plant populations would result in decreased future costs to the Forest Service and thus to tax payers as the occurrence of invasive species is reduced and controlled over time.

Alternative C – No Broadcast Application in Riparian Habitat Conservation Areas

Direct and indirect effects resulting from the implementation of Alternative C would be the same as described above under Alternative B, except as noted below.

Perceptions of the potential for harm to nontarget plant species, wildlife, water quality and human health may be slightly lower than would occur under Alternative B among some members of the public due to the use of more selective herbicide application methods within riparian areas. However, as is true of Alternative B, a limited number of herbicides have been approved for use in the R6 2005 FEIS, which found that the potential for harm to nontarget plants, plant pollinators, wildlife, and human health and safety would be adequately resolved by adherence to the standards incorporated in the Wallowa-Whitman Forest Plan through amendment by the R6 2005 ROD. The findings of that analysis are incorporated by reference. As under Alternative B, perceptions of the potential for harm would be likely to persist among many members of the public.

Economic Effects

The undiscounted cost of implementing treatments on all affected acres one time is estimated at $5,693,200 in 2006 dollars. This estimate includes inventory and monitoring costs. Assuming an estimated rate of effectiveness of 80 percent of treated acres, the average cost per effectively treated acre is $312 under Alternative C.

Early detection, rapid response (EDRR) would be utilized to address new infestations of currently occurring species or new species at an estimated cost of $265 per effectively treated acre. Only methods proposed and analyzed through the EIS would be utilized, however aerial treatment methods would not be utilized to for EDRR treatments. Implementation of EDRR would reduce future costs and environmental impacts by eliminating or controlling new infestations before they can become established.

Economic benefits and costs difficult to quantify include maintenance and improvement of biodiversity, improved forage for wildlife and domestic cattle grazing, and prevention of spread to adjacent lands. Other potential benefits and costs under this alternative are discussed in detail in the specialist reports for other affected resources.

Environmental Justice

Alternative C was assessed to determine whether there would be a disproportionately adverse impact to minority or low-income populations in accordance with Executive Order 12898 (President 1994). Effects under this alternative are the same as described above under Alternative B.

Based on the above analysis no disproportionate adverse impacts to minority or low income groups are anticipated under this alternative.

Cumulative Effects of Alternative C

Cumulative effect under Alternative C would be the same as described above under Alternative B.

Alternative D – No Aerial Application

Direct and indirect effects resulting from the implementation of Alternative D would be the same as described above under Alternative B, except as noted below.

Perceptions of the potential for harm to nontarget plant species, wildlife, and human health may be lower than under Alternatives B and C among some members of the public due to the elimination of aerial herbicide applications and the reduced number of acres to be treated with chemicals.

Due to the elimination of aerial application as a method of treatment, some difficult to access sites would not be treated due to safety issues and/or costs associated with alternative methods. Some areas that are difficult to access may also be dropped to a lower priority for treatment due to cost factors. These sites are estimated to total approximately 875 acres. There is a higher risk of the loss of native species and the continued spread of invasive species within, and from remote, difficult to access locations under Alternative D than would occur under Alternatives B and C.

Over the long-term, additional treatment efforts may be required around the borders of these sites to ensure infestations are contained and do not spread to other areas of the Forest or to neighboring lands.

Economic Effects

The undiscounted cost of implementing treatments on all affected acres one time in one year is estimated at $5,863,880 in 2006 dollars. This estimate includes inventory and monitoring costs. At the estimated rate of effectiveness of 80 percent of treated acres, the average cost per effectively treated acre is $334 under Alternative D. The reason the average cost is higher than Alternative D is because aerial application costs less per acre than the other methods. This represents highest effective cost per acre of the action alternatives, but is considerably lower than Alternative A.

EDRR would be utilized to address new infestations of currently occurring species or new species at an estimated average cost of $275 per effectively treated acre. Only methods proposed and analyzed through the EIS would be utilized. Implementation of EDRR would reduce future costs and environmental impacts by eliminating or controlling new infestations before they can become established.

