CHAPTER 1.0

PROPOSED ACTION AND ITS PURPOSE AND NEED

1.1 INTRODUCTION

The Nez Perce, Clearwater, Lolo, and Bitterroot National Forests are proposing activities to manage noxious weeds and other potentially harmful invasive non-native plant species within the Selway Bitterroot Wilderness and key areas adjacent to the Wilderness, including mainline trails and trailheads that lead into the Wilderness and other geographic areas and features identified on the project area map.

The total project area is approximately 1,400,000 acres in size. The Selway Bitterroot Wilderness comprises 1,350,000 acres of the total. There is an additional 31,000 acres of Inventoried Roadless Area included (480 acres plus 30,402 acres, respectively from the Lolo Creek IRA and the Selway Bitterroot IRA). The remaining acres are general forest lands. The project area map is shown on the following page.

Non-native invasive plants are a growing concern in the Selway Bitterroot Wilderness and surrounding areas. Without efforts to control these weeds, they will continue to expand into new areas and the number of new weed species will increase.

The proposed project area occurs only on National Forest lands. This document follows regulations as defined by the Council of Environmental Quality for implementing procedural provisions of the National Environmental Policy Act of 1969 (NEPA, as amended, 40 CFR1500-1508); US Forest Service Environmental Policy and Procedures Handbook (FSH 1909.15); and US Forest Service Handbook 3409 on Forest Pest Management.

1.2 DOCUMENT STRUCTURE

The Forest has prepared this Draft Environmental Impact Statement (DEIS) in compliance with the National Environmental Policy Act and other relevant federal and state laws and regulations. This document is organized into five chapters.

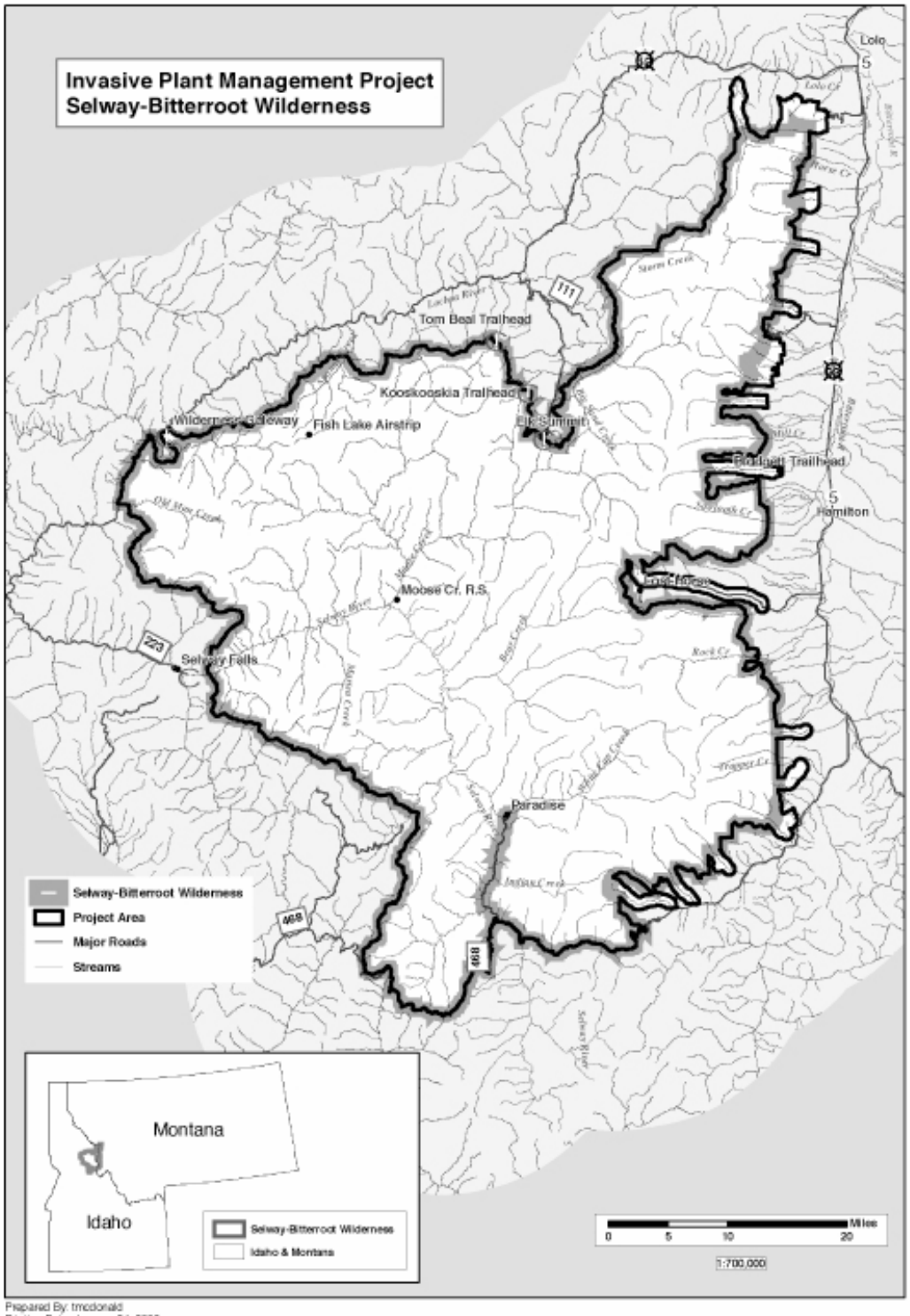
Chapter 1 – Purpose and Need for the Action: This chapter includes information on the history of the project proposal, background information on weeds and weed treatments, purpose of and need for the project, and the agency's proposal for achieving that purposed and need

Chapter 2 – Alternatives Considered: This chapter provides a detailed description of the agency's Proposed Action and Alternatives for achieving the stated purpose. Alternatives are developed based on potential impacts resulting from implementation of the Proposed Action and issues raised by the public and other agencies.

Chapter 3 – Affected Environment and Environmental Consequences: This chapter describes the existing environment that could be affected by the proposed weed treatment program and the direct and indirect impacts, commitment of resources and cumulative effects associated with the Alternatives.

Chapter 4 – List of preparers and DEIS distribution list.

Map 1- 1: Invasive Plants Management Project



Appendices:

- Appendix A – Best Management Practices for Invasive Weeds
- Appendix B – Herbicide Safety and Spill Prevention Plan
- Appendix C – Wilderness Minimum Tool Guidelines
- Appendix D – Social Assessment for the Seven-county Area Surrounding the Selway Bitterroot Wilderness
- Appendix E - Adaptive Management Strategy
- Appendix F – Integrated Weed Management Strategy
- Appendix G – SBW Public Education Plan
- Appendix H – Noxious Weed Lists for Idaho and Montana
- Appendix I – Herbicide Risk Assessment
- Appendix J – Herbicide Descriptions
- Appendix K – Annual Herbicide Treatment Thresholds
- Appendix L – Ecological Risk Summary
- Appendix M – Herbicide Effects Analysis for Terrestrial Wildlife
- Appendix N – Literature Cited
- Appendix O - Glossary

1.3 PURPOSE OF AND NEED FOR ACTION

Non-native invasive plants are a growing concern in the Selway Bitterroot Wilderness and surrounding areas. Without efforts to control these weeds, they will continue to expand into new areas and the number of new weed species will increase.

The 1964 Wilderness Act contains several key statements that apply to the current degraded conditions caused by invasive plants in the Selway Bitterroot Wilderness. The Act defines Wilderness as an area of undeveloped federal land:
"…administered for the use and enjoyment of the American people in such a manner as will leave [it] unimpaired."

> "…where earth and community of life are untrammeled by man."
> "…that retains its primeval character and influence."
> "…which is protected and managed so as to preserve its natural condition."

Weeds threaten wilderness values in the Selway Bitterroot Wilderness, namely, native plant communities and natural ecosystems. Invasive species are not only a threat to the flora and fauna associated with or dependant upon the native plant communities being displaced, in addition, physical regimes such as those associated with fire and hydrology may be altered. These natural functions and features of the landscape constitute a fundamental cornerstone of wilderness values.

The purpose of this project is to prevent the establishment of new invaders in the project area and reduce the impacts of established invasive plants on native plant community stability, sustainability and diversity in the Selway Bitterroot Wilderness.

1.4 BACKGROUND

1.4.1 INVASIVE PLANT SPECIES IN THE PROJECT AREA

The current list of invasive plant species in the project area is divided into two groups: “new invaders” and “established species”. Several of these plants occur on the noxious weed lists for Idaho and Montana but the lists for the two states are not identical. Differing management strategies typically apply to each group of plants (see Appendix H).

New invaders have not yet established strong populations within the project area but have begun to show up and have the potential to expand rapidly. The list of these plants includes yellowstar thistle, rush skeletonweed, Dalmatian toadflax, oxeye daisy, leafy spurge, hawkweeds, Canada thistle, musk thistle, and others.
Established species are well distributed throughout the project area in favorable environments. The list of these plants includes spotted knapweed, sulfur cinquefoil, St. Johnswort, and cheatgrass. Established species may be treated similarly to new invaders when they begin to populate previously weed-free native plant communities.

Susceptible habitats includes grasslands and open canopy sites that are at high risk of invasion by new / uncommon invasive plants or are currently weed-free. Approximately 150,000 - 200,000 acres requiring analysis for treatment using the adaptive management strategy discussed below. Susceptible habitat acres vary depending on the characteristics of individual invasive species posing a risk.

Inside the Selway Bitterroot Wilderness, approximately 109,000 acres are currently occupied to some degree by spotted knapweed, sulfur cinquefoil, St. Johnswort (goatweed), cheatgrass, and oxeye daisy. Currently, invasive species are most common along the Selway River and its major tributaries and across the open side slopes that flank these streams. Most major tributaries draining into the Bitterroot River are also heavily infested with weeds. Spotted knapweed accounts for approximately 90 percent of the occupied acres. Newer invaders such as Dalmatian toadflax, musk thistle, and meadow hawkweed occupy very small acreages at the present time.

Cheatgrass creates a unique and difficult management dilemma both inside and outside of the Wilderness. The species is not listed as a noxious weed in either Montana or Idaho yet is widely acknowledged as one of the most aggressive landscape-altering invasive plants in our midst (Pellant, 1996). The probable effects of the proposed action on the spread of cheatgrass would be considered in the analysis.

Outside the Wilderness but within the project area, approximately 5,000 acres are occupied by invasive species with the potential to expand into new areas of the Wilderness.

Table 1- 1: Invasive Plants Threatening the SBW

Plant Species	Scientific Name	Plant biology
Species confirmed to exist within the project area (Established).		
Spotted knapweed	Centaurea maculosa	Tap root
Cheatgrass	Bromus tectorum	Annual/fibrous root
Sulfur cinquefoil	Potentilla recta	Tap root
St. Johnswort	Hypericum perforatum	Perennial/Deep-root Rhizominous
Oxeye daisy	Chrysanthemum leucanthemum Or Luecanthemum vulgaris	Perennial/Shallow – root / Rhizominous

Plant Species	Scientific Name	Plant biology
Dalmatian toadflax	Linaria dalmatica	Perennial/Deep-root Rhizominous
Hoary alyssum	Berteroa incana	Tap root
Tall buttercup	Ranunculus acris	Fibrous/Tap root
Common tansy	Tanacetum vulgare	Perennial/ Rhizominous
Hawkweeds	Hieracium spp.	Perennial//Rhizominous
Musk thistle	Carduus nutans	Tap root
Houndstonge	Cynoglossum officinale	Perennial/tap root
Canada thistle	Cirsium arvense	Perennial/Deep-root Rhizominous
Species of concern confirmed near the project area. Possible near-term threats (New Invaders).		
Diffuse knapweed	Centaura diffusa	Tap root
Yellow starthistle	Centaurea solstitialis	Tap root
Leafy spurge	Euphorbia esula	Perennial/Deep-root Rhizominous
Yellow Toadflax	Linaria vulgaris	Perennial/Deep-root Rhizominous
Tansy ragwort	Scnecio jacobaea	Perennial/fibrous root
Whitetop	Cardaria draba	Perennial/ Rhizominous
Rush skeletonweed	Chondrilla juncea	Tap root
Japanese knotweed	Polygonum cuspidatum	Perennial shrub
Scotch broom	Sytisus scoparius	Perennial shrub

1.4.2 MANAGEMENT AND REGULATORY FRAMEWORK FOR INVASIVE PLANTS IN THE PROJECT AREA

Direction and authority for invasive weed management is provided in the National Forest Management Act (PL94-588), Federal Land Policy and Management Act (PL 94-579), Carlson-Foley Act (PL-583), Federal Noxious Weed Control Act (PL-629), Idaho's noxious weed law (Idaho Code Title 22-2402), and the Montana Weed Management Plan (2001).

The Federal Noxious Weed Act of 1974 defines a noxious weed as a "plant which is of foreign origin, is new to or is not widely prevalent in the United States, and can directly or indirectly injure crops or useful plants, livestock or fish and wildlife resources in the United States, or the public health" (P.L. 93-629).

The Montana Noxious Weed Control Act defines a noxious weed as "any exotic plant species established or potentially could be established in the State which may render land unfit for agriculture, forestry,

livestock, wildlife, or other beneficial uses, and is further designated as either a state-wide or county-wide noxious weed" (MCA 7-22-2101).

The Idaho Noxious Weed Law defines "noxious weed" as any plant having the potential to cause injury to public health, crops, livestock, land, or other property; and which is designated as noxious by the Idaho Director of Agriculture (Idaho Code Title 22-2402).

In Idaho, it is unlawful for any individual to allow noxious weeds to propagate or go to seed on their land unless they are complying with an approved weed management plan. This law directs the counties to develop weed control districts to plan and implement weed control efforts. The law also directs district (county) weed boards to "make all reasonable efforts to develop and implement a noxious weed program covering all land within the district owned or administered by a Federal agency."

Executive Order 13112 (1999) directs all agencies to prevent introduction of invasive species, provide for their control, and to minimize economic, ecological, and human health impacts that invasive species cause.

US Forest Service Manual 2080 defines noxious weeds as "those plant species designated as noxious by the Secretary of Agriculture or by the responsible State official. Noxious weeds generally possess one or more of the following characteristics: aggressive and difficult to manage, poisonous, toxic, parasitic, a carrier or host to serious insects or disease, and being non-native or new to or not common to the United States or parts thereof."

As a point of clarification, the term "noxious weeds" are those plants listed by the Federal, State or Counties, while "invasive weeds" are exotic or poisonous plants that have been identified as plants of concern within the project area and will be treated in the same manner as noxious weeds. Together these species will be referred to as invasive plant species throughout the rest of this document and assessment. See Table 1-1 for a current list of weed species that threaten the Selway Bitterroot Wilderness.

Federal and state laws define invasive weeds primarily in terms of interference with commodity use of land. However, impacts of invasive weeds on non-commodity resources such as water quality, wildlife, and natural diversity are also of concern.

The Wilderness Act (P.L. 88-577) mandates that the Wilderness be managed so its community of life is untrammeled by man, its primeval character is retained, and its natural conditions are preserved. Forest Service policy direction is to maintain wilderness in such a manner that ecosystems are unaffected by human manipulation and influences so that plants and animals develop and respond to natural forces (FSM 2320.2). It is also policy to control and eliminate exotic vegetation (FSH 24.21) In keeping with this mandate, SBW managers must determine the risk invasive plant species pose to wilderness values and what management alternatives are available.

The Wild and Scenic Rivers Act (P.L 90-542) protects free-flowing rivers possessing "outstandingly remarkable" scenic, recreation, geologic, fish and wildlife, historic, cultural, or other similar values associated with the rivers. Under the Act, the Selway River is managed under the "wild" designation from Paradise to Selway Falls.

The US Forest Service strategy for noxious and non-native invasive plant management (USFS, 1998b) provides the Forest Service with a "roadmap into the future for preventing and controlling the spread of noxious weeds and non-native invasive weed plants." Executive Order 13112 directs all federal agencies to conduct activities that reduce invasive populations.

In 1994, the Supervisors of the Bitterroot, Nez Perce, Clearwater and Lolo National Forests signed a Decision Notice and FONSI that amended the vegetation section of the General Management Direction (GMD) for the entire Selway Bitterroot Wilderness. The GMD is amended to the Land Management Plans for each of these Forests. The Supervisors stated that the intent of the amendment was to "establish goals and objectives" that "specifically address direction to diminish the spread of weeds, ensure that impacted sites are restored with native vegetation, and maintain or restore rare plant populations".

The goals and objectives called for the eradication of new weed populations and the containment of existing populations through reducing the area occupied or, at the least, by holding infestations to their current size. While the EA did not make a decision on management tactics, it stated "manual and cultural removal of weeds will be evaluated first and given preference over the use of herbicides and biological control methods." Conditions within the Wilderness indicate these methods have been largely ineffective at containing or controlling the spread of invasive plants except in isolated or highly localized situations.

The vegetation management portion of the GMD was revised in 1996 to include the new emphasis on invasive plants from the 1994 decision. This revision expanded on the objectives and standards narratives in the EA and states, "when control of a weed population is being evaluated, all applicable control practices for a given specie will be considered."

Weed-free areas, boundaries of existing weed populations targeted for containment, and areas critical as native plant and animal species habitat would receive highest priority for prevention and control actions under this proposal.

In 2001, the Nez Perce, Bitterroot, and Clearwater National Forests published the "Selway and Middle Fork Clearwater Subbasin Assessment. This assessment recognizes the adverse effects of invasive weeds on natural ecosystems and plant communities and recommends integrated approaches to manage and reduce these impacts both inside and outside of the Wilderness.

In 2004, the Chief of the USDA Forest Service, Dale Bosworth, published a list of the four most serious threats to National Forest System lands, nationwide. One of the four was the threat posed by invasive species, including weeds.

The noxious weeds / invasive plants issue was assigned priority in the District Ranger's SBW Emphasis Plan for 2003 – 2007. Work in 2003 focused on inventory and mapping through the use of Forest Service personnel and SCA (Student Conservation Association) field crews. The 2004 update of the Emphasis Plan called for the development of an integrated noxious weed / invasive plant strategy for the entire Selway Bitterroot Wilderness.

Currently, all four National Forests involved in the Selway-Bitterroot Wilderness have revisions of their Land Management Plans well underway. The development of this proposal is expected to proceed concurrently with the Forest Plan revisions. The site-specific vegetation management goals, objectives and actions of this proposal will track with those NEPA decisions, as needed, but remain anchored to the 1994 GMD amendment.

1.4.3 ECOLOGICAL IMPACTS OF INVASIVE PLANTS

Invasive plants can alter the structure, organization and function of ecological systems (Olsen, 1999), including soil, plants, and animal relationships (Kurz, 1995; Randal, 1996). Spotted knapweed dominance on many open timber and grassland communities on the Forest may be affecting soil properties such as

microbial activity, nutrient cycling and moisture content, as well as increasing soil erosion. Native plant composition, diversity, species richness, and litter production are also affected. Changes in plant communities from native to non-native species impact wildlife species that depend on open timber and grassland for forage, and breeding and nesting habitat. Spotted knapweed is prevalent throughout the Forest and extensive research on this species has revealed numerous ecological impacts associated with its presence. A recent study has proven that spotted knapweed releases a phytotoxic chemical that inhibits the growth of Idaho fescue thus giving a competitive advantage to spotted knapweed (Harsh *et al.*, 2003). Other invasive plants species may have similar impacts to ecosystem processes. Examples of ecological impacts from spotted knapweed will dominate the discussion in this section, but this does not preclude the impacts caused by the presence other species.

A. Water and Soil

Invasive plants can affect the structure of ecosystems by altering soil properties. Soil in areas dominated by invasive plants may have lower amounts of organic matter and available nutrients than areas supporting native grasslands (Olsen, 1999). A study conducted by Montana State University (Lace *et al*., 1989) found that runoff and sediment yield increase 56 percent and 192 percent, respectively, on spotted knapweed sites compared to sites dominated by native bunchgrass.

B. Native Plant Communities

Invasive plants have a variety of mechanisms giving them a competitive advantage over native species. For example: invasive plants can be alleopathic (contain compounds that suppress other plants). Invasive plants tend to out-compete native species because the invaders often produce more abundant seed, establish and spread in a wider range of habitats, grow more rapidly, initiate growth earlier in the season and later in the season, exploit water and nutrients better, and have no native enemies. Once established, non-native plants threaten biological diversity of native plant communities and can alter ecosystem processes.

C. Wildlife Habitat

The introduction of exotic plants influences wildlife by displacing forage species, modifying habitat structure (such as changing grassland to a forb-dominated community), or changing species interactions within the ecosystem (Belcher and Wilson, 1992; Bedunah, 1992; Trammell and Butler 1995). Exotic plants within the project area have invaded important winter ranges of native ungulates, primarily deer, elk, and bighorn sheep, reducing forage available for over-wintering animals. Forage that is low in nutrients hinders elk and deer because they metabolize fat at an accelerated rate to stay warm in colder temperatures (Thomas, 1979). Additionally, demands are placed on the forage for non-migratory species that forage yearlong on some ranges. Yearlong foraging makes bighorn sheep more dependent on high quality forage on low elevation big game winter ranges than elk and deer (USFS, 2001b).

D. Humans

Spotted knapweed has direct and indirect effects on humans. Beekeepers value spotted knapweed because of the quality of honey produced from its flowers. However, the flowers are also pollen sources, which produce positive allergic skin tests and are a significant allergen causing allergic reactions (Olsen, 1999). People residing in knapweed-infested areas are treated for a variety of knapweed allergies ranging from skin hives to knapweed-induced asthma attacks. (Olsen, 1999)

1.5 PROPOSED ACTION

In October 2006 the national forests of the Selway Bitterroot Wilderness propose the following actions to the public and asked for comments and suggestions. In the proposed action, the forest would apply integrated and adaptive approaches to reduce the effects of non-native invasive plant species on natural plant communities and ecosystems within the project area. Approximately 500 to 1500 acres annually are proposed for physical treatments including: chemical treatments, hand pulling, and revegetation with native plants. The proposal would analyze a larger "area of operations" for treatment effects. Biological control organisms would be applied to approximately 10,000 additional acres within the project area. All treatments and applications would be ground-based. Within the Selway Bitterroot Wilderness, the method of herbicide treatment would be through selective, hand-operated, spray applications using backpack and stock-mounted sprayers.

Prevention, education, enforcement, effectiveness monitoring, compliance monitoring, cooperation with landowners, user groups, and other interested parties, and regular inventories of invasive species in the area would be used to provide feedback to the adaptive management process.

The emphasis of the treatments would be to eradicate new invaders as they are discovered and to contain the spread of established non-native plants.

These actions would be designed to help maintain the natural conditions of the Wilderness, in accordance with the intent of the 1964 Wilderness Act.

After reviewing comments from the public, other agencies, and tribal government alternatives to this proposal were developed and analyzed in detail. The Proposed Action along with the other alternatives, including the preferred alternative, are evaluated in Chapters 2 and 3 of this document.

1.5.1 MANAGEMENT STRATEGIES

A. Integrated Weed Management

Integrated weed management as defined by Sheley *et al*. (1999) is the "application of many kinds of technologies in a mutually supportive manner. It involves the deliberate selection, integration and implementation of effective weed control measures with due consideration of economic, ecological, and sociological consequences." The integrated weed management approach developed for this Project does not center on treatment methods but rather on a multi-faceted strategy that includes education, inventory, ecological impact and risk assessment, prioritizing treatment areas, choosing management techniques, evaluating the program through monitoring and adapting as the program evolves. Sheley *et al*. (1999) described the overall goal of integrated weed management as "maintaining or developing healthy plant communities (restoration) that are relatively weed resistant, while meeting other land management objectives." In the case of this project the primary emphasis is on maintaining healthy native plant communities.

Key elements of integrated weed management program include:

- Preventing encroachment into non-infested sites;
- Detecting and eradicating new introductions;
- Eradicating small populations within or adjacent to high priority areas;
- Containing large weed populations;

- Re-vegetating when necessary; and
- Properly managing competitive vegetation (Goodwin and Sheley, 2001).
- Training field employees in the identification of invasive weeds.

A successful program consists of a sustained effort, constant evaluation, and adoption of improved strategies as they arise.

The goals of implementing the various element of integrated weed management are to:

- Increase public awareness regarding impacts of noxious weeds to resource values;
- Limit weed seed dispersal from roads and trails:
- Contain neighboring weed infestations; and
- Minimize soil disturbance.

B. Adaptive Management

The most effective time to treat new infestations of invasive species is when they are first discovered, particularly if the plants have not yet established extensive root systems or produced viable seed. An adaptive management strategy is proposed that supports early detection, rapid response and eradication of new invaders along with the containment of established weed populations. This strategy would allow the following actions:

a) rapid response with the use of chemical herbicides on small newly detected infestations of new or uncommon invaders wherever these sites are discovered within the priority areas of operation analyzed in the proposal.
b) use of newly approved herbicides (according to label restrictions) and biological control agents
c) addition of new invasive species to the list of targeted weeds to stay in compliance with State and County noxious weed laws.

New technology, biological controls, herbicide formulations, and supplemental labels are likely to be developed within the time frames of this project (10-15 years). New treatments would be considered, as appropriate, where treatment effectiveness would be greater and environmental effects would be equal to or less that those considered in this analysis. These measures would be applied only when it is determined that all applicable State and Federal legal requirements are met. Just as important as the consideration of new methods and treatments under the adaptive management strategy is the continued evaluation of approved methods and treatments for efficacy, safety, and environmental hazards as new information becomes available.

The adaptive management strategy would allow incorporation of these new treatment methods, as appropriate:

- New herbicides or formulations registered and approved by the US Environmental Protection Agency would be applied according to label specifications.

- New biological control agents that are approved and certified by the Animal and Plant Health Inspection Service would be applied according to all conditions that may be specified.

Prior to the use of a new treatment or the need to treat new invaders outside of the identified priority areas of operation, an interdisciplinary team would review to confirm that the new treatment is within the scope of the effects analysis and framework of the decision for this project.

C. Minimum Tool

Within the SBW, invasive plant management will incorporate the concept of using the "minimum tool." This means that when planning necessary actions, managers would utilize the minimum methods necessary to accomplish the management objectives.

Parameters considered when selecting minimum tools include species biology, infestation size, proximity to water and recreation sites, and extent of susceptible habitats adjacent to infestations. Methods would include manual, biological, or chemical control. For example, if all of these methods were equally effective in controlling a particular species or infestation, the least impactive method would be employed. Hand pulling or grubbing is effective for some species but not for others, such as deeply rooted species.

Effective biological control agents are not available for many exotic species and bio-controls are not effective on small isolated infestations. In many situations herbicide use may be the only effective control and thus the minimum tool.

1.5.2 TREATMENT PRIORITIES

Treatments would be focused where they have the greatest effect on preventing or minimizing invasive plant impacts on wilderness resources. Plant species to be managed include those listed in Table 1.1, Invasive Plant Species Threatening the SBW. The delineation of plants with respect to treatment priorities is determined by (1) ability of the plant to invade and displace native plant communities, (2) the potential rate of expansion, (3) the physical nature of the plant (a tall and thorny species verses a small and unobtrusive species), and (4) the extent and proximity of susceptible native plant communities.

1.5.3 PRIORITY AREAS OF OPERATION

Priority areas would be the focus of attention with this proposal. These include areas that are: most vulnerable to seed introduction and dispersal due to human traffic patterns; areas where weeds currently exist and may expand their range; and areas that are highly susceptible to invasion by new or uncommon invasive plants.

Based on the most current information regarding distribution, density, and composition of invasive plants, the project area is divided, spatially, into three broad categories. These categories are displayed on the alternative maps at the end of Chapter 2, and are defined as follows:

Advanced Infestation Areas – Widespread density and distribution of established invasive plants exceeds the capability of managers to eliminate or eradicate existing populations. Containment priorities would reduce risk of seed distribution to other areas, via contact with humans and livestock, by treating high use areas termed, **Designated Treatment Areas**, such as travel corridors, campsites, and other areas (listed below) with herbicides. Bio-controls would be introduced in the densest infestations to begin moving populations of invasive weeds from epidemic toward endemic levels. New invaders would be eradicated, using a variety of treatment methods, wherever new starts are discovered.

Early Infestation Areas – Native plant communities currently dominate these areas and would be maintained. Isolated, existing populations of established invasive plants would be managed for containment and, where possible, eradication using a variety of treatment methods, including herbicides. Many of these local populations of invasive weeds exist in proximity to high use areas. New invaders as

well as established species of invasive plants would be eradicated, if feasible, using a variety of treatment methods, wherever new starts are discovered.

Weed Free Areas – Native plant communities, with no known populations of invasive plant species dominate these areas and would be protected. New invaders as well as established species of invasive plants would be eradicated throughout the more remote areas of the project termed **Dispersed Treatment Areas**, using a variety of treatment methods, wherever new starts are discovered.

Examples and extent of high use areas or disturbed sites most vulnerable to invasive plant establishment are listed below. Such sites would be a priority for treating target invasive weeds. Actual chemical or other treatment within the annual planned areas of operation would be much less than the acreages listed below and dependent on treatment objectives:

- Transportation Corridors: Approximately 7,500 acres. Includes the Selway River, roads and trails outside of the Wilderness, and trails within the Wilderness. Priority would focus on treating up to 3 acres per mile of trail, 12 acres per mile of road, and 5 acres per mile of river.
- Trailheads: Approximately 150 acres.
- Dispersed Campsites: Approximately 300 acres. Includes river and trail sites.
- Administrative Sites: Approximately 250 acres.
- Airstrips and Helispots: Approximately 100 acres.
- Private Inholding Buffer Areas: Approximately 120 acres.
- Dams and Impoundments: Approximately 180 acres.

1.5.4 ESTIMATED ANNUAL TREATMENT ACRES

Within the priority areas, mentioned above, it is estimated that the average number of acres that would receive chemical, cultural, or mechanical treatments would range from 500 to 1,500 per year under the proposed action (Alternative 2). Most of these acres would be treated through the use of chemicals. Chapter Two, of this document examines and considers alternatives to the proposed action.

Additional areas would be evaluated over the life of the project, as necessary, applying the principles of "adaptive management," discussed previously.

1.5.5 TREATMENT METHODS

Aerial spray application is not proposed. Grazing of domestic animals to reduce weeds within the Wilderness is not proposed. All treatments would be ground-based.

A. Chemicals

Chemical treatments would consist of ground applied herbicides and supplemental compounds. Applications would take place at the appropriate time of year considering targeted species and environmental factors such as proximity to water, plant growth stage, and adjacent sensitive flora and fauna. Equipment such as horse and backpack sprayers would be used inside the Wilderness. Outside of the Wilderness, other equipment such as ATV and truck-mounted sprayers would be used as well. Registered water-soluble herbicides displaying toxicity, leaching, and persistence characteristics less than or equal to picloram would be used and newly registered herbicides with similar characteristics may be used as they become available. Herbicide use would follow labeled requirements.

Surfactant adjuvant would be used in certain situations to increase efficacy, primarily on target species with a waxy cuticle, especially toadflax, or when temperature and humidity are not optimal (but still within label limits) yet other conditions such as plant phenology are ideal. Surfactants would be used in accordance with all applicable label requirements.

The use of non-toxic, water-soluble colored dyes might also be used where it is difficult keeping track of what has been sprayed.

B. Biological Controls

Biological controls, primarily insects, would continue to be introduced, where appropriate, and newly approved agents would be considered for use where environmental conditions would support their use.

C. Mechanical/ Cultural Treatments

Mechanical treatments such as hand pulling and grubbing would occur on sensitive areas or in very small infestations. Also, surface scarification of the soil followed by seeding of approved native plant seeds would occur where natural recovery of native species is inadequate to provide needed site occupancy to prevent reinfestation by invasive species.

1.6 Scope Of The Analysis

The scope of this analysis is limited to the effects of non-native invasive plants and weed control treatments on resources and uses within the project area boundary.

1.6.1 Impacts

Regulations contained in 40 CFR 1508.25(c) require analysis of direct, indirect, and cumulative impacts. Direct effects are caused by the action and occur at the same time and place as the Proposed Action. Indirect effects are caused by the action and occur later in time or farther removed in distance, but are still reasonably foreseeable. Cumulative impacts are those impacts on the environment that result from incremental impact of the action where added to other past, present, and reasonably foreseeable future action.

1.6.2 Alternatives

In determining the scope of analysis, the agency must consider three types of alternatives to the proposed action (40 CFR 1508.25[b]): no action alternative, other reasonable courses of action, and mitigation measures. Chapter 2 presents a range of alternatives for site-specific treatment of invasive weeds. Alternatives that have a reasonable likelihood of partial success are discussed in detail. Mitigation measures and/or Design Criteria for each alternative have been developed by the interdisciplinary team and included as Environmental Protection Measures. Impacts of the no-action alternative, which would maintain the current program projects on the forest, are also considered.

1.6.3 Connected, Cumulative And Similar Actions

Regulations in Code of Federal Regulations (CFR) Title 40 1508.25 address the scope of analysis and elements to be considered in a proposed action. The regulations recognize that separate activities can combine and interact to create impacts that may be significantly beyond the effects of individual actions. These actions are considered cumulative, and their additive effects must be addressed in the analysis.

Federal regulations also require a combined analysis of connected actions. Connected actions are those that are closely related and 1) automatically trigger other actions, 2) could not or would not proceed unless other actions are taken previously or simultaneously, and 3) are interdependent parts of a larger action and depend on the larger action for their justification. The effects of connected actions should be analyzed together.

Similar actions are those that share a common timing or geography and therefore can be evaluated together.

1.7 Scope Of The Decision To Be Made

1.7.1 Geographic Scope

The geographic scope of this analysis is confined to the treatment areas that would occur within the project area boundary. The project area boundary is the same for all alternatives and is displayed on the Alternative Maps at the end of Chapter 2 of this document. For each resource issue an analysis area was determined that could be used to adequately measure cumulative effects of the proposed alternatives. Unless otherwise stated, the cumulative effects area is the same as the project area.

1.7.2 Temporal Scope

The timeframe for project implementation is 5 to 15 years. Direct, indirect, and cumulative effects, if any, would occur during that period.

1.7.3 Decision Framework

Based on the environmental analysis in the EIS and consideration of public comments, the Forest Supervisors of the Nez Perce, Clearwater, and Bitterroot National Forests are responsible for making the decision concerning this proposal. Given the purpose and need, the deciding officials review the alternatives and the environmental consequences in order to make the following decisions:

- Whether to expand current efforts to control invasive weeds;
- What treatment methods would be used;
- What herbicides would be used;
- Where specific treatments would be used;
- What protection and monitoring measures would be required; and
- Whether to include an adaptive approach to address future spread of invasive weeds.

The DEIS is a project level analysis. The scope of the project is confined to issues and potential environmental consequences relevant to the decision. This analysis does not attempt to re-evaluate or alter decisions made at higher levels. The decision is subjected to and would implement direction from higher levels.

National, regional, and Forest Plan rules, policies, and direction require consideration of effects of all projects on weed spread and prescribe mitigation measures where practical to limit those effects. Reconsideration of other existing project level decisions or programmatically prescribing mitigation measures or standards for Forest management activities (such as travel management, timber harvest, and grazing management) are beyond the scope of this document. Cumulative effects of the Project are addressed where appropriate in Chapter 3, combined with effects of other Forest activities.

Decisions that will not be made based on this analysis are briefly discussed below:

- Changes in land use and Forest Management objectives;
- Changes in the level of wildland fire suppression, strategies and tactics, and decisions on whether or not to control wildfire;
- Changes in travel, road use, and access;
- Re-evaluation of road analyses or road management decisions.

Prevention measures, already in effect, that minimize establishment and spread of noxious weeds are already a part of Forest Service policy and recent decisions will not be repeated in this analysis.

Forest Service Policy (FSM2080 R1 Supplement) provides Best Management Practices for weed control. They specify incorporation of weed prevention and control through project layout, design, and alternative evaluation and project decisions to reduce potential sites for weed establishment.

Coordination of weed prevention and control efforts continues at the local, county, state, regional, and national levels.

The Weed Seed Free Feed and Straw program is a Forest and Region-wide requirement.

The Off Highway Vehicle (OHV) amendment for Region One was implemented in January 2001 on the Bitterroot National Forest. Off road or trail use by OHV is restricted and will reduce an important vector of weed spread. The first year focused on public education of riders in the field. In 2002 the enforcement phase of the amendment resulted in more enforcement, resulting in citations and warnings.

Each Ranger District Office provides a wide array of information on noxious weed identification, prevention, and control. In addition, most trailheads are posted with information about weed identification and the requirement to use only certified noxious weed seed-free feed for livestock.

CHAPTER 2

ISSUES AND ALTERNATIVES CONSIDERED

CHAPTER 2 STRUCTURE

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2.1 CHANGES TO THE PROPOSAL SINCE SCOPING

1) Six major trailhead entry portals serving the Selway Bitterroot Wilderness have been added to the project area along with the associated trail segments previously excluded. These trailheads are located at Race Track (main lower Selway River portal), Wilderness Gateway, Kooskooskia, Tom Beal, Blodgett Canyon, and Lost Horse Pass.

2.2 INTRODUCTION

Chapter 2 provides information on how the public was involved in providing comments on this Project, how the alternatives were developed, and a description of how issues and alternatives were addressed in this document. This is followed with a description of the four alternatives that are studied throughout the document, a description of adaptive management, a brief economic comparison of the alternatives, and a list of design measures. A summary comparison and maps of the four alternatives can be found at the end of the chapter.

2.3 PUBLIC INVOLVEMENT IN THE DEVELOPMENT OF THE DRAFT EIS

During the past few years, considerable input from local Indian tribes, County governments, organizations, and members of the general public has been sought and received by the national forests concerning the expansion of invasive weeds in and around the project area. In May 2005, public meetings were held to gather information from stakeholders that would help guide the development of this proposal. Overall, public sentiment from these sensing efforts indicated a concern for how the current expansion of invasive plants is affecting one or more of the following: native plant communities, wildlife and fisheries habitat, water quality, recreational values, and Wilderness values. Concerns have also been voiced over the effects of possible treatment strategies on these same values.

Additionally, local tribes (Nez Perce Tribe and Confederated Salish and Kootenai Tribes of the Flathead Nation) have expressed concerns about the effects of invasive plants and possible treatment measures on traditional cultural uses of the area.

On October 26, 2006, a public scoping letter was sent to more than 350 members of the public as well as interested state and federal agencies in Montana and Idaho asking for comments on the Selway Bitterroot Wilderness invasive weed management proposal. During the same time period, letters were sent to the Nez Perce Tribe, the Coeur D Alene Tribe, the Confederated Salish and Kootenai Tribes of the Flathead Nation, and the Confederated Tribes of the Colville Reservation. A Notice of Intent to prepare an EIS on this proposal was published in the Federal Register on November 1, 2006. Publication of the Notice of Intent initiated a thirty-day public scoping period. Legal Notices were also published in the Lewiston Tribune, Idaho County Free Press, and the Ravalli Republic newspapers during the scoping process. In total, twenty-three written comments were received from the scoping effort.

Although most people providing input expressed concern over the presence of invasive plant species and the possible effects to the resources and values of the area, there are a wide variety of opinions over what should be done about the situation. Opinions range from favoring aggressive treatment using all methods available to simply accepting weeds as part of the changing vegetative landscape. Concerns over costs and effectiveness of treatments were expressed. Opinions were also expressed that active management of invasive species may be in conflict with the 1964 Wilderness Act. These differences of opinion reflect an open and ongoing discussion in social and scientific publications about appropriate management of Wilderness areas.

Comments received during scoping were evaluated to determine potential issues, and then the identified issues were categorized according to relevance, to the purpose and need. The categories included: significant issues and concerns; and issues and concerns beyond the scope of the purpose and need for this project (see project file for content analysis on scoping letters). Significant issues were used to develop a range of alternatives to the proposed action. Concerns were used to help define the scope of analysis. Issues and concerns that were considered outside the scope of the project are described in this chapter, along with alternatives that were dismissed from detailed analysis. Design criteria and monitoring that were identified to meet the intent of the alternatives are listed near the end of this chapter.

2.4 ALTERNATIVE DEVELOPMENT PROCESS

Comments from the public, agencies, tribes, and resource specialists on the interdisciplinary team were used to determine issues of concern that could result from implementing the proposed action. The following issues were considered to be significant because there is uncertainty regarding the effects of the proposed action. The best way to analyze the issues, are through the development of alternatives, which display the effects and trade-off between different alternative actions. The effects are measured by an "Issue Indicators," and are summarized in the "Summary Comparison of Alternatives" Table xxx, at the

end of the chapter. Additional information regarding the effects of the different alternatives on various resources can be found in Chapter 3.

2.5 ISSUES CONSIDERED IN THIS ANALYSIS

Issues are disagreements or debates about potential environmental impacts of a proposed action. As such, issues influence the design and evaluation of alternatives to the proposed action. Issues and concerns influenced the development of alternatives, environmental protection measures known as design criteria, and the analyses conducted as part of the assessment process.

The following Primary Issues have been key to the development of alternatives or the range of alternatives considered or they resulted in certain design criteria to protect specific resource values.

2.5.1 PRIMARY ISSUES

1.) The effects of the proposal on maintaining Wilderness character
2.) The effects of the proposal on maintaining natural ecosystems
3.) The effects of the proposal on existing human uses
4.) The extent and priority of areas needing to be treated to manage invasive plants
5.) The effectiveness of treatment methods and strategies proposed to manage invasive plants

2.5.2 DISCUSSION OF PRIMARY ISSUES

1.) The effects of the proposal on maintaining Wilderness character

The Wilderness Act of 1964 outlines basic wilderness values in the following manner.

"A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserves its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value."

These two sentences have been – and continue to be – examined and interpreted and their meaning debated.

At the crux of the different interpretations of the Act's definition of wilderness is whether the act allows managing for naturalness or managing for wildness. Peter Landres of the Leopold Institute explains: "According to this Act, wilderness should support both the attributes of naturalness and wildness." He adds, " . . . 'naturalness' describes an ecological condition . . .." and "'wildness' represents . . . [a] social condition, one in which an area is untrammeled and free from human control, regardless of preexisting conditions or future consequences."

Numerous responses to the initial project proposal were directed at this issue spanning the breadth of the debate.

Following are some of those comments:

- "What considerations have been made regarding the fundamental definition of 'wilderness' and how this proposal will completely violate those principles?"

- "Among the resource values significant to the NHT [Lewis and Clark National Historic Trail] are landscapes as little changed as possible from conditions encountered 200 years ago. Encroachment by invasive species, either plant or animal, pose considerable risk to the diversity and sustainability of native habitats."

- "… aggressive control of invasive/noxious plants through every means possible…."

- "The Selway Wilderness is one of the largest Wilderness areas in the contiguous U.S. and epitomizes the values articulated in the Wilderness Act. As such, it is encouraging to see that the Forest Service is proposing measures to control and treat invasive plants and noxious weeds that would degrade some of those values."