Economic benefits and costs difficult to quantify include maintenance and improvement of biodiversity, improved forage for wildlife and domestic cattle grazing, and prevention of spread to adjacent lands. Other potential benefits and costs under this alternative are discussed in detail in the specialist reports for other affected resources.

Environmental Justice

Alternative D was assessed to determine whether there would be a disproportionately adverse impact to minority or low-income populations in accordance with Executive Order 12898 (President 1994). Effects under this alternative are the same as described above under Alternative B.

Based on the above analysis no disproportionate adverse impacts to minority or low income groups are anticipated under this alternative.

Cumulative Effects of Alternative D

Cumulative effect under Alternative D would be the same as described above under Alternative B.

Summary of Effects

The effects of all alternatives are displayed in Table 88 below. Although the cost of treating all acres proposed for treatment one time under the action alternatives is much higher than under the no action alternative, the average cost per effectively treated acre under the action alternatives is much lower, ranging from 29 to 40 percent of the cost per acre under Alternative A. Based on past experience under the strategy proposed in Alternative A, treatments are expected to be only 25 to 35 percent effective, thereby requiring a much higher level of repeat treatments and expenditure of funds to achieve containment or control. Additionally, Alternative A would leave approximately 77 percent of the currently inventoried acres of infestation untreated. These untreated acres would continue to spread resulting in an increasingly rapid decline in resource conditions and biodiversity across the forest and on neighboring lands. Commodity and noncommodity values would continue to decline at ever increasing rates as more and more native species succumb to invasive species. Future efforts to treat invasive species would require increasingly aggressive measures in order to achieve containment or control. The potential costs and socio-economic effects of these future efforts would continue to escalate until action is taken to successfully arrest the spread of these species.

The programs of treatment proposed under Alternatives B, C, and D, are projected to result in declining populations of invasive species, allowing the biodiversity of native species to be maintained and enhanced. The adverse economic effects of nonnative invasive species would be contained and reduced as the treatment programs proposed reduce the occurrence of these species.

Table 84-Summary of Effects by Alternative

Indicator	Alternative A	Alternative B	Alternative C	Alternative D
Undiscounted Cost to Treat All Acres Proposed for Treatment One Time	$1,485,190	$5,601,390	$5,693,200	$5,863,880
Cost per Effectively Treated Acre (Currently Inventoried Infestations)	$820	$307	$312	$334

3.10 Heritage Resources

Section 106 of the National Historic Preservation Act (NHPA) requires Federal agencies to consider the potential effects their undertakings may have on historic properties. The definition of undertaking encompasses all agency decision-making actions including the approval of land management plans such as the Wallowa-Whitman National Forest Invasive Plants Treatment Final Environmental Impact Statement (FEIS). The NHPA also compels agencies to consult tribes in determining whether the undertaking has potential to pose an effect on historic properties. Government-to government tribal consultation has been initiated for the Invasive Plant Treatment Plan and staff-to-staff communication will continue during project implementation. Under the Programmatic Agreements among the United States Department of Agriculture Forest Service Pacific Northwest Region (Region 6), the Advisory Council on Historic Preservation, and the Oregon State Historical Preservation Officer Regarding Cultural Resource Management (June 2004), a **“no potential to cause effects”** determination has been made per Appendix C.1 and Appendix C.2 of the agreement. Section 106 review of any proposed treatments other than application of herbicide or hand removal will take place to determine if any protection measures are necessary. Tribes would be notified of annual treatments areas, as stated in PDF M-1, in Chapter 2. Documentation to this affect would be forwarded to the Oregon SHPO, in compliance with the National Historic Preservation Act of 1966 (as amended), and the Oregon Programmatic Agreement.

3.11 Impacts to Cultural Uses and Treaty Rights.

3.11.1 Introduction

The following is a summary of information provided by the tribes on their internet sites and/or taken from information and maps prepared for the Interior Columbia Basin project. The intent of the section is to characterize use and interests of the lands managed by the National Forest and in no way is intended to indicate differences between tribal use and culture.

3.11.2 Affected Environment

Confederated Tribes of the Umatilla Indian Reservation: The Cayuse (Weyiiletpuu), Walla Walla (Waluulapan), and Umatilla (Imatalamlama) tribes make up the members of this reservation. Their reservation lands are adjacent to the Wallowa-Whitman and the Umatilla National Forests and the city of Pendleton, Oregon. Their interest area includes the Malheur River and Malheur and Harney Lakes to the south, the Grande Ronde and lower Snake River in the east and north, the Yakima, John Day, and Umatilla Rivers and the Columbia River from Vantage, Washington, to west of The Dalles, Oregon. Important rivers for fisheries include the Grande Ronde, Imnaha, John Day, Tucannon, Walla Walla, Wallowa, Touchet, Umatilla, Columbia, and Minam along with their tributaries. The Tribe has been active with salmon restoration in the Umatilla and Walla Walla Rivers. They have worked locally with several agencies to return water to these two streams in order to maintain migratory routes. In addition they have established a mission to protect, restore and enhance the ‘First Foods.’ First Foods are idenfied as water, salmon, deer, cous, and huckleberry. These items are important to the perpetual cultural, econimc and sovereign benefit of the CTUIR (Jones et al. 2008).

Confederated Tribes of the Warm Springs Reservation: The Wasco Bands, the Warm Springs Bands and the Northern Paiutes are members of the reservation. Their area of interest includes Malheur and Harney Lakes in the southeast to the headwaters of the Deschutes River in the southwest, crossing Mount Hood to west of Portland, Oregon and along the Columbia River to the mouth of the Snake River along with the John Day system. There are historic family connections with the Umatillas and since the co-location of other tribes to the reservation, other family connections have developed. Important streams are the Columbia, Crooked, Deschutes, Hood, and John Day River and Fifteen Mile Creek. Their Treaty ceded the majority of the John Day system to the United States.

Nimi'ipuu (Nez Perce): Their treaty established a reservation for the Nez Perce tribe. The reservation is located along the Clearwater River, east of Lewiston Idaho. Their area of interest includes lands east of the Snake River as far north as Coeur d’Alene, Idaho. It extends westward including the Snake and Palouse Rivers and the Columbia to The Dalles. To the south it includes the North Fork of the John Day to the confluence of the Malheur and Snake Rivers. Important streams include the Clearwater, Grande Ronde, Imnaha, Powder, Rapid, Salmon, Lower Snake, Lochsa, Selway, and Columbia Rivers.

Deep canyons were the traditional Nez Perce lands. They traveled with the seasons relying on the rivers, mountains and prairies for sustenance. In early spring, the women traveled to the lower valleys to dig root crops and the men traveled to the Snake and Columbia rivers to intercept the early salmon runs. In mid-summer all the people of the village moved to higher mountainous areas setting up temporary camps to gather later root crops, fish the streams, and hunt big game. By late fall they settled back into their traditional villages along the Snake, Clearwater, and Salmon rivers. Salmon and other fish, game, dried roots and berries provided winter foods.

The basic roots gathered for winter storage include camas bulb (kehmmes), bitterroot (thlee-tahn), khouse or cous (qawas), wild carrot (tsa-weetkh), wild potato (keh-keet), and other root crops. Fruit collected includes service berries, gooseberries, hawthorn berries, thorn berries, huckleberries, currants, elderberries, chokecherries, blackberries, raspberries, and wild strawberries. Other food gathered includes pine nuts, sunflower seeds, and black moss.

3.11.3 Environmental Consequences

Impacts Common to all Alternatives

Direct and Indirect Effects

Access: Access to National Forest Systems lands would not be impacted by invasive plant treatments. The Forest's Access and Travel Management Plan would not be changed. If an open road or a road permitted for Off Highway Vehicle (OHV) use needs to be closed as part of the effective treatment prescription, a separate analysis would be completed. The proposed invasive plant treatments would not impact access to the forest to exercise treaty rights.