- "[T]he DEIS must show how this proposal is different than what occurs outside of wilderness. Since wilderness is set aside to allow natural processes to determine the character o the area, weed control, if it is even consistent with the Wilderness Act, must be different than what occurs on the national forests outside of designated wilderness."

2.) The effects of the proposal on maintaining natural ecosystems

Natural ecosystems reflect the relationships between native flora and fauna as well as natural process, such as fire and floods that occur on the landscape. Healthy watersheds and high quality water in streams and lakes of the area is also very important to the overall ecosystem function. Aggressive non-native invasive plant species can alter these relationships.

The project area contains important habitat for sensitive plant species including Payson's milkvetch, Idaho barren strawberry, and Puzzling halimoloblos. It also contains habitat for sensitive wildlife and fish species including wolverine and west slope cutthroat trout, as well as species listed under the Endangered Species Act (ESA) including the bald eagle, rocky mountain gray wolf, bull trout, and steelhead trout.

In addition, areas susceptible to dominant occupancy by invasive plant species and areas currently occupied by these species typically coincide with key winter ranges for large ungulates such as deer, elk, and bighorn sheep.

For these reasons, loss, degradation, or alteration of key ecosystem components or processes due to invasive plant species is a concern to local Indian tribes and agencies with fish, wildlife, and plant management authorities.

Comments from the public also indicate concerns that methods proposed to manage invasive plant species may also degrade certain ecosystem components or result in unintended consequences affecting native flora, fauna, or water quality.

Following are some of the comments representing this range of opinions:

- "In drafting the EIS, the FS should promote the recovery of declining populations of impacted species."
- "How does the FS quantify and define the term "affecting' regarding weed relationships to water, fisheries, wildlife, and wilderness values?"
- "We are concerned about the potential adverse impacts of the proposed action to water quality and aquatic resources."
- "Thanks, too, for this continued interest in keeping natural processes working in this great wild place."

3.) The effects of the proposal on existing human uses

Human uses within the project area include such recreational activities as hiking, camping, horseback riding, fishing, hunting, river floating, and sightseeing. Native American tribes exercise their treaty rights for activities including hunting, fishing, gathering, and observance of cultural and religious traditions. The USDA-Forest Service occupies several administrative sites and uses them in the administration of the area. And there are several private land inholdings that are occupied during various time of the year.

Comments from the public question the effects that the various invasive plant management activities and treatment methods may have on some of the uses, mentioned above. Concerns have also been brought forward as to the effects certain treatment methods, primarily those associated with chemical application, may have on human health.

Following are some of those comments:

- "Also, for decades, I have been very concerned about the effects of toxic herbicides on humans and many other species as well."
- "The proposed chemical treatment may impact waters that serve as sources of drinking water."
- An owner of a private inholding wrote, "I am very aware of the problem—especially with knapweed. We actively use chemicals and flood irrigation to eradicate knapweed at the Ranch. However, our efforts are somewhat fruitless because the surrounding federally owned hillsides and trails are so badly infested."
- "Some members returning from public lands now worry about bringing the weeds home…."

4.) The extent and priority of areas needing to be treated to manage invasive plants

Several people responded to the proposed action with comments related to the size of the area proposed for treatment as well as the specific areas proposed for treatment.
Following are some of those comments:

- "The Forest Service should also conduct an analysis to identify and prioritize roads, air strips, trailheads and trails that are contributing to the spread of noxious weeds and

invasive plants. Roads, air strips, trailheads, and trails with large populations of these species should be treated first."

- "The only comment we wish to impart is to encourage the U.S. Forest Service to treat not only any public use airport within the treatment area, but also any privately-owned, private use airports which might lie within this area."

- "The planning team should develop an alternative that expands the physical treatment to 2,000 acres per year."

- "I would think that your planning will also need to focus on weed control at trailheads near the Wilderness, and also along access trails. The basic treatment system being proposed seems very sound to me, but the scale (500 to 1500 acres/year) seems small,"

- "The 500-1,500 acres of treatment seems like an adequate range to allow the required projects to proceed. Please review if this figure will allow enough treatment to actually demonstrate invasive plant reduction on a watershed basis."

5.) The effectiveness of treatment methods and strategies proposed to manage invasive plants

The widest assortment of comments to the proposed action pertained to the issue of treatment methods and strategies.

Treatments in the proposed action include the use of herbicides and related chemicals, bio-control agents, as well as mechanical methods and revegetation.

Invasive species management strategies in the proposed action involve integrated weed management, adaptive management, education, and prevention.

Within the scoping responses, the widest divergence of opinion exists in the area of herbicide or chemical use to manage weeds. Some respondents expressed strong opposition to any use of chemicals. Some would support a limited use of chemicals, after other treatments have been analyzed and found insufficient. Some respondents would support rather aggressive use of herbicides in the project area.

Bio-control methods seem to be nearly as controversial as herbicides. Some respondents expressed support for the use of such agents as a means to help control the size and rate of spread of invasive species. Others expressed strong reservations pertaining to the use of bio-control agents fearing unintended consequences and/or questioning the logic of introducing a new non-native species to help control a problem with another non-native weed species.

Among those supporting the use of a full range of treatment options in the project area, there was also a tendency to support integrated weed management and adaptive management strategies.

Respondents who mentioned prevention and/or education efforts in their comments tended to support such efforts as management strategies that ought to receive more emphasis. And for prevention strategies and practices, some provided specific suggestions pertaining to what, where, and how practices should be implemented.

Following are some comments related to treatment methods for invasive plants:

- "I hope the Forest Service will continue to focus efforts on weed control in the Selway-Bitterroot Wilderness and that it will do so with a more intense push and without the use of herbicides or biological controls."

- "Introducing biological control insects is dangerous and contrary to the Wilderness Act. Biological control insects have a real possibility of changing host plants, and therefore disturbing the natural balance between native species."

- "I am not against reducing noxious weeds if done within a specific framework. This refers to the use of mechanical elimination, with biological possibly secondary. I do not feel chemical should be utilized within the wilderness."

- "We support treatment methods such as hand pulling and revegetation with native species. We are cautiously optimistic about biological controls and chemical treatments."

- "We fully support aggressive control by any available methods outside the wilderness. Within the wilderness, we would support chemical spraying by traditional methods such as horse and backpack sprayers until infestations are controlled. Then biological control using insects or pathogens may help reduce further infestation. Mechanical control could be utilized as available."

- Following are some comments related to management strategies for invasive plants:

- "[I]t is important that a holistic approach be taken that emphasizes a wide array of preventative measures."

- "We also encourage use of Integrated Noxious Weed Management (INWM) strategies because of their potential to minimize effects on environmental resources that would be at risk in the project area."

- "EPA promotes integrated pest management because it represents a prudent approach to understanding and dealing with environmental concerns. IPM neither blindly embraces nor rejects new technology; rather it promotes a thoughtful awareness of the pest management inherent in natural systems through an understanding of pest life cycles and through the use of beneficial organisms, cultural modifications, physical barriers and other mechanical controls. It does not rule out the use of pesticides, but requires that their use be thoughtfully considered."

- "I support the adaptive management concept presented. It appears to address items which have proven to be the downfall in other forests in relation to quick treatment of new sites or new weeds."

- "We appreciate the fact that "minimum tool" methods of control and treatment are being proposed, and that aerial spraying and domestic livestock grazing will not be used."

- Following are some comments related to prevention and/or education strategies:

- "This strategy should also integrate an aggressive informational campaign to both explain the problem and its importance, as well as to inform Wilderness users regarding how they can help to prevent spreading invasive plants and noxious weeds."

- "Any solution that aims to effectively deal with noxious weeds needs to use preventative measures to try and reduce spread of noxious weeds."

- "What is shown to be true is that prevention is the best way to control weeds."

- "Although control is critical, focusing on prevention should be a first priority, as change in forest management techniques could prevent or help slow the spread of invasive species."

- "There are any number of preventative measures the FS could take in regard to noxious weeds, particularly related to keeping high-use areas weed-free and ensuring livestock are not seed carriers."

- "Within the margins your Environmental Impact Statement there needs to be a program that not only better educates the public but also provides an easier means of communicating to enforcement so that affected areas can be treated effectively and efficiently."

Other issues, concerns, or comments considered in detail within the analysis or the analysis process but not used to generate specific alternatives relate to the following:

- Unintended consequences and scientific uncertainty: This concern is addressed in the environmental consequences section of Chapter 3.

- Safe handling of chemicals: This concern is addressed in the design criteria section of this chapter as well as the monitoring plan.

- Cumulative effects: This concern is addressed in the environmental consequences section of Chapter 3.

- Monitoring: This concern is addressed in the monitoring plan.

- Tribal consultation: Tribal consultation has occurred and will continue to occur throughout the development of this project and during its implementation.

- Public participation: Public participation has occurred and will continue to occur.

Issues and concerns considered but not studied in detail:

- Road and highway management outside the project area: This concern is beyond the scope of this analysis.

- Cattle grazing outside of the project area: Cattle grazing does not occur within the Selway Bitterroot Wilderness. There are no active cattle allotments immediately adjacent to the Wilderness and unauthorized grazing in the project area has not been reported in recent

years. This issue is therefore beyond the scope of this analysis and irrelevant to this proposed action.

- Personal opinion statements which are unsubstantiated or of a general nature, including simple statements of support or opposition to the proposal: Such statements are considered in determining the overall sentiments of the public and, to some extent for their value in representing the range of public opinion regarding the project. However, without substance or supporting arguments, these statements do not tend to drive alternatives or design criteria within the analysis.

2.6 ALTERNATIVES

2.6.1 SUMMARY OF ALTERNATIVES CONSIDERED IN DETAIL

Five alternatives, including the No Action Alternative, were developed from the Primary Issues, stated previously, and analyzed in detail. The following summary of the alternatives displays the key variables defining each alternative as well as the range of alternatives considered.

A. Alternative 1 – No Action

- Use All Currently Approved Methods

- Includes such methods as removal by hand and use of mechanical means on airstrips and administrative sites, with limited herbicide use at administrative sites. Also allows for continued use of previously approved bio-control agents outside of the Wilderness and the continued existence, but not supplementation, of previously introduced biological control agents within the Wilderness.

  Acres of Manual/Cultural Treatment: Historically, fewer than 100 acres per year, estimated.

  Acres of Herbicide Treatment: Approximately 70 acres per year, estimated. Fewer than 20 acres per year, within the Wilderness, have been treated with herbicides, historically, and herbicide use has been limited to maintaining the grounds at administrative sites and limited spot treatments along trails and campsites, approved under the Bitterroot National Forest Noxious Weed Treatment Project, March 2003, within the Wilderness. The vast majority of acres currently being treated with herbicides are associated with old road prisms located outside of the Wilderness.

Weed-Free Watersheds:

Objective: Allow native plant communities and invasive plants to interact without any new management or intervention actions.

Treatment Prescription:
a) No current herbicide applications.
b) Continue manual / cultural actions = Less than 1 acre / yr.
c) No biological control releases are occurring

Early Infestation Watersheds: Objective: Allow native plant communities and invasive plants to interact without any new management or intervention actions. Treatment Prescription: a) Continue herbicide applications on all currently approved sites. b) Continue manual / cultural actions = Less than 1 acre / yr. c) Continue approved biological control releases outside the Wilderness.
Advanced Infestation Watersheds: Objective: Allow native plant communities and invasive plants to interact without any new management or intervention actions. Treatment Prescription: a) Continue herbicide applications on all currently approved sites. b) Continue manual / cultural actions = Less than 100 acre / yr. c) Continue approved biological control releases outside the Wilderness.

B. Alternative 2 – Proposed Action

- Use all currently approved methods, plus herbicides and new releases of bio-control agents on all priority areas as needed, within all portions of the project area. Designated Treatment areas include all trails and associated camps, trailheads, Selway River camps, administrative sites, airstrips, private land buffers, dams sites, etc., that are situated in currently infested areas inside the Wilderness. Also includes roads inside the project area but outside the Wilderness.

- Provides opportunity for limited chemical treatment of new invaders and new colonies of established invasive plant species in susceptible Dispersed Treatment areas. (Allows for treating future weed expansion and colonization in currently weed free areas or areas currently in the early infestation phase, weed condition categories I and II on Alternative maps.)

  Acres of Manual/Cultural Treatment: Same as Alternative 1.

  Acres of Herbicide Treatment: Less Than 1500/year.
  Designated and Dispersed Treatment Areas

  Acres of Bio-control Treatment: Up to 10,000 acres over project life.

Weed-Free Watersheds: Objectives: a) Eliminate starts of target invasive plant species that are present in the project area. b) Eradicate all target invasive plant species that are new to the project area. Treatment Prescription: a) Herbicide: Treat all areas, including trails, camps and high risk susceptible dispersed habitat types, as needed, as new invasive plants are discovered.

b) Manual / Cultural = Treat where feasible. c) Biological Control = None currently needed; evaluate and treat when needed.
Early Infestation Watersheds: Objectives: a) Reduce the density and range of target invasive plant species currently present in the project area. b) Eradicate all target invasive plants new to the project area. Treatment Prescription: a) Herbicide: * Designated Treatment Areas: Treat up to 100% of known infestations in designated areas (including roads, trails, administrative sites, airstrips, etc.). * Dispersed Treatment Areas: Treat all areas, including trails, camps and high-risk susceptible dispersed habitat types, as needed, as new invasive plants are discovered. b) Manual / Cultural = Treat where feasible. c) Biological Control = Treat largest areas with greatest potential to spread.
Advanced Infestation Watersheds Objectives: a) Contain the spread of target invasive plants (such as spotted knapweed, St. Johnswort and sulfur cinquefoil) that are more common in the project area by reducing seed transport along priority vector corridors and contact sites such as system trails, camps, airstrips, administrative sites and roads. b) Contain the spread of target invasive plants into and out of private inholdings within the Wilderness portion of the project area. c) Reduce the density and range of less common target invasive plants (such as oxeye daisy). d) Eradicate all target invasive plant species that are new to the project area. Treatment Prescription: a) Herbicide: * Designated Treatment Areas: Treat up to 100% of known infestations in designated areas (including roads, trails, administrative sites, airstrips, etc.). * Dispersed Treatment Areas: Treat all areas, including trails, camps and high-risk susceptible dispersed habitat types, as needed, as new invasive plants are discovered. *Selway River camps and boat launch sites: Treat up to approximately 70 sites, average of 1 acre each/yr. b) Manual / Cultural = Treat where feasible. c) Biological Control = Treat highest priority areas (current target species are spotted knapweed; St. Johnswort; Dalmatian toadflax…others as needed).

C. Alternative 3 – Confined Treatment (No Herbicides in Riparian Areas, No New Bio-controls)

- Use all currently approved methods.

- Inside SBW, manage weeds without introducing new bio-controls. Limit use of herbicides to Designated Treatment areas including all trails and associated camps, trailheads, administrative sites, airstrips, private land buffers, etc., that are situated in currently infested areas.
- No herbicides would be used within 50 feet of live water. In addition, this alternative would not treat Selway River camps or dam sites with herbicides.
- Outside SBW, treatments same as Alternative 2.

Acres of Manual/Cultural Treatment: Same as Alternative 1.
Acres of Herbicide Treatment: 1806/year.
Designated Treatment Areas Only, Inside Wilderness
Designated and Dispersed Treatment Areas Outside Wilderness.

Weed-Free Watersheds Objectives: Use prevention and education methods to reduce the potential for invasive plants to spread into weed-free areas. Treatment Prescription: a) Herbicide: None b) Manual / Cultural = Treat where feasible. c) Biological Control = None
Early Infestation Watersheds Objectives: a) Reduce the density and range of target invasive plant species currently present in the project area. b) Eradicate all target invasive plants new to the project area. Treatment Prescription: a) Herbicide: * Designated Treatment Areas: Treat up to 100% of known infestations in designated areas (including roads, trails, administrative sites, airstrips, etc.). * Dispersed Treatment Areas: No herbicide treatment. b) Manual / Cultural = Treat where feasible. c) Biological Control = None.
Advanced Infestation Watersheds Objectives: a) Contain the spread of target invasive plants (such as spotted knapweed, St. Johnswort and sulfur cinquefoil) that are more common in the project area by reducing seed transport along priority vector corridors and contact sites such as system trails, camps, airstrips, administrative sites and roads. b) Contain the spread of target invasive plants into and out of private inholdings within the Wilderness portion of the project area. c) Reduce the density and range of less common target invasive plants (such as oxeye daisy). d) Eradicate all target invasive plant species that are new to the project area. Treatment Prescription: a) Herbicide:

* Designated Treatment Areas: Treat up to 100% of known infestations in designated areas (including roads, trails, administrative sites, airstrips, etc.). * Dispersed Treatment Areas: No herbicide treatment. *Selway River camps and boat launch sites: No herbicide treatment. b) Manual / Cultural = Treat where feasible. c) Biological Control = None.

D. Alternative 4 – Bio-control Emphasis

- Use all currently approved methods.
- Inside SBW, manage weeds without using herbicides. Bio-control agents would be introduced and widely distributes in all currently infested areas to reduce spread rate of existing weed populations.
- Outside SBW. treatments same as Alternative 2.
- Provide designed/constructed stock grooming stations at Race Track, Gateway, and Paradise trailheads.

Acres of Manual/Cultural Treatment: Same as Alternative 1.
Acres of Herbicide Treatment: 996/year.
Designated and Dispersed Treatment Areas Outside Wilderness.
Acres of Bio-control Treatment: Up to 50,000 acres over project life.

Weed-Free Watersheds Objectives: Use prevention and education methods to reduce the potential for invasive plants to spread into weed-free areas. Treatment Prescription: a) Herbicide: None b) Manual / Cultural = Treat where feasible. c) Biological Control = None currently needed; evaluate and treat when needed.
Early Infestation Watersheds Objectives: a) Within Wilderness: Reduce the density and range of target invasive plant species currently present in the area. b) Outside of Wilderness: In addition to reducing the density and range of target invasive plant species currently present in the project area, eradicate all target invasive plants new to the project area. Treatment Prescription: a) Herbicide: * Designated Treatment Areas: No herbicide treatment within Wilderness. Treat up to 100% of known infestations in designated areas such as roads, trails, and trailheads leading into the Wilderness, within the project area. * Dispersed Treatment Areas: No herbicide treatment. b) Manual / Cultural = Treat where feasible. c) Biological Control = Treat all infestations capable of sustaining reproducing colonies of bio-

control agents.

Advanced Infestation Watersheds

Objectives:
a) Within Wilderness: Reduce the density and range of target invasive plant species currently present in the area.
b) Outside of Wilderness: In addition to reducing the density and range of target invasive plant species currently present in the project area, eradicate all target invasive plants new to the project area.

Treatment Prescription:
a) Herbicide:
* Designated Treatment Areas: No herbicide treatment within Wilderness. Treat up to 100% of known infestations in designated areas such as roads, trails, and trailheads leading into the Wilderness, within the project area.
* Dispersed Treatment Areas: No herbicide treatment.
b) Manual / Cultural = Treat where feasible.
c) Biological Control = Treat all infestations capable of sustaining reproducing colonies of bio-control agents.

E. Alternative 5 – Preferred Alternative, Expanded Treatment (Dispersed and Bio-controls)

- Use all currently approved methods.
- Expand areas proposed for treatment beyond Alternative 2. Treatment is constrained by unique sub-watershed herbicide thresholds as explained in the Design Criteria and the Water section of Chapter 3.
- Designated treatment areas include all trails and associated camps, trailheads, Selway River camps, administrative sites, airstrips, private land buffers, dams sites, etc., that are situated in currently infested areas. Also includes roads inside the project area but outside the Wilderness.
- Provides opportunity for more aggressive chemical treatment of new Invaders and new colonies of established invasive plant species in susceptible Dispersed Treatment areas. (Allows for treating future weed expansion and colonization in currently weed free areas or areas currently in the early infestation phase, weed condition categories I and II on Alternative maps.)
- Provide designed/constructed stock grooming stations at Race Track, Gateway, and Paradise trailheads.

  Acres of Manual/Cultural Treatment: Same as Alternative 1.
  Acres of Herbicide Treatment: 4125/year.
  Designated and Non-designated Treatment areas.
  Acres of Bio-control Treatment: Up to 50,000 acres over project life.

Weed-Free Watersheds

Objectives:
a) Eliminate starts of target invasive plant species that are present in the project area.
b) Eradicate all target invasive plant species that are new to the project area.

Treatment Prescription: a) Herbicide: Treat all areas, including trails, camps and high risk susceptible dispersed habitat types, as needed, as new invasive plants are discovered. b) Manual / Cultural = Treat where feasible. c) Biological Control = None currently needed; evaluate and treat when needed.
Early Infestation Watersheds Objectives: a) Reduce the density and range of target invasive plant species currently present in the project area. b) Eradicate all target invasive plants new to the project area. Treatment Prescription: a) Herbicide: * Designated Treatment Areas: Treat up to 100% of known infestations in designated areas (including roads, trails, administrative sites, airstrips, etc.). * Dispersed Treatment Areas: Treat all areas, including trails, camps and high-risk susceptible dispersed habitat types, as needed, as new invasive plants are discovered. b) Manual / Cultural = Treat where feasible. c) Biological Control = Treat all infestations capable of sustaining reproducing colonies of bio-control agents.
Advanced Infestation Watersheds Objectives: a) Contain the spread of target invasive plants (such as spotted knapweed, St. Johnswort and sulfur cinquefoil) that are more common in the project area by reducing seed transport along priority vector corridors and contact sites such as system trails, camps, airstrips, administrative sites and roads. b) Contain the spread of target invasive plants into and out of private inholdings within the Wilderness portion of the project area. c) Reduce the density and range of less common target invasive plants (such as oxeye daisy). d) Eradicate all target invasive plant species that are new to the project area. Treatment Prescription: a) Herbicide: * Designated Treatment Areas: Treat up to 100% of known infestations in designated areas (including roads, trails, administrative sites, airstrips, etc.). * Dispersed Treatment Areas: Treat all areas, including trails, camps and high-risk susceptible dispersed habitat types, as needed, as new invasive plants are discovered. *Selway River camps and boat launch sites: Treat up to approximately 70 sites, average of 1 acre each/yr. b) Manual / Cultural = Treat where feasible. c) Biological Control = Treat all infestations capable of sustaining reproducing colonies of bio-control agents.

All Action Alternatives Include:

- Updated public education plan/program.

- Internal policy requiring 48 hour enclosure in weed free facility, including feed, for all FS administrative stock.
- Use of education program to achieve voluntary compliance, by the public, with prevention measures including grooming and feeding weed-free feed for 48 hours prior to entering the wilderness.
- Use of Adaptive Management, Integrated Pest Management, and Minimum Tool strategies.

Summary Comparison of Proposed Herbicide and Bio-control Treatments

Table 2- 1: Acres Summary by Alternative

Note: Treatment acres are an estimate, not a constraint. Constraints are specified in each alternative and/or project design criteria.

Alt. No.	New Bio-Controls (Acres Over Project Life)	Designated and Dispersed Herbicide Treatment, Non-SBW (Acres/yr)	Designated Herbicide Treatment, SBW *** (Acres/yr)	Dispersed Herbicide Treatment, SBW (Acres/yr)	Total Herbicide Treatment (Acres/yr)	Herbicide Treatments w/in 100' of H2O (Acres/yr)
1 *	0	50	<20	0	<70	0
2**	10,000	996	1129	500	< 1500	358 +
3	0	945	861	0	1806	174
4	50,000	996	0	0	996	125
5	50,000	996	1129	2000	4125	558 +

*No new activities, beyond those currently authorized or permitted, are considered under the "No Action" Alternative.

**The Proposed Action is constrained to a total herbicide treatment of less than 1500 acres per year from all categories comprising the total acres identified in Alternative 2.

***Designated Herbicide Treatment Areas for Alternatives 2 & 5 include 70 acres of boating sites along the Selway River. Specific design criteria involving types of herbicides, their use and transport apply to these treatments.

+ The total includes Designated Treatment Areas and up to 10% of the Dispersed Treatments that may also occur w/in 100 feet of live water.

Mapped Features Included in Designated Herbicide Treatments Areas

- Roads – 60' Treatment Corridor.
- Trails – 40' Treatment Corridor.
- Administration Sites (3) – 10 acres per site.
- Trailheads (6) – 3 acres per site.
- Airstrips (2) – 10 acres Shearer and 40 acres Moose Creek
- Selway River Sites (~70) – Less than 1 acre each. 70 acres total.
- Private Land Parcels (2) – 100' perimeter treatment zone.
- Dams (18) – 10 acres per dam.

2.6.2 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

Prevention Emphasis Alternative

This alternative would focus primarily on prevention as the main method to manage invasive plant species within the project area. In addition to prevention measures already in place, it would require such

requirements as mandatory quarantine of all stock entering the wilderness, aggressive compliance enforcement, and Outfitter and Guide permit modifications. Secondary methods may include the use of mechanical means such as hand pulling.

This alternative was not considered in detail because, although prevention is a very important tool when integrated with other methods of treating invasive plant species, prevention alone would do little to contain established populations of weeds. It would do little to provide for eradication of new invaders. And, prevention would be limited to human related vectors. Weeds would continue to expand and be imported into the area by natural factors such as wide-ranging wildlife species (elk, deer, wolves, etc.), wind currents, and running water.

Mechanical/Cultural Emphasis Alternative
This alternative would focus on additional efforts using mechanical and cultural methods such as hand pulling, grubbing, hand site prep and planting of desirable species.

This alternative was not considered in detail because the measures indicated are already approved for use under Alternative 1, the No Action Alternative.

Reduce Human Use Alternative
This alternative would restrict human access to and use of the Wilderness to levels significantly below current use levels in order to decrease the vector potential associated with such activity.

This alternative was not considered in detail because current use is not considered to be high or excessive in the Selway Bitterroot Wilderness. Additionally, as mentioned under the Prevention Emphasis Alternative, above, this alternative would do little to provide for eradication of new invaders. And, prevention would be limited to human related vectors. Weeds would continue to expand and be imported into the area by natural factors such as wide-ranging wildlife species (elk, deer, wolves, etc.), wind currents, and running water.

Additionally, reducing human use, as a primary method for managing weeds in the project area was not specifically identified in the proposed action that was made available for public scoping nor was reducing human use or access to the wilderness below current levels raised as an issue by the public during scoping. Such measures, though having possibly positive as well as negative effects on weed management, have implications that go well beyond decision being considered in this analysis and are therefore beyond the scope of this analysis.

Maximum Allowable Herbicide Alternative
This alternative would allow herbicide treatment to the extent that overall environmental thresholds are approached. The acreage treated would vary by specific herbicide analyzed. Of the herbicides considered in this analysis, picloram presents the first environmental threshold, as described in the watershed section of Chapter 3. This analysis shows the maximum allowable number of acres that could be treated in each watershed. When summed, that acreage amounts to approximately 8,000 acres, considerably more than the maximum acreage analyzed, in detail, in Alternative 5.

Thresholds for other herbicide formulations analyzed for this project pose less of an environmental risk and therefore allowable acreages would be greater than for picloram.

This alternative was not analyzed in detail because, due to its size combined with terrain limitations in the project area, effective implementation using ground application methods would exceed the foreseeable logistical capability of the forest service. Also, an alternative of such magnitude was considered unnecessary to meet the objectives of this project at this time.

Treat Aquatic Invasive Plants
Montana and Idaho share similar concerns about the spread of aquatic invasive plants. Both states have developed Aquatic Nuisance Species Management Plans that recognize the "threat to the ecological integrity of forests, grasslands and waterways" posed by exotic species (Montana ANS Management Plan 2002).

Aquatic vascular plants include ferns and flowering plants that grow submersed in water, float on the water surface, or have basal portions inundated with foliage and upper parts immersed. Hydrilla (Hydrilla verticillata), Eurasian watermilfoil (Myriophyllum spicatum), Saltcedar (Tamarisk spp) and purple loosestrife (Lythrum salicaria) are well known example of how invasive plants can alter the physical and biological functions of aquatic systems. Their collective impacts include: reduction of wildlife cover and habitat; drying up of lakes, ponds, wetlands and lotic (flowing) systems; and degrading water quality and fish habitat.

While these plants may become a management concern within the project area in the future, there are currently know known populations of aquatic invasive plants within the project area. This alternative may be considered in the future when it is more timely.

2.7 INVASIVE PLANT MANAGEMENT CONSIDERATIONS

2.7.1 INVASIVE PLANT SPECIES CONSIDERED A THREAT TO THE SBW

Invasive plant species that are considered to be a threat to the Selway Bitterroot Wilderness and the project area, as a whole, are listed in Table 1.0 in Chapter 1 of this document.

2.7.2 MANAGEMENT STRATEGIES

The three primary strategies that would be used to achieve the overall purpose of this project are Adaptive Management, Integrated Weed Management, and Minimum Tool. These strategies are explained in Chapter 1 and, with greater detail, in the Appendices section of this document. A brief summary is provided below:

A. Adaptive Management

An adaptive management strategy is proposed that supports early detection, rapid response and eradication of new invaders along with the containment of established weed populations. This strategy would allow the following actions:

- A rapid response with the use of chemical herbicides on small newly detected infestations of new or uncommon invaders wherever these sites are discovered within the priority areas of operation analyzed in the proposal.
- The use of newly approved herbicides (according to label restrictions) and biological control agents
- The addition of new invasive species to the list of targeted weeds to stay in compliance with State and County noxious weed laws.

B. Integrated Weed Management

Integrated weed management as defined by Sheley *et al*. (1999) is the "application of many kinds of technologies in a mutually supportive manner. It involves the deliberate selection, integration and implementation of effective weed control measures with due consideration of economic, ecological, and sociological consequences."

C. Minimum Tool

When planning necessary actions, managers would utilize the minimum methods necessary to accomplish the management objectives.

Parameters considered when selecting minimum tools include species biology, infestation size, proximity to water and recreation sites, and extent of susceptible habitats adjacent to infestations. Methods would include manual, biological, or chemical control. For example, if all of these methods were equally effective in controlling a particular species or infestation, the least impactive method would be employed. Hand pulling or grubbing is effective for some species but not for others, such as deeply rooted species. In many situations herbicide use may be the only effective control and thus the minimum tool.

2.7.3 Invasive Plant Management Objectives

To meet the overall purpose of the project, all action alternatives would employ the Adaptive Management, Integrated Weed Management, and Minimum Tool strategies to implement a variety of treatment methods that best achieve the following objectives within the alternative-specific constraints.

Prevention
Prevent or reduce the introduction of new invasive plant species into the project area or the spread of existing invasive plant species into areas of the project currently unoccupied by such species.

Reduction (Suppression)
Reduce the site-specific presence or uncontrolled effects of weeds or other vegetation for a specific purpose other than containment or eradication, e.g. mowing or spraying weeds on an airstrip for safety purposes or pulling or spraying weeds in a campsite to improve usability. Note: The effects of reduction are generally short-term or seasonal in duration.

Containment
Contain the expansion of invasive plants to limit the population size and/or to prevent colonization of new areas.

Eradication
Eradicate small populations of invasive plants (primarily applied to new invaders) in order to eliminate the possibility of reproduction and expansion within the project area.

Elimination
Eliminate satellite or isolated colonizing populations of established invasive plants in order to contain established populations within objective boundaries.

2.7.4 Invasive Plant Treatment Methods and Costs

Table 2- 2: Compares the Relative Limitations, Management Effectiveness, and Approximate Costs of the Weed Management Methods used in the Analysis

Methods	Limitations	Management Effectiveness[1]	Approximate Cost/Acre
CULTURAL			
Seeding	Environmental limitations; cannot be conducted on steep, remote, rocky sites; causes ground disturbance which may increase likelihood of re-invasion; most effective after weed populations have been reduced by other control actions.	Not able to estimate	$100 to $300 Average $250
MECHANICAL			
Mowing	Limited to smooth gentle slope; treatment timing critical; impact on non-target vegetation	Low cost / low effectiveness	$200
Hand pulling/ Grubbing	Labor intensive; not effective on deep-rooted or rhizomatous perennial; causes ground disturbance which may increase susceptibility of site; effective on single plants or small low-density infestations.	High cost/ low effectiveness	$400
BIOLOGICAL			
Parasites, Predators and Pathogens	Does not achieve eradication; effective only on one species, only a few weeds with available agent; most agents not effective by themselves need multiple agents.	Moderate cost/ moderate effectiveness	$10 - Highly variable due to rates of population expansion by each agent type
HERBICIDES			
Ground Application	Not cost effective on slopes greater than 40 percent; must have accessible sites; potential impacts to non-target vegetation; application timing limited based on plant phenology and weather conditions.	Low cost/ moderate to high effectiveness	$30 –Vehicle. $125 –Backpack, $50 – ATV, $65 – Horse Average $100
WEED PREVENTION			
All Methods	Not effective on existing infestations; ineffective if not enforced	Not measurable	

Notes: [1]Percent of target species killed in a treatment area: High = 75 to 100 percent; Moderate = 46 to 75 percent; Low = 25 to 45 percent; Very Low = 0 to 24 percent.
Not measurable – means the cost/effectiveness is not measurable or quantifiable.

2.8 DESIGN CRITERIA

The following table outlines the project design criteria (protection measures). This list is not all-inclusive as the Forest Plan standards are incorporated by reference.

Project design criteria are linked to specific alternatives or sub-sets of alternatives and would be applied prior to or during activity implementation to reduce or prevent potential impacts to resources and values.

Table 2- 3: Design Criteria (Protection Measures)

Design Criteria	Objective, Effectiveness, and Basis for Rating	Applied to Alternatives(s)
Herbicide Use		
(H1) Operators shall calibrate spray equipment at regular intervals (approximately after every 80 to 160 hours of use) to ensure proper rates of herbicide applications.	Control Application Rates; Moderate effectiveness (Logical –check equipment); Monitor – equipment for wear	2, 3, 4, & 5
(H2) Herbicides will be used in accordance with label instructions and restrictions. Application will be done or supervised by licensed applicators.	Ensure responsible application of herbicide; Moderate effectiveness Monitor –Daily Pesticide Application Record or similar database.	2, 3, 4, & 5
(H3) Herbicide applicators shall carry spill containment equipment, be familiar with and carry an Herbicide Emergency Spill Plan. A spill cleanup kit will be available at temporary storage sites and with all transportations (vehicles, raft, plane, mules) carrying herbicides.	Ensure responsible application of herbicide; High effectiveness (Professional experience)	2, 3, 4, & 5
(H4) Equipment used for transportation, storage, or application of herbicides shall be maintained in leak proof condition. When transporting chemicals on raft, chemical containers would be triple wrapped.	Prevent spillage in rafts that may come into contact with humans or may directly enter surface waters. High Effectiveness, Practical experience.	2, 3, 4, & 5
(H5) Chemicals will not be used over live water (streams, ponds, springs, etc.), including water standing or running in ditch lines.	Prevent contact with open water. High effectiveness. Logic.	2, 3, 4, & 5
(H6) Procedures for mixing, loading, and disposal of herbicides and a spill plan will be followed. All herbicide storage, mixing, and post-application equipment cleaning is completed outside of riparian habitat conservations areas (RHCAs). If no other alternative is available, mixing and loading operations must take place in an area where an accidental spill would not contaminate a stream or body of water before it could be contained. Particular attention would be given to avoiding mixing, loading, or cleaning within 100 feet of live water. These procedures are outlined in Appendix A and B as well as categories and descriptions of RHCAs. Drafting equipment used for filling herbicide spray tanks will be equipped with appropriate back-siphoning prevention devices.	Avoid impact to sensitive plants and non-target aquatic species. High effectiveness Professional experience.	2, 3, 4, & 5
(H7) No spraying of herbicides would occur from a boat/raft.	Prevent contact with open water. High effectiveness. Logic.	2, 3, 4, & 5
(H8) Additional herbicides may be considered for use within the project area in the future. Only EPA registered herbicides having a completed Human Health and Ecological Risk Assessment Final Report will be considered for use.	Assure product safety. High effectiveness. EPA Studies.	2, 3, 4, & 5
(H9) In public recreation areas (such as developed campgrounds, and trailheads) post treated area until the area is safe to re-enter.	Inform public and reduce exposure; High effectiveness (Logical – prevent exposure)	2, 3, 4, & 5

Design Criteria	Objective, Effectiveness, and Basis for Rating	Applied to Alternatives(s)
(H10) The Annual Plan of Operations for herbicide application will be reviewed by an interdisciplinary team that includes, at a minimum, hydrology and or fisheries biology, botany, and wildlife biology skills. The review will take place prior to implementation to ensure the protection of native flora and fauna and to ensure that herbicide thresholds, as described in the Water section of Chapter 3, are not exceeded.	Provide for annual, pre-application oversight. High effectiveness. Coordination.	2, 3, 4, & 5
Surfactants		
(H11) Surfactants are proposed for use with the same mitigation as picloram. Only those labeled for use in and around water will be used within 50 feet of water, or the edge of subirrigated land, whichever distance is greater, or on high run-off areas. Some surfactants are labeled for use in and around water such as: Activate Plus ®, LI-700 ®, Preference ®, R-11 ®, Widespread® and X-77®. Use of POEA (used in **Roundup**) and NPE-based surfactants is prohibited within 100 feet of water to protect amphibians.	Protect Aquatic Resources; High effectiveness Prior testing.	2, 3, 4, & 5
Dyes		
(H12) Water-soluble colorants, such as Hi-Light® blue dye, will be used in some situations to enable applicators and inspectors to better see where herbicides has been applied.	Safe handling of herbicide; High effectiveness (Logical – visible)	2, 3, 4, & 5
Biological Controls		
(B1) Biological agents will not be released until screened for host specificity and approved by the USDA Animal Plant Health Inspection Service.	Minimize injury to non-target species; Highly effective (Logical – tested prior to approval)	2, 4, & 5
Adjacent Land		
(L1) In cooperation with federal, state, county agencies and private landowners, weeds on non-Forest Service land may be treated when adjacent to national forest lands within the project boundary. Decisions regarding the treatment methods will be negotiated between the Forest Service and the other owner/agency.	Prevent weeds from spreading onto FS land; Moderate effectiveness (Professional experience); Monitor results in weeds database	2, 3, 4, & 5
Cultural Resources		
(C1) Yearly assess potential affects to historic properties by reviewing the annual weed treatment operating plan. Mechanical/cultural treatments, that would disturb the soil, will not be used on any known historical or archaeological site without proper clearances by a Forest Archaeologist.	Protect Cultural Resource sites; High effectiveness (Logical – avoids impact to area)	2, 3, 4, & 5
Tribal Coordination		
(T1) The Annual Plan of Operations for herbicide application will be provided to the Nez Perce Tribe and the Confederated Salish and Kootenai Tribes of the Flathead Nation prior to implementation.	To protect treaty resources that may only be known to tribal members. Moderate to high effectiveness depending on level of response.	2, 3, 4, & 5
Aquatic		
(A1) Herbicides will not be used to control weeds within a 100-foot radius of any potable water spring development or diversion within the project area.	Protect aquatic resources and ground water; High effectiveness Application standards.	2, 3, 4, & 5

Design Criteria	Objective, Effectiveness, and Basis for Rating	Applied to Alternatives(s)
(A2) No ester formulations of herbicides will be used (i.e., 2,4-D ester, triclopyr-BEE), due to relatively high fish toxicity.	Protect aquatic resources; High effectiveness. Avoids potentially harmful exposure.	2, 3, 4, & 5
(A3) Herbicides and surfactants used within 100' of surface water or wetlands will meet the requirements defining chemical type and environmental conditions identified in the RHCA Chemical Use Restrictions Chart, at the end of this section.	Protect aquatic resources and ground water; High effectiveness. Practical experience.	2, 3, 4, & 5
(A4) Limit application of herbicide chemicals to below 1/20 of the Lethal Concentration (LC50), or No Observed Effect Level/Concentration (NOEL/NOEC) as determined by watershed annually (Appendix I).	Protect aquatic resources High Effectiveness Avoids potentially harmful exposure.	2, 3, 4, & 5
Soils		
(S1) At maximum of 1.0 pounds/acre of Picloram, spot treatment only, no more that 50% of any treated acre (USDI-EPA 1995a).	Protect Soil Resources Avoids potentially harmful exposure.	2, 3, 4, & 5
Wildlife		
(W1) As part of the annual pre-season interdisciplinary coordination process, District/Forest wildlife biologists will provide applicators maps of known raptor nesting areas, wolf homesites, or other critical wildlife areas that may be affected by weed control activities, to ensure the protection measures described in this report are implemented properly. In addition, wildlife specialists will provide tools and training to applicators to assure that the risks from herbicide applications, particularly in riparian areas, are minimized with respect to amphibians and aquatic associated herptiles, including western toads, tailed frogs, Pacific tree frogs, spotted frogs, Coeur d'Alene salamanders, Idaho Giant salamanders, painted turtles, rubber boas, and western terrestrial and common garter snakes.	Ensure weed staff have current wildlife information; Moderate Effectiveness (Professional experience); Monitor – document meeting	2, 3, 4, & 5
(W2) When ground application of authorized herbicides (See RHCA Chemical Restriction Table 2.5, below) is necessary within 50 feet of a water body, wetland, or river beach, surveys of the treatment area by applicators, at time of application, will be required to determine potential presence of amphibians and aquatic associated herptiles, including western toads, tailed frogs, Pacific tree frogs, spotted frogs, Coeur d'Alene salamanders, Idaho Giant salamanders, painted turtles, rubber boas, and western terrestrial and common garter snakes. If adult amphibians or aquatic associated herptiles are identified, the broadcast spraying application method will not be used. The extent of species population distribution within the treatment area will be reported to the district amphibian specialist (fisheries or wildlife biologist) as soon as possible. If treatment is not possible without directly spraying individuals, then hand pulling or wick application will be employed, or treatment will be deferred upon advisement of amphibian specialist.	High effectiveness with training and diligence of applicator. Avoids potentially harmful exposure. High Effectiveness	2,3,4,& 5

Design Criteria	Objective, Effectiveness, and Basis for Rating	Applied to Alternatives(s)
If tadpoles or metamorphs of amphibian species are identified, the location will be reported to the amphibian specialist and weed coordinator as soon as possible, and application of herbicides will be delayed until metamorphs disperse.		
(W3) Avoid directly spraying any terrestrial organism other than invasive plant species, including snakes, lizards, salamanders, small mammals, ground nesting birds, and insect concentrations such as ladybug swarms. If treatment is not possible without directly spraying individuals, then hand pulling or wick application will be employed.	Reduce potential for incidental contact of spray compounds with non-target species of concern. Moderate effectiveness due to tendency for some species to hide under rocks and debris. Practical experience.	2, 3, 4, & 5
(W4) Avoid weed treatment operations when and where reproduction is occurring, including elk calving, bighorn sheep lambing, carnivore denning, and bird nesting sites.	Reduce potential for disturbing wildlife during critical periods. High effectiveness. Practical experience.	2, 3, 4, & 5
(W5) Activities associated with weed control will avoid areas within 400 meters of active bald eagle or peregrine falcon nest sites until getting further direction from the Wildlife Biologist. (Note: No such nests are currently known to exist within the project area.)	Minimize impact to nesting eagles; High effectiveness (MT Bald Eagle Working Group. 1994. page 24)	2, 3, 4, & 5
(W6) Food, garbage, and human waste associated with project implementation work crews will be properly managed so as not to attract or habituate wildlife. Crew camps will be located to avoid disturbance to wildlife in reproductive sites during active reproductive periods, including calving and lambing areas, raptor nesting and carnivore den sites.	Minimize human effects on wildlife. High effectiveness. Practical experience.	2, 3, 4, & 5
(W7) Noise levels from spray equipment motors will be low and should not cause significant disturbance to wildlife.	Moderate depending on equipment and diligence of applicators.	2, 3, 4, & 5
(W8) Chemical application is prohibited where amphibian breeding activity is occurring.		2, 3, 4, & 5
(W9) Chemical application is prohibited within 300 feet of all sites where northern bog lemmings are known to occur, as well as peatland sites not yet surveyed for northern bog lemmings, pending review and approval by the Forest Wildlife Biologist.	Protect Bog Lemmings. Avoids potentially harmful exposure. High Efffectiveness Based on research,	2, 3, 4, & 5
Sensitive Plants		
(SP1) Consult with district/forest botanist each year for updates to species-specific protection measures, before any site applications begin.	Avoids potentially harmful exposure. M-H Effectiveness	2, 3, 4, & 5
(SP2) All treatment sites would be evaluated for sensitive plant habitat suitability. Highly suitable habitat would be surveyed as necessary prior to treatment.	Avoids potentially harmful exposure. M-H Effectiveness	2, 3, 4, & 5

Design Criteria	Objective, Effectiveness, and Basis for Rating	Applied to Alternatives(s)
(SP3) Provide the weed crew with maps of all known sensitive plant locations so that these sites can be identified and protected.	Avoids potentially harmful exposure. M-H Effectiveness	2, 3, 4, & 5
(SP4) Train the weed crew to identify sensitive plants so that new sites can be identified and protected.	Avoids potentially harmful exposure. M-H Effectiveness	2, 3, 4, & 5
(SP5) Botanist would provide Site-specific treatment guidelines for weed infestations within or adjacent to known sensitive plant populations.	Avoids potentially harmful exposure. M-H Effectiveness	2, 3, 4, & 5
(SP6) No spraying with vehicle-based spraying devices would be done within 50 feet of any known sensitive plant occurrence.	Avoids potentially harmful exposure. Moderate Effectiveness	2, 3, 4, & 5
(SP7) No chemical spraying would be done within 25 feet of any known sensitive plant occurrence, only mechanical treatment would be used.	Avoids potentially harmful exposure. M-H Effectiveness	2, 3, 4, & 5
General Wilderness		
(G1) Livestock and equipment used for conducting project activities would be properly cleaned prior to entering the project area to prevent possible importation of weed seeds from outside the area.	Prevent Weed Introductions. M-H effectiveness Personal Experience	2, 3, 4, & 5
(G2) Areas with bare soil and areas proposed for cultural treatments would be monitored to assess need for revegetation. Revegetation would be considered for treated sites where vegetation density is low enough to allow re-infestation or introduction of target invasive plant species. Only native seed mixes would be used.	Restore native ground cover. M-H Effectiveness Practical Experience	2, 3, 4, & 5
(G3) The public would be notified of herbicide use and locations by signing at entry portals and at the location of the activity. A starting and ending date for the activity will be included on the sign allowing visitors to choose to go elsewhere if they desire. Forest web sites would maintain current information during the field season and press releases would also serve to notify potentially affected users.	Keep public informed. Minimize potential encounters between visitors and weed crews. High effectiveness.	2, 3, 4, & 5
(G4) Wilderness rangers hitch plans will be coordinated, where possible, to cover the drainages where the weed management work will be happening to conduct monitoring work as well as answer any questions or concerns visitors may have.	Maintain communication with Wilderness visitors. Provide feedback to Wilderness managers. High Effectiveness Based on past experience.	2, 3, & 5

Table 2- 4: RHCA Chemical Use Restrictions

Distance from live water	Maximum allowable wind speed	Application Activity	Herbicides Authorized
0 feet	N/A	Chemicals will not be used over live water (streams, ponds, springs, etc.), including water standing or running in ditch lines.	None

Distance from live water	Maximum allowable wind speed	Application Activity	Herbicides Authorized
		No broadcast spraying of any herbicide within 100 ‘ of water.	
0-15 feet	**5 mph** and blowing away from the direction of the water	Spot applications only, such as: Spot spraying, wicking, wiping, dripping, painting, or injecting of individual plants with aquatically approved chemicals. **No broadcast spraying** Apply spray pointed away from the water, not towards the water.	**Aquatically approved chemicals:** **Glyphosate** (Rodeo)
15 – 100 feet	**5 mph** and blowing away from the direction of the water	Spot applications only, such as: Spot spraying, wicking, wiping, dripping, painting, or injecting of individual plants with aquatically approved chemicals. Focused spraying of target species with aquatically approved chemicals– may include treating larger patches of weeds or multiple patches in close proximity. **No broadcast spraying** Apply spray pointed away from the water, not towards the water.	**Aquatically approved chemicals:** **Glyphosate** (Rodeo) **Triclopyr-TEA** (Garlon 3A) **Aminopyralid** (Milestone) **Metsulfuron methly** (Escort) **Clopyralid** (Transline) **Dicamba** (Banvel, Vanquish, Clarity) **2,4-D amine** (Weedone, Weedar, Savage)
50 – 100 feet	**5 mph**	Spot applications only, such as: Spot spraying, wicking, wiping, dripping, painting, or injecting of individual plants. **No broadcast Spraying**	All chemicals listed above, as well as **Picloram**.
100-300 feet	**Less than 10 mph**	Spot applications only, such as: Spot spraying, wicking, wiping, dripping, painting, or injecting of individual plants. **No broadcast Spraying**	**2,4-D/Clopyralid Blend** (Curtail) **Glyphosate** (Roundup) **Clopyralid** (Transline) **2,4-D amine** (Weedone, Weedar, Savage) **Dicamba** (Banvel, etc.)

*Proposed application rates for each herbicide (pounds/acre) can be found in Appendix I

2.9 MONITORING

A monitoring program would be incorporated as part of the adaptive management approach. Monitoring is the collection of data to determine effectiveness of management actions in meeting prescribed objectives. Monitoring would focus on the: 1) density and rate of spread of invasive exotic plant species and the effect these aggressive plants have on natural resources, 2) effect of herbicides on noxious weeds and desirable vegetation, 3) effectiveness of biological control agents, 4) effect of cultural weed management activities, and 5) effects of herbicides on surface water quality.

Citizen Monitoring

A citizen monitoring team would be established and invited to participate in monitoring weed treatment projects. They would be asked to review project implementation and monitoring data.

Water Quality
Under Alternatives 2, 3, and 5, the project hydrologist or fish biologist would review the annual program of work and select sensitive water resources (streams, lakes, wetlands) to monitor.

Vegetation
Under all action alternatives, vegetation plots would be established prior to treatment in a representative sample of all treatment methods to determine species composition, frequency, and cover. The plots would be remeasured at one, three, and five years after treatment.

Sensitive Plants
Under all action alternatives, sensitive plant populations would be inventoried prior to weed treatment and a follow-up inventory would be conducted post-treatment to identify and document non-target damage. Monitoring plots may be established to coincide with vegetation monitoring. The combination of inventory results would be used to adjust buffer widths on sensitive plant populations.

Heritage Resources
Under Alternatives 2, 3, and 5, vegetation resources with cultural significance (peeled trees, cultural plant collection areas) would be inventoried prior to weed treatment and a follow-up inventory would be conducted post-treatment to identify and document non-target damage. The combination of inventory results would be used to adjust buffer widths on heritage plant populations.

Wilderness Resources
Forest Service wilderness rangers will provide additional on-site monitoring during project work to ensure wilderness and resource protection standards are met at sites with the project area. The wilderness ranger will provide feedback to ensure project work meets protection standards, including those in the Selway Bitterroot General Management Direction documents. The recently adopted national framework for monitoring wilderness character will be utilized (RMRS-GTR-151, April 2005).

Evaluation
Under all alternatives, the noxious weed treatment program would be evaluated and results made public.

2.9.1 PROGRAM ADAPTATION

An annual evaluation of the monitoring results will indicate where adjustments need to be made in the program.

New infestations or growth of existing infestations would be evaluated to determine if they fit within the scope of the analysis relative to issues and potential effects of treatment.

In addition to increasing the potential area proposed for treatment, new biological controls would also be considered once federal approval is provided. All design criteria described above, in this chapter, would also apply to treatments occurring on new infestations.

2.10 CONSISTENCY WITH FOREST PLANS

All of the alternatives considered in detail are consistent with management direction contained in the Forest Plans, as amended, of the Lolo, Nez Perce, Bitterroot, and Clearwater National Forests.

2.11 AGENCY PREFERRED ALTERNATIVE

Alternative 5, the Preferred Alternative, was developed in response to public input and in recognition of the fact that an aggressive and responsive approach would be needed to contain established populations of invasive plants within currently infested watersheds and to eradicate new invaders as they are discovered in the project area. Of the alternatives considered, Alternative 5 best addresses the basic purpose and need for the project while providing for the maintenance of Wilderness character, overall. This alternative is consistent with existing management direction contained in the Forest Plans for the Nez Perce, Clearwater, and Bitterroot National Forests and all elements comprising the regulatory framework of the project.

2.12 SUMMARY COMPARISON OF ALTERNATIVES

Table 2- 5: Cost/Effectiveness Summary by Alternative

Note: Treatment acres are an estimate, not a constraint. Constraints are specified in each alternative and/or project design criteria.

Alt. No.	Mechanical/ Cultural Treatments (Acres/yr)	Bio-Control Treatments (Acres Over Project Life)	Total Herbicide Treatment (Acres/yr)	Total Estimated Costs * ($/yr)	Overall Effectiveness Meeting Project Objectives for Invasive Plants (H/M/L)**
1	<100	0	< 70	$35,000	L
2	<100	10,000	< 1500	$152,000	M
3	<100	0	1806	$160,000	L/M
4	<100	50,000	996	$160,000	L/M
5	<100	50,000	4125	$383,000	H

Inventory and monitoring costs are estimated to be approximately ten percent of the total costs and are included.

** Effectiveness rating is relative within the range of alternatives considered in detail.

Table 2- 6: Alternative Summary Related to Major Issues

Primary Issues	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Maintaining Wilderness Character (Remoteness & Solitude)	Opportunities for remoteness and solitude would be **maintained** at current levels**.**	The potential for social encounters would slightly increase in **Designated treatment areas** and **Dispersed treatment areas**. Opportunities for remoteness and solitude would be **maintained** within acceptable levels.	The potential for social encounters would slightly increase in **Designated treatment areas.** Opportunities for remoteness and solitude would be **maintained** within acceptable levels.	The potential for social encounters would slightly increase in heavily infested portions of the SBW. Potential for visitor/weed-worker encounters is greater than Alt.1 but less than Alts 2, 3, & 5. Opportunities for remoteness and solitude would be **maintained** within acceptable levels	The potential for social encounters would slightly increase in **Designated treatment areas** and **Dispersed treatment areas**. Potential for visitor/weed-worker encounters is greatest for this alternative. Opportunities for remoteness and solitude would be **maintained** within acceptable levels.
Maintaining Natural Ecosystems/ Natural Integrity	**Wilderness:** Threat level to natural ecosystems remains high in all susceptible portions of the SBW.	**Wilderness**: **Advanced Infestation Areas**: Invasive plants are contained. Bio-controls introduced. **Early Infestation Areas:** Invasive plants are reduced or eliminated. Natural integrity is restored or maintained. **Weed Free Areas:** Invasive plants are eradicated. Natural integrity is protected.	**Wilderness**: **Advanced Infestation Areas**: Invasive plants are reduced in high use areas. **Early Infestation Areas:** Invasive plant populations would likely expand. **Weed Free Areas:** Invasive plant populations would likely become established and expand.	**Wilderness**: Bio-controls introduced. Rate of invasive plant expansion to all susceptible portions of the SBW would be reduced. Intensity of infestations would be reduced. Threat of natural integrity loss in all susceptible habitats throughout SBW would remain high.	**Wilderness**: **Advanced Infestation Areas**: Invasive plants are contained. Bio-controls introduced. **Early Infestation Areas:** Invasive plants are reduced or eliminated. Natural integrity is restored or maintained. **Weed Free Areas:** Invasive plants are eradicated. Natural integrity is protected.

Primary Issues	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
	Non-Wilderness: Threat level to natural ecosystems remains high.	**Non-Wilderness:** **Advanced Infestation Areas**: Invasive plants are contained. Bio-controls introduced. **Early Infestation Areas:** Invasive plants are reduced or eliminated. Natural integrity is restored or maintained.	**Non-Wilderness:** **Advanced Infestation Areas**: Invasive plants are contained. Bio-controls introduced. **Early Infestation Areas:** Invasive plants are reduced or eliminated. Natural integrity is restored or maintained.	**Non-Wilderness:** **Advanced Infestation Areas**: Invasive plants are contained. Bio-controls introduced. **Early Infestation Areas:** Invasive plants are reduced or eliminated. Natural integrity is restored or maintained.	**Non-Wilderness:** **Advanced Infestation Areas**: Invasive plants are contained. Bio-controls introduced. **Early Infestation Areas:** Invasive plants are reduced or eliminated. Natural integrity is restored or maintained.
Effects on Human Uses	All current human uses would continue to be affected by presence and expansion of invasive plants throughout the project area. Current education & prevention would remain unchanged.	1. Visitors would notice increased emphasis on education & prevention. 2. Visitors would notice signs at trailheads identifying areas where herbicides are being used. 3. Visitors may be restricted from certain, localized, areas during spray operations. 4. Visitors would notice a reduction in weeds at high use areas.	1. Visitors would notice increased emphasis on education & prevention. 2. Visitors would notice signs at trailheads identifying areas where herbicides are being used. 3. Visitors may be restricted from certain, localized, areas during spray operations. 4. Visitors would notice a reduction in weeds at high use areas with lesser change noticeable at Selway River camps.	**Wilderness:** 1. Visitors would notice increased emphasis on education & prevention. 2. Weeds would remain, possibly at slightly reduced levels in high use areas, expanding in remote areas. **Non -Wilderness:** 1. Visitors would notice increased emphasis on education & prevention. 2. Visitors would notice signs at trailheads identifying areas where herbicides are being used. 3. Visitors may be restricted from certain, localized, areas during spray operations. 4. Visitors may notice a slight reduction in weeds at high use areas.	1. Visitors would notice increased emphasis on education & prevention. 2. Visitors would notice signs at trailheads identifying areas where herbicides are being used. 3. Visitors may be restricted from certain, localized, areas during spray operations. 4. Visitors would notice a reduction in weeds at high use areas.

Primary Issues	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Extent and Priority of Treatment Areas	**Wilderness:**	**Wilderness:** Trail corridors and high use areas treated w/herbicides to reduce spread by contact. Bio-controls in advanced infestations. Remote areas w/ low weed densities treated w/ herbicides to remove or reduce populations.	**Wilderness:** Trail corridors and high use areas treated w/herbicides to reduce spread by contact. No bio-controls. No use of herbicides in remote areas other than Designated Areas. No herbicides w/in 50 feet of water.	**Wilderness**: Bio-controls in areas of Advanced Infestation. No new use of herbicide.	**Wilderness:** Trail corridors and high use areas treated w/herbicides to reduce spread by contact. Bio-controls in advanced infestations. Remote areas w/ low weed densities treated w/ herbicides to remove or reduce populations.
	Non-Wilderness:	**Non-Wilderness:** Trail corridors, roads, and high use areas treated w/herbicides to reduce spread by contact. Bio-controls in advanced infestations.	**Non-Wilderness:** Trail corridors, roads, and high use areas treated w/herbicides to reduce spread by contact. No herbicides w/in 50 feet of water.	**Non-Wilderness:** Trail corridors, roads, and high use areas treated w/herbicides to reduce spread by contact. Bio-controls in advanced infestations.	**Non-Wilderness:** Trail corridors, roads, and high use areas treated w/herbicides to reduce spread by contact. Bio-controls in advanced infestations.
Effectiveness of Treatment Methods and Strategies	**Low**	**Moderate**	**Low – Moderate** (Low effectiveness in Early Infestation and Weed Free areas of the SBW and riparian areas.)	**Low – Moderate** (Low effectiveness in Early Infestation and Weed Free areas of the SBW)	**High**

2.13 MAPS OF ALTERNATIVES

Selway Bitterroot Invasive Plants Management Project
Alternative 2

Bio Control - 10,000 Acres
Total Herbicide Treatment - Less than 1,500 Acres/year

Lolo Cr
Lolo Cr, E Fk
One Horse Cr
Lochsa River
Big Cr
Fred Burr Cr
Sponge Creek
Wilderness Gateway
Fish Lake Airstrip
Elk Summit
Big Sand Creek
Blodgett Trailhead
Old Man Creek
East Fork Moose Creek
Lost Horse Cr
Lost Horse
Moose Cr. R.S.
Bear Creek
Rock Cr
Selway Falls
Marten Creek
White Cap Creek
Paradise
Indian Creek
Selway River
Storm Creek
Sabe Creek

Weed Infestations
Project Area
Trails
Wilderness Boundary

Watershed Condition
I - Weed Free
II - Early Infestation
III - Advanced Infestation

Designated Herbicide Treatments
Dispersed Treatment
Road / Trail Corridor
Airstrip
Administrative Sites
Trailhead
Dam
Selway River Camps

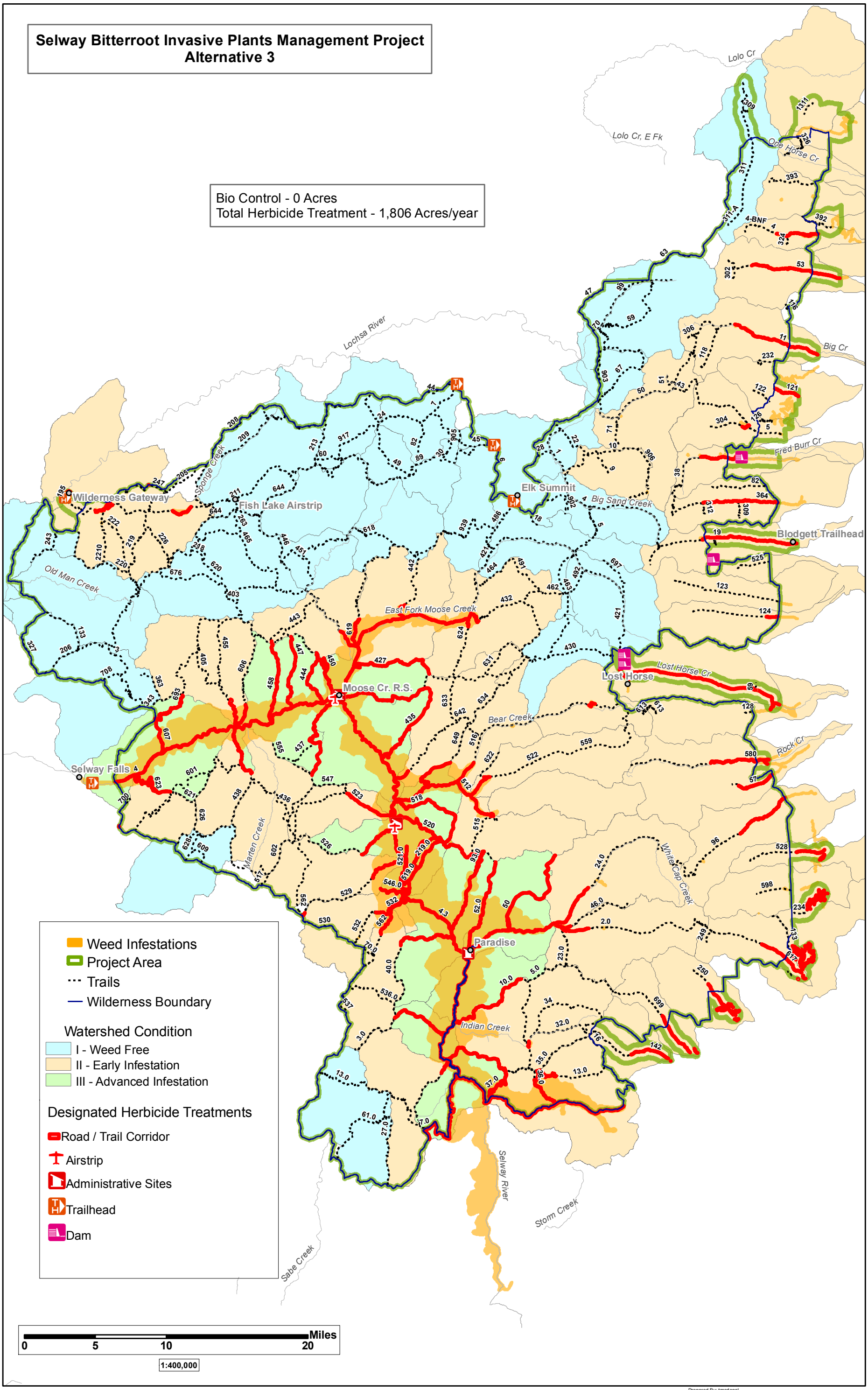
Selway River Camps -
The symbols for Selway River camps in this map are not intended to be accurate as to geographic location or number. Rather, the symbols are intended to convey that there are a series of river camps along the watercourse which will be included as treatment sites.

0 5 10 20 Miles
1:400,000

Prepared By: tmcdonal
Printing Date: 22 February 2008
File: J:\fsfiles\office\forest_projects\sbw_invasives\maps\prep_alts_deis_final.mxd

Selway Bitterroot Invasive Plants Management Project
Alternative 3

Bio Control - 0 Acres
Total Herbicide Treatment - 1,806 Acres/year



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Printing Date: 22 February 2008
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Selway Bitterroot Invasive Plants Management Project
Alternative 4

Bio Control - 50,000 Acres
Total Herbicide Treatment - 996 Acres/year

Lolo Cr
Lolo Cr, E Fk
One Horse Cr
Big Cr
Lochsa River
Fred Burr Cr
Big Sand Creek
Blodgett Trailhead
Elk Summit
Wilderness Gateway
Fish Lake Airstrip
Sponge Creek
Old Man Creek
East Fork Moose Creek
Lost Horse Cr
Lost Horse
Moose Cr. R.S.
Bear Creek
Rock Cr
Selway Falls
Marten Creek
Whitecap Creek
Paradise
Indian Creek
Selway River
Storm Creek
Sabe Creek

Weed Infestations
Project Area
Trails
Wilderness Boundary

Watershed Condition
I - Weed Free
II - Early Infestation
III - Advanced Infestation

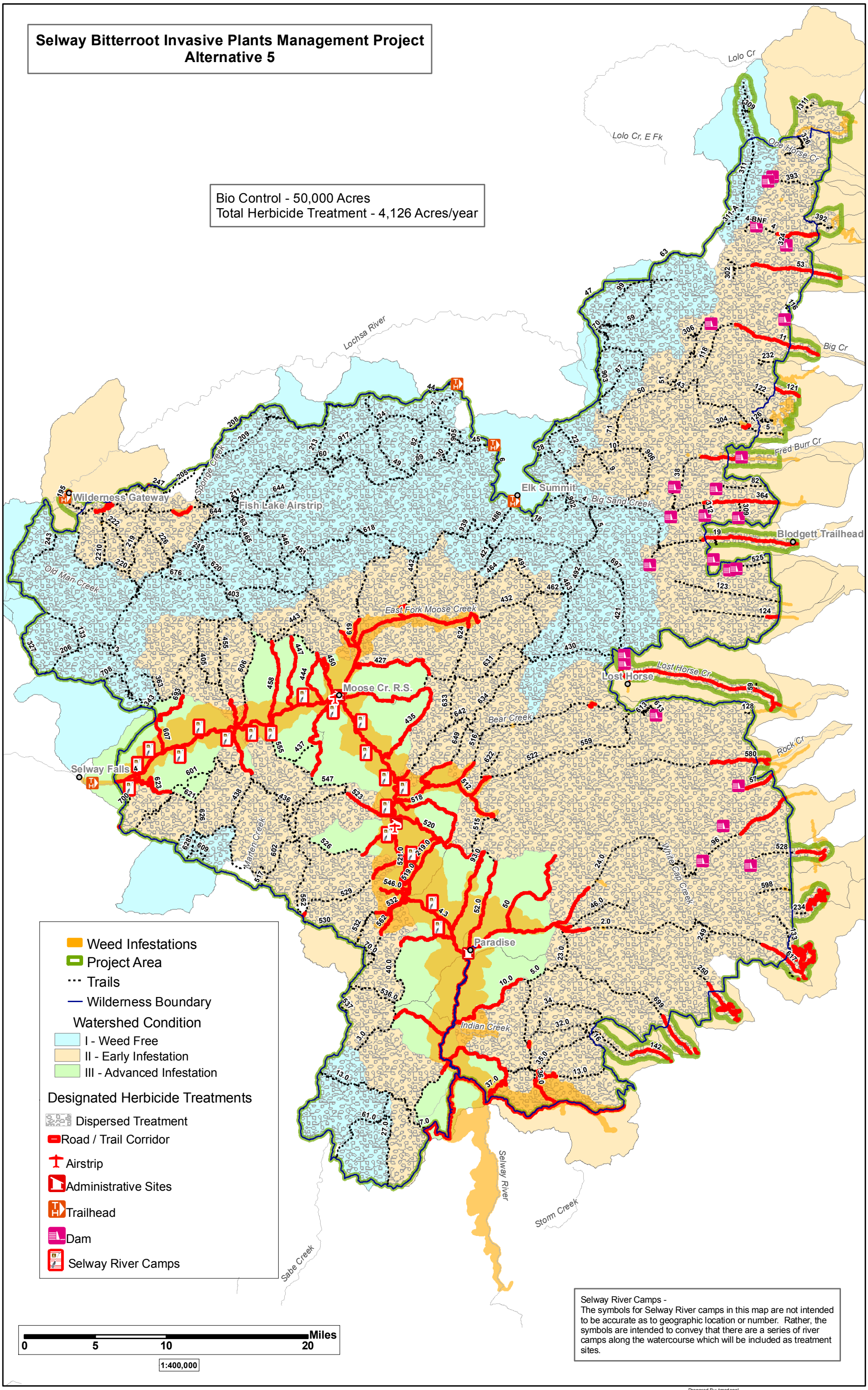
Designated Herbicide Treatments
Road / Trail Corridor
Airstrip
Administrative Sites
Trailhead
Dam

0 5 10 20 Miles
1:400,000

Prepared By: tmcdonal
Printing Date: 22 February 2008
File: J:\fsfiles\office\forest_projects\sbw_invasives\maps\prep_alts_deis_final.mxd

Selway Bitterroot Invasive Plants Management Project
Alternative 5

Bio Control - 50,000 Acres
Total Herbicide Treatment - 4,126 Acres/year



Selway River Camps -
The symbols for Selway River camps in this map are not intended to be accurate as to geographic location or number. Rather, the symbols are intended to convey that there are a series of river camps along the watercourse which will be included as treatment sites.

Prepared By: tmcdonal
Printing Date: 22 February 2008
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3.1 VEGETATION

3.1.1 REGULATORY FRAMEWORK

The relevant direction in the Bitterroot, Nez Perce, Clearwater and Lolo Forest Plans (FP) and the 1996 SB Wilderness Vegetation Management Direction (VMD) for the vegetation resources in the project area includes the following management goals and objectives:

- eradicate new populations of noxious weeds (invasive plants) in the Wilderness (VMD)
- maintain and/or restore the viability of rare native plant populations (VMD)
- decrease or stabilize the percent cover of designated "weed" (invasive plant) species in key areas (VMD)
- keep invasive plant species out of weed-free areas (VMD)
- maintain vegetative diversity and processes by natural disturbances such as fire, wind, avalanches, insects and disease (VMD)
- Provide optimal habitat on elk winter range (FP)
- Provide habitat for the support of viable populations of native and desirable non-native wildlife (FP)
- Control "noxious weeds" (invasive plants) to protect resource values and minimize adverse affects on adjacent private land (FP)

3.1.2 AFFECTED ENVIRONMENT

A. Existing Condition

Vegetation varies widely across the Project Area due to variations in elevation, aspect, climatic factors and past disturbances. A National Hierarchy of Ecological Units is used to describe similar settings. The Selway-Bitterroot Wilderness and adjacent non-Wilderness portion of the Project Area falls within the Idaho Batholith Section (ecosection). This section contains mountains with alpine ridges and cirques at higher elevations. Large U-shaped valleys with broad bottoms indicate that the area has been strongly glaciated. Vegetation is grand fir-Douglas fir forest, western spruce-fir forest, western ponderosa forest and widespread western redcedar in the Selway basin.

Each ecosection contains broad vegetation and topographic conditions. Local landtype classifications (Vegetation Response Units) were used to group each section into three settings, which are similar to the subsections described in Ecological Units of the Northern Region: Subsections (Nesser, 1997). These settings are breaklands, uplands, and subalpine. Within these three ecosection settings are Vegetation Response Units (VRUs), which are a land classification and mapping system that delineates units of lands based on predictable patterns of potential vegetation and disturbance dynamics, predominantly fire regimes (Applegate, 1992). VRU's are used to interpret historic and existing condition and trend in plant community composition, structure, and process. The following sections describe these three subsections and the Vegetation Response Units (VRU) within the Project Area.

Breaklands: (VRUs 3 and 8)

Breaklands are mostly steep slopes at lower elevations, typically warmer and dryer than other settings on the forest. Potential vegetation includes ponderosa pine, Douglas-fir, dry grand fir, grasslands, and shrublands. Inclusions are moist grand fir types, and western redcedar along the lower Selway drainage. Succession without disturbance has allowed grand fir to establish and mature on these sites.

VRU 3: Breaklands, Grand Fir and Douglas-Fir
VRU 3 is the most common at the lower to mid elevations in canyons and steep south aspects. This VRU comprises approximately 500,000 acres in the project area. It is most common in the Middle and Upper Selway Canyon compared to the Lower Canyon because of the shift from maritime to more continental climate.

On South aspects, dry Douglas-fir habitat types are dominant. Open stands of large Douglas-fir and ponderosa pine were historically common. Low and mixed severity fire at frequent intervals (5 to 25 years) occurred on south aspects. Here, 60-90 percent of stands showed evidence of survival through one to many fires. Ponderosa pine old growth occupied about 40 to 60 percent of these warm dry sites.

On North aspects, grand fir habitat types are dominant. Grand fir and Douglas-fir were common cover types, with ponderosa pine, western larch and sometimes Engelmann spruce or lodgepole pine. Pacific yew occurred on lower slopes. Mixed severity fire at frequent intervals (25 to 75 years) was common on north aspects. About 30-60 percent of stands retained 10 or more trees per acre through at least one fire. Twenty to 30 percent of stands included at least 10 trees per acre older than 150 years. Ponderosa pine, western larch, Douglas-fir, and grand fir formed the old overstory.

Vegetation response unit 3 has been highly impacted by invasion of invasive species, non-native grasses and forbs on the open, low elevation, south-facing slopes. These habitats are highly susceptible to weed colonization, as disturbance, open canopies, seed availability, and dispersal all promote exotic plant expansion. The invasive plants currently found in the Proposed Project Area have spread throughout the transportation system which includes roads, trails, and dispersed recreation areas. The majority of the identified infestations occur near these areas, as well as in disturbed grasslands and open pine stands. Spotted knapweed is the most abundant weed and occupies thousands of acres within the Selway-Bitterroot Wilderness.

VRU 8: Breaklands, Cedar and Grand Fir
This VRU is confined to lower slopes and riparian areas along the lower Selway River, Moose Creek, and Lochsa River. It comprises approximately 25,000 acres of the analysis area. It is most common along the lower Selway River canyon, outside the wilderness,

Moist grand fir and cedar habitat types are dominant in VRU 8. Grand fir, Douglas-fir and western redcedar were the dominant species. Western larch, western white pine, Engelmann spruce, and Pacific yew were less common. Ponderosa pine and lodgepole pine were minor. Small to medium fires occurred at frequent intervals (25 to 75 years) and large stand replacing fires at infrequent intervals. About 40-50 percent of stands originated from mixed severity fire, and 50-60 percent from stand replacing fire.

VRU 8 is associated with the moist maritime forest of western redcedar and grand fir. These habitats are cooler, wetter, and have closed canopies, providing less sunlight to the ground. Ground disturbance is limited within this VRU, confined mostly to stream crossings and small pockets of low flatlands. Invasive species infestations identified within these areas tend to be locally confined to specific sites because of their tolerance to shade

Uplands: (VRUs 6 and 10)

Uplands are generally above the breaklands in elevation, and have a more rolling topography. They tend to be cooler and more mesic than the breaklands. Typical potential vegetation includes grand fir, western redcedar, and shrubs. Subalpine fir and lodgepole pine types occur as inclusions on colder sites, while ponderosa pine and Douglas-fir occur as inclusions on warmer, dryer sites.

VRU 6: Cold Basins, Grand Fir and Subalpine Fir
This VRU is uncommon in the proposed project area and occurs at mid elevations in the headwaters of several large drainages, including Halfway and Meeker Creek. It comprises approximately 10,000 acres.

Grand fir and subalpine fir habitat types are dominant. Lodgepole pine was the dominant seral species. Western larch, Douglas-fir, and Engelmann spruce were important components. Medium to large stand replacing fires occurred at infrequent intervals. With advancing forest succession and fire suppression, lodgepole pine has increased as shrub dominated old burns have become reforested. More shade tolerant mixed conifer forests have increased. Whitebark pine has essentially disappeared as even a minor component.

VRU 6 occupies colder, mid-elevation basins and represents a small portion of the analysis area. These colder habitats tend to be more shaded than the Breaklands below, and the increase in elevation keeps them as potential frost pockets most of the year. Invasive species establishment and expansion is limited in this VRU due to the colder, shorter seasons and increased canopy. Suitable locations for new invasive plant establishment would be mostly confined to trails and camps.

VRU 10: Uplands, Alder, Grand Fir and Subalpine Fir
VRU 10 like VRU 6 is uncommon in the analysis area. It is called Grand fir mosaic and occurs along the Western fringe of the Selway-Bitterroot Wilderness at mid-elevations and comprises approximately 10,000 acres.

Mesic grand fir, subalpine fir, and alder habitat types are dominant. Grand fir, Engelmann spruce, subalpine fir, and sitka alder were historically important cover types. Douglas-fir, western larch, lodgepole pine, and Pacific yew were common on ridges. Small fires occurred frequently, but mixed severity infrequent fire (at intervals of 75 to more than 150 years) was typical, with stand replacement usually confined to ridges.

The habitats in this VRU are cold, open canopies with multi-aged old growth, and tall shrub communities. While colder and wetter than the breaklands below, this VRU has moderate potential for invasive species colonization and expansion because of the open canopy and various travel routes used buy ungulates within these habitats.

Subalpine: (VRUs 1, 2 & 9)

The subalpine setting is above the uplands elevationally, with mixed topography, generally colder temperatures, and variable moisture conditions. Typical potential vegetation includes subalpine fir, cool grand fir, shrublands, and some whitebark pine. Inclusions on warmer sites are dry grand fir, and Douglas-fir. Forest cover types are a mix of shade-intolerant (lodgepole pine, Douglas-fir, western larch) and shade tolerant (subalpine fir, Engelmann spruce, grand fir) trees in a variety of size classes.

VRU 1: Convex Slopes, Subalpine Fir
This VRU occurs in the upper reaches of Meadow Creek and the Selway headwaters at mid and upper elevations. It comprises approximately 150,000 acres within the proposed project area.

Grand fir and subalpine fir habitat types are dominant. Lodgepole pine was historically a dominant cover type in many settings. Engelmann spruce, subalpine fir, western larch, Douglas-fir, and whitebark pine were less common. Large infrequent (75 to 150 years or more) severe fires were typical of most settings. Historically, about 700 acres burned per year. About 60-80 percent of stands originated from stand replacing fire, and 20-40 percent from mixed severity fire. Moist lower slopes were most prone to mixed fire. Wet meadows are important elements of this landscape.

VRU 1 comprises a fair amount of south facing slopes above the upland setting in the upper reaches of the Selway river canyons. Mixed canopy types along with dry open ridges and variable disturbance regimes, make this VRU moderate to highly susceptible to invasive plant colonization. Known populations of spotted knapweed along the canyons below this VRU and could rapidly increase in the event of a major disturbance such as fire.

VRU 2: Glaciated Slopes, Subalpine Fir
This VRU is very common in the upper elevations of the Selway-Bitterroot Wilderness and Bitterroot Mountains and comprises approximately 650,000 acres.

Subalpine fir and whitebark pine habitat types are dominant. Lodgepole pine, Engelmann spruce, and subalpine fir were historically dominant on side slopes. Whitebark pine was important on ridges. Historically about 400 acres burned per year. Mid-slopes tended to experience stand replacing fire at infrequent intervals (75 to 150 years). Open ridges or moist valley bottoms were more prone to mixed severity fire. Rock outcrops, lakes, wetlands, and montane parklands are important elements of this landscape.

Due to the shortened growing season and increase in elevation, invasive species invasion is slow to occur within this VRU and usually confined to highly disturbed dispersed campsites. Invasive weeds that occupy the breaklands below this VRU show a significant reduction in numbers as the elevation climbs above 6,500 feet, and new colonization is slow and stunted in size.

VRU 9: High Elevation Ridges, Subalpine Fir and Whitebark Pine
This VRU is well represented in the highest elevations of the Selway-Bitterroot Wilderness and Bitterroot Mountains, and comprises approximately 150,000 acres.

Cold subalpine fir and whitebark pine habitat types are dominant. This was the major stronghold of whitebark pine. Engelmann spruce, subalpine fir, and lodgepole pine were common. Mixed severity fire occurred at frequent to infrequent (25 to more than 150 years) intervals. About 40-60 percent of stands originated from mixed severity fire and 40-60 percent from stand replacing fire. Old whitebark pine and lodgepole pine are common on rock outcrops and open ridges.

These open alpine communities typically occupy the highest elevations within the Selway-Bitterroot Wilderness, starting at around 7,000ft and climbing to well over 9,000. The soils are shallow and the growing season is very short, with snow lasting well into July, making most invasive plant establishment difficult. The plant communities that occupy these sites have adapted to the brutal weather that can linger most of the year. No significant invasive plant infestations have been identified within this VRU. Weed establishment could occur, but would be limited to warm microsites at the lowest elevations within the VRU.

B. Project Area Susceptibility Summary

Table 3.1- 1: Acres and Susceptibility by VRU

Vegetation Response Unit (VRU) Number and Cover Type	Invasion Susceptibility Rating (Invasiblity)*	Susceptible Acres (potential total)**
3: Breaklands, Grand Fir, Douglas-fir	High	400,000
8: Breaklands, Cedar, Grand Fir	High	20,000
6: Cold Basins, Grand Fir, Subalpine Fir	Low	200
10: Uplands, Alder, Grand Fir, Subalpine Fir	Moderate to High	8,000
1: Convex Slopes, Subalpine Fir	Moderate to High	120,000
2: Glaciated Slopes, Subalpine Fir	Moderate to High	100,000
9: High Elevation Ridges, Subalpine Fir, Whitebark Pine	Low	500
Total Susceptible Acres	--	648, 700

*the susceptibility (invasibility) rating is based on the potential ability of one or more invasive plant species to occupy, in a dominant fashion, more than 10% (cumulatively) of the VRU area (Mantas 2003)
** the total potential susceptible acres are based on the assumption that landscape level disturbances such as fire, insects/disease or hydrologic events reach about an 80% level within the moderate to highly susceptible VRUs (Mantas 2003)

C. Invasive Plant Overview

Numerous recent research papers, texts and periodicals identify the invasion of natural communities by introduced plants as one of the most serious threats to biodiversity (Heywood 1989, Mack 2000). Exotic plants in conservation areas are increasingly recognized as a major threat to the preservation of biodiversity (Humphries et al. 1991, Schmitz et al 1997). Lonsdale (1999) examined 184 sites around the globe and found that nature reserves contained one-half of the exotic plant fraction of sites outside reserves. Nearly 70% of the variation in the number of exotic species was accounted for by looking at a statistical correlation to the presence of two predictors: the number of native species in the sample area and whether or not the site was in a nature reserve (Lonsdale 1999).

The Selway-Bitterroot Wilderness and Project Area currently hosts about 17% of the invasive plant species that are found in or near Idaho and Montana (see Appendix H). There are a number of additional uncatalogued exotic or nonnative plant species present within the Selway, Clearwater and Bitterroot River Basins that occupy niches in many habitat types throughout the Project Area (Selway Assessment 2001,) but these fall into the "naturalized" category. Invasive plants are found on approximately 10% (about 160,000 acres) of the total project area or approximately 25% of the 650,000 susceptible visual response unit acres (Table 3.1-1). The Project Area supports fewer invasive species than much of the surrounding area (Bitterroot Forest EIS 2003, Lolo National Forest EIS 2007, Ravalli County Weed Management Plan 2007). In this characteristic, the Project Area and the Selway-Bitterroot Wilderness match the plant biodiversity refugia character for natural areas described in Lonsdale (1999).

Two species, spotted knapweed and cheatgrass, comprise the vast majority (97%) of the current infested acres (Table 3.1-3). The remaining eleven invasive plant species infest about 2,400 acres or 0.2% of the project area and 0.4% of the susceptible acres, respectively, within the project area.

All the plant communities within the project area are susceptible to invasion by exotic species to varying degrees (Selway Assessment 2001, Bitterroot Forest EIS 2003). Three primary factors determine the risk of establishment and colonization of a site by invasive plants. These are: the number of propagules (seeds or regenerative plant parts) entering the new environment (propagule pressure), the characteristics of the invading species, and the overall susceptibility (invasibility) of the environment to invasion by new species (Lonsdale 1999, Williamson 1996).

Scientific research has developed a theory of "fluctuating resources" to help predict invasions and understand the susceptibility (invasibility) of habitats (Davis 2000). In this model, invasibility of many communities changes from year to year, and even within a given year, as the amount of unused resources (such as light, water, or nutrients) fluctuates. This can lead to a pattern where successful species invasions are likely to occur as episodic events.