Gathering: (Also see the botany report) When herbicides are used as the selected treatment method, individual tribal members may shift to other locations for gathering cultural plants. Early involvement with the Tribes prior to treatment would allow a schedule to be developed so that gathering could occur prior to treatments or in the case of huckleberries, early enough prior to fruit setting so any residual herbicides would be gone. Most treatments (72 percent of the acres) would occur within 20 feet of a road, disturbed site, or other high use area; occasionally treatments would extend to 100 feet. The areas adjacent to these high use areas do not provide quality habitat for cultural plants and can be easily avoided during gathering. Areas receiving herbicide treatments will be posted with warning signs. Herbicide treatments adjacent to high use areas would have low impacts on the gathering of cultural plants, and to the quantity or quality of the plants collected since the treatment areas can be avoided.

The most extensive invasive plant sites beyond the high use areas have yellow starthistle. These sites are located in dry grasslands or moist meadows that are potential habitat for cous and camas. Biological control methods are the primary treatment method and would not impact cultural plants or their use. High densities of yellow starthistle displace native plants and likely would not be strongholds of cultural use plants; these areas are not likely to be used for gathering. Controlling the spread of yellow starthistle would preserve native plant habitat and reduced yellow starthistle densities would allow native plants to recover.

If herbicides are used to treat yellow starthistle, there is an increased possibility of herbicide contact with cultural plants (including First Foods). This can be reduced by the application method. If the site is located in a traditional use area, the treatment could be designed around the target and cultural plant life cycles. If effective, spot treatments could be used; however, the density of yellow starthistle would normally require broadcast treatments. Since cous and camas normally go dormant between mid July and August on the Forest (depends on elevation and year) it would be possible to treat after the cultural plants are dormant and/or in the fall as yellow starthistle germinates.

A mixture of methods could be used as well depending on the size of the invasive plant site. For knapweeds growing with lomatiums (cous), it would be possible to pull the knapweed to delay the rosette stage until after the lomatiums are dormant to follow up with herbicide at a later visit. This could be used around rock sources, particularly when other cultural gatherings are planned for the area in early summer.

In the higher elevations where huckleberries are found, the vast majority of invasive plants are associated with roads. Very few invasive plants would be found off the roads because forest cover and herbaceous plants would inhibit invasive plant growth. Any areas treated with herbicide would be posted. Since treatments would be along the road edges and surface, contact with herbicide can be avoided by moving further from the road.

Invasive plant treatments are not expected to impact the gathering of plants, roots, or berries. When herbicides are used, the areas can be avoided. The area treated would be largest the first year with follow-up treatments in later years either covering fewer acres or using nonherbicide methods. Displacement of tribal members would vary depending on the success of treatments and the amount of time needed to control or eradicate the target species. Since the treatment is mainly associated with roads and other high use areas, impacts to gathering will be low. Approximately 10 percent of the total acres proposed for herbicide treatment are distant to roads meaning that very little of the Forest landscape outside of high use areas would be impacted by treatments. Informing the tribes of proposed treatments each year would help avoid conflicts and allow the Forest and Tribe to work together if restoration is necessary due to invasive plants displacing cultural plants.

Fish habitat and water quality: Impacts to fisheries habitat are analyzed in the Fisheries Report. The Project Design Features are expected to keep herbicides levels well below levels of concern for fish reproduction or human use. The low levels of herbicide used in riparian areas are not expected to concentrate in fish or create health issues. The Project Design Features would limit activities along stream banks when fish are spawning. Areas of high quality riparian habitat are distant from roads and contain very few sites. These areas would not have any measurable impacts from herbicide use and would continue to function as strongholds for recovery efforts.

Hunting: Impacts to big game are disclosed in the wildlife section. Big game or birds are not expected to bioconcentrate herbicides. With the majority of treatments near roads, the potential use of forage treated with herbicide is low.

During the time of treatments, animals would disperse due to the workers being present and noise of equipment. The activity is short duration and would not impact hunting or the populations of game species.

Cumulative Effects

Other than harassing of fish or game from other resource management actions or recreational uses when they occur at the same time as treatment, there would be few cumulative effects expected with other ongoing or reasonable foreseeable future actions. Each action would have its own prevention plan that would reduce the risk for spread of invasive plants. There is a low likelihood of these actions causing a need for additional invasive plant treatments.

Other than prescribed fire, very few ground disturbing actions are proposed in the meadow/grassland habitats away from roads. Forest harvest activities would retain cover. Grazing may increase the spread of local invasive plants however allotment management plans reduce this risk by requiring the permittee to inventory and report any new invasive plant sites and taking measures to reduce the risk of carrying invasive plants onto the forest when they turn out in the spring. In some allotments pastures have been closed until the invasive plants can be controlled. These activities will likely cause new invasive plant sites to appear in areas of high use, but the amount is likely much less than five percent of the current inventory over the next ten to fifteen years.

Impacts Associated with Alternative C

Direct, Indirect and Cumulative Impacts: Alternative C does not use broadcast spray methods in riparian areas. There would be a slight reduction in the amount of herbicide used near streams but would not be measurable. Otherwise effects are the same as Alternative B.

Impacts Associated with Alternative D

Direct, Indirect and Cumulative Impacts: Effects on recreation would be the same as Alternative B even though 875 acres would not be aerially sprayed. The impacts of avoiding the aerial spray would not be significant to cultural or heritage resources

3.12 Irreversible or Irretrievable Use of Resources

No irreversible or irretrievable uses of resources are associated with the Proposed Action of this project. This project restores native vegetation in areas where nonnative plants have been introduced. Herbicide treatments in accordance with the alternatives would have relatively short-lived impacts; effects on nontarget species would be minimized through the implementation of Forest Plan Standards and Project Design Features disclosed in Section 2.2.3.

The No Action Alternative is a continuation of the present invasive plant treatment program. To date while some locations have succeeded in controlling weeds, overall the presence and effect of weeds has spread. In time this would have irreversible/irretrievable effects on range resources, range ecology and the management of programs dependent on range.

3.13 Effects of Short-term Uses and Maintenance of Long-term Productivity

Positive effects on site productivity would be expected as native vegetation is restored. Some herbicides have potential to reduce soil productivity; Project Design Features are intended to avoid use of such herbicides where soil productivity may be threatened.

3.14 Consistency with Forest Service Policies and Plans

The proposed project is consistent with all Forest Service policies and existing plans. The laws and policies applicable to this project are listed in Section 1.5 of this FEIS. Policy consistency includes following the Forest Plan (1990) as amended by PACFISH/INFISH (1995) and the Regional Invasive Plant Program FEIS (2005). Specific standards from the existing Wallowa-Whitman National Forest LRMP (Forest Plan), as amended by the R6 2005 ROD, that apply to invasive plants treatment were reviewed in planning this project. Selected excerpts are in Appendix A. The project is consistent with Forest Plan standards and guidelines.

All alternatives would meet visual quality objectives associated with the various management areas. Most of the treatment areas on the Wallowa-Whitman National Forest are along roadsides and in recreation sites. Therefore, the existing scenic condition for most of the National Forest treatment areas is of a developed setting in the immediate foreground. Notable exceptions are in wilderness areas and meadows, which appear undeveloped. Treatments would maintain the scenic integrity of these areas by helping to restore native vegetation and are consistent with visual quality objectives associated with undeveloped areas.

There will be no cutting, sale or removal of timber, nor road construction or road reconstruction within any inventoried roadless areas with this project. This project is consistent with Forest Service roadless area policies.

3.15 Conflicts with Other Plans

No conflicts with existing plans have been noted.

3.16 Adverse Effects That Cannot Be Avoided

Most of the important issues are resolved through adherence to Project Design Features that minimize or eliminate the potential for adverse effects. However, some adverse effects are inherent to invasive plant treatments and cannot be avoided. These include:

- Taxpayers will likely be responsible for the costs of some if not all the treatments
- Herbicide toxicity exceeding thresholds of concern are unlikely but possible given an herbicide spill
- Minor to moderate physical injuries due to forestry work are possible
- Local effects on some groups of soil micro-organisms that may be temporarily sensitive to certain herbicide chemicals
- Some common nontarget plants are likely to be killed by their close proximity to treatments. This is most likely with broadcast herbicide treatments and less likely (but possible) for all other treatment methods. The adverse effects of the invasive plants themselves far outweigh the potential for adverse effects of treatment