An increase in resource availability occurs in two basic ways. In one scenario, the use of resources by resident vegetation can decline after disturbances such as fire, disease or drought. In the other situation, resource supply can increase at a rate faster than the resident vegetation can sequester it, as might occur in a particularly wet year (increased water supply), through eutrophication (increased nutrients) or following removal of a tree canopy (increased light for the understory vegetation). Whether resource supply goes down for a time or gross supply goes up, there are more resources available to invaders, and this is when the plant community is particularly vulnerable to invasion.

Nonnative plant invasions alter ecosystem structure and function and pose a serious threat to native species diversity (Vitousek 1990, Mack et al. 2001). Effects include the alteration of resource availability and soil stability, promotion of erosion, accumulation of litter, salts or other soil resources, allelopathy, and the alteration of natural fire regimes and trophic structures (Vitousek 1990, Gordon 1998, Wolfe and Klironomos 2005).
Many of the most serious invasive plant species originated in western Asia and eastern Europe.

Dynamics of Invasion
According to Cousens and Mortimer in Dynamics of Weed Populations (1995), weeds generally invade a region through a three-phase process. This process operates the same way on both non-Wilderness and Wilderness lands within the project area:

- Introduction: As a result of dispersal, seeds or plant fragments arrive at a site beyond their previous geographic range and establish populations of adult plants. Potential new invaders such as yellow starthistle, tansy ragwort or rush skeleton weed could become a serious problem in the project area if allowed to establish and advance beyond the introduction phase.

- Colonization: The plants in the founding population reproduce and increase in number to form a self-perpetuating colony. houndstongue and dalmatian toadflax are examples of weeds in the colonization phase in the project area.

- Naturalization: The species establishes new self-perpetuating populations, undergoes widespread dispersal and displace native flora. Spotted knapweed is the most prevalent species in this stage in the project area group of ecosystems.

Invasion and range expansion by an invasive plant involves all three phases. Typically, plant invasions do not occur along a single front. Instead, new outbreaks initiated by long distance dispersal become the centers for shorter distance dispersal that may eventually fill the gaps between them. The rate at which weed populations expand can be difficult to determine, and may be exponential, (i.e. a constant proportional rate of increase) or two-phased (with sudden range expansion following a period of little or

slow increase in abundance). Typically, only when the naturalization phase is reached, is when a species is likely to be recognized as a nuisance and considered an invader. Control efforts are then focused on limiting further spread of naturalized invaders into areas previously not infested. Eradication is a widely sought common goal to prevent naturalization.

How Invaders Spread

Vehicles, people and livestock promote the transportation of invaders into areas previously not infested. As corridors, road systems allow weeds to invade both disturbed and undisturbed areas.

Creeks and rivers function similar to roads and trails in regards to weed spread, except that they are natural features and they can carry and spread weeds in the absence of human travel or other activity. Creek and riverside areas are critical routes of weed spread because high water tables and dense riparian vegetation reduce weed management options once a weed becomes established. Once established from waterways, weeds can spread upland onto disturbed and undisturbed areas. Some species, such as yellowflag iris, have buoyant seeds that facilitate transportation for long distances on the water surface.

Wildlife and domestic livestock also transport weeds. The spread of houndstongue, for example, is an indirect effect of livestock grazing and domestic dogs walking because the velcro-like seed sticks tenaciously to the hair of these animals. Weed seeds consumed by animals or attached to their fur are carried off road and trail corridors into less or undisturbed areas. Through the influences of wind, waterways and wildlife, invasive have been able to occupy undisturbed habitats far removed from road or trail systems.

A Colorado study confirmed that horses can transport viable invasive plant seeds in their digestive tracts for long distances resulting in the establishment of exotic plants far from their point of origin. In this study, 85% of the seedlings that established after passing through the horse seca, were exotic species, although not all of these fit an invasive category (Wells 2007).

Wind is a major vector for the spread of several species of concern such as rush skeletonweed, Canada thistle, musk thistle and others. Recent protocols developed by the University of Idaho recommend that inventory work extend out for a five mile radius from the furthest occurrence of rush skeletonweed in order to cover the maximum dispersal distance of it's airborne seed (Prather Personal Communication - 2008). Seed carried in this manner introduces an element of unpredictability to the colonization patterns of certain species and highlights the importance of early detection and rapid eradication of small pioneering infestations.

Viable spotted knapweed seeds can also pass through the digestive systems of sheep, deer and other wildlife. Wallander, et. al. (1995) found that sheep manure contained viable spotted knapweed seeds from 2 to up to 7 days after dosing. Viable seeds were recovered from mule deer manure 10 days after dosing. Viability of seeds was reduced, but not eliminated by passing through sheep and mule deer. Sheep and especially mule deer are likely to transport viable seeds of spotted knapweed and thus disseminate weed seeds (Wallander 1995). However, any invasive plant dispersal caused by the movement of mule deer and other large wild ungulates cannot be controlled.

Airplanes landing on strips inside the wilderness can leap-frog potential invaders hundreds or even thousands of miles across natural barriers and deliver them to susceptible habitats inside the project area. The airstrips at Shearer and Moose Creek Administrative Sites have spotted knapweed and other species present. These contaminated sites can also export invasive seed on aircraft to other states and regions that may not have those species present. Fire management involving helicopters or smokejumpers may introduce exotic seed (Personal Communication – Romero/Shotzberger 2006).

D. Current Infestation Description

Distribution records of invasive plants over time show a steady increase in the number of exotic species entering and expanding their range through the landscapes of the West (Rice 1999). Table 3.1-2 displays how exotic plants have invaded the State of Montana by decade (Flathead National Forest EA 2001).

Table 3.1- 2: Sample of Invader Species Introductions by Decade, State of Montana

< 1900	1900s	1910s	1920s	1930s	1940s	1950s	1960s	1970s	1980s	1990s
ox-eye daisy Canada thistle bindweed hound's-tongue wormwood yellow toadflax reed canarygrass sheep sorrel mullein	St. John's-wort goat's beard	hoarycress spotted knapweed poison hemlock tall buttercup	musk thistle blueweed leafy spurge field milkthistle	burdock Russ. knapweed dyer's woad per. pepperweed common tansy	kochia sulfur cinquefoil creep. bellflower purple mustard	white bryony diffuse knapweed yellow starthistle dalmatian toadflax scent. chamomille	orange hawkweed	tansy ragwort purple loosestrife	mead. hawkweed	rush skel. weed

There are thirteen species of invasive plants catalogued within the project area at this time. These plants display a range of density and distribution characteristics. The ecologically attainable management opportunities for these established species varies according to the invasive biology of each plant specie, degree of colonization, and treatment potential
(Table 3.1-3 below).

Table 3.1- 3: Species Management Options By Objectives*

This table displays the ecologically attainable management objectives for the invasive plant species in the project area

Species: Distribution – Density Acres within project area	Eradication Potential (from the project area)	Reduction / Control Opportunities (within project area)	Containment Opportunities (within project area)
1) Spotted Knapweed: Widespread – High Density 110,000 acres	Not feasible	Reduce / eliminate small pioneering infestations within weed-free areas along trails or within openings.	Constrain the transport of seed out from large infestations by treating high priority contact / vector sites such as camps, trails, airstrips, administrative sites, helispots, roads, etc.
2) Cheatgrass: Widespread – High Density Uninventoried – estimate > 50,000	Not feasible	Reduce / eliminate small pioneering infestations within weed-free areas where the distribution is extremely limited	Constrain the transport of seed out from large infestations by treating camps, trails, airstrips, etc.
3) Sulfur cinquefoil: Widespread – Moderate Density 2,000 acres	Doubtful	Same as for knapweed, above	Same as for knapweed, above
4) St. Johnswort: Widespread – Low Density 200 acres	Doubtful	Same as for knapweed, above	Same as for knapweed, above
5) Oxeye daisy: Scattered – Low Density 50 acres	Doubtful	Reduce known populations to negligible levels. Eliminate small pioneering starts along trails, river corridor, camps, etc.	Specie distribution and density is still low enough that management can reasonably pursue the reduction objective throughout the analysis area
6) Dalmatian toadflax: Isolated – Low Density < 1 acre	Highly Possible: eradicate known sites at Shearer airstrip	n/a	n/a
7) Berteroa: Isolated – Low Density < 5 acres	Possible: eradicate at known sites at Paradise	n/a	n/a
8) Tall buttercup: Isolated – Low Density > 50 acres	Doubtful	Reduce known populations to negligible levels. Eliminate small pioneering starts along trails, river corridor, camps, etc.	n/a
9) Common tansy: Scattered – Low Density > 50 acres	Doubtful	Reduce known populations to negligible levels. Eliminate small pioneering starts along trails, river corridor, camps,	n/a

Species: Distribution – Density Acres within project area	Eradication Potential (from the project area)	Reduction / Control Opportunities (within project area)	Containment Opportunities (within project area)
		etc.	
10) Hawkweed: Isolated – Low Density < 5 acres	Highly Possible: eradicate at known site along Lochsa	n/a	n/a
11) Musk thistle Isolated – Low Density < 5 acres	Highly Possible: eradicate known site on Bitterroot	n/a	n/a
12) Houndstongue Scattered – Low density > 30 acres	Doubtful	n/a	n/a
13) Canada thistle Isolated – Low density < 10 acres	Possible	n/a	n/a
14) All New Invasive Plant Species Isolated – Low Density	Highly Possible	n/a	n/a

*The management options assume the use of all currently accepted treatment techniques but does not specify any particular prescription or treatment-type mix proportion

In addition, about sixty other nonnative plant species pose an invasive threat from either Montana or Idaho (Appendix H). Many of these exotic plants possess the capability of establishing a dominant presence on the landscape of the project area (Mantas, 2003). The two states use different categories to identify the priority of each specie. As a result, Appendix H displays the plant list differently for each state.

Additional information on these species is available through the invaders database maintained by the University of Montana at: http://invader.dbs.umt.edu/

Aquatic Invasive Plants

Montana and Idaho share similar concerns about the spread of aquative invasive plants. Both states have developed Aquatic Nuisance Species Management Plans that recognize the "threat to the ecological integrity of forests, grasslands and waterways" posed by exotic species (Montana ANS Management Plan 2002).

Aquatic vascular plants include ferns and flowering plants that grow submersed in water, float on the water surface, or have basal portions inundated with foliage and upper parts immersed. Hydrilla (Hydrilla verticillata), Eurasian watermilfoil (Myriophyllum spicatum), Saltcedar (Tamarisk spp) and purple loosestrife (Lythrum salicaria) are well known example of how invasive plants can alter the physical and biological functions of aquatic systems. Their collective impacts include: reduction of wildlife cover and habitat; drying up of lakes, ponds, wetlands and lotic (flowing) systems; and degrading water quality and fish habitat.

Aquatic invasive plant species have the potential to threaten ecological processes and native species in the project area. A sample of invaders whose presence rings the Wilderness includes eurasian watermilfoil,

hydrilla , yellowflag iris, and purple loosestrife. Reproductive plant parts (seeds and vegetative fragments) can be transported in non-motorized water craft (rafts, kayaks, etc) and fishing gear (Montana ANS Management Plan 2002). While the scouring action typical of lotic (flowing) water systems can thwart the establishment of some of these aquatic species, there are ample foothold opportunities in the suitable habitats of eddy pools, lakes and smaller streams. Once a pioneering infestation secures a site, it has the capacity to alter the immediate environment to promote it's spread. For example, both hydrilla and yellowflag iris can trap sediment and shape microsite conditions to create a habitat more conducive to their expansion (Personal Communication 2007).

Currently there are no known aquatic invasive plants (aquatic nuisance species) within the project area.

Available treatments include a variety of mechanical and herbicidal methods. Idaho and Montana have initiated aggressive control actions outside the project area that include the use of diver assisted suction dredging; aquatic labeled herbicides, handpulling, and bottom barriers (Personal Communication - Woolf 2007).

Fire and Invasive Plants

Fire is a natural part of most forest and grassland ecosystems in the western United States and functions as the single most frequent and powerful disturbance force in the project area (Selway Assessment 2001). In recent decades, average fire sizes and severity have increased (Covington and Moore 1994). Increased availability of light, nutrients and bare ground are all associated with high severity fires. These conditions are known to aid in the establishment of nonnative plant species (Freeman 2007).

Recent research hypothesizes that a plant community becomes more susceptible to invasion whenever there is an increase in the amount of unused resources. An invading species will enjoy greater success in gaining a foothold on a site when it does not encounter intense competition for these resources from resident species (Davis 2000). Given this assumption, it follows that any factor(s) that increase the availability of limiting resources, such as water and nutrients, will increase the vulnerability of a plant community to invasion. Fire is one of the disturbance factors that can tilt the availability of resources advantage towards invasive plants.

Environmental differences in overstory, aspect and topography as well as species composition prior to fire will affect the plant responses on a given site. Some invasive plant species (such as St. Johnswort and sulfur cinquefoil) show a measurable increase in percent occurrence for several years following a low to moderate spring burn but no increase on higher intensity burn sites (Vance, 2003).

In a recent postfire study on the Bitterroot National Forest, researchers found that invasive plant persistence correlated directly with forest floor burn severity over time (Ferguson 2007). Spotted knapweed cover increased on plots with high burn severity and decreased on plots with low burn severity. The low burn severity plots experienced a relatively rapid revegetation with native species. Disturbance is not a prerequisite for invasion by knapweed into Ponderosa pine habitat types but will it will accelerate the expansion the specie on those sites. On Douglas-fir habitat types, which include a substantial number of acres in the project area, disturbance is a prerequisite for spotted knapweed invasion and for a number of other species as well (Mantas 2003). Spotted knapweed and other invaders do not readily colonize undisturbed vegetation on Douglas-fir habitat types. The pattern of increasingly larger and hotter fires appears to increase the potential risk of invasion of these habitat types by exotics.

In the absence of any landscape scale revegetation potential, the best defense against colonization and expansion of invasive plants on burned sites (the most common disturbance event in the Project Area) is a focused program of eradication of new invaders and containment of existing infestations.

Grassland habitat types in the project area are also vulnerable to an increased risk of invasion after disturbance by fire. Cheatgrass (discussed below) is an annual exotic specie, present throughout the Project Area, that can shorten the fire interval normally experienced by a perennial bunchgrass community. This pattern increases the fire damage and reduces the reproductive ability of native species. Cheatgrass maintains expansive monocultures in the grassland/sagebrush habitats in the intermountain west partly through this adaptation.

Cheatgrass
Cheatgrass (Bromus tectorum), an annual plant, is one of the most aggressive invasive species in the western United States yet is not listed as a noxious weed in either Montana or Idaho primarily because of it's pandemic presence and resistance to available control measures. It poses a serious threat to grassland habitat types below 5,000 feet elevation in the Project Area.
Attempts to replace cheatgrass with perennial grasses can be difficult. Efforts to remove cheatgrass will require filling the interspaces between the plants. This requires seeding shallow rooted species such as sandberg bluegrass, Sherman big bluegrass, or covar sheep fescue. The perennial plant cover in a stand of cheatgrass is generally less than five percent. A successful weed treatment seeding would occur if the perennial species establish a groundcover of 15 to 25 percent.

Research suggests that native bunchgrasses are able to thrive in a lower nutrient environment and can outcompete cheatgrass when nitrogen and other essential elements are relatively scarce (Beckstead 2004). Once cheatgrass gains a foothold, through several mechanisms, it appears able to alter the nitrogen cycling pattern of native grasslands in a manner that allows the plant to monopolize much of that nutrient supply to it's advantage (Sperry 2006). The specie germinates in the fall or early spring, giving it the early advantage of tapping water reserves in the upper soil profile and completing it's growth cycle more rapidly than surrounding native vegetation. In addition, cheatgrass has a well-documented ability to alter the natural fire cycle by shortening the burn intervals of native grassland habitat types (Mack 1981). This creates conditions that promote it's entrenchment and spread. A native plant community that is weakened by another invader, such as spotted knapweed, may offer the opportunity for cheatgrass to colonize and expand rapidly through the susceptible area. Landscape scale efforts in other parts of the West to contain or shrink large infestations have not achieved any notable success.

(Gundale et al 20007) explained how cheatgrass may establish heavy persistent pocket colonies under Ponderosa pine trees in the Ponderosa pine/bunchgrass cover type that is common in the lower elevations of the Project Area. As a rapid and early colonizer of disturbed sites, the plant exploits the nitrogen pulses and needle litter reduction that occurs after a ground fire. This provides a launch point from which the specie may foray into adjacent susceptible habitats as additional fires, other disturbances or variables provide the opportunity.

E. Current Treatments Occurring In the Project Area

Permitted control activities at present focus heavily on the early detection / rapid response (EDRR) to pioneering infestations of new and existing invaders as well as attempting to contain the spread of established invaders.

Wilderness Trails, Campsites (river and trail) and Administrative Sites
Approximately 100 miles of trails are eligible for treatment with herbicide under existing NEPA decisions inside the project area. About 10 acres of ground actually receives treatment either annually or biannually (every two years). The herbicide is spot applied to small scattered individual plants and plant clusters spread out along the length of the eligible trail system within an approximate 30 foot wide trail corridor (15 feet on either side of the trail). Infestations at the start of the treatment program in the 1990s were larger

and more connected (Henderson Personal Communication 2008). Currently, herbicide use is restricted to the trail corridor and would not be permitted, for example, if an infestation of a new invader were discovered on a wildfire affected site in susceptible habitat some distance off of the trail.

The Selway River Ranger monitors and handpulls invasive plants at most of the established campsites along the Selway River. This has helped keep existing and new invaders in check on those campsites. The campsites are generally less than one acre in size with target plants occurring as individuals or lightly scattered throughout. Wilderness Rangers, Trail Crews and Invasive Plant Mapping Crews selectively handpull exotics along trails and in established upland campsites when the opportunity arises.

Recently a small patch of Dalmatian toadflax was discovered on the Shearer Administrative Site airstrip by Forest Service personnel. The rhizomatous root system was removed by handgrubbing and the site is monitored regularly for regenerating stems and other pioneering patches. Both the Moose Creek and Shearer Administrative sites and airstrips harbor well-established patches of spotted knapweed. Some herbicide control work occurs on private inholdings within the Wilderness.

Non-Wilderness Trails, Trailheads, Roads and Administrative Sites

Approximately 50 acres of Forest Road rights-of-way within the Project Area are treated annually with herbicides at this time. These road treatments consist of spot spray applications spread out over about 60 miles of system roads within a 60 foot wide corridor bracketing the road bed (30 feet on either side of the road edge). The rights-of-way along the Nez Perce, Elk City and Paradise Roads on the Bitterroot National Forest receive spot applications of herbicide under previous NEPA. These travelways are major vector corridors through and along parts of the Selway-Bitterroot Wilderness. In 2002, several yellowstar thistle plants in the seed set stage were discovered by Forest Service personnel on the shoulder of the Elk City Road near the Selway River crossing. Seeds of this specie had been transported over 200 miles from Idaho along the edge of the Selway and Frank Church Wildernesses before jarring loose. The young plants were handpulled and bagged. The area immediately under and adjacent to the plants was treated with picloram at 1 pint/acre rate in order to kill any seedlings that might establish before the next inspection trip. The site is checked several times each year and no additional plants have germinated since the eradication of the first crop. No polygons or blocks of open timber / grassland habitat currently receive herbicide treatment. Herbicide is applied to about 2 acres along trails within the Project Area. These treatments consist of spot spray applications that are spread out along about 15 miles of non-Wilderness trail within the Project Area inside a 30 foot wide corridor (15 feet on either side of the trail tread).

Many trailheads on the boundary of the Project Area receive herbicide treatment at this time. The Paradise Administrative Site, within the Project Area, hosts the campground and launch site for Selway River float trips and contains small persistent infestations of oxeye daisy, spotted knapweed, hoary alyssun (Berteroa), and St. Johnswort. These species, within the administrative area, receive herbicide and handpulling treatments. The infestations have shrunk in extent and density since the initiation of treatments.

No planned bio-control releases have occurred within this portion of the Project Area.

Prevention / Education Actions, Signing, etc

The National Forests in Idaho and Montana require the use of only certified weed-seed free feed within their boundaries through a formal Special Order. Regular inspections at trailheads and backcountry camps insure compliance with this regulation. The weed free feed program has proved successful in restricting the import of exotic propagules by this specific vector. Inspections show a consistent compliance with the regulation and awareness of the issue by a high percentage of stock users. Wilderness rangers incorporate invasive plant education messages and information brochures into their contacts with recreationists and hunters. Trailheads into the project area display invasive plant / noxious weed education posters and weed-free feed requirements. Fire fighting and Fire Use personnel receive training and briefing in the problem of

invasive plant seed transport and prevention. Invasive plant seed import and export prevention measures are standard practices in fire incidents for personnel and equipment (Forest Service Manual 2080)

3.1.3 INVASIVE PLANT MANAGEMENT ACTIVITIES ADJACENT TO THE PROJECT AREA

All four National Forests involved in this proposed project sponsor active invasive plant management programs that incorporate all the principles of Integrated Weed Management (IWM). The Forests engage in regular inventory, mapping and monitoring of existing and new infestations. The concept of Early Detection/Rapid Response is an important part of the annual work for each program. Treatment actions include: numerous bio-control releases on a variety of target species; selective backpack and stockmounted herbicide applications along trails and in larger polygons where small pioneering infestations are inventoried; Burned Area Emergency Rehabilitation (BAER) treatment and monitoring; some selective aerial applications for containment of larger infestations and improvement of wildlife habitat; roadsite spot spraying for vector control; revegetation with native species; small site handpulling/hoeing with volunteer crews; and other measures. The Forests work with local county weed districts on cooperative education and prevention programs that reach schools, user groups such as ATV clubs, Backcountry Horsemen Chapters, public schools, garden clubs, hunting associations, other state and federal agencies, etc. The Forests compete for and have received grants for exotic species control with such organizations as the Rocky Mountain Elk Foundation, The Federation of North American Wild Sheep and the National Forest Foundation. Counties adjacent to the National Forests have created a number of Cooperative Weed Management Areas (CWMAs) that work both independently or with the Forest in the area to control invasive plants. Ravalli County (Montana) sponsors two small CWMAs (of several thousand acres) adjacent to the National Forest near the Project Area boundary. Idaho County (Idaho) sponsors one large CWMA that includes the entire Idaho portion of the Selway-Bitterroot Wilderness and extends south and westward onto private lands to the Salmon and Snake Rivers and northward to the county line above the Lochsa River. The counties work with these CWMAs on identifying priorities for treatment and locating funding through grants or other sources.

3.1.4 BIOLOGICAL CONTROL ORGANISMS

A. Approval Process for Bio-control Releases

For nearly 50 years, technical review groups have assisted researchers and regulatory agencies in evaluating the safety of insect or pathogen introductions for the biological control of invasive plants in the United States (USDA – TAG 2003). Current national protocols dictate a lengthy screening and testing process prior to permitting the release of any new insect or pathogen biological control agents (Personal Communication – Adams 2007). The protocols include reciprocal review procedures with Canada and Mexico (USDA – TAG 2003).

The USDA Agricultural Research Service (ARS) performs extensive tests at facilities both abroad and in North America for host specificity of a proposed bio-control organism. The tests examine feeding behavior, ovipositing, larval development and other impacts that the proposed bio-controls might display on non-target agricultural, threatened, endangered and other native plants. Variations of these screening tests for ecological impacts, as well as economic effects, have been in place for over twenty years (Personal Communication – Story 2007).

The Animal and Plant Health Inspection Service (APHIS) performs an environmental assessment for any bio-control organism petitioned for release in the United States. The alternatives involving the use of bio-controls propose to release only organisms that are approved by APHIS.

B. Current Status In and Around the Project Area

There are several bio-control organisms currently present in the project area (Table 3.1-4). Some of the populations may have established through unassisted migration into the project area from adjacent release and colonization sites such as the Salmon-Challis National Forest (S-C NF Noxious Weed Management Program FEIS, 2003), private lands in Ravalli County, Montana (Jim Story, Personal Communication, 2007), the Bitterroot National Forest (Noxious Weed EA, 1998; Noxious Weed Treatment Project EIS, 2003) and Idaho County, Idaho (North Idaho Bio-control Action Plan, 1999). Cyphocleonus achates and Bangasternus fausti were released in several small trial sites within the project area within the last decade.

The management of invasive plants with biological controls involves the deliberate use of natural enemies (parasites, predators, or pathogens) to reduce weed densities. Natural enemies and competitive vegetation prevent weed species from dominating other species in native habitats. Invasive plants are problems in the project are due in part to a lack of these limiting factors.

Biological management is self-perpetuating, selective, energy self-sufficient, economical, and well suited to integration in an overall weed management program (Wilson and McCaffrey 1999). Management with biological agents is a slow process that does not achieve eradication. Biological agents may be ineffective without being integrated with other strategies. Biological management may also not be appropriate against weeds closely related to beneficial plants because the natural enemy may be unable to discriminate between related plant species (Duncan et al. 2001). About 29 percent of the overall biological management efforts in the United States have demonstrated some level of success (DeLouch 1991). However, success rates can reach much higher levels of effectiveness depending on the target invasive plant species and the predator organism.

A weed infestation may increase in density and area faster than the newly released bio-control agent populations; therefore, other control methods must be used in conjunction with the release of bio-control agents. The perimeter of the infestation may be sprayed to keep the weed from spreading. As bio-control agents increase in density and begin to occupy more area, herbicide use may be reduced to occasional spot treatments. Effective biological control agents are not available for many exotic species. Bio-controls generally are not effective on small isolated target plant infestations.

Table 3.1- 4: Potential and/or Present Biological Control Agents

Target Weed	Agent	General Mode of Action
Knapweeds	Agapeta zoegana (moth)	Root miner
	Bangasternus fausti (weevil) ##	Seed head feeder
	Chaetorellia acrolophi (fly)	Seed head feeder
	Cyphocleonus achates (weevil) ##	Root miner
	Larinus minutus (weevil) ##	Seed head feeder
	Larinus obtusus (weevil) ##	Seed head feeder
	Metzneria paucipunctella (moth)	Seed head feeder
	Pelochrista medullana (moth)	Root miner
	Pterolonche inspera (moth)	Root miner
	Sphenoptera jugoslavica (beetle)	Defoliator, root miner
	Terellia virens (fly)	Seed head feeder
	Urophora affinis (fly) ##	Seed head feeder

Target Weed	Agent	General Mode of Action
	Urophora quadrifasciata (fly)	Seed head feeder
Yellow starthistle	Bangasternus orientalis (weevil) ## Chaetorellia austalis (fly) Eustenopus villosus (weevil) Larinus curtus (weevil) ## Urophora sirunaseva (fly)	Seed head feeder Seed head feeder Seed head feeder Seed head feeder Seed head feeder
Purple loosestrife	Galerucella calmariensis (beetle) Galerucella pusilla (beetle) Hylobius transversovittatus (weevil) Nanophyes brevis (weevil) Nanophytes marmoratus (weevil)	Defoliator Defoliator Root miner, defoliator Seed head feeder Seed head feeder
Rush skeletonweed	Cystiphora schmidti (gall midge) Eriophytes chondrillae (gall mite) Puccinia chondrillina (rust fungus)	Galls leaves/stem Galls terminal buds Rusts foliage/flowers
Leafy spurge	Apthona abdominalis (flea beetle) A.cyparissiae (flea beetle) A.czwalinae (flea beetle) A.flava (flea beetle) A.lacertosa (flea beetle) A nigriscutis (flea beetle) Chamaesphecia empiformis (moth) C.hungarica (moth) C.tenthrediniformis (moth) Dasineura sp. nr. Capsulae (gall midge) Hyles euphorbiae (hawkmoth) Oberea erythrocephala (beetle) Spurgia esula (gall midge)	Defoliator, root miner Defoliator, root miner Defoliator, root miner Defoliator, root miner Defoliator, root miner Defoliator, root miner Root miner Root miner Root miner Galls growing tips Defoliator Feeds on crown/root Galls growing points
St. Johnswort	Agrilus hyperici (beetle) Aplocera plagiata (moth) Chrysolina hyperici (beetle) ## C.quadrigemina (beetle) Zeuxidiplosis giardi (gall midge)	Feeds on stem/roots Feeds on foliage Feeds on leaves/flowers Feeds on leaves/flowers Galls leaves
Tansy ragwort	Longitarsus jacobaeae (flea beetle) Pegohylemyia seneciella (fly) Tyria jacobaeae (tiger moth)	Root miner Feeds on flower Feeds on terminal buds
Canada thistle	Ceutorrhynchus litura (weevil) Larinus planus (weevil) Urophora cardui (fly)	Defoliator Seed head feeder Creates galls in stem
Musk thistle	Cheilosia corydon (fly) Rhinocyllus conicus (weevil) Trichosirocalus horridus (weevil)	Defoliator Seed head feeder Root miner
Dalmatian toadflax Yellow toadflax	le) Calophasia lunula (moth) Gymnetron antirrhini (weevil)	Flower feeder Foliage feeder Seed head feeder

- denotes known or highly probable occurrence of this insect specie inside the project area

Biological control releases for spotted knapweed have been made in north Idaho for a number of years. Farragut State Park in Athol, Idaho has been used as an insectary for three seed head feeding agents : Metzneria paucipunctella, Urophora affinis, and Urophora quadrifasciata. In the late 1990s, other agents became available and were released in north Idaho including the seed head feeding weevil Larinus minutus, two root feeders Agapeta zoegana (a moth) and Cyphocleonus achates (a weevil). An agent of particular

interest to the group, which has not been widely released in north Idaho, is a root- boring beetle Sphenoptera jugoslavica. Sphenoptera jugoslavica is established in Washington State on diffuse knapweed.

In the 1950's St. John's wort was considered noxious in the state of Idaho. A biological control program featuring two beetles Chrysolina hyperici and Chrysolina quadrigemina was launched and the population of St. John's wort was dramatically reduced. It is unclear why St. John's wort has increased in abundance in the 1990s. The Chrysolina beetles are still abundant in St. John's wort patches. Because there was a noticeable increase in abundance the group decided that it was appropriate to look into additional biological control agents for St. John's wort. There were two additional agents released in north Idaho as part of biological control efforts in the 1990s, Agrilus hyperici (a root borer), and Aplocera plagiata (defoliating moth).

The Western Agricultural Research Center in Ravalli County, Montana has performed pioneering research, releases and monitoring of the spotted knapweed root miner weevil (Cyphocleonus achates) on non-federal land near the project area since 1988 (Personal Communication – Story 2007). There are currently several commercial bio-control insect enterprises in western Montana that market a variety of bio-control insects in Ravalli County. Chrysolina beetles are established in the Lost Horse Creek drainage adjacent to the project area on the Bitterroot National Forest (Copeland Biologicals, personal communication). A number of small releases of Cyphocleonus achates have occurred along the Selway River inside the project area since the late 1990s. Larinus minutus is present inside the project area in the upper Selway River watershed.

3.1.5 RESEARCH NATURAL AREAS

Research Natural Areas (RNAs) and Special Interest Areas (SIAs) are managed to maintain the undisturbed conditions and natural processes that characterize these areas. There are eight Research Natural Areas with all or part of their designated boundaries within the Project Area listed in Table 3.1-5 below.

Table 3.1- 5: Research Natural Area List

Research Natural Area (RNA)	Approximate RNA Acreage within Project Area	Total Individual RNA Acreage	National Forest Location
Bitterroot Mountain Snow Avalanche	670	1850	Bitterroot
Boulder Creek	840	1042	Bitterroot
Lower Lost Horse Canyon	641	1601	Bitterroot
Upper Lost Horse Canyon	250	1720	Bitterroot
Grave Peak	360	360	Clearwater
Fenn Mountain (Proposed)	600	600	Clearwater
Carlton Ridge	920	920	Lolo
Total Acreages	4,281	8,093	-

Two Proposed RNAs have actions pending. The Bass Creek Proposed RNA, listed as such in the 1987 Bitterroot Forest Plan, will be dropped from further consideration and establishment when the Forest Plan revision occurs and is not included in Table 3.1-1 for that reason. The Fenn Mountain Proposed RNA is

listed in the above table because it's eventual designation is certain. The Fenn Mountain Proposed RNA will receive interim management consideration as if it held formal RNA status.

A. Regulatory Framework

The Code of Federal Regulations (CFR) provides management direction as follows "Forest Planning shall provide for the establishment of RNAs" (36 CFR 219.25) and "[RNAs] will be retained in a virgin or unmodified condition except where measures are required to maintain a plant community which the area is intended to represent" (36 CFR 251.23). The Forest Service Manual (FSM) also provides guiding management direction for RNAs (FSM 4063) and SIAs (FSM 2372). In addition, the individual establishment record for each area serves as Forest Plan direction (as amended).

Applicable to invasive species management, FSM 4063.3.8, 9 directs activities to comply with the following standards: "8) where pest management activities are prescribed, they shall be as specific as possible against target organisms and induce minimal impact to other components of the ecosystem. The release of biological control organisms for exotic species control should be carefully considered to avoid introduction of other exotic species, and 9) If practicable, remove exotic plant or animal life." Further, FSM 4063.32 directs that "If exotic plants or animals have been introduced into an established RNA, the Station Director and the Regional Forester shall exercise control measures that are in keeping with established management principles and standards to eradicate them, when practical."

Lastly, FSM 4063.34 [in part] "Use only tried and reliable vegetation management techniques and then apply them only where the vegetative type would be lost without management. The criterion here is that management practices must provide a closer approximation of the naturally occurring vegetation and the natural processes governing the vegetation than would be possible without management. Unless the manager is certain that the management practice will meet this criterion, do nothing. Responsibility for management of RNAs is shared between the National Forest System and the Forest Service Rocky Mountain Research Station. The Regional Forester, with concurrence of the Research Station Director, has the authority to establish RNAs and approve research and monitoring activities. FSM 4063.34 continues, "The Station Director, with the concurrence of the Forest Supervisor, may authorize management practices that are necessary for noxious weed control or to preserve the vegetation for which the research natural area was created." While the list of practices does not mention herbicides specifically, chemical control methods are used in RNAs as long as it meets the vegetation management criterion.

The direction that "Management of the RNA will be compatible with and consistent with Wilderness management direction." is included in the wording that established the RNAs falling within Wilderness.

B. Analysis Area

The analysis areas for RNAs and SIA are the RNAs and SIA themselves or portions of same that fall within the Project Area. All of the RNAs lie along or close to the boundary of the Project Area. All of the RNAs have invasive plants within striking distance that pose an imminent threat to at least some of their habitat types or have infestations that could expand with or without natural disturbances such as fire.

C. Analysis Method

Information for the Affected Environment came from the Establishment Records for the individual RNAs and SIA and current invasive plant inventory data and field knowledge. The analysis is based on the effect the proposed activities in each alternative would have on the establishing criteria for each RNA and SIA, and potential for affecting ecological integrity.

3.1.6 ENVIRONMENTAL CONSEQUENCES

A. Effects Common to All New Herbicide Use: (Alternatives 2, 3, 4 and 5)

The use of herbicides for weed treatment involves application of products developed, labeled and produced to treat weed species at certain stages of plant growth. Herbicides considered in this analysis include: 2, 4-D, aminopyralid, chlorsulfuron, clopyralid, dicamba, diuron, glyphosate, hexazinone, imazapic, imazapyr, metsulfuron methyl, picloram, sulfometuron methyl, and triclopyr.

Herbicides proposed for use in this Project vary in selectivity to plant families and have different effects on native vegetation. Herbicide rate and timing of application can be adjusted to avoid long-term impacts to non-target vegetation. The composition of invasive plants, grasses, and forbs would likely change with herbicide use, however applications at prescribed rates should not eliminate any native (or non-native) populations from the plant community. Herbicides constitute a short-term disturbance to plant communities that have evolved to withstand and recover from long-term changes and disturbances (Rice 2001). If infestations remain untreated, they would expand and reduce native vegetation through competition.

The length of time each herbicide controls invasive weeds varies with the type of herbicides, environmental conditions, and target weeds. Some herbicides control weeds for a short time, while others can provide a few years of control from one application. The U.S. Environmental Protection Agency approved herbicide labels include safe handling practices, application rates, and practices to protect human health and the environment. A description of herbicides including copies of labels, susceptibility of weeds to different herbicides, Material Safety Data Sheets (MSDS), and guidelines proposed for use on the Project are contained in the Project Record. Herbicide labels and MSDS information can be found at http://www.greenbook.net/search/QuickList/ .

One feature common to all action alternatives is the "adaptive" flexibility to use current and updated agents as they are registered and approved by the EPA. Any new herbicide introduced for use in this project under the adaptive management option, must display effects that are less impactive than picloram All herbicides will be applied according to label specification; or when additional protection measures are required by Forest Service policy as described in this chapter. Impacts on soil and water will be mitigated to meet State laws and Pesticide Application Requirements, Northern Region Soil and Water Standards, and Forest Plan Standards. Table 3.1-6, below, lists the herbicides addressed in this document, and their associated target weed species.

Conversely, reliable new information or research on a listed herbicide/chemical that identifies adverse effects or problems not analyzed in this document, will trigger the withdrawal of that chemical from use in this project.

Herbicide selection would be based on environmental conditions such as groundwater depth, soil type, non-target vegetation, and management objectives. Appendix I displays examples of herbicides proposed for use and a range of application rates. Herbicide selection considers the following criteria:

- Herbicide label considerations;
- Herbicide effectiveness on target weed species;
- Proximity to water or other sensitive resources;
- Soil characteristics;
- Potential unintended impacts to non-target species such as conifers or shrubs;
- Application method (aerial-broadcast, ground-spot, ground-broadcast, or wick application);

- Other weed species present at the site, and effectiveness of herbicides on those species (for example spotted knapweed infestations with inclusions of toadflax);
- Adjacent treatments (private land);
- Timing of treatments (spring/fall); and
- Priority weeds – new invaders vs. existing.

Herbicides, like biological control agents, go through an extensive screening and testing process before they are registered and approved for use, by the U.S. EPA. Initial pesticide registrations with the EPA typically require a minimum of 120 tests, take seven to ten years to complete, and cost between $30 and $50 million. Herbicide labels have the force of law and include safe handling practices, application rates, and practices to avoid undesirable impacts to humans and the environment.

Impacts to Native Vegetation Communities

VRUs 3 and 8 (Grasslands and Shrublands)
Members of the Asteraceae family are common in target treatment areas and sites and may be impacted by applications of picloram and clopyralid. These species may include yarrow, fringed sage, arrowleaf balsamroot, and hairy goldenaster. In the long-term, however, these native forbs are known to recover (2-3 years) to pre-spray levels when herbicides are applied at 1 pint/acres (picloram) or 2/3 pint/acre (clopyralid) (Rice and Toney 1996). This has been shown to be true even with a second application of herbicide (at the same rates) three years after initial treatment (Rice et al. 1997). Herbicides applied at higher rates would have more noticeable adverse impacts the first few years, but forbs should gradually recover.

VRUs 3 and 8 (Ponderosa Pine and Dry Douglas-fir Cover Types
Non-target species that may be impacted by picloram and clopyralid applications in ponderosa pine and Douglas-fir cover types include arrowleaf balsamroot, yarrow, and American vetch. Species such as worm-leaved sedum, lupine, and paintbrush would not likely be affected.

Broad-leaved species present in these vegetative type such as ninebark, grouse whortleberry, spiraea, and snowberry are not members of families targeted by either picloram or clopyralid. Impacts to non-target species would not likely change the composition of the dominant species.

VRUs 1,2, and 6 (Lodgepole Pine and Lower Subalpine Cover Types
Few non-target broad-leaved species may be impacted by ground and aerial herbicide application. Non-target species that may be impacted by herbicide applications include queenscup, twinflower, beargrass, common horsetail, spleenwort-leaved goldthread, and bilberry.

VRUs 1, 2, 6, 9 and 10 (Upper Subalpine and Timberline Cover Types
Few treatment areas are proposed in these cover types. Non-target species, such as woodrush, grouse whortleberry, and fool's huckleberry would not likely be impacted by herbicide applications. Proposed treatments are unlikely to change the composition of the dominant community.

Herbicide Effects on Mushrooms
There are no studies on relationships between herbicide applications and edible forest mushroom production or consumption. There is literature regarding fungi being efficient bioaccumulators of heavy metals, however it is not known if this characteristic applies to organic compounds. Although mushrooms seem unaffected by herbicides, they may accumulate residues. It is unlikely that LD_{50} concentrations would be reached by anyone eating mushrooms.

Response of Native/Non-target Plant Communities to Herbicide Application

The herbicides being used for noxious weed control are rate-selective. Forb species exhibit varying degrees of susceptibility and tolerance at the lower rates of application, while high rates kill many broadleaf species and also can injure grasses. In addition to rate, phenological stage (timing/season of application), environmental factors controlling physiological activity, adjuvants, and application method all influence the spectrum of direct species kill and tolerance. More importantly, in natural plant communities the herbicide treatment alters the complex competitive interactions between plant species. The non-target species that are susceptible to herbicide application may recover from initial herbicide injury and even increase in abundance in the absence of intense pressure from the herbicide targeted aggressive and dominating invasive weeds. The herbicide pulse is transitory, decaying over time (Wauchope and Leonard 1980; Watson and others 1989; Rice and others 1997; Vencill 2002), but competition from dominating invaders is perpetual and increasing over time. The theoretical basis for maintenance or increase in diversity after herbicide application is that by causing a short term reduction in overall plant biomass, the resultant prevention or slowing of competitive exclusion by dominant species favors niche occupation by other plant species (Grime 1979). In addition, persistent seed banks are typical of annual and perennial forbs in grasslands subjected to summer draught (Daubenmire 1968; Grime 1979; Rice 1989); and underground perennial regenerative meristematic tissues, below 12 to 22 inches in depth, receive little or no herbicide dose (Watson and others 1989; Rice and others 1997).

In an example of an extremely strong ecological benefit obtained by using a herbicide to reverse competitive exclusion by a dominant invader (Getsinger and others 1997) treated a Eurasian watermilfoil infestation in the Pend Oreille River Washington with triclopyr. Non-target native plant biomass increased 500-1,000% by one year post-treatment, and remained significantly higher in the treated river cove two years after treatment. Native species diversity doubled following herbicide treatment, and the restoration of this robust native plant community delayed the re-establishment and dominance of Eurasian water milfoil for three growing seasons.

Herbicide application may decrease short term species richness while simultaneously increasing or not affecting diversity because of the reduced abundance of the dominating target invader.

(Rice and Toney 1998) used canopy cover data from an experiment to compare the overall plant community similarity of herbicide sprayed grassland plots to the potential natural vegetation in absence of weed infestation. Historic data sets (Mitchell 1958; Mueggler and Stewart 1980) taken before extensive knapweed invasion were used as quantitative reference points to determine if herbicide application was making the plant communities of the current weed infested sites more or less natural in regard to their potential native species composition. Herbicide treatment generally increased similarity to the potential natural community, relative to the no-spray controls. In the no-spray controls similarity to the potential natural community continued to decline over the five year period of measurement at one of the two sites analyzed. The site with lower pretreatment cover of exotic species and higher pretreatment composition of native species had the largest positive response to herbicide application in terms of increasing similarity to the potential natural vegetation. Although some treatments caused relative initial depressions in species richness one year after herbicide application, recovery of forbs was evident in the second year, and in the third year after herbicide application all six spray treatments had the same or a higher percent of pretreatment species present compared to the untreated control plots.

(Rice and Toney 1996) examined the frequency of occurrence of 48 most common individual non-target forb species at three years after initial herbicide applications in another study. Statistical analyses of these types of data are constrained because most forbs have a low abundance and patchy distribution so the data sets have high variance. Nine non-target forbs had declined significantly in their measurements of frequency of occurrence and three had increased significantly relative to the no-spray control. Thirty-six non-target forb species did not have statistically significant differences in measurement ($p>0.20$); among these forbs the actual sample counts for 20 forb species were lower and 16 were higher relative to the no-

spray controls. No non-target forb species were eliminated by herbicide applications to the test sites, although some of the most sensitive forbs were no longer found in the samples taken on all of the individual replicated test plots where they had been sampled prior to herbicide application. Total non-target forb canopy cover, which had initially declined due to herbicide application, had recovered to no-spray control plot levels by the third year after spraying. The investigators concluded that the herbicide treatments were very selective and had low overall impact on non-target forb species (Rice and Toney 1996)

The direct effects of herbicides on native plants in the Project Area are expected to be limited to species such as common yarrow and arrowleaf balsamroot, which commonly occur in the dry grass and shrub habitats that have a high susceptibility to invasive species. Many of the herbicides proposed for use in the designated treatment alternatives degrade quickly and do not bioaccumulate in the environment.

Methods of Application

The most common method of herbicide delivery in these alternatives, away from roads, will be by spot-spraying with backpack or with mule/horse mounted tanks. This involves applying chemical selectively to individual plants, small clumps of plants or relatively narrow but continuous linear infestations such as are found along trails. Spot-spraying minimizes impacts to non-target species at the site or polygon scale. While some non-target species mortality may occur, it is limited to microsite patches immediately surrounding the target plant(s).

Roadside applications use a truck-mounted, computer-monitored boom sprayer or a handline on a reel to treat infestations within the rights-of- ways of designated roads. This application method is less selective than hand spot-spraying but is still capable of providing a high degree of precision and minimizing non-target species mortality (Project File – Contract Inspections)

Safe application methods and practices would minimize health risks to applicators and forest visitors, and protect native vegetation, wildlife, and watersheds. All chemicals would be handled within Forest Service Handbook 6709 and 2109 guidelines and the EPA label restrictions included with each type of herbicide for storage, mixing, application, and disposal methods.

Application of herbicides to treat weeds would be performed by, or directly supervised by, a State licensed applicator following all current legal application procedures administered by the Montana or Idaho Department of Agriculture.

Following the Adaptive Management Strategy (see Appendix E and Chapter 2), other herbicides may be used when they become available if they are permitted by the EPA, have a human health and environmental risk assessment completed per direction of Forest Service Handbook 2109.14, Chapter 10, and are registered for use by the states of Montana or Idaho.

Surfactant adjuvant would be used in certain situations to increase efficacy, primarily on target species with a waxy cuticle (especially toadflax), or when temperature and humidity are not optimal (but still within label and more locally-prescribed limits) yet other conditions, such as plant phenology, are ideal. Surfactants may be used during periods of drought. Surfactants proposed for use will follow the same protection measures as picloram. Only those labeled for use in and around water would be used within 50 feet of water, or the edge of sub-irrigated land, whichever distance is greater, or on high run-off areas. Some surfactants are labeled for use in and around water including Activate Plus ®, LI-700 ®, Preference ®, R-11 ®, Widespread® and X-77®.

Herbicide Descriptions and Effects

Picloram generally affects members of the Asteraceae (composite), Fabaceae (legume), Polygonaceae (buckwheat), and Apiaceae (parsley) families. Members of the Brassicaceae (mustard), Liliaceae (lily), and Scrophulariaceae (figwort) families are less affected. The selectivity of picloram is rate and season dependent. Spring and fall applications at 1 pint per acre would have a short-term effect on native broadleaf plants (Rice and Toney 1996). Fall applications would be more selective at rates up to 1½ pints per acre because many non-target native plants are dormant and herbicide uptake is reduced. Rates under 1 quart per acre generally do not kill woody plants. Picloram application rates are proposed at between 1 pint and 2 quarts per acre, depending on location, target weed species and other environmental protection concerns.

Impacts to non-target native plants from picloram would be offset by reduction of noxious weed competition, and an increase in vigor and abundance of surviving species. Picloram can control weedy plants for two to four growing seasons depending on weed biology and site conditions that would allow plant communities to become more resistant to weed invasion. Application of picloram on the Sawmill Creek Pilot Project area on the Bitterroot National Forest resulted in healthy stands of native bunchgrass (Rice 2000b).

Clopyralid (Transline) is the most selective herbicide proposed for use on spotted knapweed and affects members of four plant families: Asteraceae, Fabaceae, Solanaceae (nightshade) and Polygonaceae (Dow AgroSciences 1997). Clopyralid does not affect conifers, including old-growth ponderosa pine, or important browse species. The herbicide can be applied near or over conifers, and many shrubs and forbs without damaging the native plant community.

Invasives such as leafy spurge and sulfur cinquefoil are not effectively controlled by clopyralid herbicides. If these species occur in a complex with spotted knapweed and infestations are treated only with clopyralid, tolerant invaders would expand within the plant community even though spotted knapweed is controlled. Clopyralid usually provides one growing season of control.

2,4-D is a short-residual herbicide that remains active for 10 to 14 days. It can kill or injure many broadleaf plants depending on site conditions, plant growth stage, and herbicide application rate. However, broadleaf plants germinating from seed, or initiating growth more than 10 days following application should remain unaffected. On woody species, vegetative growth may be killed, but plants generally recover in a year or less (USDA FS 1998c).

Dicamba (Banvel, Vanquish) is a selective broadleaf herbicide. It has limited application for proposed treatment areas but is effective on plants in the Asteraceae (composite) and Fabaceae (legume) families.

Imazapic (Plateau) is a selective herbicide used for control of leafy spurge. Imazapic also controls annual grasses and can be used for restoration of native bunchgrass sites. The effect of the herbicide on perennial grasses and broadleaf weeds can vary within a plant family. In general, plants in the Brassicaceae (mustard) family, leafy spurge, and some cool-season perennial grasses are sensitive to the herbicide. Fall applications increase tolerance of cool-season grasses, such as mountain brome, to imazapic. Warm season grasses and plants in the Asteraceae and Fabaceae family are very tolerant. Woody species are generally tolerant due to poor translocation of imazapic to meristem and lack of herbicide uptake through woody stems or roots.

Metsulfuron (Escort) is a selective herbicide used to control plants in the mustard and borage families including whitetop and houndstongue, respectively.

Aminopyralid (Milestone) is a recent addition to the approved herbicide list. It is similar in effectiveness to picloram but is more selective and causes less damage to non-target woody and forb species. It does not have the residual half-life of picloram and is permitted for use close to water. Is effective against some mesic species such as oxeye daisy that are difficult to control with the aquatic formulation of 2-4,D.

Table 3.1- 6: Comparison Of Herbicides

Chemical/Brand Names/Mode of Action	Properties	General Uses/Known to be Effective on:	Comparisons/Issues
2,4-D / (Weedone, Weedar, many more) / Synthetic auxin - Mimics natural plant hormones.	Readily absorbed through leaves or roots. Accumulation is primarily in the young, rapidly growing meristematic regions of roots or shoots.	Readily absorbed and metabolized. Used for the control of many broadleaf species.	Half-life in soil is usually not longer than 1 or 2 weeks during the growing season due to rapid decomposition by soil micro-organisms. Amines and esters are the most common formulations of 2,4-D. The esters are the most active and can be used at the lower rates and for brush control. Since vapor drift is a potential problem with the ester formulations, only the amines should be used in susceptible lawn, garden, or crop areas. Low-volatile esters can be used in areas where risk of damage to sensitive non-target vegetation is low.
Aminopyralid / (Milestone) pyridine carboxylic acid auxinic growth regulator - disrupts plant growth metabolic pathways	Aminopyralid provides systemic postemergence control	Broad-spectrum control of a number of key noxious and invasive annual, biennial and perennial weed species, as well as agronomic broadleaf weeds. Aminopyralid can also provide residual weed control activity controlling re-infestations and reducing the need for re-treatment depending on the rate applied and the target weeds.	It provides broad-spectrum broadleaf weed control at very low labeled use rates (4 to 7 fl oz/acre, or 0.06 to 0.1 lb ae/acre), compared to currently registered herbicides with the same mode of action, including 2,4-D, clopyralid, triclopyr, picloram and dicamba. Can be applied up to the water's edge
Chlorsulfuron / (Telar,Glean,Corsair) / Sulfonylurea- Interferes with enzyme acetolactate synthase w/ rapid cessation of cell division and plant growth in shoots and roots.	Glean -Selective preemergent or early postemergent Telar – Selective pre- and post-emergent. Chlorsulfuron can be used for many	Use at very low rates on annual, biennial and perennial species; especially Canada thistle, dalmation toadflax, hounds tongue and perennial pepperweed. Safe for most grasses.	Safe for most perennial grasses, conifers. Some soil residual. Potential for offsite movement through runoff or wind erosion is substantial in conditions that favor these actions. Damage to some aquatic

Chemical/Brand Names/Mode of Action	Properties	General Uses/Known to be Effective on:	Comparisons/Issues
	annual, biennial and perennial broadleaf species.		plants possible at peak concentration. Without drift mitigation (selective spot hand treatment, etc.), offsite drift from ground broadcast application may cause damage to non-tolerant species up to 900 feet.
Clopyralid / (Transline) / Synthetic auxin – Mimics natural plant hormones. Similar to picloram. Contains hexachlorobenzene.	A highly translocated, selective herbicide active primarily through foliage of broadleaf species. Little effect on grasses.	Particularly effective on Asteraceae, Fabaceae, Polygonaceae, Solanaceae. Some species include knapweeds, yellow starthistle, Canada thistle, hawkweeds.	Not as persistent as picloram. Can persist from one month to one year. More selective than picloram. Potentially mobile depending on site specific conditions.
Dicamba / (Banvel , Vanquish) Synthetic auxin - Mimics natural plant hormones	Readily absorbed by roots, stems or leaves and then translocated to other plant parts. Control is best when weeds are small and actively growing.	Used for the control of a variety of broadleaf and woody vegetation. Particularly effective against bindweed and Canada thistle.	Spray drift is toxic to non-tolerant plants in the same manner as 2, 4-D, thus similar precautions should be followed. Banvel is more likely to generate dicamba vapor than Vanquish. Dicamba is often mixed with grass herbicides or with phenoxy herbicides to provide a broader spectrum of weed control.
Diuron / (Karmex, Diurex 80W) / Substituted urea; strong inhibitor of photosynthesis	Most readily absorbed by roots, less so by foliage. Translocated upward in the xylem. Applied to crops as a preemergence or directed early postemergence spray, preferably before weed growth becomes dense. Better control of emerged weeds is obtained by the addition of a	Used as a herbicide to control a wide variety of annual and perennial broadleaf and grassy weeds. Diuron is used on industrial sites, on rights-of-way, around buildings, and on irrigation and drainage ditches.	Should not be used where it is likely to leach or wash into contact with the roots of desirable trees or shrubs. Diuron is a highly persistent and fairly immobile herbicide. When applied to soil it will not leach below 5 to 10 cm from the surface.

Chemical/Brand Names/Mode of Action	Properties	General Uses/Known to be Effective on:	Comparisons/Issues
	suitable surfactant. In non-crop areas, diuron may be sprayed anytime except when ground is frozen.		
Glyphosate / (RoundUp, Rodeo etc.) / Inhibits three amino acids and protein synthesis.	A broad spectrum, nonselective translocated herbicide with no apparent soil activity. Translocates to roots and rhizomes of perennials. Adheres to soil which lessens or retards leaching or uptake by non-targets.	Low volume applications are most effective. Control for purple loosestrife, reed canarygrass and other weeds common in wetland and riparian habitats.	Aquatic formulations can be used near water. Rain within 6 hours of application may reduce effectiveness. Complete control may require re-treatment. Without drift mitigation (selective spot hand treatment, etc.), off site drift damage from ground broadcast application to non-tolerant species up to 100' possible.
Hexazinone / (Velpar) Inhibits photosynthesis	Primarily soil-active; some foliar activity.	Broad spectrum control with some selectivity for conifers	Minimal volatility. Adsorbed by organic matter and clay; highly water-soluble with potential for leaching on sandy soils
Imazapic / (Plateau) / Inhibits the plant enzyme acetolactate, which prevents protein synthesis.	Selective against some broadleaf plants and some annual grasses.	Use at low rates can control leafy spurge, cheatgrass, and hounds tongue. Useful in grassland prairie habitat restoration because it is selective against annual grasses.	Without drift mitigation (selective spot hand treatment, etc.), off site drift from ground broadcast application may damage non-tolerant species up to 50' possible Even very tolerant species could be damaged directly. Some damage to aquatic plants at peak concentrations.
Imazapyr / (Arsenal, Chopper, Stalker, Habitat) / Inhibits the plant enzyme acetolactate, which prevents protein synthesis.	Broad spectrum, nonselective pre- and postemergent for annual and perennial grasses and broadleaved species.	Most effective as a postemergent. Has been used on cheatgrass, white top, perennial pepperweed, tamarisk, dyers woad, and woody species.	High potential for leaching. Highly mobile and persistent. Residual toxicity up to several years. May be actively exuded from the roots of legumes, likely as a defense mechanism by these plants.
Metsulfuron methyl / (Escort) / Sulfonylurea – Inhibits acetolactate synthesis, protein synthesis inhibitor, block formation of amino acids.	Selective against broadleaf and woody species. Most sensitive crop species in the Lily family.	Use at low rates to control such species as houndstongue, perennial pepperweed, sulfur cinquefoil. Safest sulfonylurea around non-target grasses.	Potentially mobile in water or through wind erosion. Damage to some aquatic plants possible at peak concentrations. Without drift mitigation (selective spot hand treatment, etc.), off site drift from ground broadcast

Chemical/Brand Names/Mode of Action	Properties	General Uses/Known to be Effective on:	Comparisons/Issues
			application may cause damage to non-tolerant plants up to 500'.
Picloram (Tordon) Restricted Use Herbicide Contains hexachlorobenzene.	Selective, systemic for many annual and perennial broadleaf herbs and woody plants.	Use at low rates to control such species as knapweeds, Canada thistle, yellow starthistle, houndstongue, toadflaxs, St. Johnswort, sulfur cinquefoil and hawkweeds.	Also can leak out of roots to non-targets. One application may be effective for 2 or more years. Can move offsite through surface or subsurface water. Can be relocated through livestock urine.
Sulfometuron methyl / (Oust) / Sulfonylurea - Inhibits acetolactase synthase, a key step in branch chain amino acid synthesis.	Broad spectrum pre- and post-emergent herbicide for both broadleaf species and grasses.	Used at low rates as a pre-emergent along roadsides. Known to be effective on canary reedgrass (but not labeled for aquatic use), cheatgrass and medusahead.	. Highly mobile by water or by wind erosion. Substantial damage has occurred to croplands in arid and wet regions. Damage to some aquatic plants possible at peak concentration
Triclopyr / (Garlon, Pathfinder, Remedy) / Synthetic auxin - Mimics natural plant hormones.	A growth regulating selective, systemic herbicide for control of woody and broadleaf perennial weeds.	Little or no impact on grasses. Effective for many woody species such as basal bark or cut stump treatment for salt cedar.	Garlon 4 (ester compound) is toxic to fish and aquatic invertebrates. Amine formulations may be used near or over water. Offsite movement by water possible.

* This table is a brief summary of some of the attributes of these herbicides. More information is provided in the species write
ups or more information can be found from the references given.
** The information on effectiveness by species (third column) contains examples of just some of the species the herbicides can treat.
*** Issues listed in this table and in following species-specific tables were identified in Forest Service Risk Assessments prepared by Syracuse Environmental Research Associates, Inc. Risk assessments are available at:

http://www.fs.fed.us/foresthealth/pesticide/work.shtml

Formulations

An herbicide formulation is the total marketed product, and is typically available in forms that can be sprayed on as liquids or applied as dry solids. It includes the active ingredient(s), any additives that enhance herbicide effectiveness, stability, or ease of application such as surfactants and other adjuvants, and any other ingredients including solvents, carriers, or dyes. The application method and species to be treated will determine which formulation is best to use. In most cases, manufacturers produce formulations that make applications and handling simpler and safer. Some herbicides are available in forms that can reduce risk of exposure during mixing, such as pre-measured packets that dissolve in water, or as a liquid form already mixed with surfactant and dye (e.g., triclopyr - Pathfinder II®).

Sprayable / Liquid Formulations

Water-soluble formulations: soluble liquids , soluble powders or packets, and soluble granules. Only a few herbicidal active ingredients readily dissolve in water. These products will not settle out or separate when mixed with water.

Emulsifiable formulations (oily liquids): emulsifiable concentrates and gels. These products tend to be easy to handle and store, require little agitation, and will not settle out of solution. Disadvantages of these products are that most can be easily absorbed through the skin and the solvents they contain can cause the rubber and plastic parts of application equipment to deteriorate.

Liquid suspensions (liquid or flowable) that are dispersed in water include: suspension concentrates, aqueous suspensions, emulsions of water-dissolved herbicide in oil, emulsions of an oil-dissolved herbicide in water, micro-encapsulated formulations, and capsule suspensions. All these products consist of a particulate or liquid droplet active ingredient suspended in a liquid. They are easy to handle and apply, and rarely clog nozzles. However, they can require agitation to keep the active ingredients from separating out.

Dry solids that are suspended in water include: wettable powders, water-dispersible granules, or dry flowables. These formulations are some of the most widely used. The active ingredient is mixed with a fine particulate carrier, such as clay, to maintain suspension in water. These products tend to be inexpensive, easy to store, and are not as readily absorbed through the skin and eyes as emulsifiable concentrates or other liquid formulations. These products, however, can be inhalation hazards during pouring and mixing. In addition, they require constant agitation to maintain suspension and they may be abrasive to application pumps and nozzles.

Dry Formulations
Granules: Granules consist of the active ingredient absorbed onto coarse particles of clay or other substance, and are most often used in soil applications. These formulations can persist for some time and may need to be incorporated into the soil.

Pellets or tablets: Pellets are similar to granules but tend to be more uniform in size and shape.

Dusts: A dust is a finely ground pesticide combined with an inert or inactive dry carrier. They can pose a drift or inhalation hazard.

Salts versus Esters
Many herbicidally active compounds are acids that can be formulated as a salt or an ester for application. Once the compound enters the plant, the salt or ester cation is cleaved off. This allows the parent acid (active ingredient) to be transported throughout the plant. When choosing between the salt or ester formulation, consider the following characteristics:

Salts: Most salts are highly water soluble, which reduces the need for emulsifiers or agitation to keep the compound suspended. Salts are not soluble in oil. They generally require a surfactant to facilitate penetration through the plant cuticle (waxy covering of leaves and stems). Salts are less volatile than esters and can dissociate in water. In hard water the parent acid (i.e. the active ingredient) may bind with calcium and magnesium in the water, precipitate out, and be inactivated.

Esters: Esters can penetrate plant tissues more readily than salts, especially woody tissue. Esters generally are more toxic to plants than salts. They are not water soluble and require an emulsifying agent to remain suspended in water-based solvents. Esters have varying degrees of volatility

Adjuvants / Surfactants
An adjuvant is any material added to a pesticide mixture that facilitates mixing, application or pesticide efficacy. An adjuvant enables an applicator to customize a formulation to be most effective in a particular situation. Adjuvants include surfactants, stickers, extenders, activators, compatibility agents, fertilizers, buffers and acidifiers, deposition aids, de-foaming agents, thickeners, and dyes. The common fertilizer,

ammonium sulfate, has been used to control undesirable species, like the poisonous tall larkspur, in other areas.

Surfactants are the most important adjuvants. They are chemical compounds that facilitate the movement of the active herbicide ingredient into the plant. They may contain varying amounts of fatty acids that are capable of binding to two types of surfaces, such as oil and water. Some herbicide formulations come with a surfactant already added, in others, surfactants can be added prior to application. Whether a surfactant should be added will be determined by the type of herbicide being applied and the target plant. The label should be followed for use of appropriate surfactants.

Adjuvants are not under the same registration guidelines as are pesticides. The U.S. Environmental Protection Agency (U.S. EPA) does not register or approve the labeling of spray adjuvants. All adjuvants are generally field tested by the manufacturer with several different herbicides against many weeds, and under different environments. Basic information concerning adjuvants commonly used with herbicides describes hazard information and is used in conjunction with Forest Service national herbicide risk assessments (Bakke 2002).

Inert Ingredients
Herbicide manufacturers add inert ingredients (or "other ingredients") to enhance the action of the active ingredient. Inert ingredients may include carriers, surfactants, preservatives, dyes, and anti-foaming agents among other chemicals. Inert refers to any ingredient that is not intended to affect the target species and does not convey any information regarding toxicity of the chemical (USEPA 2003a). Many manufacturers consider inerts in their herbicide formulations to be proprietary and do not list specific chemicals. Some of the listed inert ingredients for the herbicide formulations being considered include water, ethanol, isopropanol, isopropanolamine, kerosene, polyglycol 26-2, and polyoxyethylamine (USDA FS 1992b, 1995c, 1996c, 1996d, 1997c, 1998c-d, 1999b-e, 2000c, 2001f). None of these chemicals are listed as Level 1 or Level 2 compounds at present (i.e., "Inert Ingredients of Toxicological Concern" or "Potentially Toxic Inert Ingredients", respectively) (USEPA 2003a). There is some concern regarding the toxicity of polyoxyethylamine (POEA), a surfactant included in a formulation of glyphosate, specifically Roundup by Monsanto (Ecobichon 2001; USDA FS 1996d). Recent research (Relyea 2005) suggested that the toxic effects of Roundup on tadpoles may be attributable to the presence of POEA in the formulation. Proactive concern about the possible impacts of this product is incorporated into the design criteria that modify herbicide use within this project.

Mechanisms Of Herbicide Dissipation

Dissipation refers to the movement, degradation, or immobilization of an herbicide in the environment.

Degradation
Degradation occurs when an herbicide is decomposed to smaller component compounds, and eventually to CO_2, water, and salts, through photochemical, chemical, or biological (microbial metabolism) reactions. Biodegradation accounts for the greatest percentage of degradation for most herbicides (Tu, et. al., 2001). When a single herbicide degrades, it usually yields several compounds ("metabolites"), each of which has its own chemical properties including toxicity, adsorption capacity, and resistance to degradation. Some metabolites are more toxic and/or persistent than the parent compound. In most cases, the natures of the metabolites are largely unknown.

Photodegradation
Photodegradation refers to decomposition by sunlight. Sunlight intensity varies with numerous factors including latitude, season, time of day, weather, pollution, and shading by soil, plants, litter, etc. Studies of

the photodegradation of herbicides are often conducted using UV light exclusively, but there is some debate as to whether most UV light actually reaches the surface of the earth. Therefore, photodegradation rates determined in the laboratory may over-estimate the importance of this process in the field (Tu, et. al., 2001).

Microbial Degradation
Microbial degradation is decomposition through microbial metabolism. Different microbes can degrade different herbicides, and consequently, the rate of microbial degradation depends on the microbial community present in a given situation (Voos and Groffman 1997). Soil conditions that maximize microbial degradation include warmth, moisture, and high organic content.

Herbicides may be microbially degraded via one of two routes. They may be metabolized directly when they serve as a source of carbon and energy (i.e. food) for microorganisms, or they may be co-metabolized in conjunction with a naturally occurring food source that supports the microbes (Tu, et. al., 2001). Herbicides that are co-metabolized do not provide enough energy and/or carbon to support the full rate of microbial metabolism on their own.

There is sometimes a lag time before microbial degradation proceeds. This may be because the populations of appropriate microbes or their supplies of necessary enzymes start small, and take time to build up. If this lag time is long, other degradation processes may play more important roles in dissipation of the herbicide (Tu, et. al., 2001). Degradation rates of co-metabolized herbicides tend to remain constant over time.

Chemical Decomposition
Chemical decomposition is degradation driven by chemical reactions, including hydrolyzation (reaction with hydrogen, usually in the form of water), oxidation (reaction with oxygen), and disassociation (loss of an ammonium or other chemical group from the parent molecule). The importance of these chemical reactions for herbicide degradation in the field is not clear (Tu, et. al., 2001).

Immobilization/Adsorption
Herbicides may be immobilized by adsorption to soil particles or uptake by non-susceptible plants. These processes isolate the herbicide and prevent it from moving in the environment, but both adsorption and uptake are reversible. In addition, adsorption can slow or prevent degradation mechanisms that permanently degrade the herbicide.

Adsorption refers to the binding of herbicide by soil particles, and rates are influenced by characteristics of the soil and of the herbicide. Adsorption is often dependent on the soil or water pH, which then determines the chemical structure of the herbicide in the environment. Adsorption generally increases with increasing soil organic content, clay content, and cation exchange capacity, and it decreases with increasing pH and temperature. Soil organic content is thought to be the best determinant of herbicide adsorption rates (Tu, et. al., 2001). Adsorption is also related to the water solubility of an herbicide, with less soluble herbicides being more strongly adsorbed to soil particles. Solubility of herbicides in water generally decreases from salt to acid to ester formulations, but there are some exceptions. For example, glyphosate is highly water-soluble and has a strong adsorption capacity.

The availability of an herbicide for transport through the environment or for degradation is determined primarily by the adsorption/desorption process. Adsorption to soil particles can stop or slow the rate of microbial metabolism significantly. In other cases, adsorption can facilitate chemical or biological degradation (Tu, et. al., 2001). Adsorption can change with time and, in most cases, is reversible (i.e. the herbicide can desorb from the soil or sediments and return to the soil solution or water column).

Movement/Volatilization

Movement through the environment occurs when herbicides are suspended in surface or subsurface runoff, volatilized during or after application, evaporated from soil and plant surfaces, or leached down into the soil. Although generally studied and discussed separately, these processes actually occur simultaneously and continuously in the environment (Tu, et. al., 2001).

Volatilization occurs as the herbicide passes into the gaseous phase and moves about on the breeze. Volatilization most often occurs during application, but also can occur after the herbicide has been deposited on plants or the soil surface. The volatility of an herbicide is determined primarily by its molecular weight. Most highly volatile herbicides are no longer used.

Volatility generally increases with increasing temperature and soil moisture, and with decreasing clay and organic matter content (Tu, et. al., 2001). The use of a surfactant can change the volatility of a herbicide. In extreme cases, losses due to volatilization can be up to 80 or 90% of the total herbicide applied (Tu, et. al., 2001). Of the herbicides in this analysis, only 2, 4-D and triclopyr can present volatilization problems in the field.

Herbicide Resistance

Herbicide resistance is the genetic ability of an individual plant to survive a herbicide application to which the wild-type population is otherwise susceptible. Resistant individuals remain reproductively compatible with the wild-type, and may confer genetic resistance to their offspring.

Resistance may occur in plants by random and infrequent mutations. Through selection, where the herbicide is the selection pressure, susceptible plants are killed while herbicide resistant plants survive to reproduce without competition from susceptible plants. If the herbicide is continually used, resistant plants successfully reproduce and become dominant in the population.

Herbicide resistance was first reported in 1957 in California with common groundsel (Senecio vulgaris) (Prather et al., 2000). Development of resistance occurs mostly in croplands where repeated applications of a single herbicide select for resistant survivors. However, resistance is known to occur in a few wildland invasives, including yellow starthistle resistance to picloram and clopyralid (Sabba et al., 2003). A resistant biotype was observed in Washington in a pasture subjected to intensive picloram selective pressure. Reports of resistant strains of perennial ryegrass (Lolium perenne) to sulfometuron methyl, Russian thistle (Salsola tragus) to chlorosulfuron and sulfometuron have been found in California (Prather et al, 2000). Other resistant species were reported.

Resistance to glyphosate is debated in the literature (Owen and Zelaya, 2005). Arguments indicate that not only would the evolution of glyphosate resistance be an issue, but also weed populations shifts would occur in response to the adoption of glyphosate-resistant crops. In field situations, resistance to sulfonylurea herbicides has been reported to occur after 3 to 5 years of repeated use (Liebman, et. al., 2001).

Herbicide factors that contribute to the potential for resistance include long soil residual activity, single target site and specific mode of action, and high effective kill of a wide range of weed species. All of these factors rapidly deplete susceptible genes from the population (Prather et al., 2000). Resistance is avoided or overcome by having multiple herbicides with different modes of action (plant-killing chemistries) available for use. The use of short-residual herbicides also reduces selection pressure for herbicide resistance as well as integrating non-herbicide control techniques into a weed management program (Prather et al., 2000).

The repeated use of one herbicide allows these few resistant plants to survive and reproduce. As the number of resistant plants increases, the efficacy of the herbicide diminishes until the herbicide no longer

effectively controls the undesirable plant populations. Where repeated herbicide use is predicted to be necessary to meet control objectives, strategies must be designed to minimize risk of developing resistance.

To develop resistance avoidance strategies, long-term site plans should recognize which of the various herbicide families have available and effective herbicides if multiple applications are expected to be necessary. Integrated chemical and non-chemical controls are highly effective where feasible because any surviving herbicide resistant plants can be removed from the site.

Development of chemical resistance has not been documented to date on sites inside the Project Area where herbicides are currently approved under a previous NEPA decision. However, it is not impossible that some invaders might develop a degree of resistance in the future. As an adaptive management approach, herbicide rotation will be considered where resource management objectives can still be met. Rotating herbicides by chemical family and preferably by mode of action would minimize the potential development of herbicide resistant weeds.

Behavior In The Environment

Perhaps the most important factor determining the fate of herbicide in the environment is its solubility in water (Tu, et. al., 2001). Water-soluble herbicides generally have low adsorption capacities, and are consequently more mobile in the environment and more available for microbial metabolism and other degradation processes. Esters, in general, are relatively insoluble in water, adsorb quickly to soils, penetrate plant tissues readily, and are more volatile than salt and acid formulations (Tu, et. al., 2001).

B. Effects Common to all New Bio-control Use: Alternatives 2, 4, and 5

It is difficult to make precise predictions about the results of bio-control introductions because of the variability in success experienced on different sites.
Spotted knapweed is the most prevalent invasive plant in the project area. There are thirteen approved bio-control insect species (eight seed head feeders and five root feeders) currently introduced to control spotted knapweed in Montana and Idaho. Many of these species have been released within only the last few years. Table 3.1-7 below summarizes the current status of these organisms in Montana and in the Project Area.

Table 3.1- 7: Status and Effects of Spotted Knapweed Biological Control Agents

Bio-control Insect	Plant Part Affected by the Insect	Status: MT = Montana PA = Project Area	Effect
Urophora affinis*	seed head fly	MT: well established PA: Present	reducing knapweed seed production by 50-90 percent
Urophora quadrifasciata*	seed head fly	MT: well established PA: Present	reducing knapweed seed production by 50-90%
Metzneria paucipunctella*	seed head moth	MT:established in low numbers PA: Unknown	reducing knapweed seed production
Agapeta zoegana*	root moth	MT: established in good numbers at some locations	reducing knapweed vigor and density in some areas

Bio-control Insect	Plant Part Affected by the Insect	Status: MT = Montana PA = Project Area	Effect
		PA: Unknown	
Cyphocleonus achetes*	root weevil	MT: established in moderate numbers PA: Present in a few locations	reducing knapweed vigor and density in some areas
Pelochrista medullana	root moth	MT: established in low numbers PA: Unknown	NA
Pterolonche inspersa*	root moth	MT: not established PA: not established	NA
Larinus obtusus*	seed head weevil	MT:established in low numbers PA: scattered in low numbers	reducing knapweed seed production
Larinus minutus*	seed head weevil	MT: established in moderate numbers PA: scattered in low numbers	causing decline of diffuse knapweed in some areas
Terellia viren*s	seed head fly	MT: established in low numbers PA: unknown	NA
Chaetorellia acrolophi	seed head fly	MT: established in low numbers PA: unknown	NA
Sphenoptera jugoslavic*	root beetle	MT: established in moderate numbers PA: unknown	reducing knapweed vigor and density in some areas
Bangasternus fausti*	seed head weevil	MT:status uncertain PA: present in a few locations	NA

The Lolo NF in Montana has released 11 biological control species on spotted knapweed. MSU/WARC studies have shown that the two seed head flies, Urophora spp., are reducing knapweed seed production by a minimum of 50 percent where the two flies coexist. Likewise, recent studies indicate that the root moth, Agapeta zoegana, and the root weevil, Cyphocleonus achates, are causing significant reductions of spotted knapweed vigor and density at several release sites.

Two other spotted knapweed biological control agents, Agapeta zoegana and Cyphocleonus achates have slow reproductive rates so MSU/WARC has initiated a mass-rearing program to hasten their distribution and population increase around the state. Both insects have now been released in every knapweed-infested

county in Montana. The Forest Service, Nez Perce Tribe, counties and private commercial operations have released Cyphocleonus achates at numerous locations around the perimeter of the project area. There have been a few trial releases of Cyphocleonus achates and Bangasternus fausti on the project area within the last decade.

Biological releases alone can, in some cases, control leafy spurge. For example, the Apthona flea beetle has provided over 95 percent spurge control (U.S. Department of Agriculture-FS 1996) on a southerly, dry, lower elevation leafy spurge site near Hayes Creek at the Blue Mountain Recreation area on the Lolo National Forest in Montana. The possibility of success is high on sites with similar soils and aspect. Apthona effectiveness measurements on leafy spurge at other sites are variable.

Another researcher suggests that biological control insects may increase competitive ability of spotted knapweed. (Callaway et. al. 1999) found that when one bio-control insect (Agapeta zoegana) fed on the roots of spotted knapweed neighboring Idaho fescue (Festuca idahoensis) plants actually did more poorly than when grown with un-attacked spotted knapweed. Instead of releasing the neighboring grass from competition and allowing it to thrive as intended, the insect had no detectable impact on knapweed and may have indirectly suppressed the fescue. Some observers suggest that other bio-control agents have negative indirect effects on some native species that are not yet recognized.

Biological controls have been released extensively on the Lolo and Bitterroot National Forests in Montana. Since 1978, the Lolo National Forest has conducted over 400 releases of 35 different biological control agents on seven weed species (Canada thistle, spotted knapweed, diffuse knapweed, leafy spurge, St. Johnswort, Dalmatian toadflax and musk thistle). On some sites, biological agents have spread onto the Lolo from releases on adjacent lands. Since 2000, the Bitterroot Forest has carried out over 300 releases of 8 insect species that have targeted, to varying degrees, spotted knapweed, leafy spurge, Canada thistle, Dalmatian toadflax and St. Johnswort (Bitterroot Forest Monitoring Report 2007).

The results of these releases have been variable. Some biological agents have noticeably reduced some weed infestations. Other releases have had little apparent effect so far. While some biological agents can fly and readily spread to other weed infestations, others have to hike from weed to weed, which slows their rate of spread. Some biological agents cannot survive annual variation in our weather. Biological control also appears cyclic, meaning that weed populations vary as the populations of biological control agents wax and wane in response to the weed population and other factors.

Biological control monitoring files at the Lolo National Forest indicate anywhere from over 90 percent to little or no weed control from biological control agents depending on factors such as weed species, biological control species, aspect and elevation (USDA, Lolo NF 1996, 1998). Monitoring observations on the Bitterroot Forest have shown successful establishment of predator insects on spotted knapweed, Canada thistle and leafy spurge. The time elapsed since the initial releases is not sufficient to demonstrate target plant mortality or reproduction / spread trends on more than a microsite scale at this time (Bitterroot Forest Monitoring Report 2007).

Irreversible and Irretrievable Commitment of Resources with Bio-controls

The successful establishment of insects or other approved pathogens employed to control invasive plants is not guaranteed. Local climate, among other variables, may prove inhospitable to some species that showed initial promise in controlling target plants. In these cases, the released bio-controls may die off and vanish from the project area. Bio-control organisms that succeed in establishing, reproducing and finding new host infestations will become permanent residents of the biotic landscape. Their populations will oscillate in cycles that follow the rise and fall of their prey plant species. Since bio-controls do not generally eradicate a target species, they would persist in varying densities over time, depending on the population size and distribution of their host specie.

C. Effects Common to all Alternatives Using Mechanical Control: Alternatives 1-5

Invasive weeds can be treated by various mechanical methods such as hand pulling, prescribed burning, mowing, and tilling. Pulling weeds by hand, would probably be the primary mechanical treatment method in the Project Area and would occur on particularly sensitive areas, or areas of small infestations. Hand pulling is not very effective on plants that spread via roots because the soil needs to be excavated repeatedly to remove all root fragments. Sites less than a tenth acre with non-rhizomatous species and low weed density could be hand pulled. On some sites herbicides can be used in conjunction with pulling to help reduce plant density so that pulling is cost efficient.

It is even more difficult to achieve eradication objectives by hand pulling alone because it requires the complete elimination of any propagule production. This may require multiple return treatment trips within a single growing season to a site to detect and remove new germinating plants or rhizomes that launch above ground stems and flowering parts (Project File).

Mechanical weed management methods can be effective on small infestations. Hand pulling and hoeing are the oldest and most traditional weed management methods. These methods are labor intensive and relatively ineffective for management of large, dense infestations of perennial weeds. Best results are achieved when the entire root is removed on non-clonal species. This is not always possible when treating deep rooted or rhizomatous weeds. Hand pulling often leaves root fragments that generate new plants. Hand pulling also causes disturbance that may increase susceptibility of the site to reinvasion. While this control method is effective on single plants or relatively small infestations, it is not economically feasible on large, well-established knapweed infestations. In addition, hand pulling plants that contain toxins or skin allergens can expose individuals to their poisonous effects (DiTomaso, 1997 and 1999).

Test plots established on Blue Mountain (Lolo National Forest) and the Lee Metcalf National Wildlife Refuge near Stevensville, Montana, measured effects of hand pulling on spotted knapweed. On the two sites spotted knapweed covered 76 percent and 53 percent, respectively. Average pulling cost for the two locations was calculated at $8494 per acre per year and is used to estimate and analyze pulling costs. Hand pulling provided 100 percent flower control and 56 percent plant control at Blue Mountain, but increased bare ground from 2.7 percent to 13.7 percent during the first year after treatment (USDA, FS 2005).

Mowing and tilling (such as discing or plowing) are mechanical methods appropriate for candidate sites outside the Wilderness. These methods prevent plants from producing seeds when treated in the bud stage or earlier. Efforts repeated every 21 days during the growing season can deplete the underground food supply of some perennials. These methods would be required for at least a three-year period to attain satisfactory control. These methods would also weaken non-target species in treated areas.

Mechanical treatments such as tillage are most applicable to tap-rooted weed species; this method can be used on small acreages, level terrain, and infestations that are “tended’ or visited on a regular basis in order to remove new plants and re-sprouts as they occur. Tillage removes all vegetation and must be combined with seeding or planting of desirable species. Although mechanical treatments can reduce seed production for the treated season, invasive weed seeds may remain viable in the soil for several years (Stannard 1993; Messersmith et al., 1985). Re-infestation of a site from residual seed, especially when disturbed, will often occur without continued follow-up treatment. Tilling would be considered only in areas where slope is less than 10 percent and a small percentage of the vegetation consists of shrubs.

In many cases, endemic native species do not appear capable of out-competing invasive plants. On appropriate sites, herbicide application after invasives have emerged, followed by tillage and drill seeding,

can be an effective treatment for establishing desirable species. This process, however, can lead to increased soil compaction (DiTomaso, 1999), and cannot be conducted on steep, remote, and rocky sites, characteristic of many sites.

Mowing or cutting is more effective on tap-rooted perennials such as spotted knapweed compared to rhizomatous perennials. Cutting or mowing plants can reduce seed production, if conducted at the right phenological stage. For example, a single mowing at late bud growth stage can reduce the number of seeds produced by spotted knapweed (Duncan et al.). Mowing can also weaken the competitive advantage of weeds by depleting root carbohydrate reserves. Because of large carbohydrate reserves, mowing must be conducted several times a year for consecutive years to reduce the competitive ability of the weed.

Because invasive weeds 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 (DiTimaso 2001, 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).

Mulching with plastic or organic material can be used on relatively small weed infested areas (less than ¼ acres), but will also stunt or stop growth of desirable native species. Mulching prevents weed seeds and seedlings from receiving sunlight necessary for survival, and can smother some established weeds. Although hay mulch was used in Idaho to reduce flowering of Canada thistle (Tu et al., 2001), most rhizomatous perennial weeds cannot be controlled by this method because their extensive root reserves allow re-growth through or around mulch.

D. Effects Common to all Alternatives Using Cultural (revegetation) Methods: Alternatives 1-5

Cultural methods of noxious weed management are generally targeted toward enhancing desirable vegetation to minimize exotic plant invasion. Plug planting or seeding desirable species to shade or out-compete targeted weeds and applying fertilizer to desirable vegetation are common examples of cultural treatments.

In most cases, endemic native species have difficulty out-competing invasive plants. On appropriate sites, herbicide application after weeds have emerged, followed by tillage and drill seeding, can be effective for establishing desirable species (Sheley et al. 1999). This process, however, can lead to increased soil compaction (DiTomaso 1999) where it involves mechanized equipment. Revegetation equipment is appropriate only outside the Wilderness and is poorly suited to the steep, remote, and rocky sites that are characteristic of most of the non-Wilderness project area.

When seed is introduced to a site by non-natural means (e.g., seeding by humans), there is a risk of introducing non-native and/or invasive species. Use of certified weed-free seed reduces this risk. The magnitude of the risk varies and may be determined by seed source, cleaning practices, and other factors. Certified weed free seed has tolerances for certain weed species and is only certified free of certain weed seeds (Montana Weed Act Section 4.12.3010 -11).

Inside the Wilderness, any revegetation work would use only native ecotypes. These would consist of containerized plants or second generation seed that originate from seed collected from nearby habitat types that are the same as the revegetation site. Outside the Wilderness, native plant material from commercial sources would provide the revegetation stock for the project site. Seedling establishment of native species

depends on proper seeding depths, soil, adequate moisture, prior removal of as many invasive weeds as possible (Goodwin and Sheley 2001).

E. Direct, Indirect and Cumulative Effects of Each Alternative

This section analyzes the effects on invasive plants and native plant / non-target plant communities that are specific to each alternative. The primary issues pertaining to vegetation as identified in Chapter 1 are shown below. The applicable indicators are used to distinguish the variation in effects of the alternatives and to rate their effectiveness in achieving the project purpose and need. These issues and indicators are discussed below, along with other relevant factors, and are summarized in Table 3.1-10 at the end of this section.

Table 3.1- 8: Applicable Issues and Indicators

Issue	Indicator
#2: Maintaining natural ecosystems	* Ability to conserve naturalness or ecological conditions as represented by native flora by controlling invasive plant species
#4: Extent of area needing treatment	*Acres treated by selected measures in order to respond to disturbances that would promote conditions for invasive plant establishment
#5: Types of treatment methods and strategies for managing invasive plants	* Effectiveness of integrated treatments in achieving overall objectives. Ability to use a variety of treatments in a broad range of conditions. * Responsiveness to multiple disturbance events (such as fire) and associated multiple starts of new invaders.

Alternative 1 - No Action

Direct and Indirect Effects

Conservation-Control, Responsiveness and Other Effects
Within the Project Area, existing invasive plant treatments would continue on roads, trails, trailheads and administrative sites as approved under previous NEPA. Treatments underway within some parts of the project area include ground-based herbicide application, hand pulling and revegetation. On the sites receiving combined herbicide and manual treatment, there is a high probability that new invaders (Category 3 – Montana species / EDRR category -Idaho species) will be eradicated or contained in these areas. Existing infestations of established but scattered invaders (Category 2-Montana species / Control category – Idaho species) on these treated sites would shrink or remain static on many sites as a result of treatment with herbicides (Project File – Bitterroot Forest Monitoring Report). Well-established and widely distributed species (Category 3-MT/Contain category-ID), such as spotted knapweed, may remain static.

A sample of Westside Canyon trails on the Bitterroot National Forest showed that herbicide treated acres continued to drop by thirty percent (30%) between 2002 and 2007 even though treatment had commenced on the sample trails around 1999 (Table 3-1.9). No treatment data was is available on these sites prior to 2002. One would expect that even more dramatic results showed up during the first few years of treatment. After these initial treatments, gains in controlling the distribution and density of invaders gradually leveled off to the values shown in Table 3-1-9. Ocular estimates indicate that target invasive plant densities and distribution along these trails has shrunk considerably since the initiation of treatment (Project File – Bitterroot Forest Monitoring Report).

Table 3.1- 9: Bitterroot National Forests Westside Canyon Acres Treated 2002 - 2007*

Location	2002 Acres treated	2007 Acres Treated
Kootenai	1.5	.5
Big Creek	1.3	.5
Bear Creek	1	.5
Blodgett	1.2	.25
Sawtooth	1	.5
Rock Creek	2.2	1
Roaring Lion	1	.5
Tin Cup	2.1	2
Boulder	1.2	.5
Watchtower	2	4 – whole drainage treated
Sheepshead	1.3	1
TOTAL	15.8	11.25

*Many of these canyons were not treated in 2005 and currently are planned for treatment every other year.

However, while the current range of integrated invasive management actions around the perimeter and within the project area (roads and trails) may slow the advance of new species into the area, some invasive propagules will inevitably slip through and establish beyond the current permitted reach of herbicide treatment. New invaders may also escape the road corridor rights-of-way and establish on sites outside the herbicide use zone. The second line of defense under this alternative consists of early detection and manual control (digging or handpulling). As discussed above under "Effects Common to All Alternatives – Mechanical Control", the success of manual treatment techniques depends on early detection of a small isolated infestation, rapid response, and close monitoring and followup treatment while the target plants are extremely low in number. The remote nature of the vector pathways (trails and waterways) makes multiple treatment trips difficult. Disturbances, such as wildfire, may accelerate this establishment process and boost invasive plant numbers and distribution beyond the threshold for control by manual treatment.

Similarly, low density – lightly distributed invader populations that are currently found inside the Selway-Bitterroot Wilderness (Table 3.1-3) are already beyond the point of reasonable control by manual techniques alone, particularly rhizomatous species such as hawkweed, Canada thistle and Dalmatian toadlfax (Bitterroot Forest FEIS 2003). Reliance on manual controls alone within the Project Area may slow the establishment and spread of new and existing invaders to a slight degree on a few sites. The use of substantial numbers of volunteers would improve the effectiveness of manual control methods.

In the long term, over most of the project area that is not covered by current NEPA decisions, this alternative would allow invasive plants to colonize the maximum possible number of suitable sites and acreage amounts within the untreated project area. Widespread loss of species diversity, composition and ecosystem function would follow. The rate of invasion (and the associated decline in the components and functions of native plant communities) is determined by biotic, climatic and disturbance factors as well as transportation vectors such as humans, recreational stock, vehicles and wildlife (Mantas 2003, Potito 2005).

Some biological control organisms would continue to migrate into the area unassisted by deliberate human distribution. A flying predator on spotted knapweed seedheads, Urophora spp. (gallfly) for example, is known to have extended its range into the project area from release sites outside the area (Personal Communication 2007). The predicted rate of migration and number of potentially successful bio-control species is unknown.

The most susceptible Vegetation Response Units (VRUs) on the warmer, drier and lower elevation sites have the highest probability of becoming infested first and at the most rapid rate. These sites already host the greatest density and number of invaders. The remnant native plant communities will suffer further depauperizataion and loss of diversity (Lonsdale 1999).

Wildfire events will accelerate the invasion of invasive species present in and area and will create site conditions conducive to the establishment and colonization of new and existing invaders. New and existing invaders will be able to establish and spread from disturbance sites unchallenged by any control technique other than handpulling / hoeing or lopping.

Management Flexibility
This alternative applies only manual/cultural treatments and prevention measures from the Integrated Weed Management toolbox. Herbicide applications and new biological controls are excluded from use in the project area. Limiting the range of measures will hamper the ability of the invasive plant management effort to achieve the objectives of containing established infestations and eradicating new infestations.

Acres of Herbicide/Bio-control Treatment
No new or additional acres would receive treatment with herbicide. This limits the ability of invasive plant managers to effectively treat target species that have established and set a seed crop or developed past the seedling stage. No additional acres would receive new bio-control releases.

Estimated Person-Days for Implementation inside the Wilderness
No assignment of additional personnel (contract, volunteer or Forest Service) or stock inside the Wilderness would occur.

Cumulative Effects
The movement of invasive plant seeds and propagules would proceed unimpeded between Idaho and Montana across the project area. The Selway-Bitterroot Wilderness would serve as a transit zone for new invasive species to enter new territory around the perimeter of the project area. Control efforts outside the project area show results and additional promise for reducing and containing numerous species (Rice 2006, Lolo National Forest EA 2007). This could result in a scenario where the Wilderness supported a greater variety and density of invasive plant species than the adjacent lands outside the project area.

For example, yellowstar thistle is absent from Montana and the Project Area but is common in certain areas of eastern Idaho. Under Alternative 1, this particular plant could colonize potentially thousands of susceptible acres inside the project area and develop a density, range and seed bank that rivals the current monocultures of spotted knapweed outside the project area in Montana. Within several decades possibly,

of unchecked colonization, yellowstar thistle could threaten the entire eastern flank of the project area and all susceptible habitat in western Montana from inside the Selway-Bitterroot Wilderness.

Over time the probability is high that numerous new invasive plant species will establish and spread throughout the Project Area, occupying much of the susceptible habitat (Table 3.1-1, Mantas 2003). The vegetation along most of the trail system rights-of-way within the project area could eventually be dominated by exotic species. The corridors along secondary trails as well as mainline trails could also support a variety of nonnative plants that displace native species to a high degree (Potito 2005). The opportunity for transport of exotic seed inside and outside the project area will increase. This will accelerate the movement and establishment of exotics in susceptible habitats. As invasive species advance across the landscape of the Project Area and colonize additional susceptible acres, the biological diversity within a broader range of native plant communities will decline. Eventually, invasive plant species over much of the area would have a high probability of reaching a dominant community status.

The application of "fire use" practices, in contrast to fire suppression, will increase the amount of susceptible habitat prime for invasion and will increase the probability of the establishment of new invaders or the expansion of established invaders. Without a full range of treatment options, any new or expanding invasive plant infestations may more freely colonize susceptible burned habitat types. In recent years, thousands of newly burned acres are created by wildfires each year in the Selway-Bitterroot Wilderness (Project File)

Helispots, helicopter activity and fire fighting crew movement associated with fire management can introduce new invasive plants and spread existing species within the Project Area. These activities can also export invasive seed out of the area. Prevention measures to reduce this probability are part of current standard practices.

Recreational activities inside the Wilderness (including river rafting, hiking, hunting, stock use and airplane landings at two airstrips) can serve as vectors for invasive plant introduction and spread. Additionally, outside the Wilderness, motorized travel on roads and trails can introduce and spread invasives.

Alternative 2

Direct and Indirect Effects

Conservation/Control, Responsiveness and Other Effects

This alternative would prove moderately to highly effective at preventing the establishment of new invader species depending on the watershed category. Weed-free watersheds and new disturbances occurring in these watersheds would have small pioneering occurrences of new invaders that could be easily managed primarily with herbicides coupled with followup manual control on small numbers of young individual plants.

Invasive plant densities and extents are greater in Early Infestation and Advanced Infestation Watersheds. In these watershed categories, the allowable limit of 1,500 acres per year of herbicide application may fall short of the amount needed to contain the expansion of existing infestations. However, new invaders, by definition having only small infestations, could be effectively eradicated.

The risk of damage and mortality to non-target herbaceous and woody plant species is minimized by the application of design criteria and standard best management practices. These mitigation measures will reduce negative effects on non-target vegetation species and community to a low level. In addition, the transitory potential microsite adverse impact of spot herbicide application around non-target species is

compensated by a reduction in competition from the target invasive plants. The reduction in competitive exclusion by invasives will generally release native grass species and have a neutral or positive effect on forb composition and density (Rice and Toney 1998). On sites where cheatgrass occurs in relative abundance, removal of a dominant invader, such as spotted knapweed, may open the door to an increase in cheatgrass cover at the expense of native or desirable non-native species.

Some heavily infested trail corridors may receive narrow blocks of hand-applied intensive herbicide treatment in the early phases of implementation. These trails have some of the more continuous, varied and connected infestations strung out along miles of the travel corridor. Collateral damage to non-target forb (broadleaved) species will be highest along these trail corridors due to the heavier invasive plant densities and the lessened ability to spot-spray selectively. However, impacts to non-targets should prove transitory with native and non-target forbs recovering or exceeding pre-treatment densities (Rice and Toney 1998). As the target species infestations shrink in size, herbicide use will drop and become more occasional (Project File -Bitterroot Monitoring Report).

Herbicide treatment effects on target invasive plants would follow the pattern displayed in Table 3.1-9 of Alternative 1 ((Bitterroot Forest Westside Canyon Acres). Newly permitted roadside acre herbicide treatments outside the Wilderness would eliminate the opportunity for existing invaders to expand their range closer to the Wilderness. The additional treatments would prevent the establishment of new invaders in the numerous key road and trail vector corridors that thread through the Project Area from adjacent infested terrain.

Approximately 10,000 acres could receive bio-control agent releases over the term of the project. The effectiveness of this accelerated bio-control program would progress at a moderate rate on target species. The reduction of spotted knapweed monocultures that contain high densities of cheatgrass and low densities of native species, may result in a shift in plant composition towards cheatgrass instead of the natives on certain habitat types.

Management Flexibility
This alternative allows the use of all the tools in the Integrated Weed Management toolbox. The use of herbicide will increase the effectiveness and success probability of eradicating new invaders, irregardless of factors such as whether they were detected as early as possible or have root systems that are difficult to kill (i.e. taproot vs rhizomatous). Management flexibility is high with this alternative and allows managers to respond to changing conditions and new target plant locations.

Acres of Herbicide/Bio-control Treatment
While constrained to a maximum of 1,500 herbicide treated acres per year, Alternative 2 still allows herbicide applications wherever new invaders are found. This option provides flexibility in prioritizing sites for treatment anywhere in the Project Area. Up to 10,000 acres could receive new bio-control releases.

Estimated Person-Days for Implementation Inside Wilderness
Approximately 870 additional person-days would be needed to implement the monitoring and treatment aspects of this alternative. About 200 mule/horse days would be part of the work. The bulk of the nutritional needs for the stock would be certified weed-free feed that is packed in. The limited amount of on-site grazing associated with the stock would be negligible. The stock will spend most of their time transporting supplies/equipment rather than attached to the crew camps for the duration of a hitch.

Cumulative Effects
Alternative 2 would prove moderately effective in preventing the establishment of new invasive plant species over the long term. It has a moderate to high probability of success in preventing the movement of

new invaders across the barrier zone of the Wilderness into the areas free of those species outside the Wilderness.

Cumulative impacts to non-target plant species include those associated with on-going Forest management. Notable activities currently occurring and reasonably foreseeable that potentially affect non-target plants include: other previously approved weed treatment programs, firewood gathering and other timber management outside the Wilderness, "fire use" practices, fires suppression, recreational activities and stock use. Cumulative effects from these activities are similar to those described in Alternative 1. While all these activities will continue into the near future, design criteria (e.g., environmental protection and mitigation measures) are included with this alternative to protect sensitive resources, including animals and plants. Due to the minimal potential for impacts to non-target species from implementing this alternative and the environmental protection measures associated with other ongoing and reasonably foreseeable activities on the Forest, no cumulative effects would result.

While "fire use" practices may increase the amount of susceptible acres exposed to invasion, this alternative has a generally moderate ability to prevent the establishment or expansion of invaders into burned areas.

Bio-control releases would augment the natural in-migration of some species and accelerate their establishment and effectiveness. Other species, such as the root miner weevil (Cyphocleonus achates) are non-fliers and move relatively slowly across the ground. Species such as these might never be able to move through elevation, terrain or vegetation cover type barriers to reach all the suitable colonization sites. Programmed releases of non-flier species would enhance the range and density of their occurrence throughout the project area.

Bio-control releases occurring on private inholdings within the Wilderness would be additive to the rates of establishment and migration of the bio-controls introduced to the National Forest. Other private, state, and county entities release biological control agents on land adjacent to the Forest. There is potential for movement and establishment of these agents on Forest land in the absence of intentional introductions by the Forest.

Alternative 3

Direct and Indirect Effects

Conservation/Control, Responsiveness and Other Effects

With manual control (handpulling, hoeing or lopping) of invasive plants, as the only direct method allowed within 50 feet of live water, a higher probability exists of establishment of new invaders in the wetter environments in the Project Area. While manual methods are effective on infestations comprised of a few individual taprooted plants (Project File BNF Monitoring Report), the method does not work well on rhizomatous species or larger, more widely distributed infestations. Proximate rhizomatous invasive plants, such as Canada thistle, leafy spurge and meadow hawkweed, that thrive on moist sites would prove resistant to control by mechanical methods such as hand pulling or hoeing (Bitterroot Forest Noxious Weed EIS 2003). Lopping, which focuses on flower removal, would prevent seed dispersal (if timed correctly) and would slow the off-site spread of these species but would not slow the expansion of rhizomes. Management flexibility is low to moderate with this alternative because of the restricted ability to choose from the full range of the treatment options available under an Integrated Weed Management approach. The diverse habitats and routine hydrologic disturbances make riparian zones particularly susceptible to invasion by exotic species (Planty-Tabacchi 1996).

This method succeeds best on small infestations of a few shallow tap-rooted plants. Early detection of new infestations is key to the effectiveness of this method. The risk is high of new invaders producing and disseminating propagules, such as seed crops or rhizomes, and establishing a firm foothold before detection. This reduces the long term effectiveness of mechanical treatments (Brown 1999).

In contrast, some common herbicides (such as picloram and clopyralid) have a residual potency, at least through the season of application, which will kill germinating target seedlings and rhizome growth. This allows for an extended period of effectiveness and fewer return trips in order to achieve an eradication or containment objective. Systemic herbicides are able to translocate into root systems of many invasive plant species and kill them.

Without the residual potency or systemic attributes of herbicides that can kill germinating seedlings or rhizomatous invaders, a dependence on handpulling / hoeing will require multiple monitoring / treatment crew trips throughout the growing season. Hand treatment of more than a few plants is slower than herbicide treatment and requires more time to accomplish the task at a given site. This also increases the amount of crew time in the Wilderness for treatment and monitoring and in the Project Area in general.

With handpulling / hoeing as the only permitted control method in river camps, dam sites, many mesic (water-influenced) areas and thousands of susceptible "dispersed area" acres within the Wilderness, it is expected that existing invaders will expand their range and that new invaders will be enabled with a high potential for establishment. For example, informal monitoring of invasive plant densities and colonization patterns along the Selway River over the last ten years indicates that: a) intensive repeated handpulling, throughout the growing season, can slow the offsite spread of new invaders but not eradicate them from a small site and b) repeated handpulling will lower the density of species migrating into the site from established off-site infestations but not achieve elimination from the campsite (Personal Communication 2008). New invaders that establish even a small foothold on these sites have the ability to gradually expand their range offsite.

Overall effectiveness in limiting invasive plant spread and conserving native plant diversity is somewhat higher (Low to Moderate) than Alternative 1 (No Action) because herbicide treatment is permitted on 861 acres of designated sites within the Wilderness and 945 acres of both dispersed and designated sites outside the Wilderness. The restriction of herbicide use in dispersed areas inside the Wilderness lowers overall effectiveness in comparison to Alternatives 2 and 5. These restrictions will cause effects similar to Alternative 1 (No Action) within the Wilderness with some slowing down of invasive plant introduction and establishment on designated sites receiving herbicide treatment.

Direct, Indirect and Cumulative Effects outside the Wilderness (non-SBW) on both designated and dispersed sites would be similar to Alternatives 2 (Proposed Action), 4 (Bio-control) and 5 (Expanded Treatment). Treatment options and acreages are similar between the "action" alternatives in the project area outside the Wilderness.

The risk of damage and mortality to non-target or native plant communities is low because of herbicide application design criteria and the distribution pattern of treatments. Some heavily infested trail corridors may receive narrow blocks of hand-applied broadcast herbicide treatment in the early phases of implementation. Effects on those sites are similar to Alternative 2.

Without a bio-control component, the in-migration or expansion of target invasive plant pathogens and predators would proceed, over the long term, at a pace similar to Alternative 1 (No Action). Bio-control effectiveness would progress at a slow rate.

Management Flexibility

This alternative allows the use of all available invasive management tools, except bio-control agents, limits herbicide use in parts of riparian zones, and limits herbicide use in key dispersed areas inside the Wilderness that are highly susceptible to non-native plant invasion. This limits the ability of managers to shift priorities and adjust to new conditions. Outside the Wilderness, management flexibility is high and effects are similar to Alternative 2.

Acres of Herbicide/Bio-control Treatment
Inside the Wilderness, 861 acres are eligible to receive herbicide treatment and outside the Wilderness, 996 acres are eligible for herbicide treatment. No bio-controls would be released with this alternative.

Estimated Person-Days for Implementation Inside the Wilderness
Approximately 580 person-days would be needed to implement the monitoring and treatment aspects of this alternative. About 130 stock-use days are associated with these activities. Stock impacts to vegetation would be the same as Alternative 2.

Cumulative Effects
Non-target plant species cumulative effects are the same as Alternative 2
Bio-control cumulative effects are the same as Alternative 1.

Alternative 4

Direct and Indirect Effects

Conservation/Control, Responsiveness and Other Effects
This alternative relies heavily on bio-controls as the primary mechanism for target invasive plant control. The accelerated pathogen / predator introduction program allowing releases on 50,000 acres over the entire project area would advance the establishment and spread of a variety of bio-control organisms faster than Alternatives 1, 2 and 3. Bio-control effectiveness would progress potentially at a relatively rapid rate.

Small infestations of new invaders generally cannot support self-sustaining populations of predators or pathogens because of the limited available substrate (Personal Communication 2005). Pioneering invasive plants infestations would need continual annual or biannual releases of bio-controls to exhibit measurable reduction in density and spread over time. The bio-control method has the ability to reduce but not eradicate infestations on a landscape scale (McEvoy 1991). As a result, new invaders would have a high probability of establishing a foothold in designated and dispersed sites within the Wilderness and growing beyond the possibility of eradication by manual methods.

Reliance on early detection and manual treatment to eradicate new invader infestations would yield overall results similar to Alternative 3 but with a higher probability of new invasive plant establishment on both designated and dispersed sites within the Wilderness. This alternative requires an increased level of detection monitoring and manual control effort inside the Wilderness because of the restriction of herbicide use on all susceptible acres. New invader species, that overwhelmed manual eradication attempts, would then gradually expand their range and density and join the ranks of species currently established in the Wilderness (Brown 1999). After reaching established status, these new invaders would develop the potential to export seeds outside the Wilderness similar to the effects described in Alternative 1 (No Action). The reduction of spotted knapweed monocultures that contain high densities of cheatgrass and low densities of native species, may result in a shift in plant composition towards cheatgrass instead of the natives on certain habitat types at a faster rate than Alternative 2.

Perennial invasive plant species that are established inside the Wilderness (such as oxeye daisy or sulfur cinquefoil), and lack approved or effective biological control organisms, would have an elevated opportunity for expansion. Achieving the containment objective for these species would prove difficult using manual methods alone. These established species would develop the population density potential, over time, to export a continual supply of propagules into the surrounding non-Wilderness portion of the Project Area.

Management Flexibility
Overall management flexibility would be moderate with this alternative. Managers would have limited ability to eradicate new infestations or respond to changed conditions in Weed-Free and Early Infestation watersheds inside the Wilderness because bio-controls generally serve to contain rather than eliminate exotic plant populations. The use of bio-controls at an elevated level in Advanced Infestation watersheds would allow the manager to target more infestation sites and would increase the containment potential for certain exotic species such as spotted knapweed.

Acres of Herbicide/Bio-control Treatment
This alternative would allow herbicide use only outside the Wilderness on 996 acres. Up to 50,000 acres would receive initial releases of bio-controls.

Estimated Person-Days for Implementation Inside the Wilderness
Approximately 320 person-days would be needed to implement the monitoring and treatment aspects of this alternative. About 72 stock-use days are associated with these activities. Stock impacts to vegetation are the same as Alternative 2.

Cumulative Effects
Bio-control releases occurring on private inholdings within the Wilderness and adjacent to the Forest outside the Wilderness would add to a small degree to the accelerated rates of establishment and migration of bio-control organisms released on the National Forest.

Cumulative effects related to all other activities inside the Wilderness would be the same as Alternative 1. Outside the Wilderness, Cumulative Effects are the same as Alternative 2.

Alternative 5

Direct and Indirect Effects

Conservation/Control, Responsiveness, and Other Effects
This alternative would prove highly effective at preventing the establishment of new invader species depending on the watershed category. Weed-free watersheds and new disturbances occurring in these watersheds would have small pioneering occurrences of new invaders that could be easily managed primarily with herbicides coupled with followup manual control on small numbers of young individual plants. Invasive plant densities and extents are greater in Early Infestation and Advanced Infestation Watersheds. In these watershed categories, the projected 4125 acres per year of herbicide application is expected to be adequate to contain the expansion of existing infestations and eradicate isolated starts of new invaders.

The risk of damage and mortality to non-target herbaceous and woody plant species is minimized by the application of design criteria and standard best management practices. These mitigation measures will reduce negative effects on non-target vegetation species and community to a low level. In addition, the transitory potential microsite adverse impact of spot herbicide application around non-target species is

compensated by a reduction in competition from the target invasive plants. The reduction in competitive exclusion by invasive weeds will generally release native grass species and have a neutral or positive effect on forb composition and density (Rice and Toney 1998). On sites where cheatgrass occurs in relative abundance, removal of a dominant invader, such as spotted knapweed, may open the door to an increase in cheatgrass cover at the expense of native or desirable non-native species.

Some heavily infested trail corridors may receive narrow blocks of hand-applied, intensive, herbicide treatment in the early phases of implementation. These trails have some of the more continuous, varied and connected infestations strung out along miles of the travel corridor. Collateral damage to non-target forb (broadleaved) species will be highest along these trail corridors due to the heavier invasive plant densities and the lessened ability to spot-spray selectively. However, impacts to non-target plants should prove transitory with native and non-target forbs recovering or exceeding pre-treatment densities (Rice and Toney 1998). As the target species infestations shrink in size, herbicide use will drop and become more occasional (Project File -Bitterroot Monitoring Report).

Herbicide treatment effects on target invasive plants would follow the pattern displayed in Table 3.1-9 of Alternative 1 ((Bitterroot Forest Westside Canyon Acres). Newly permitted roadside acre herbicide treatments outside the Wilderness would eliminate the opportunity for existing invaders to expand their range closer to the Wilderness. The additional treatments would prevent the establishment of new invaders in the numerous key road and trail vector corridors that thread through the Project Area from adjacent infested terrain.

Approximately 50,000 acres could receive bio-control agent releases over the term of the project. The effectiveness of this accelerated bio-control program would progress at a moderate rate on target species. The reduction of spotted knapweed monocultures that contain high densities of cheatgrass and low densities of native species, may result in a shift in plant composition towards cheatgrass instead of the natives on certain habitat types.

Effectiveness, Responsiveness and Other Effects

Alternative 5 maximizes the ecologically achievable eradication potential for species by raising the "cap" on total allowable annual herbicide treatment acres. It would allow for expanded herbicide treatment in dispersed areas. This would improve the probability of reduction, containment and elimination of established species such as sulfur cinquefoil, oxeye daisy and others that are poised to colonize many more susceptible acres within the Project Area.

The theoretical risk of damage and mortality to non-target broadleaved herbaceous and woody species would be the greatest with this alternative because of the higher number of treated acres in dispersed areas. However, field experience has shown that trained applicators using proper equipment, methods and rates can minimize non-target species impacts even with relatively high volume ground-based delivery systems such as truck-mounted sprayers (Project File – Contract Inspections). The application of design criteria and best management practices will reduce this risk to a low level. Along heavily infested trail corridors, the effects to non-target or native plants will be similar to Alternative 2.
Bio-control effects are the same as Alternative 4.

Management Flexibility

This Alternative would provide high flexibility in prioritizing treatments and the greatest ability to take advantage of treatment funding opportunities. The level of flexibility in changing priorities and responding to new conditions is the same as Alternative 2.

Acres of Herbicide/Bio-control Treatment

This alternative would permit "dispersed" herbicide treatment on approximately 2000 acres per year within the Wilderness. The result is a high level of responsiveness to the colonization by new or existing invaders of disturbed sites (particularly burned areas) on all susceptible habitat and cover types. It would allow 1,129 acres of herbicide treatment on designated sites within the Wilderness and 996 acres outside the Wilderness. Up to 50,000 acres could receive initial releases of bio-control agents.

Estimated Person-Days for Implementation Inside the Wilderness
Approximately 2,340 person-days would be needed to implement the monitoring and treatment aspects of this alternative. About 600 stock-use days are associated with these activities. Stock impacts to vegetation are the same as Alternative 2.

Cumulative Effects
The amount of human resources required to successfully implement this alternative is high (Duncan et al 2001; Bitterroot EIS 2003). Full implementation would require a period of adjustment (1-3 years) in order to develop and adequate labor force that does not deplete or reduce the effectiveness of the local finite available crew and volunteer labor pool from other invasive plant management efforts on the National Forests surrounding the project area.

Cumulative Effects on the non-target vegetation community are the same as Alternative 2.

Bio-control effects are the same as Alternative 4.

Table 3.1- 10: Relative Overall Effectiveness In Meeting Objectives

Watershed Category	Issue Indicator	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Weed Free	Conservation/ Control (native flora/ invasive plants)	1	3	1	1	3
	Responsiveness to Disturbances	1	3	1	1	3
	Mgt. Flexibility, (IWM)	0	3	1	1	3
Early Infestation	Conservation/ Control (native flora/ invasive plants)	1	2	1	1	3
	Responsiveness to Disturbances	1	2	1	1	3
	Mgt. Flexibility, (IWM)	0	3	2	2	3
Advanced Infestation	Conservation/ Control (native flora/ invasive plants)	1	2	2	2	3
	Responsiveness to Disturbances	1	2	2	2	3
	Mgt. Flexibility, (IWM)	0	3	2	2	3
Overall Effectiveness		6 L	23 M	13 L-M	13 L-M	27 H

This table assigns a rating for each non-numerical indicator / concern that is based on the following scale:

- 0 to 1 = Low;
- 2 = Moderate;
- 3 = High.

These ratings are derived from the narrative discussion found in the Direct, Indirect and Cumulative Effects sections of each alternative.

The indicator ratings in the table are then combined to determine a general "Overall Effectiveness" rating. This subjective rating is intended to define the degree to which each alternative satisfies the project objectives and purpose/need for conserving native plant diversity – ecosystem naturalness and managing invasive plants. The Overall Effectiveness Rating is based on the following scale:

- Low = < 10
- Low to Moderate = 11 – 15
- Moderate = 16 - 25
- High = > 25

Other relevant effects on vegetation and human resources are discussed to varying degrees in the narrative of each alternative.

3.1.7 THREATENED, ENDANGERED, AND SENSITIVE PLANT SPECIES (TES)

A. Regulatory Framework

Threatened and Endangered species are designated under the Endangered Species Act. It is policy of Congress that all Federal departments shall seek to conserve endangered and threatened species and shall utilize their authorities in furtherance of this purpose (ESA 1531.2b). A Threatened species, as determined by the U.S. Fish & Wildlife Service (USFWS), is any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. According to U.S. Fish & Wildlife Service list # 2007-SL-0302 (letter updated 03/15/2007), four plants listed as Threatened or Proposed Threatened may occur within the geographic extent of the Nez Perce and Clearwater National Forests. These plant species include MacFarlane's four-o'clock (Mirabilis macfarlanei), Water howellia (Howellia aquatilis), Ute ladies'-tresses (Spiranthes diluvialis), and Spalding's catchfly (silene spadingii). According to the quarterly Species list update, these four plants, including their habitat are not found in Moose Creek or Lochsa Ranger Districts. Therefore a biological assessment for the project proposal is not necessary, nor will these plant species be further addressed in this analysis. No federally listed threatened plant species occur on the Bitterroot National Forest.

Sensitive species are defined in the Forest Service Manual (FSM 2670.5) as "those plant and animal species identified by the 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 reduce a species existing distribution". In FSM 2670.22, management direction for sensitive species is in part, to ensure that species do not become threatened or endangered, because of Forest Service actions and to maintain viable populations of all native species. The Forest Service must evaluate impacts to sensitive species through a biological evaluation.

B. Analysis Methods

Assessment of the TES plants and their suitable habitat occurrence included review of old survey records and study of topographic and forest habitat maps to prioritize potential habitat for plants of concern. Individual species requirements were reviewed and existing information from Element Occurrence Records through the Idaho Conservation Data Center were evaluated.

The basic mapping unit used is the Habitat Type Group (HTG). This classification groups similar forest habitats into functional categories based upon vegetation type, moisture and temperature characteristics. Using GIS and Idaho CDC occurrence records, known locations and habitat units important to sensitive plants were identified and mapped for the project area.

C. Sensitive Plant Species

There are 68 sensitive plant species known or suspected to occur on the Bitterroot, Clearwater, and Nez Perce National Forests. Approximately 24 are known or suspected to occur within or near the project area. According to element occurrence records from the Idaho Conservation Data Center, Montana Natural Heritage Program, and Forest survey records, 17 actually occur within the analysis area.

Sensitive plant species can be assigned to one or more Habitat Type Groups based on similar general habitat requirements. Habitat Type Groups do not necessarily represent the forest habitat type or potential vegetation of a site they do represent the ecological factors of a site, such as moisture and temperature. The analysis area was assessed for inclusion of habitat suitable for sensitive plant species. Using this evaluation method, a list was compiled of sensitive plant species that were known to occur, within the potential treatment areas.

Table 3.1- 11: Potential Sensitive Plant Species within the Project Area

Sensitive Plant Species	Habitat
Astragalus paysonii (Payson's milkvetch)	Openings and gaps in mixed conifer forests (susceptible)
Blechnum spicant (Deerfern)	Moist riparian areas of mesic forests
Botrychium minganense (Mingan moonwart)	Shaded moist sites under various conifers, dry to moist meadows
Buxbaumia viridis (Green bug-on-a-stick)	Openings in moist grand fir and cedar forests on large decayed logs and ash soils
Cardamine constancei (Constance's bittercress)	Partial shade under western red cedar (susceptible)
Castilleja covilleana (Rocky mountain paintbrush)	Ponderosa pine, grasslands, rocky alpine (susceptible)
Cornus nuttallii (Pacific dogwood)	Gaps in low elevation western red cedar
Cypripedium fasciculatum (Clustered Ladyslipper)	Partial shade of warm moist western red cedar, grand or Douglas-fir (susceptible)
Dasynotus daubenmirei (Dasynotus)	Openings in moist mid-elevation grand fir
Douglasia idahoensis (Idaho douglasia)	Open subalpine ridges, unstable granitics
Erigeron asperugineus (Rough fleabane)	Rocky alpine
Erigeron evermannii (Evermann fleabane)	Rocky alpine
Lesquerella humilis (Bitterroot bladderpod)	Rocky alpine
Nodobryoria subdivergens (Old man's beard)	Rocky alpine
Rhizomnium nudum (Naked stem rhizomnium)	Moist mineral soil of warm grand fir and western red cedar (including streams)
Saxifraga tempestiva (Storm saxifrage)	Rocky vernal alpine
Synthyris platycarpa (Evergreen kittentail)	Forest openings under grand fir mosaic (susceptible)

The treatment sites are commonly disturbed areas not generally conducive to potential sensitive plant occurrence. In many cases, the habitat has been altered enough that it is not considered potential habitat for sensitive plants. Typical examples of such sites include campgrounds, trailheads, administrative sites, roads, trails, and airstrips.

D. Environmental Consequences

The effects from the control of invasive weeds on Sensitive Plants are assessed by evaluating the potential for adverse impacts on habitat, known occurrences, and population viability for these species.

E. Effects Common to All Alternatives

Biological control methods should have no effect on sensitive plant species or their habitat. Insects have been intensively tested for specificity to target weed species.

Sensitive plants would be protected by the Design Criteria specified for this project in Chapter 2.

Protection measures range from not treating the site, to implementing buffers, to monitoring effects. Chosen site-specific measures used would be commensurate with the type of treatment (mechanical, biological or chemical) and the threat to the species and/or population.

Alternative 1: No Action

Direct and Indirect Effects
Without treatment, invasive weeds would continue to spread throughout the forest, affecting native plant establishment and displacing understory vegetation. Native plants are especially vulnerable to extirpation if invasive weed populations are allowed to expand. Loss of native plant communities may continue to occur as invasive weeds occupy and out-compete native species. Once invasive species begin to dominate native plant communities, a loss of species diversity, composition, and ecosystem function could occur.

The invasive plants would not be treated and would continue to compete with sensitive plants for sunlight, soil nutrients, and water. An increase in invasive weeds would reduce native and sensitive plants on the forests. This could lead to a reduced viability of certain sensitive plant populations or species.

Cumulative Effects
In the long term, the No Action Alternative could lead to a decrease in the amount of potential habitat for sensitive plant species. Native plant communities will continue to degrade and sensitive plant species will continue to be at risk from weed invasions over the coming decades. This effect would cumulatively increase over time due to lack of weed control on sites without existing weed management decisions.

Alternatives 2, 3, and 5:Herbicide Treatment

Direct and Indirect Effects
The risk with these alternatives is that herbicides will accidentally be sprayed on sensitive plants. The Design Criteria specified in Chapter 2, would provide adequate protection for sensitive plants and result in minimizing the overall risks to these species. Many of the sensitive plant species occurring in the Project Area are limited to habitat types carry a low susceptibility to invasion. For example, Idaho douglasia (Douglasia idahoensis), rough fleabane (Erigeron asperugineus), and few-seeded bladderpod (Lesquerella humilis) typically inhabit harsh, rocky sites above 8,000 feet elevation. There are five sensitive species that are known to occur in some of the susceptible habitat types within the Project Area (Table 3.1-11).

Herbicide treatments in these alternatives may impacts individual plants or microsite portions of their habitat but will not reduce viability or cause a trend towards federal listing for the following species: Payson's milkvetch, Constance's bittercress, clustered ladyslipper, rocky mountain paintbrush and evergreen kittentail.

A summary of determination of effects for sensitive plant species for each alternative is presented in Table 3.1-12.

Cumulative Effects
In the long term, treatment of invasive species with chemicals could reduce the total area densities occupied by invasive species and improve habitat for potential colonization by sensitive plants. The threat to sensitive plant species will be reduced under these alternatives which provides for increased integrated weed management of invasive plants that would protect and enhance suitable habitat for sensitive plants. Biological control methods could also benefit sensitive plant species and their habitat by controlling the spread of invasive weed species into weed-free areas. Viability of sensitive plant species would be maintained by all action alternatives.

Alternatives 4: Herbicide Treatment

Herbicide treatment will occur only outside the Wilderness in this alternative. Rocky mountain paintbrush (Castilleja covilleana) is the only species that might potentially occur on susceptible sites within the Project Area outside the Wilderness. Herbicide application may impact some individuals or microsite portions of non-Wilderness habitat of this species under this alternative but will not reduce viability or cause a trend toward federal listing.

Cumulative Effects

Cumulative effects are the same as Alternatives 2,3 and 5.

Table 3.1- 12: Summary of Effects for Regional Designated Sensitive Plant Species

Plant Species	Known Occurrence	Effects Determination				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Astragalus paysonii	K	NI	MI	MI	NI	MI
Blechnum spicant	K	NI	NI	NI	NI	NI
Botrychium minganense	K	NI	NI	NI	NI	NI
Buxbaumia viridis	K	NI	NI	NI	NI	NI
Cardamine constancei	K	NI	MI	MI	NI	MI
Castilleja covilleana	K	NI	MI	MI	MI	MI
Cornus nuttallii	K	NI	NI	NI	NI	NI
Cypripedium fasciculatum	K	NI	MI	MI	NI	MI
Dasynotus daubenmirei	K	NI	NI	NI	NI	NI

Plant Species	Known Occurrence	Effects Determination				
		Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Douglasia idahoensis	K	NI	NI	NI	NI	NI
Erigeron asperugineus	K	NI	NI	NI	NI	NI
Erigeron evermannii	K	NI	NI	NI	NI	NI
Lesquerella humilis	K	NI	NI	NI	NI	NI
Nodobryoria subdivergens	K	NI	NI	NI	NI	NI
Rhizomnium nudum	K	NI	NI	NI	NI	NI
Saxifraga tempestiva	K	NI	NI	NI	NI	NI
Synthyris platycarpa	K	NI	MI	MI	NI	MI

Sensitive Species Determination: NI = No Impact; MI = May impact individuals or habitat but not likely to cause trend toward federal listing or reduce viability for the population or species; LI = Likely to impact individuals or habitat with the consequence that the action may contribute towards federal listing or result in reduced viability for the population or species.

F. Consistency with the Forest Plan and Environmental Law

As stated under regulatory framework, the objective for managing sensitive species is to secure population viability throughout their range on National Forests and to ensure they do not become federally listed as threatened or endangered. The forest plan supports this direction but does not set specific standards and guides for sensitive plants. The alternatives are consistent with this direction to the extent that proposed management actions would not adversely affect viability of existing sensitive plant populations.

3.1.8 Research Natural Areas and Special Interest Areas

Research Natural Areas (RNA) and Special Interest Areas (SIA) are designated areas representing major, natural timber types or other plant communities in an unmodified condition. Invasive plants and the control of invasive plants may have a detrimental impact on RNAs and SIAs. The Fenn Mountain Proposed RNA and the Lost Horse Canyon and Boulder Creek RNAs have invasive plants within and adjacent to these protected areas. The other RNAs have invasive plant populations within striking distance of their boundaries.

A. Direct and Indirect Effects

Alternatives 2 and Alternative 5

Both of these alternatives would have the same treatment potential for the RNAs and SIAs. These alternatives allow herbicide treatments on dispersed sites where invaders pose a threat to the plant communities within the RNA and SIA. The treatment would involve spot application of herbicide treatment in all RNAs and SIAs at risk to invasion.

The overall goal of RNA management is to maintain the full suite of ecological processes associated with the natural communities and conditions for which the RNA is designed to protect. Until recently, the primary course of action was to leave RNAs alone. However, with the emphasis on ecosystem management, more attention is being placed on restoration of natural processes such as fire, and control of invasive alien species, which alter the composition, and functioning of natural communities (Natural Heritage Program 2004). Weed treatments would protect the natural ecological composition of the RNA and SIA, and protect their identified values for research or special interest. Since invasive plants have been located in the general vicinity of most of the RNAs, effective treatment of those adjacent infestations would help protect the RNA by reducing the opportunity for invasive plants to colonize them.

Damage to native vegetation from herbicide or handpulling would be limited because of the selective nature of the treatments and the low densities of target invasives. No bio-controls currently available for release are known to affect native plant species in the Project Area.

Proposed adaptive management activities include the identification and treatment of invaders that may enter the RNA through natural sources (e.g. wind, wildlife, fire). Following identified mitigation measures, effects from treatment of new locations would be the same as those already identified. If future additional treatment is needed within the RNAs, concurrence of the Research Station Director and the Forest Supervisor will ensure that herbicide use is consistent with FSM and Forest Plan direction.

Alternatives 1 and 3 - No Herbicides in Dispersed Areas inside Wilderness and No New Bio-control Introductions

RNAs located inside the Wilderness are at higher risk for colonization in the event that disturbances or lack of detection allows invaders to establish a density that exceeds the abilities of manual controls. Manual methods would impact native vegetation to a low degree. RNAs located outside the Wilderness could receive herbicide treatment.
Effects to native vegetation would be the same as Alternative 2.

Alternative 4 - Bio-controls

Biological control could be used when effective agents are available, however the target plants would always be present (biological control agents never eradicate their host). Effective biological control agents are only available for a few weed species. Mechanical pulling of small patches of non-rhizomatous weeds would be implemented where practical. The majority of our most aggressive weed species spread via their roots so pulling is not an effective method of control unless all of the roots are removed and the patch is very small. Also, extensive ground disturbance within the RNAs or SIA is not appropriate because of the damage to the resource that is being protected.. Under Alternative 4, most invaders would could pioneer into these areas. This alternative would not provide opportunities to prevent the introduction of invasive plants.

Cumulative Effects
Under all alternatives, there are no past, present, or reasonably foreseeable actions that, along with the proposed activities within the RNAs or SIA, would cumulatively increase the risk of invasive plant spread, with the exception of wildfire. Cumulative effects may occur when weed-spreading activities occur next to RNAs. Under Alternatives 2 and 5 effective treatments of invaders would maintain the ecological integrity and research value of the areas. Under Alternatives 1,3 and 4 the long-term lack of effective treatment of potentially new infestations, along with the likelihood that weeds would eventually spread from outside the RNAs into them, poses a risk to both the research value and biological diversity of the RNAs inside the Wilderness.

Consistency with Laws and Policies – Research Natural Areas and Special Interest Areas

Forest Plan Direction and Individual Establishment Records
All of the alternatives are consistent with the Forest Plans associated with this project. All alternatives are consistent with direction in the Establishment Records by proposing specific control against target organisms, and by taking measures to control or eradicate these populations.
FSM 4063 – Research
Alternatives 2 and 5 would be consistent with the Forest Service Manual 4063 by removing exotic plant or animal life. Alternatives 1,3 and 4 would either not be consistent with the manual or would be least effective in following management direction because of the inability to apply herbicides on those RNAs located inside the Wilderness.

Mitigation Measures

- If any treatment with herbicide is planned within RNA boundaries, concurrence must be obtained through the Research Station Director and Forest Supervisor. This includes any future treatment need of new infestations. Since SIA are designated by the Forest and not on a Regional level, the Forest Supervisor has authority to approve all projects within the SIA. A concurrence letter from the Research Station Director is not needed for SIA (Steve Shelly, personal communication, 2004).

- No motorized access will be allowed in RNAs outside the Wilderness except on the few exceptions where roads exist as identified in the individual establishment record for an RNA or SIA.

- Wilderness area management will take precedence over RNA or SIA direction when proposed invasive plant control activities are identified for an RNA or SIA within designated wilderness boundaries.

3.1.9 IRREVERSIBLE AND IRRETRIEVABLE EFFECTS, VEGETATION

Irretrievable effects for all alternatives would be the temporary loss of native plant species that are sprayed with herbicides or uprooted by mechanical methods incidental to treating target invasive plants. These effects are reversible. See: Impacts to Native Vegetation Communities, previous in this chapter. Irreversible and irretrievable effects of Alternatives 1, 3, and 4 would be the permanent reduction or loss of native plant communities and associated natural ecosystem components as established invaders and new invaders advance into currently weed-free and early infestation areas of the project.

An irreversible effect of Alternatives 2, 4, and 5 would be the establishment, if successful, of non-native bio-control agents within the project area.

3.2 SOILS

3.2.1 REGULATORY FRAMEWORK

***36 CFR 219.27*:** Requirements set forth under this direction include: conserving the soil and water resource; protecting streams, streambanks, and wetlands; providing for adequate fish habitat; and giving special attention to riparian areas, considering topography, vegetation type, soils, climate, and management objectives.

All proposed activities with follow the Forest Service Soil and Water Conservation Practices Handbook, FSH 2509.22 13.07-13.

The Forest will follow regional direction to prevent the spread of invasive plants for each of these activities (see Appendix A, FS Manual 2080). Management of individual activities to prevent the introduction and spread of invasive plants is designed to reduce the amount and extent of invasive plants across the project area over time.

Regional (R1) soil quality standards (USDA 1999) specify that a least 85 percent of an activity area (which is defined as a land area affected by a management activity) must have soil that is in satisfactory condition. Detrimental soils impacts (compaction, displacement, rutting, severe burning, surface erosion, loss of surface organic matter, and soil mass movement) shall be less than 15 percent of an activity area, including past management impacts. In areas where less than 15 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effect of the current activity following project implementation and restoration must not exceed 15 percent.

Applicable Forest Plan standards for the Clearwater, Nez Perce, Lolo, and Bitterroot National Forests are listed in the Forest Plan Consistency section at the end of the Soils report.

Best Management Practices are site specific control mechanisms for non-point source pollutants, to enable the achievement of water quality standards. BMPs can be applied before, during and after management activities to reduce or eliminate the introduction of pollutants into receiving waters. BMPs would be implemented as outlined in Appendix A: Best Management Practices. BMP selection and design would be based on site-specific conditions; technical, economic and institutional feasibility; and the designated beneficial uses of the streams.

3.2.2 AFFECTED ENVIRONMENT

The affected areas for the analysis of proposed actions on soil quality are weed-infested sites currently under consideration for spray with herbicide, mechanical/cultural treatment, and bio-control releases. Invasive plants currently occur on approximately 109,000 acres within the project area.

Several landforms exist over these subbasins including: alluvial deposits, low relief rolling hills, colluvial midslopes, breaklands, frost churned ridges, alpine glaciated ridges and troughs, and mass wasted areas.

Soil within the project area has formed in materials derived from three different parent materials: granite/gneiss, metamorphic, and volcanic rocks. Stream deposits or alluvium in the major valley bottoms are composed of mixed rock sources. Granite/gneiss material is associated with the Idaho Batholith granitics. These soil types formed from highly weathered, coarse-grained, granitic parent material, and are

the most infertile. They are weakly cohesive, coarse, sandy-textured, and low in nutrient and water-holding capacity. In some instances the coarse-grained soil is intermingled with slightly finer-grained soil derived from granitic and associated gneiss bedrock. This fine-grained soil has slightly higher water-holding capacity and stability than the coarse granitics, but fertility is low.

Metamorphic rock material is associated with Precambrian-age Belt rocks. These are loamy-textured, moderately cohesive soil types with low to moderate water and nutrient-holding capacities. Soil weathered from metamorphosed Belt Series rocks has higher fertility and water-holding capacity and is not as erosive as the granitic soil type.

Volcanic rock material is a thin, volcanic ash surface deposit originating from ancient volcanic eruptions in the Cascade Range of the Pacific Northwest. Much of the area has an ashcap originating from Mt. Mazama 6,700 years ago. Volcanic ash has high water and nutrient holding capacity and tends to enhance productivity and watershed functions in the soil. Volcanic ash surface layers offer a superior growth medium compared with soil formed in native parent material.

Due to the nature of interactions between soil and herbicides, potential effects to soils are an important part of this analysis. Herbicides have the potential to buildup in soil, contaminate groundwater through infiltration, and enter streams through surface runoff. There are concerns with long-term buildup of herbicides in soils, not only because they could approach toxic levels, but they may become more susceptible to movement and contamination as concentrations increase.

Percent of organic matter in the soil, available water holding capacity of the soil, soil permeability and the chemical properties of a given herbicide determine both the availability of the herbicide for uptake by plants and its tendency to move through the soil.

When incorporated into the soil, a portion of herbicide dissolves in the soil water and a portion is taken into soil particles – primarily fine particles and organic matter. The amount of herbicide absorbed, or attached, to soil particles depends on the characteristics of the chemical and the amount of organic matter and fine material in the soil. Any herbicide that remains in water is available for uptake by plant roots. However, if the water moves off-site or out of the rooting zone, it takes some of the dissolved herbicide with it.

Most undisturbed soils in the project area have a litter layer one to five inches thick. The lower part of this litter layer is highly decomposed and would have a high likelihood of herbicide absorption. Below the organic litter layer, volcanic ash is a common mineral soil layer. The ash layer varies from being absent, or mixed, or up to 25 inches or more in thickness. The top part of the ash is rich in organic matter; the entire ash layer has a very high water holding and herbicide-nutrient holding capacity.

Based on soil characteristics, sites can be classified as either infiltration-dominated or runoff dominated. Infiltration-dominated sites include coarse-textured or gravelly soils such as those in the project area. On these soils, water infiltrates at a rate fast enough that runoff does not normally occur. In the process, toxins on the soil surface may be carried by water (rainfall, snowmelt, etc.) as it percolates down through the soil profile.

Runoff-dominated sites, by comparison, occur where soils are either very fine-textured or clayey or have high levels of rock and other coarse fragments that do not absorb water. Infiltration of water into the soil profile is slow causing the water to run off in a normal precipitation event producing overland flow. Some of the proposed treatment sites are near streams and on or near bedrock and very rocky soils that would need to be treated as run-off dominated soils. High water tables are common near stream channels, lakes, and seeps/springs. As one moves away from these areas, the chance of encountering a high water table diminishes.

For purposes of the herbicide risk assessment it was assumed that 50 percent of the lands in the project area are located on infiltration-dominated sites and 50 percent on run-off dominated sites. The herbicide picloram (Tordon®) is considered highly mobile and persistant in the environment, because it is quite soluble in water, does not bind strongly with soil particles, and does not degrade rapidly (Tu et al. 2001). Estimates of piloram persistence ranges from a few months to as long as three years, depending on soil and environmental conditions (Tu et al. 2001). Picloram is degraded primarily by microbial metablism. Photochemical degradation occurs only at the soil surface. For these reasons, picloram is used as an index in this evaluation.

Due to most of the project area occurring in Wilderness, there are minimal impacts to the soil resource. Areas of surface erosion occur on abandoned, unauthorized or non-maintained trails and heavily impacted sites near alpine lakes. Use of recreation sites such as campgrounds, and trails compact and disturb soils and can lower soil productivity. Soil displacement removes the nutrient rich surface soil from a site and the underlying mineral soil is often more erosive and lower in nutrients. (USDA 2001) These less productive sites are often repopulated with invasive plants.

There is evidence that soil stability is lowered and erosion rates higher on weed-infested ground than on native grassland sites (Roche and Roche in Sheley and Petroff 1999). Currently, eight percent of the project area is infested with invasive plants. The decrease in native bunchgrass density results in an increase in the amount of soil exposed to the erosive forces of wind and water. Potentially, erosion losses would result in a decrease in the long-term productivity of the site. Invasive plants commonly occupy areas that have vegetation that can't compete with the more aggressive invader species.

3.2.3 ENVIRONMENTAL CONSEQUENCES

A. Alternative 1 – No Action

With this alternative no new herbicide, mechanical/cultural, or bio-control treatment would occur.

Direct and Indirect Effects

Currently, within the Selway Bitterroot Wilderness, invasive plants are being treated chemically at administrative sites, and a few selected areas along trails and campsites on the Bitterroot National Forest (less than 20 acres) and mechanical treatment is occurring on approximately 100 acres. Biological control measures introduced in the past are still active. In the non-Wilderness portions of the project, approximately 450 acres of chemical treatment has been approved, mainly along old roads and road prisms on the Bitterroot National Forest. Annual treatment of these acres would average less than 50 acres per year. Due to the small size, localization, and minimal soil disturbance of the ongoing treatments there is no direct effect to soils. These ongoing actions would continue in each of the alternatives.

No new treatment is proposed with this alternative, so no direct effects to soil would occur.

Without large-scale, integrated, weed treatments within the analysis area, it becomes increasingly likely that invasive plants will become more widely established within the project area. Under this alternative, invasive plants already established will continue to spread and new invaders will not be treated. An indirect effect of weed invasion could be increased soil erosion and reduced soil productivity from infested sites.

At the present time, most infested sites are along road clearings, trailheads, campsites, and trail corridors. Currently, weed infested areas cover 109,000 acres (eight percent) within the project area. Impacts from the future spread of invasive plants would depend on the slope, soil characteristics, precipitation patterns, and distance to water from the infested sites. Under the worst-case invasive plant scenario, it is possible that decreases in soil productivity will occur where the native ground cover is lost to invasive weed species. Shifts in plant community composition caused by spread of invasive plants can alter soil community configuration by altering soil structure, decreasing or changing types of soil organisms and mycorrhizal fungi, and modifying nutrient cycling (Wolfe and Klironomos 2005).

Cumulative Effects

Cumulative effects arise from the *incremental impact of an action* when added to other past, present, and reasonably foreseeable actions. Because there are no activities that would cause direct effects and because it is unknown whether or not indirect effects could occur, there is no cumulative effect associated with this alternative.

B. Alternative 2 – Proposed Action

With this alternative, no more than 1500 acres of herbicide treatment would occur per year, 10,000 acres of bio-control releases during the life of the project, and less than 100 acres of mechanical/cultural treatment per year.

Direct and Indirect Effects

Mechanical/Cultural Treatment
Mechanical treatments would cause a direct disturbance to soil. It would, however, be limited to relatively small areas and with re-vegetation, disturbance would only be short-term (1 to 3 years). Noxious weeds commonly invade areas that have vegetation that can't compete with aggressive invader species. Consequently, after weeds are controlled on a site it is beneficial to establish desirable native vegetation that would compete with noxious weeds, restrict or prevent additional infestations, and help prevent soil erosion and further soil nutrient loss. Cultural treatments such as seeding, transplanting and fertilizing would negligibly impact soils. Fertilizers would be applied according to Forest Service and manufacturer guidelines and will increase soil productivity. Seeding and transplanting activities would involve only limited soil disturbance of very small areas. Due to the limited extent of this treatment and the short-term disturbance, mechanical/cultural treatment would not have a direct or indirect effect to the soil resource.

Bio-control Releases
Release of biological controls would cause no direct effects to the soil resource. Indirectly, the elimination of weeds could increase areas of bare ground, resulting in increased soil erosion for the short-term (1 to 3 years). In the long-term, however the reduction of weed species would help to improve native plant communities and diversity, and thus help maintain soil stability and quality. Because of the uncertainty that the elimination of weeds could leave areas of bare ground and the short duration that soil would be bare, there is no direct or indirect effect to the soil resource.

Herbicide Treatment
There are no direct effects to soil physical properties or productivity from herbicide treatments. Herbicides used for weed control, even in steeper terrains, do not disturb soil and maintain hydrologic conditions.

Indirectly, the elimination of weeds could increase areas of bare ground, resulting in increased soil erosion for the short-term (1 to 3 years). For the long-term, however, application of herbicides would reduce the density of invasive weeds and promote beneficial vegetative recovery, restore surface protection, and provide erosion control benefits. Herbicides encourage grasses by the selective pressure on broadleaf species. Since grasses have better soil-binding characteristics than the target broadleaf species, herbicide treatment would result in higher soil stability on the treated sites.

Another indirect outcome of herbicide use is the persistence of the chemical in the soil. All the herbicides analyzed for this project have some soil activity; that is, they dissolve to some extent in water and can be absorbed fairly readily from soil moisture by susceptible plants. These herbicides can move with water as it moves through soil. Although these herbicides are all water soluble and soil active to some extent, they vary significantly in persistence in the environment (Table 3.2-1). Persistence can be a benefit in restoration efforts because it provides more time for some native grasses and broadleaf plant species to establish themselves prior to re-invasion by noxious weeds. Target weed species all produce many seeds that remain viable in the soil for long periods.

Since these chemicals can move with water, we must consider the permeability and water-holding capacity of the soil on a site. These properties determine how much water moves through the soil into ground or surface water after rainfall. If the soil retains a large quantity of water in its upper horizons for later use by plants, the water and partially dissolved herbicide would have little opportunity to move. In contrast, if a soil is highly permeable and has little water-holding capacity, moisture passes through the soil rapidly and carries some of the herbicide with it.

Soil adsorption coefficient (Koc) can be used as an index of the herbicide mobility. The larger the Koc the more strongly the herbicide is held to soil organic matter and the less likely it will leach. Of the herbicides proposed for treatment glyphosate is the least likely to leach with a Koc of 24.000 and dicamba is the highest at 2 (see Table 3.2-1). Clopyralid and Picloram are also highly susceptible to leaching.

Soil half-life is the period of time it takes for one-half of the amount of herbicide in the soil to degrade (see Table 3.2-1). Each half-life that passes reduces the amount of herbicide present in the soil by one-half. Half-life can vary due to soil microbial populations, soil moisture, soil temperature and other factors. Non-persistent herbicide would have a half-life of 30 days or less. Persistence herbicides have a half-life of greater than 100 days. On average, all proposed herbicides have a moderate persistence. Picloram had the longest reported half-life up to 513 days and did not degraded overtime (USDI-EPA 1995a).

Table 3.2- 1: Herbicide Characteristics in Soils

Chemical Evaluated	Soil Half Life (Days)	Sorption Coefficient (soil Koc)	Soil Adsorption Coefficient
Aminopyralid	103.5	1.05-24.3	Low to Moderate
Clopyralid	40	6	Low
Dicamba	90	2	Very Low
Glyphosate Rodeo	47	24,000	Very High
Glyphosate Roundup	47	24,000	Very High
Metsulfuron Methyl	120	35	Moderate
Picloram	90-513	16	Moderate
Triclopyr -TEA	46	20	Moderate
2,4-D Amine	10	100	Moderate

Picloram is water soluble, mobile in sandy soils low in organic matter, and may affect desirable plants that have roots growing in treated areas. Degradation by soil microorganisms is slow, and primary breakdown is by ultraviolet light. Picloram is relatively persistent, although its persistence varies with soil type and weather. Pictloram's mobility and persistence has generated concerns over possible groundwater contamination or runoff to surface water if applied contrary to label instructions. Because of this concern, picloram is unsuitable for use on areas with shallow water tables or in riparian areas, and is restricted from use near surface water or groundwater.

Research on a grassland site in Missoula County found no picloram below 20 inches soil depth (Watson et al. 1989). The minimum detection limit in this study was 10 parts per billion. On a forested site with coarser soils and precipitation rates more comparable to sites analyzed here, this study found picloram levels ranging from 206 to 366 parts per billion in the upper 5 inches of soil after an application of 1 pound of picloram per acre. A maximum concentration of 24 parts per billion was detected at soil depths between 30 and 40 inches. No picloram was measured in shallow groundwater wells with a detection limit of 0.5 parts per billion.

Results reported by Scifres (1977) showed that 2,4-D and dicamba are less persistent than picloram. Residues of dicamba in the soil usually occur no deeper than 3 to 4 feet following application and dissipated after 2 to 4 months. Residues of 2,4-D were found closer to the surface and dissipated within days. Picloram, which is decomposed by microorganisms, may persist for a year after application at rates of 1 lb/acre.

Additional studies of the movement and persistence of herbicides in soil at several sites in western Montana are ongoing. These studies include comparisons of picloram, 2,4-D, and clopyralid. Picloram has been shown to be mobile under field conditions. In Montana picloram was applied at half the maximum label rate (1 pound/acre), and was detectable 790 days after application in the 48 to 60 inch soil layer (soil with 2.2% organic matter; USDI-EPA 1995).

In the EPA Re-registration Eligibility Decision (RED) for Picloram, the agency was concerned with ground water contamination and risk to endangered species. Data currently available to the EPA indicated that picloram has been detected in groundwater in 10 states with concentrations up to 30 parts per billion. Once in groundwater the chemical is unlikely to degrade even over a period of several years (USDI-EPA 1995a, 1995b). The levels detected were below the lethal concentrations for rainbow or cutthroat trout.

Based on the persistence in soil, soil half-life, and the possibility of repeat application herbicides are expected to have a short term effect to soil productivity. Long-term soil productivity (Region 1 Standards) would be maintained.

Herbicides could also cause temporary reductions in biodiversity and relative biomass of individual species of macro- and micro-organisms in soil due to chemical loading. These effects, however, are not expected to persist under the proposed herbicide application frequency because the negative effects are temporary and the populations generally recover after a few days or weeks.

Best Management Practices (BMPs) (Appendix A) and project design measures (Chapter 2) that will be applied to minimize the effects to soil productivity and soil organisms from herbicides are summarized here.

No direct application to water. No application within 50 feet of streams or water for picloram. Reduce application rate to a maximum of 1.0 pounds/acre of Picloram with spot treatment of no more that 50% of an acre (USDI-EPA 1995a).

Limited application of herbicide chemicals to below 1/20 of the Lethal Concentration (LC50), or No Observed Effect Level/Concentration (NOEL/NOEC) as determined by watershed annually (Appendix I).
Controlled mixing, storage and transportation of all herbicides as described in Appendix B.
No application of 2,4-D amine (ester formulation) or triclopyr-BEE.

By removing noxious weed infestations, mechanical/cultural, biological, and herbicide treatments are expected to increase current levels of native plant communities and diversity, and thus help maintain and promote long-term soil stability and quality.

C. Alternative 3

With this alternative, treatments are confined to high use areas. A total of 1806 acres are identified for herbicide treatment. All treatment would occur in designated areas, with no treatment in dispersed sites. No herbicide treatment would occur within 50 feet of water. No bio-control releases would occur. Up to 100 acres of mechanical/cultural treatment would take place per year.

Direct and Indirect Effects

Mechanical/Cultural Treatment
Alternative 3 has the same amount of mechanical/cultural treatment proposed as Alternative 2. Due to the limited extent of this treatment and the short-term disturbance, mechanical/cultural treatment would not have a direct or indirect effect to the soil resource.

Bio-control Releases
There are no bio-control releases proposed with this Alternative.

Herbicide Treatment
As described under Alternative 2, herbicides are expected to have a short term effect to soil productivity, due to the persistence in soil, soil half-life, and the possibility of repeat application. Long-term soil productivity (Region 1 Standards) would be maintained.

Herbicides could also cause temporary reductions in biodiversity and relative biomass of individual species of macro- and micro-organisms in soil due to chemical loading. These effects, however, are not expected to persist under the proposed herbicide application frequency because the negative effects are temporary and the populations generally recover after a few days or weeks.

Alternative 3 proposes to treat approximately 300 more acres with herbicides than alternative 2. Because Best Management Practices (BMPs) (Appendix A) and project design measures (Chapter 2) will be applied to minimize the effects to soil productivity and soil organisms the effect from herbicide treatment are the same as those for Alternative 2.

D. Alternative 4

With this alternative 996 acres are identified for herbicide treatment, all outside the wilderness; 50,000 acres of bio-control release during the life of the project; and up to 100 acres of mechanical/cultural treatment per year.

Direct and Indirect Effects

Mechanical/Cultural Treatment
Alternative 4 has the same amount of mechanical/cultural treatment proposed as the other action alternatives. Due to the limited extent of this treatment and the short-term disturbance, mechanical/cultural treatment would not have a direct or indirect effect to the soil resource.

Bio-control Releases
As described under Alternative 2, release of biological controls would cause no direct or indirect effects to the soil resource.

Herbicide Treatment
As described under Alternative 2, herbicides are expected to have a short term effect to soil productivity, due to the persistence in soil, soil half-life, and the possibility of repeat application. Long-term soil productivity (Region 1 Standards) would be maintained.

Herbicides could also cause temporary reductions in biodiversity and relative biomass of individual species of macro- and micro-organisms in soil due to chemical loading. These effects, however, are not expected to persist under the proposed herbicide application frequency because the negative effects are temporary and the populations generally recover after a few days or weeks.

Alternative 4 has identified the least amount of area to be treated by herbicides when compared to the other action alternatives, all occurring outside the wilderness boundary. Because Best Management Practices (BMPs) (Appendix A) and project design measures (Chapter 2) will be applied to minimize the effects to soil productivity and soil organisms the effect from herbicide treatment are the same as those for Alternative 2.

E. Alternative 5

With this alternative a total of 4,165 acres are identified for treatment with herbicides. This includes the same acres identified in Alternative 2, but with a more expanded dispersed treatment (an additional 1500 acres). This alternative also proposes 50,000 acres of bio-control releases during the life of the project up to acres of mechanical/cultural treatment per year.

Direct and Indirect Effects

Mechanical/Cultural Treatment
Alternative 5 has the same amount of mechanical/cultural treatment proposed as the other action alternatives. Due to the limited extent of this treatment and the short-term disturbance, mechanical/cultural treatment would not have a direct or indirect effect to the soil resource.

Bio-control Releases
As described under Alternative 2, release of biological controls would cause no direct or indirect effects to the soil resource.

Herbicide Treatment
As described under Alternative 2, herbicides are expected to have a short term effect to soil productivity, due to the persistence in soil, soil half-life, and the possibility of repeat application. Long-term soil productivity (Region 1 Standards) would be maintained.

Herbicides could also cause temporary reductions in biodiversity and relative biomass of individual species of macro- and micro-organisms in soil due to chemical loading. These effects, however, are not expected to

persist under the proposed herbicide application frequency because the negative effects are temporary and the populations generally recover after a few days or weeks.

Alternative 5 has identified the greatest amount of area to be treated by herbicides when compared to the other action alternatives. Even though 4,165 acres is the greatest amount of proposed herbicide treatment proposed, it affects less than one percent of the project area and less than one percent of any given subwatershed. Because Best Management Practices (BMPs) (Appendix A) and project design measures (Chapter 2) will be applied to minimize the effects to soil productivity and soil organisms the effect from herbicide treatment are the same as those for Alternative 2.

Cumulative Effects for Alternatives 2, 3, 4 and 5

Cumulative effects are the incremental impacts of actions added to other past, present and reasonably foreseeable future actions. Cumulative soil impacts are considered from both timing and spatial perspectives. Any past management related soil impacts within a proposed treatment unit are considered as part of the limit of 15% detrimental soil impacts allowable in the Regional soil standards. Cumulative effects include outcomes of foreseeable future federal, state, tribal, or private actions that are reasonably certain to occur in the activity area. For the purpose of this project, the entire boundary area is considered the activity area.

Past and Ongoing Actions

Other activities occurring within the project area include road building and maintenance (outside the wilderness boundary), fire suppression, weed suppression, maintenance and use of administrative sites, and recreation (includes designated trails, campsites, and boat launches). Designated roads, trails, campsites, and administrative sites are not considered when estimating the amount of detrimental soil impacts. Based on this, detrimental disturbance in the project area is very low and occurs in the form of user created trails and campsites.

The Bitterroot National Forest has treated approximately 430 acres in the Bitterroot River drainage within the project area, mostly along roads and approximately 20 acres in the Selway River drainage.

During 2006, the Clearwater Forest treated 123 acres at administrative sites within the Lochsa River and Middle Fork Clearwater River drainages. The majority of the treatment (92 percent) involved the use of clopyralid. Also in 2006, the Idaho Transportation Department treated approximately 68 acres along US Highway 12 in the Lochsa River drainage. It is not known how much spraying of noxious weeds is occurring on private lands adjacent to the project area.

Cumulative effects to soil productivity would occur for Alternatives 2, 3, 4 and 5 due to herbicide persistence in the soil. Based on the small amount of area proposed for treatment (less than one percent of the project area) and with implementation of project design measures (Chapter 2) and Best Management Practices (Appendix A) the effects to soil productivity would be very low. Cumulative effects to soil organisms from herbicide applications also may occur; however, these adverse impacts are expected to be short-term. Positive cumulative effects would occur for weed treatment areas where native vegetation communities' increase and long-term soil stability/quality improve. Overall, long-term soil productivity (Region 1 Standards) would be maintained for all alternatives.

Future Actions

Other foreseeable actions include treatment of weeds by other agencies or by private landowners within the portions of the subwatersheds outside the project area. These actions would be evaluated to determine if more than the maximum allowable acres to be treated annually are proposed for any given subwatershed.

This will include land managers from the Clearwater, Bitterroot, and Nez Perce National Forests. Refer to Table 1 (Appendix I) for the maximum allowable acres by watershed to be treated by a particular herbicide. Based on the information in Table 3.3-13 (cum. Effects – water) using the herbicide, Picloram, as the worst case scenario, subwatersheds that would need particular attention include Trapper Creek, West fork Bitterroot River, Lost Horse Creek, South Fork Lost Horse Creek, Chaffin Creek, Tin Cup Creek, Rock Creek, Mill Creek, Sheafman Creek, Sweathouse Creek, Bass Creek, Carlton Creek, Deep Creek, Selway River-Magruder Creek, and Selway River-Sheep Creek.

Irreversible and Irretrievable Commitment of Resources
No irreversible or irretrievable commitment of soil or ground water resources is expected to result from any of the proposed alternatives.

3.2.4 CONSISTENCY WITH FOREST PLAN AND ENVIRONMENTAL LAW

All activities proposed with this project will meet the requirements stated in the following: 36 CFR 219.97; Forest Service Soil and Water Conservation Practices Handbook, FSH 2509.22 13.07-13; FS Manual 2080; and Regional (R1) soil quality standards (USDA 1999). Table 3.2-2 displays compliance with the Clearwater, Nez Perce, Lolo, and Bitterroot National Forest Plans.

Table 3.2- 2: Forest Plan Compliance

Description	Compliance Achieved By
Clearwater National Forest Plan	
Manage activities on lands with ash caps such that bulk densities on at least 85 percent of the area remain at or below 0.9 gram/cubic centimeter.	Project design measures would minimize erosion and compaction and maintain bulk densities well below the standard
Design resource management activities to maintain soil productivity and minimize erosion.	See Table 2-1 in Chapter 2 – project design measures.
Minimum coordinating requirements on land types with high or very high mass stability or parent material erosion hazard ratings are: 1) field verified, 2) road locations are reviewed by a team, and 3) road design mitigation would be staked.	Little to no ground disturbance is planned for this project. No new roads are proposed.
Nez Perce National Forest Plan	
Evaluate the potential for soil displacement, compaction, puddling, mass wasting, and surface soil erosion for all ground-disturbing activities	Project design measures would minimize erosion and compaction. Little to no ground disturbance is planned for this project.
A minimum of 85 percent of an activity area shall not be detrimentally compacted, displaced, or puddled upon completion of activities.	
Maintain sufficient ground cover to minimize rill erosion and sloughing on road cut and fill slopes and sheet erosion on other activity areas.	
Bitterroot National Forest	
Reductions in soil productivity potential caused by detrimental compaction, displacement, puddling, and severe burning are minimized.	Project design measures would minimize erosion and compaction. Little to no ground disturbance is planned for this project.
Soil loss, accelerated surface erosion, and mass wasting caused by the proposed project would not result in unacceptable reductions in soil productivity and water quality.	

Description	Compliance Achieved By
Soil and water conservation practices are incorporated into project design and implementation to ensure soil and water resources are protected.	Best Management Practices (Appendix A) and project design measures (Chapter 2, Table 2-1) will be followed.
Lolo National Forest	
Developmental projects in areas with steep slopes, granitic soils, wet glacial tills, and lake sediments will not be scheduled until they have been analyzed for environmental effects and economic feasibility.	An environmental effects analysis was conducted.
All management practices will be designed or modified as necessary to maintain land productivity.	Project design measures would minimize erosion and compaction. Little to no ground disturbance is planned for this project.

3.3 WATERSHED AND FISHERIES RESOURCES

SCOPE OF THE ANALYSIS

The elements addressed in this section include water quality and quantity, stream conditions, habitats, and acquatic species found in areas potentially affected by the project. The analysis area for Aquatic Resources includes most watersheds within the Lower Selway subbasin, all watersheds within the Upper Selway subbasin from Moose Creek upstream to the mouth of Deep Creek, includling Deep Creek, all watersheds in the Bitterroot River subbasin draining out of the Selway-Bitterroot Wilderness Area, and all watersheds in the Lochsa River subbasin draining out of the Wilderness. Also included are the mainstem river sections of the Selway, Lochsa, and Bitterroot Rivers below the mouths of the 6th code HUC watersheds potentially affected by the project.

A list of all 6th code HUC watersheds is found in Table 3.3.1.

3.3.1 REGULATORY FRAMEWORK

Clean Water Act
The Clean Water Act stipulates that states are to adopt water quality standards. Included in these standards are provisions for identifying beneficial uses, establishing the status of beneficial uses, setting water quality criteria, and establishing Best Management Practices (BMPs) to control non-point sources of pollution. Executive Order 12088 and 11990 also requires the Forest Service to meet the requirements of the Act.

Section 313 of the Clean Water Act requires Federal agencies to comply with all Federal State, interstate, and local requirements, administrative authority, and process and sanctions with respect to control and abatement of water pollution.

Section 303(d) of the Clean Water Act stipulates that states must identify and prioritize water bodies that are water quality limited (i.e., water bodies that do not meet water quality standards). For waters identified on this list, states must develop a total maximum daily load (TMDL) for the pollutants, set at a level to achieve water quality standards. The Lolo Creek Subbasin Assessment and TMDLs have not been completed at the time of this report. Until the assessment is finished and the implementation plan developed, Idaho Department of Environmental Quality direction is to improve or maintain water quality conditions in order to support beneficial uses.

All State and Federal laws and regulations applicable to water quality would be applied. These include 36 CFR 219.97; the Clean Water Act; Forest Service Soil and Water Conservation Practices Handbook, FSH 2509.22 13.07-13; standards within the Clearwater, Nez Perce, Lolo and Bitterroot National Forest Plans; PACFISH and INFISH Riparian Management Objectives (RMOs) and Riparian Habitat Conservation Areas (RHCAs); and Executive Orders 12088 and 11990.

36 CFR 219.27
Requirements set forth under this direction include: conserving the soil and water resource; protecting streams, streambanks, and wetlands; providing for adequate fish habitat; and giving special attention to riparian areas, considering topography, vegetation type, soils, climate, and management objectives.

Forest Service Manual 2670
FSM 2670 directs the Forest Service to seek to conserve endangered and threatened species, utilize its authorities in furtherance of the Endangered Species Act, and to avoid actions that would cause a species to become threatened or endangered. FSM 2670 also directs the Forest Service to maintain viable populations of native and desired non-native wildlife, fish, and plant species in habitats distributed throughout their geographic range on system lands.

Endangered Species Act
The project area includes habitat for fish species listed as threatened under the Endangered Species Act, which include Snake River steelhead trout and Columbia River bull trout. Snake River fall chinook salmon, also listed as threatened, are found downstream of the project area in the mainstem Clearwater River. The project area includes designated critical habitat for steelhead trout in the Selway and Lochsa drainages. All laws and regulations related to the ESA and critical habitat apply to this project. As directed by the ESA, a biological assessment of the potential effects of this project is being completed for listed steelhead trout, bull trout, and fall chinook salmon.

Nez Perce Forest Plan
The Nez Perce Forest Plan includes fish/water quality objectives for all prescription watersheds on the Forest, including sediment yield and entry frequency guidelines roughly related to timber harvest, road construction, and other sediment producing activities. Specific direction related to herbicide use is lacking. In general, watersheds in the Selway – Bitterroot Wilderness Area were assigned a fish/water quality objective of 100 percent with an allowable sediment yield guideline of 0 percent over base.

Also included in the Nez Perce Forest Plan were guidelines related to general riparian management direction. The guidelines include:

- Consider cumulative impacts of proposed actions on the entire riparian ecosystem.
- Manage riparian areas to maintain and enhance their value for wildlife, fishery, aquatic habitat, and water quality.
- Maintain sufficient streamside vegetative canopy to ensure acceptable water temperature for fish and provide cover.
- Management activities shall not be permitted to change adversely the composition and productivity of key riparian vegetation. Riparian areas now degraded by management should be rehabilitated before any further non-dependent resource use.

Management Indicator Species identified in the Nez Perce Forest Plan include steelhead trout, chinook salmon, and westslope cutthroat trout.

Clearwater Forest Plan
Similar to other Forest Plans, the Clearwater Forest Plan contains management goals for various resources. Those relevant to fisheries include the following:

- Manage watershed, soil resources, and streams to maintain high quality water that meets exceeds State and Federal water quality standards, and to protect all beneficial uses of the water, which include fisheries, water-based recreation, and public water supplies.
- Manage the Forest's fisheries streams to achieve optimum levels of fish production by: (1) maintaining high quality habitat in existing high quality streams, and (2) rehabilitating and improving degraded streams on certain developed portions of the Forest, and then maintaining optimal levels.

For riparian areas, the following relevant management goals and standards include the following:

- Maintain streamside vegetation to provide adequate cover and habitat components for fish.
- Restrict or prohibit applications of approved chemicals that may be damaging to dependent resources.

Management Indicator Species identified in the Clearwater Forest Plan include steelhead trout, chinook salmon, bull trout, and westslope cutthroat trout.

Bitterroot Forest Plan
The Bitterroot Forest Plan requires that habitat is provided to support viable populations of native and desirable non-native fish and the habitat needs of sensitive species and protection of threatened and endangered species is considered in all project planning.

Management Indicator Species identified in the Bitterroot Forest Plan include westslope cutthroat trout and bull trout.

PACFISH/INFISH
PACFISH amended the Nez Perce and Clearwater Forest Plans in 1995 and incorporated all direction and guidelines for riparian areas, watersheds, and streams. INFISH amended the Bitterroot Forest Plan in 1995 as well and included most of the same provisions as PACFISH. Both documents established riparian goals, Riparian Management Objectives (RMOs) and Riparian Habitat Conservation Areas (RHCAs). Included in both documents was the general notion that actions that reduce habitat quality, whether existing conditions are better or worse than objective values, are inconsistent with purposes of INFISH and PACFISH.

Guidelines that are relevant to this project include the following:

- Apply herbicides, pesticides, and other chemicals in a manner that does not retard or prevent attainment of RMOs and avoids adverse effects on listed anadromous fish (or inland native fish).
- Prohibit storage of fuels and other toxicants within Riparian Habitat Conservation Areas.

Recovery Plans/Conservation Agreements/Forest Plan Biological Opinions
The Endangered Species Act requires a formal recovery plan for listed species. The federal recovery plans for bull trout and steelhead trout are currently being developed by the U.S. Fish and Wildlife Service and NOAA Fisheries. At present, critical habitat is not designated for bull trout in any of the areas potentially affected by this project. Critical habitat is designated for steelhead trout in the portions Lochsa and Selway River drainages included in the project.

In 1998 NOAA Fisheries established priority watersheds for listed steelhead trout in both the Lochsa and Selway Rivers in their Forest Plan Biological Opinions. All of the subwatersheds in this project area in the Selway and Lochsa basins are considered priority watersheds. This BO also included special management considerations for the Selway, Middle Fork Salmon, and South Fork Salmon, because genetically and ecologically unique sub-populations of steelhead have been identified in these three subbasins. These management considerations are generally not directly applicable to actions proposed under this project.

The State of Montana completed a Bull Trout Restoration Plan in June 200. The plan contains the following goals for the Bitterroot River drainage:

- Establish a self-reproducing migratory bull trout population in the Bitterroot River that spawns in tributary streams. The preliminary goal is to have a minimum 100 redds or 2,000 individuals in the migratory population over a 15 year period (3 generations), with spawning distributed among the core watersheds.

- Maintain self-sustaining bull trout populations in watersheds where they currently exist.
- Maintain the genetic structure of the population throughout the watersheds.
- Re-establish connectivity between the Bitterroot River and its tributaries.

In May 1999, Montana Fish, Wildlife, and Parks developed a conservation agreement for westslope cutthroat trout in Montana, a cooperative effort among state and federal resource agencies, conservation and industry organizations, resource users, and private landowners. The Forest Service is a partner in this conservation agreement.

A. Idaho State Water Quality Standards and Criteria Necessary to Protect Beneficial Uses

The *Water Quality Standards and Wastewater Treatment Requirements* for the State of Idaho designates the Clearwater River with the following beneficial uses: domestic water supply, cold water biota, primary and secondary contact recreation, salmonid spawning and special resource waters. The Lochsa and Selway Rivers are tributaries to the Clearwater River.

There are no state designated small public water supplies in the analysis area. There are no state designated municipal watersheds in the analysis area.

The water quality standards listed in *Water Quality Standards and Wastewater Treatment Requirements* for the State of Idaho are to be applied to all streams within the project area to maintain beneficial uses (DEQ 2006, IDAPA 58.01.02). These include: surface waters of the state shall be free from hazardous materials in concentrations found to be of public health significance or to impair designated beneficial uses. (IDAPA 58.01.02200, 01); surface waters of the state shall be free from toxic substances in concentrations that impair designated beneficial uses. (IDAPA 58.01.02200, 02); and hazardous and deleterious materials must not be stored, disposed of, or accumulated adjacent to or in the immediate vicinity of state waters unless adequate measure and controls are provide to insure that those materials will not enter state waters as a result of runoff, wind, storage facility failure, accidents in operation, or unauthorized third party activities. This includes, but is not limited to; trash, rubbish, garbage, oil, gasoline, chemicals, sawdust, and accumulations of manure. (IDAPA 58.01.02800, 01)

Table 3.3-1 displays beneficial uses and those streams on the 2002-2003 EPA Approved 303(d)/305(b) Integrated Report (DEQ 2005). All other streams within the project area not shown must support secondary contact recreation.

Table 3.3- 1: Impaired Waters and Their Beneficial Uses for Streams in the Selway (HUC #s17060301 and 17060302) and Lochsa River (HUC # 17060303) Drainages*

Subbasin	Subwatershed Name (HUC 6)	Beneficial Uses (State Water Quality Standards) 2006						303(d) Listed Streams 2002-2003
		Domestic Water Supply	Cold Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation	Special Resource Water	
Upper Selway	Selway River-Magruder Creek	X	X	X	X		X	
	Selway River-Sheep Creek	X	X	X	X		X	
	Selway River-Bad Luck Creek	X	X	X	X		X	

Subbasin	Subwatershed Name (HUC 6)	Beneficial Uses (State Water Quality Standards) 2006						303(d) Listed Streams 2002-2003
		Domestic Water Supply	Cold Water Biota	Salmonid Spawning	Primary Contact Recreation	Secondary Contact Recreation	Special Resource Water	
	Selway River-Elk Creek	X	X	X	X		X	
	Selway River-Dog Creek	X	X	X	X		X	
Lower Selway	Selway River-Meeker Creek	X	X	X	X		X	
	Selway River-Pinchot Creek	X	X	X	X		X	
Lochsa River	Boulder Creek					X		YES
	Storm Creek					X		YES
	Lochsa River - Bald Mountain Creek	X	X	X	X		X	YES
	Lochsa River - Bimerick Creek	X	X	X	X		X	YES

*From IDAPA 58.01.02 and the 2002-2003 EPA Approved 303(d)/305(b) Integrated Report (DEQ 2005)

B. Montana State Water Quality Standards and Criteria Necessary to Protect Beneficial Uses

All surface water in the Montana portion of the Forest is classified B-1 by the MDEQ (ARM 16.20.604). The associated beneficial uses of B-1 water are drinking; culinary and food processing purposes after conventional treatment; bathing, swimming and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl, furbearers, and other wildlife; and agricultural and industrial water supply (ARM 17.30.607 & 623).

In Montana, numeric water quality standards are specified in Circular DEQ-7, Montana Numeric Water Quality Standards (MDEQ 2006a) as human health and/or aquatic life criteria (also refer to ARM 17.30.subchapter 6).

Montana also has a “nondegradation” policy with associated rules (ARM 17.30.701-717; MCA 75-5-301,303,306) that are intended to protect pristine surface water and groundwater.

Sediment is the water quality parameter most often affected by land management in the Forest. Activities that disturb vegetation and/or the soil surface have potential to produce sediment from increased erosion. Sediment in streams and rivers is naturally a variable parameter, with higher loads usually occurring during the spring runoff period. Water quality is currently maintained and improved in the Forest through application of Best Management Practices (BMPs) for controlling nonpoint sources of pollution, especially sediment, to surface water.

Water from Sheafman Creek is used for the town of Pinesdale, Montana for its drinking water supply. Darby, Montana receives some its drinking water supply from tin cup Creek. The towns of Florence and Stevensville obtain drinking water from Bass Creek and the town of Lolo acquires water from South Fork Lolo Creek. (Montana NRIS 2004)

Table 3.3-2 displays whether or not the stream is supporting its beneficial uses and those streams on the EPA approved 303(d) list (MDEQ 2006b). Streams not listed are fully supporting their beneficial uses.

Table 3.3- 2 Impaired Waters and Their Beneficial Uses (State Water Quality Standards) for Streams in the Bitterroot River Subbasin (HUC #17010205)

Subwatershed Name (HUC 6)	Beneficial Uses (State Water Quality Standards) 2006						2006
	Agriculture Supply	Aquatic Life support	Cold Water Fishery	Drinking Water Supply	Industrial Supply	Primary Contact Recreation	303(d) Listed Stream
West Fork Bitterroot River (Lower)	Y	N	N	NA	Y	Y	Yes
Lost Horse Creek	Y	Y	Y	NA	Y	N	Yes
Tin Cup Creek	Y	N	N	Y	Y	Y	Yes
Blodgett Creek	Y	N	N	NA	Y	N	Yes
Mill Creek/Sheafman Creek	NA	NA	N	Y	NA	N	Yes
Bear Creek	Y	NA	NA	NA	Y	N	Yes
Sweathouse Creek	NA	N	N	NA	NA	N	Yes
Kootenai Creek	Y	N	N	NA	Y	N	Yes
Bass Creek	Y	N	N	Y	Y	Y	Yes
South Fork Lolo Creek	Y	N	N	Y	Y	N	Yes

From Montana Department of Environmental Quality (www.deq.state.mt.us/cwaic/), Water Quality Information. Beneficial Uses: Y = Yes, Fully Supporting; N = No, Partially Supporting, Not Supporting, or threatened; NA = Not Assessed.

Best Management Practices are site specific control mechanisms for non-point source pollutants, to enable the achievement of water quality standards. BMPs can be applied before, during and after management activities to reduce or eliminate the introduction of pollutants into receiving waters. BMPs would be implemented as outlined in Appendix A: Best Management Practices. BMP selection and design would be based on site-specific conditions; technical, economic and institutional feasibility; and the designated beneficial uses of the streams.

3.3.2 ANALYSIS METHODS AND INDICATORS

This analysis compares the effects of the alternatives on the use of various herbicides throughout the project area and herbicide toxicity to aquatic organisms, including fish. Aerial application is not proposed. Treatments other than herbicides are considered as not significantly affecting fish or other aquatic resources, and their effects will not be discussed in detail.

Aquatic indicators include maximum acres proposed for each herbicide with a 6th code HUC watershed. Three methods are referenced in comparing toxicity to fish and other aquatic organisms: Lethal Concentration (LC_{50}), No Observed Effect Level (NOEL), or No Observed Effect Concentration (NOEC). Although the LC_{50} is frequently used as a toxicity standard, 50 percent fish mortality is generally not acceptable. For this reason a better parameter of NOEL or NOEC was used when it was available to evaluate effects. Toxicity is assessed with known values of these parameters, as related to maximum number of acres proposed for treatment with each herbicide.

The herbicides proposed for use are characterized by relatively low aquatic toxicity. The effects of herbicides on fish can be quantified using the 96-hour LC_{50}. The 96-hour LC_{50} refers to the concentration that is lethal to 50 percent of the fish exposed at that level for 96 hours. The lower the $LC_{50,}$ the more toxic the compound. The 96-hour LC_{50} for the herbicides proposed for use (plus the parent compound of 2,4-D amine) is provided in Table 3.3-12. For example, NOEL for picloram on cutthroat trout is 0.29 milligrams

per liter (1mg/l = 1 part per million (ppm)). Because there are frequently no long-term test results that provide safe concentrations (NOEL), the EPA has recommended that to set a standard for concentrations to protect endangered aquatic species, divide the 96-hour LC_{50} by 20. Table 3.3-12 includes those concentrations that are used as a benchmark to measure the significance of possible impacts.

The No Observed Effect Level (NOEL) or No Observed Effect Concentration (NOEC) was used in place of the LC_{50} when it was available from studies. These levels represent a conservative approach to evaluating the active ingredients of the proposed herbicides within each watershed. No Observed Effect Level/Concentration is the highest concentration of toxicant to which organisms are exposed in a full life-cycle or partial life-cycle test that causes no observable effect on survival, growth, or reproduction of the test population. This would mean there is no significant difference between the test solution and the control, as determined by hypothesis testing.

3.3.3 EXISTING CONDITION

A. Watershed Description

The project area is located within three subbasins: the Lochsa River and Selway River, both which flow into the Clearwater River, and the Bitterroot River, which flows into the Clark Fork River. The Lochsa River drains approximately 755,593 acres, with approximately 302,052 acres in the project area. The Selway River drainage encompasses 1,288,196 acres, with approximately 923,905 acres in the project area. The Bitterroot River watershed covers a total area of 1,829,120 acres, with approximately 472,274 acres located in the project area.

The majority of streams in the mountainous areas are steep and narrow, dominated by step pool morphology. These streams have narrow bands of riparian vegetation and wetlands along their banks. At lower elevations where valley bottoms widen and gradients become less steep, streams generally are less confined and have well developed floodplains.

In the higher elevations water yield patterns are dominated by spring snowmelt runoff regimes with a peak between April and June. Elevations within the analysis area range from 9,000 feet at the headwaters of the Selway River in the Bitterroot Mountains to a low of 1,469 feet at Lowell, Idaho where the Selway and Lochsa Rivers converge. Annual precipitation ranges from 40 to 70 inches. (USDA 2001)

Currently, eight percent of the project area is infested with invasive plants, with a large extent located along the Selway River. Increased erosion and sedimentation into the Selway River and associated streams may be taking place since broad-leafed plants with narrow tap-roots are less effective in anchoring soils compared to native grasses with fibrous roots the better bind the soil (Huenneke 1995 in Invasive Plants Fact Book).

The proposed activities would take place in three subbasins (4th HUC watershed). These watersheds are further divided into subwatersheds at the 6th Hydrologic Unit Code (HUC) level (Table 3.3-3).

Subwatersheds with less than ten percent of its drainage inside the SBW project area were reviewed but not analyzed in detail.

Table 3.3- 3 Subwatersheds Located Within the Project Area

Subbasin	6th field HUC	Subwatershed Name (HUC 6)	Subwatershed (acres)	Percent of subwatershed located within the project area
Bitterroot River - 17010205	170102050201	Sheephead Creek	12,397	63
	170102050202	Watchtower Creek	10,839	79
	170102050203	Soda Springs Creek	15,581	81
	170102050302	Boulder Creek	13,511	98
	170102050304	Trapper Creek	18,196	68
	170102050305	West Fork Bitterroot River (Lower)	22,063	18
	170102050601	Lost Horse Creek	27,803	29
	170102050602	South Fork Lost Horse Creek	19,975	63
	170102050803	Chaffin Creek	12,942	45
	170102050804	Tin Cup Creek	27,052	72
	170102050805	Rock Creek	36,735	82
	170102051002	Roaring Lion Creek	16,120	80
	170102051003	Sawtooth Creek	19,456	64
	170102051004	Canyon Creek	10,030	31
	170102051005	Blodgett Creek	18,146	61
	170102051101	Mill Creek/Sheafman Creek	25,486	54
	170102051102	Fred Burr Creek	15,395	58
	170102051103	Bear Creek	17,884	93
	170102051104	Sweathouse Creek	18,291	53
	170102051201	Big Creek	22,510	89
	170102051203	Kootenai Creek	20,165	87
	170102051301	Bass Creek	9,271	76
	170102051304	Sweeney Creek	12,206	66
	170102051307	One Horse Creek	9,239	50
	170102051308	Carlton Creek	16,100	23
	170102051407	South Fork Lolo Creek	24,881	52
Upper Selway - 17060301	170603010201	Deep Creek	36,320	53
	170603010202	Selway River-Magruder Creek	22,801	81
	170603010203	Indian Creek	32,106	100
	170603010204	Selway River-Sheep Creek	15,461	64
	170603010205	Selway River-Bad Luck Creek	27,277	64
	170603010301	Upper Little Clearwater River	24,590	99
	170603010302	Lower Little Clearwater River	20,784	97
	170603010401	Upper White Cap Creek	35,108	100
	170603010402	Canyon Creek	27,627	100
	170603010403	Lower White Cap Creek	21,604	100
	170603010502	Lower Running Creek	17,710	61
	170603010503	Eagle Creek	16,127	100

Subbasin	6th field HUC	Subwatershed Name (HUC 6)	Subwatershed (acres)	Percent of subwatershed located within the project area
	170603010601	Selway River-Elk Creek	18,162	100
	170603010602	Goat Creek	18,847	100
	170603010603	Ditch Creek	11,573	100
	170603010604	Selway River-Dog Creek	27,121	100
	170603010605	Pettibone Creek	20,934	100
	170603010701	Upper Bear Creek	18,018	97
	170603010702	Wahoo Creek	13,552	100
	170603010703	Middle Bear Creek	16,446	100
	170603010704	Lower Cub Creek	17,558	100
	170603010705	Upper Cub Creek	21,329	100
	170603010706	Paradise Creek	18,215	100
	170603010707	Lower Bear Creek	9,749	100
Lower Selway - 17060302	170603020101	East Fork Moose Creek Headwaters	21,615	100
	170603020102	Upper East Fork Moose Creek	22,470	100
	170603020103	Cedar Creek	16,327	100
	170603020104	Middle East Fork Moose Creek	30,759	100
	170603020105	Lower East Fork Moose Creek	29,501	100
	170603020106	Upper North Fork Moose Creek	17,394	100
	170603020107	West Moose Creek	19,117	100
	170603020108	Middle North Fork Moose Creek	10,680	100
	170603020109	Rhoda Creek	36,396	100
	170603020110	Lower North Fork Moose Creek	17,577	100
	170603020111	Lower Moose Creek	11,524	100
	170603020201	Selway River-Meeker Creek	28,276	100
	170603020202	Marten Creek	20,988	100
	170603020203	Three Links Creek	28,106	100
	170603020204	Mink Creek	10,239	100
	170603020205	Selway River-Pinchot Creek	31,829	79
	170603020206	Otter Creek	10,518	100
	170603020305	Buck Lake Creek	20,745	27
	170603020402	Gedney Creek	30,825	39
Lochsa River - 17060303	170603030102	Boulder Creek	30,023	95
	170603030201	Upper Colt Killed Creek	24,804	100
	170603030202	Upper Big Sand Creek	17,354	100
	170603030203	Hidden Creek	10,578	100
	170603030204	Lower Big Sand Creek	24,314	41
	170603030205	Middle Colt Killed Creek	10,536	72
	170603030207	Storm Creek	32,703	86

Subbasin	6th field HUC	Subwatershed Name (HUC 6)	Subwatershed (acres)	Percent of subwatershed located within the project area
	170603030401	Upper Warm Springs Creek	13,842	100
	170603030402	Wind Lakes Creek	12,537	99
	170603030403	Lower Warm Springs Creek	19,451	53
	170603030503	Lake Creek	33,306	83
	170603030505	Lochsa River - Bald Mountain Creek	28,801	11
	170603030701	Lochsa River - Bimerick Creek	34,479	19
	170603030702	Old Man Creek	28,130	99
	170603030703	Split Creek	9,995	72

B. Instream Habitat

Since the portions of streams that could be directly affected by herbicide treatments are mostly located within roadless or designated wilderness areas, existing water quality and habitat are most affected by natural processes. Exceptions include watersheds with continued presence and operation of irrigation reservoirs in Bitterroot River drainage, reaches downstream of designated wilderness, and specific areas where campsites, packstock grazing, trail erosion, fords, human-caused salt licks, , and high levels of recreational use have resulted in local impacts to specific stream reaches. Most of these impacts are limited to bank trampling, bank erosion, and over-widened channels at ford and stream access sites. High or unnatural levels of deposited sediment are generally not evident in streams in the project area, even though streambanks and riparian areas have been affected by human activity.

The introduction of invasive plants, particularly spotted knapweed, has been implicated as possibly increasing surface sediment yield (USDA-FS 2001). Lacey and Olson (1991) reported as knapweed replaces native bunchgrasses, forbs, and gramminoids, soil erosivity increases. Although the extent of such an effect on streams in the Selway-Bitterroot Wilderness Area is unknown, given the extent of the spotted knapweed infestation across the breaklands landscapes, it is possible that changes in surface sediment yield, and potentially mass erosion processes, have occurred (USDA-FS 2001).

Generally, invasive plants are most associated with areas used by humans, including trails, private camps, outfitter camps, administrative sites, dams, trailheads, and airstrips. These areas are most likely to be treated with herbicides or other methods. Most mainline trails follow along streams, and these areas demonstrate widespread infestation of weeds such as spotted knapweed and sulfur cinquefoil. Campsites and administrative sites are usually located adjacent to a stream, river, or other water source.

Arguably the most significant determinant of stream habitats in the Selway-Bitterroot Wilderness is the prevalence of wildland fire. Wildland fire affects watershed condition and stream habitats through changes in water yield, water temperature, recruitment of large woody debris, and sediment yield. In most areas, existing stream process and function is similar to the historic condition, except in areas where fire suppression has excluded fire outside of historic intervals.

C. Fish

Tables 3.3-4 – 3.3-7 identify native and non-native salmonid species in each 6th code HUC watershed within the project area. A notable departure from the historic species assemblage in many watersheds is the presence of brook trout, a non-native species introduced into mountain lakes. Brook trout have moved into some streams and adversely affected native westslope cutthroat trout through competition.

The following discussion is focused on fish species that are either listed under the Endangered Species Act or are sensitive species in Region 1.

Forest Service Sensitive Fish Species and Fish Listed Under the Endangered Species Act

Snake River Fall Chinook Salmon
Snake River fall chinook salmon (*Oncorhynchus tshawytscha*) were listed as a threatened species by the National Marine Fisheries Service (NMFS) on May 22, 1992 (Federal Register, Vol. 57, 14563). Fall chinook salmon spawn and rear in the lower portions of the mainstem Clearwater River, generally below the mouth of the North Fork Clearwater River. Critical habitat has been designated in the Clearwater River, extending from its mouth upstream to Greer, Idaho. No portion of the Selway or Lochsa Rivers is included as critical habitat, and no fall chinook salmon are known to occupy any areas in these river basins.

"Chinook salmon" were identified as a Management Indicator Species in both the Nez Perce and Clearwater Forest Plans. Neither Plan differentiated between the various races of chinook salmon in the Clearwater basin.

Fall chinook salmon are not found in the Bitterroot River subbasin.

Steelhead/Redband Trout
Steelhead/redband trout (*Oncorhynchus mykiss gairdneri*) are native to the Selway and Lochsa Rivers and are found throughout these river systems. Individuals may be present in most streams in the project area, outside of the Bitterroot subbasin. *Oncorhynchus mykiss* is not native to the Bitterroot, although hatchery rainbow trout have been introduced into both streams and lakes in the subbasin (see discussion below). Although classified as the same species, the term "steelhead" generally refers to the anadromous form, while "redband trout" refers to the stream resident form that does not migrate to the ocean. The Snake River Steelhead Distinct Population Segment (DPS) includes the anadromous form only and is currently listed as threatened under the Endangered Species Act (Federal Register Vol. 71 No. 3, 2006). Steelhead trout that spawn and rear in the Selway and Lochsa Rivers are included in this DPS.

Interior redband trout are designated as a Forest Service sensitive species in Region 1, which includes northern Idaho and Montana in its entirety.

Critical habitat for the Snake River steelhead DPS was designated on September 2, 2005 (Federal Register Vol. 30 No. 170). The Selway and Lochsa Rivers were included in their entirety, as well as most accessible tributaries to these rivers.

Co-occurrence of resident redband and anadromous steelhead trout in inland populations such as the Lochsa and Selway Rivers is frequent (Good et al. 2005). Where they co-occur, it is possible that offspring of resident fish may migrate to the sea, and offspring of anadromous steelhead may remain in streams as resident fish (Burgner et al. 1992 and Mullan et al. 1992, as cited in Good et al. 2005). Other redband populations are located above barriers that are inaccessible to anadromous fish. Both situations probably

exist within project area streams. These divergent life history strategies undoubtedly evolved such that the species could persist in variable environments and adapt as stream conditions change.

The Selway River system is recognized as supporting one of the last remaining populations of wild B-run summer steelhead in Idaho. It has not been substantially supplemented with hatchery-produced steelhead. B-run steelhead pass over Bonneville Dam later than other Snake River steelhead. Declines of B-run steelhead, including those that return to the Selway and Lochsa Rivers, are well documented and culminated with the species listed as threatened in 1997.

Available data suggest the lower reaches of the larger tributaries and many smaller tributaries are used by steelhead trout for spawning and rearing. Key spawning and rearing areas in the Selway River include mainstem Meadow Creek from its mouth upstream through the breaklands, the lower half of mainstem Marten Creek, North Fork Moose Creek, the lower reaches of Bear Creek (including Cub, Paradise, and Brushy Fork Creeks), lower Running Creek, White Cap Creek, the Little Clearwater River, and most streams flowing into the upper reaches and headwaters of the Selway River (USDA-FS 2001). Key spawning and rearing areas in the Lochsa River subbasin include Old Man Creek, Fish Creek, Crooked Fork, White Sands Creek, and many others.

Steelhead trout are included as a Management Indicator Species in both the Nez Perce and Clearwater Forest Plans.

Columbia River Bull Trout

Bull trout (*Salvelinus confluentus*) are present in the Selway, Lochsa, and Bitterroot Rivers. Bull trout in these river basins are included in the Columbia River DPS, which was listed as threatened in 1998 (Federal Register Vol. 63, No. 31647). Bull trout may be present in portions of most streams in the project area. Although critical habitat has been designated for bull trout, the Lochsa, Selway, and Bitterroot Rivers and their tributaries were not included (Federal Register, Vol. 69, No. 193, 2004).

Both the Lochsa and Selway Rivers are considered refugia for this species in the Clearwater basin, given their location, accessibility, high-quality habitat, connectivity among subpopulations, and acres of roadless and wilderness watersheds that lack significant, long-term sediment effects caused by establishment of permanent, sediment-producing features (USDA-FS 2001). Both rivers support relatively high numbers of large, migratory bull trout, which comprise a significant portion of the spawning population, in addition to smaller resident populations at the headwaters of many tributaries.

Bull trout in the Bitterroot River, conversely, have been affected by various factors including habitat degradation, introduction of non-native species, and loss of connectivity. The present distribution of bull trout in the Bitterroot River basin is much reduced from historic levels, and the migratory life form is rare (Montana Bull Trout Scientific Group 1995). Most of the larger tributaries to the Bitterroot River, including those potentially affected by this project, contain isolated populations of small bull trout in their upper reaches, but these populations are isolated from one another by habitat degradation, dewatering, and other passage barriers. Some are threatened by the presence of brook trout, and rainbow and brown trout have largely replaced bull trout as the dominant predatory salmonid in portions of the Bitterroot River basin.

Key spawning and rearing areas for bull trout in the Selway River basin include North Fork Moose Creek, the upper reaches of Meadow Creek, Running Creek, the Little Clearwater River, White Cap Creek, Deep Creek, and most headwater streams to the upper Selway River. Similar to the Bitterroot River, bull trout in some areas may be threatened by the presence of non-native brook trout, which may compete with and/or interbreed with bull trout, producing sterile hybrids.

Key spawning and rearing areas for bull trout in the Bitterroot River basin include the headwaters of the East Fork Bitterroot, tributaries to the West Fork Bitterroot upstream of Painted Rocks Reservoir, and in the Warm Springs, Skalkaho, Sleeping Child, upper Burnt Fork, Blodgett, and Fred Burr Creek drainages (Montana Bull Trout Scientific Group 1995).

Bull trout are included as a Management Indicator Species in the Clearwater and Bitterroot Forest Plans.

Spring Chinook Salmon

Spring chinook salmon (*Oncorhynchus tshawytscha*) are present in the Selway and Lochsa subbasins but are not listed under the Endangered Species Act anywhere in the Clearwater basin (see below). The species is, however, included as a Forest Service Region 1 sensitive species. Chinook salmon were also identified as a Management Indicator Species in the Nez Perce and Clearwater Forest Plans. Spawning, rearing, and adult migration occur in the Selway and Lochsa Rivers and many of their tributaries.

Spring chinook salmon are not found in the Bitterroot River basin.

Snake River chinook salmon were listed as threatened under the Endangered Species Act in 1992. Spring chinook salmon in the Clearwater River basin were exempted from listing because of uncertainty associated with the genetic integrity of this stock. Genetic integrity was questioned because the construction of Lewiston Dam in 1927 was thought to have eliminated all runs of native spring chinook salmon into the Clearwater basin, and those currently found in the basin are derived from subsequent planting efforts following removal of this dam. Historically, both the Lochsa and Selway Rivers supported substantial returns of adult spring chinook salmon. Current returns fluctuate annually but are generally low.

Key spawning and rearing areas for chinook salmon in the Selway River include lower Meadow Creek, East Fork Moose Creek, North Fork Moose Creek, main Moose Creek, Bear Creek, Running Creek, White Cap Creek, and the lower reaches of Goat and Pettibone Creeks (USDA-FS 2001). In the Lochsa River, key areas include Crooked Fork, White Sands Creek, and many of the larger tributaries.

“Chinook Salmon” were identified as a Management Indicator Species in both the Nez Perce and Clearwater Forest Plans. Neither Plan differentiated between the various races of chinook salmon in the Clearwater basin.

Westslope Cutthroat Trout

Westslope cutthroat trout (*Oncorhynchus clarki lewisi)* are native to the Selway, Lochsa, and Bitterroot River basins and may be present in most streams in the project area. The species not listed under the Endangered Species Act but are included as a Forest Service Region 1 sensitive species and are identified as a Management Indicator Species in the Nez Perce, Clearwater, and Bitterroot Forest Plans. Spawning, rearing, and migration occur in the Selway, Lochsa, and Bitterroot River basins and most tributaries.

The Lochsa and Selway Rivers are generally considered strongholds for this species when considered over its range (Quigley et al. 1998), and strong populations of migratory and resident cutthroat trout exist in these rivers and most of their tributaries. Current range is similar to the historic range, with some areas of local extirpation from introduction of non-native brook trout. Threats to this species are generally associated with introduction of non-native species, including brook trout, Yellowstone cutthroat trout, and hatchery rainbow trout. The latter two pose a threat to westslope cutthroat trout through their potential to interbreed and hybridize, while brook trout reduce or eliminate westslope cutthroat trout through interspecific competition.

In the Bitterroot River, westslope cutthroat trout currently occupy at least 70 percent of their historic habitat and are present in nearly all fish-bearing streams. Habitat losses have primarily occurred outside the project area at the lower elevations of tributary streams on private lands. Most of the cutthroat populations are considered depressed, primarily as a result of habitat fragmentation that occurs on private land between the Bitterroot River and its tributaries and the reduced number of migratory adult fish in the river.

Pacific Lamprey
The Pacific lamprey is a Forest Service Region 1 sensitive species and is listed as a state endangered species by the State of Idaho. Lamprey are present in the Selway and Lochsa Rivers and may be present in the lower reaches of the larger tributaries. Information concerning distribution in these river basins is limited. Similar to salmon and steelhead, Pacific lamprey in Idaho are anadromous. This species does not occur in the Bitterroot River. Historic runs of lamprey in the Columbia River basin were large; upwards of 400,000 lampreys were counted during some years as they migrated past Bonneville Dam on the Columbia River. Counts of lampreys passing Ice Harbor Dam on the Snake River totaled 40 in 1993 and 399 in 1994; in comparison, nearly 50,000 were counted annually in the 1960s. Available information suggest precipitous declines in abundance of both adults and juveniles even since 1994 (Cochnauer and Claire, 2004).

Presence/absence surveys for juvenile lampreys have been conducted in many areas in the Clearwater basin since 2001, by Idaho Department of Fish and Game personnel. Ammocoetes often appear in downstream migrant traps that are set to catch juvenile salmon and steelhead. Areas surveyed include the Lochsa and Selway Rivers, although tributaries have not been surveyed. Results are presented in Cochnauer and Claire (2004) and summarized below.

In the Selway River, 68 juvenile lampreys were captured in 2003 and 61 in 2002. Two survey sites where juveniles were captured were located in the lower part of the river, well downstream of Moose Creek, and two were located upstream of Moose Creek. Of the lower sites, both were located below Selway Falls.

In the Lochsa River, juveniles were found at 3 sites sampled in 2002 and 2003. Sites were located 30 km above Bald Mountain Creek, immediately below Ginger Creek, and immediately below Fire Creek. A total of 50 ammocoetes were captured in 2002, and 60 were captured in 2003.

Pacific lamprey are not included as a Management Indicator Species in the Nez Perce, Clearwater, or Bitterroot Forest Plans.

Other Fish Species Present in the Project Area

Brook Trout (Salvelinus fontinalis)
As previously mentioned, this species is present in the headwaters of many streams in the project area. Brook trout are native to the eastern United States and were introduced in streams and mountain lakes in the Selway, Lochsa, and Bitterroot River basins in the 1930s. Although no longer stocked, self-sustaining populations continue to exist in many lakes and streams in the Selway-Bitterroot Wilderness Area.

Most of these populations are considered strong and at low risk of extinction. Brook trout exert various adverse ecological effects on native fish, including competition with native fish such as westslope cutthroat trout, which often results in extirpation of the latter, and interbreeding and hybridization with bull trout (USDA-FS, 1996; Platts et al. 1993; Behnke, 2002). These effects have been documented in specific areas in all three river basins. Brook trout also result in disruption of fragile lake ecosystems.

Yellowstone Cutthroat Trout (Oncorhynchus clarki bouvieri)
Yellowstone cutthroat trout are native to streams in the Yellowstone River and were stocked into lakes and streams in the Selway, Lochsa, and Bitterroot subbasins starting in the early 1930s. Yellowstone cutthroat trout have been stocked into lakes in the headwaters of these rivers as recently as the early 1990s.

Yellowstone cutthroat trout interbreed with native westslope cutthroat trout, which results in creation of hybridized subpopulations and loss of genetic integrity.

Hatchery Rainbow Trout (Oncorhynchus mykiss)
Hatchery rainbow trout have been widely stocked in streams and lakes throughout the Selway, Lochsa, and Bitterroot River basins. Although steelhead/redband trout are native to the Selway and Lochsa Rivers, different strains of hatchery trout have been stocked. Rainbow trout of any stock are not native to the Bitterroot River basin.

Similar to Yellowstone cutthroat trout, introduced rainbow trout interbreed with westslope cutthroat trout, resulting in hybridization and loss of genetic integrity. Fluvial rainbow trout are well established in the mainstem Bitterroot River.

Brown Trout (Salmo trutta)
Brown trout were widely introduced into the mainstem Selway and Lochsa Rivers in the 1940s, but no populations became established, and currently the species does not exist anywhere in either river basin. Brown trout have also been stocked in the Bitterroot River and continue to exist as a self-sustaining population. In general, brown trout are not present in stream reaches in the Selway – Bitterroot Wilderness Area, but they are present in reaches downstream of the wilderness boundary.

Arctic Grayling (Thymallus arcticus)
Arctic grayling were historically stocked into a small number of lakes in the Selway – Bitterroot Wilderness Area and in Three Links Creek in 1941. Currently, there are no known stream-dwelling populations of this species anywhere in the Selway – Bitterroot Wilderness Area, although they may continue to exist in a few isolated lakes. The species is not native to streams or lakes in the Selway-Bitterroot Wilderness Area.

Tables 3.3-4 – 3.3-7 on the following pages summarize the distribution of trout and salmon species in Selway – Bitterroot Wilderness Area streams.

Table 3.3- 4: Distribution of Salmonid Fishes in the Lower Selway Subbasin, Nez Perce National Forest, Selway – Bitterroot Wilderness

6th Code HUC #	6th Code HUC Name	Acres	Steelhead/Redband Trout	Spring Chinook Salmon	Westslope Cutthroat Trout	Bull Trout	Brook Trout
170603020101	East Fork Moose Headwaters	21,615	Surveyed – not found	Surveyed – not found	Surveyed – not found	Surveyed – not found	Present
170603020102	Upper East Fork Moose Creek	22,470	Probably present	Probably present	Present	Probably present	Probably present
170603020103	Cedar Creek	16,327	Probably present	Probably present	Present	Unknown	Probably absent
170603020104	Middle East Fork Moose Creek	30,759	Present	Present	Present	Present	Present
170603020105	Lower East Fork Moose Creek	29,501	Present	Present	Present	Present	Probably absent
170603020106	Upper North Fork Moose Cr	17,394	Surveyed – not found	Surveyed – not found	Present	Surveyed – not found	Surveyed – not found

6th Code HUC #	6th Code HUC Name	Acres	Steelhead/Redband Trout	Spring Chinook Salmon	Westslope Cutthroat Trout	Bull Trout	Brook Trout
170603020107	West Moose Creek	19,117	Probably absent	Probably absent	Present	Unknown	Probably absent
170603020108	Middle North Fork Moose Cr	10,680	Present	Present	Present	Present	Probably absent
170603020109	Rhoda Creek	36,396	Present	Present	Present	Present	Present
170603020110	Lower North Fork Moose Cr	17,577	Present	Present	Present	Present	Probably absent
170603020111	Lower Moose Creek	11,524	Present	Present	Present	Present	Probably absent
170603020201	Meeker Creek – Selway River	28,276	Present	Present	Present	Present	Probably absent
170603020202	Marten Creek	20.988	Present	Probably present	Present	Unknown	Probably absent
170603020203	Three Links Creek	28,106	Present	Present	Present	Probably absent	Present - headwaters
170603020204	Mink Creek	10,239	Present – lower reach	Present – lower reach	Present	Unknown	Present - headwaters
170603020205	Selway River – Pinchot Creek	31,829	Present	Present	Present	Present	Present – Ballinger only
170603020206	Otter Creek	10,518	Present	Probably absent	Present	Unknown	Surveyed – not found
170603020305	Buck Lake Creek	20,745	Present	Present	Present	Unknown	Present - Headwaters
170603020402	Gedney Creek	30,825	Present	Present - lower	Present	Probably present	Present - headwaters

Table 3.3- 5: Distribution of Salmonid Fishes in the Upper Selway Subbasin, Nez Perce and Bitterroot National Forests, Selway-Bitterroot Wilderness Only (upper reaches in Frank Church – River of No Return Wilderness Excluded, Not Part of Project Area)

6th Code HUC #	6th Code HUC Name	Acres	Steelhead/ Redband Trout	Spring Chinook Salmon	Westslope Cutthroat Trout	Bull Trout	Brook Trout
170603010601	Selway River – Elk Creek	18,162	Present	Present	Present	Present	Probably absent
170603010602	Goat Creek	18,847	Present	Probably present	Present	Unknown	Probably absent
170603010603	Ditch Creek	11,573	Present	Surveyed – Not found	Present	Surveyed-Not found	Surveyed – Not found
170603010604	Selway River – Dog Creek	27,121	Present	Present	Present	Present	Probably absent
170603010605	Pettibone Creek	20,934	Probably present	Probably present	Present	Probably absent	Present
170603010701	Upper Bear Creek	18,018	Present	Probably absent	Probably present	Probably absent	Probably absent
170603010702	Wahoo Creek	13,552	Present	Probably absent	Probably absent	Probably absent	Probably absent
170603010703	Middle Bear Creek	16,446	Present	Present	Present	Present	Probably absent
170603010704	Lower Cub Creek	17,558	Present	Present	Present	Present	Probably absent
170603010705	Upper Cub Creek	21,329	Probably present	Probably absent	Present	Probably absent	Probably absent

6th Code HUC #	6th Code HUC Name	Acres	Steelhead/ Redband Trout	Spring Chinook Salmon	Westslope Cutthroat Trout	Bull Trout	Brook Trout
170603010706	Paradise Creek	18,215	Probably present	Probably absent	Present	Probably absent	Probably absent
170603010707	Lower Bear Creek	9,749	Present	Present	Present	Present	Surveyed Not Found
170603010201	Deep Creek	36,320	Present	Present	Present	Present	Surveyed – not found
170603010202	Selway River – Magruder Cr	22,801	Present	Present	Present	Present	Probably absent
170603010203	Indian Creek	32,106	Present	Present	Present	Present	Surveyed – not found
170603010204	Selway River – Sheep Creek	15,461	Present	Present	Present	Present	Probably absent
170603010205	Selway River – Bad Luck Cr	27,277	Present	Present	Present	Present	Probably absent
170603010301	Upper Little Clearwater R	24,590	Present	Probably present	Present	Present	Present (1 headwater lake)
170603010302	Lower Little Clearwater R	20,784	Present	Present	Present	Present	Surveyed – not found
170603010401	Upper White Cap Creek	35,108	Present	Present	Present	Present	Surveyed – not found
170603010402	Canyon Creek	27,627	Present	Probably present	Present	Present	Surveyed – not found
170603010403	Lower White Cap Creek	21,604	Present	Present	Present	Present	Surveyed – not found
170603010502	Lower Running Creek	17,710	Present	Present	Present	Present	Surveyed – not found
170603010503	Eagle Creek	16,127	Present	Present	Present	Present	Surveyed – not found

Table 3.3- 6: Distribution of Salmonid Fishes, Lochsa Subbasin, Clearwater National Forest, Selway – Bitterroot Wilderness

6th Code HUC #	6th Code HUC Name	Acres	Steelhead/Redband Trout	Spring Chinook Salmon	Westslope Cutthroat Trout	Bull Trout	Brook Trout
170603030102	Boulder Creek	30,023	Present	Surveyed Not Found	Present	Present	Surveyed Not Found
170603030201	Upper Colt Killed Creek	24,804	Present	Present	Present	Present	Probably present
170603030202	Upper Big Sand Creek	17,354	Surveyed Not Found	Surveyed Not Found	Present	Surveyed Not Found	Present
170603030203	Hidden Creek	10,578	Present	Surveyed Not Found	Present	Surveyed Not Found	Present
170603030204	Lower Big Sand Creek	24,314	Present	Surveyed Not Found	Present	Surveyed Not Found	Present
170603030205	Middle Colt Killed Creek	10,536	Present	Present	Present	Present	Surveyed Not Found
170603030207	Storm Creek	32,703	Present	Present	Present	Present	Surveyed Not Found
170603030401	Upper Warm Springs Creek	13,842	Probably absent	Probably absent	Present	Probably absent	Surveyed Not Found
170603030402	Wind Lakes Creek	12,537	Probably absent	Probably absent	Present	Probably absent	Surveyed Not Found

6th Code HUC #	6th Code HUC Name	Acres	Steelhead/Redband Trout	Spring Chinook Salmon	Westslope Cutthroat Trout	Bull Trout	Brook Trout
170603030403	Lower Warm Springs Creek	19,451	Present	Present	Present	Present	Surveyed Not Found
170603030503	Lake Creek	33,306	Present	Present	Present	Present	Present
170603030701	Lochsa River - Bimerick Creek	34,479	Present	Present	Present	Present	Present
170603030702	Old Man Creek	28,130	Present	Surveyed Not Found	Present	Surveyed Not Found	Present
170603030703	Split Creek	9,995	Present	Present	Present	Present	Surveyed Not Found

Table 3.3- 7: Distribution of Salmonid Fishes, Bitterroot Subbasin, Bitterroot National Forest, Selway – Bitterroot Wilderness

6th Code HUC #	6th Code HUC Name	Acres	Westslope Cutthroat Trout	Bull Trout	Rainbow Trout	Brook Trout	Brown Trout
170102050201	Sheephead Creek	12,397	Present	Present	Surveyed – not found	Present	Present
170102050202	Watchtower Creek	10,839	Present	Present	Present	Present	Present
170102050203	Soda Springs Creek	15,581	Present	Present	Present	Present	Present
170102050302	Boulder Creek	13,511	Present	Present	Probably present	Probably present	Probably present
170102050305	WF Bitterroot River	22,063	Present	Present	Present	Present	Present
170102050304	Trapper Creek	18,196	Present	Present	Probably present	Present	Present
170102050601	Lost Horse Creek	27,803	Present	Present	Present	Present	Present
170102050602	South Fork Lost Horse Cr	19,975	Present	Present	Present	Present	Present
170102050803	Chaffin Creek	12,942	Present	Present	Probably present	Present	Probably present
170102050804	Tin Cup Creek	27,052	Present	Present	Present	Present	Present
170102050805	Rock Creek	36,735	Present	Probably absent	Present	Probably present	Present
170102051002	Roaring Lion Creek	16,120	Present	Present	Present	Present	Probably present
170102051003	Sawtooth Creek	19,456	Present	Present	Present	Present	Present
170102051004	Canyon Creek	10,030	Present	Probably absent	Probably present	Present	Present
170102051005	Blodgett Creek	18,146	Present	Present	Present	Present	Present
170102051101	Mill Creek	25,486	Present	Present	Present	Present	Present
170102051102	Fred Burr Creek	15,395	Present	Present	Present	Present	Probably present
170102051103	Bear Creek	17,884	Present	Probably present	Present	Present	Present
170102051104	Sweathouse Creek	18,291	Present	Present	Present	Present	Present

6th Code HUC #	6th Code HUC Name	Acres	Westslope Cutthroat Trout	Bull Trout	Rainbow Trout	Brook Trout	Brown Trout
170102051201	Big Creek	22,510	Present	Present	Present	Present	Present
170102051203	Kootenai Creek	20,165	Present	Present	Present	Present	Present
170102051301	Bass Creek	9,271	Present	Present	Present	Present	Probably present
170102051304	Sweeney Creek	12,206	Present	Present	Present	Present	Probably present
170102051307	One Horse Creek	9,239	Present	Present	Probably present	Present	Probably present
170102051308	Carlton Creek	16,100	Present	Probably absent	Probably present	Probably present	Probably present
170102051407	South Fork Lolo Creek	24,881	Present	Present	Probably present	Present	Probably present

In the Bitterroot River, significant portions of many watersheds are located on private or non-wilderness Forest Service administered lands downstream of the Selway-Bitterroot Wilderness Area. The distribution of brown and rainbow trout is mainly restricted to these downstream reaches, mostly on non-Forest Service administered lands, while westslope cutthroat and bull trout are mostly distributed in both wilderness and non-wilderness reaches of Forest Service lands in upstream areas.

Existing bull trout distribution in the Bitterroot subbasin is almost exclusively restricted to high elevation reaches on Forest Service lands.

3.3.4 ENVIRONMENTAL CONSEQUENCES

Control of invasive plants may result in environmental effects that are both beneficial and harmful to fish and other aquatic organisms. Some of the herbicide formulations are toxic to fish, but reduction or control of invasive plant species may benefit fish and aquatic habitats by restoring native riparian vegetation and certain ecosystem and riparian functions that influence conditions in the aquatic environment. In general, adverse effects of herbicides are short-term and localized, when applied as spot treatments in a forest setting, while successful eradication or control of invasive plants is likely to provide long-term benefits through rehabilitation restoration of riparian function, surface erosion processes, prey species production, and possibly other habitat features (NMFS 2005).

The following effects analysis addresses those elements of invasive plant control that have the potential to affect fish and their prey, or the potential to affect hydrologic or riparian functions. There is a dearth of information on many potential environmental effects of herbicides; consequently, much of the effects analysis is based on modeling, extrapolation, or inference from published studies. The analysis focuses primarily on the toxic effects of the herbicides on non-target species, including ESA listed and sensitive fish and their prey. Effects related to toxins may potentially harm fish by killing them outright, through sublethal changes in behavior or physiology, or indirectly through a reduction in the availability of prey (Scholz et al. 2005).

The following analysis focuses on the toxic characteristics of each herbicide proposed for use, the concentration of herbicides to which aquatic biota may be exposed, and the effects to water quality from alternatives. Differences in treatment were used to contrast effects to habitat among alternatives and to

determine the potential adverse effects to fish. Effects analysis was based on field reviews, watershed conditions, riparian zone conditions, professional consultation, and literature reviews.

A. Alternative 1 - No Action

With this alternative no new herbicide, mechanical/cultural, or bio-control treatment would occur.

Direct and Indirect Effects

Currently, within the Selway Bitterroot Wilderness, invasive plants are being treated chemically at administrative sites, and a few selected areas along trails and campsites on the Bitterroot National Forest (less than 20 acres) and mechanical treatment is occurring on approximately 100 acres. Biological control measures introduced in the past are still active. In the non-Wilderness portions of the project, approximately 450 acres of chemical treatment has been approved, mainly along old roads and road prisms on the Bitterroot National Forest. These acres would be treated at an average rate of approximately 50 acres per year. Due to the small size, localization, and minimal soil disturbance of the ongoing treatments there is no direct effect to water quality. These ongoing actions would continue in each of the alternatives.

No new treatment is proposed with this alternative, so no direct effects to water quality would occur.

Without the proposed treatment, invasive plants would continue to spread in affected areas. An indirect effect of noxious weed invasion could result from alterations in the composition of vegetative ground cover through proliferation. On sloped terrain, the possibility of surface runoff and sediment introduction into streams and other water bodies increases as weeds replace bunchgrasses and other vegetation. Erosion is occurs because there is less overall vegetation density and diversity. Invasive weeds can also reduce infiltration and increase runoff and sediment production (Huenneke 1995 in Invasive Plants Fact Book). Water runoff was 56 percent higher and sediment yield was 192 percent higher on spotted knapweed plots compared to bunchgrass plots during a simulated rainfall period (Lacey *et al.* 1989 in Beck 1994).

Release of biological control agents outside of the Selway-Bitterroot Wilderness would have no direct effect on surface water quality and aquatic organisms. The agents would not compete with aquatic insect species since their food base is very specific. They would probably not provide more than an incidental food source for fish.

Invasive plants can adversely affect ecosystem processes by reducing their capacity to recover after disturbance (Masters and Sheley 2001). Impacts from the future spread of weeds would depend on the slope, soil characteristics, precipitation patterns, and distance to water from the infested sites. Table 3.3-8 shows the subwatersheds that are most susceptible to the spread of invasive plants. Five of the subwatersheds are currently weed free or have early infestations. Without treatment of invasive plants it is possible that much of these subwatersheds could become infested, disrupting ecosystem processes and increasing water runoff and sediment into streams.

Table 3.3- 8 Subwatersheds most Susceptible to Invasive Plants

Subbasin	Subwatershed HUC #	Subwatershed	Percent of subwatershed susceptible to invasive plants	Current Infestation Category*
Upper Selway River	170603010204	Selway River-Sheep Creek	31%	3
	170603010503	Eagle Creek	25%	2
	170603010603	Ditch Creek	39%	2

Subbasin	Subwatershed HUC #	Subwatershed	Percent of subwatershed susceptible to invasive plants	Current Infestation Category*
Lower Selway River	170603020108	Middle North Fork Moose Creek	30%	2
	170603020111	Lower Moose Creek	50%	3
	170603020204	Mink Creek	50%	2
Lochsa River	170603030205	Middle Colt Killed Creek	47%	1

*Category 1 – Weed Free; Category 2 – Early Infestation; Category 3 – Advanced Infestation

Cumulative Effects

Other activities occurring in the analysis area include trail maintenance, airstrip maintenance, dam maintenance, various types of recreation, pack stock grazing, and fire management activities. In general, human activities have not significantly affected stream habitat in the Selway-Bitterroot Wilderness Area (see existing condition discussion). Outside of designated wilderness, which includes downstream portions of the Lochsa, Bitterroot, and Selway Rivers, many other activities are ongoing, including road maintenance, prescribed fire, timber harvest, domestic livestock grazing, irrigation withdrawals, and various levels of land management/land development.

In addition, application of herbicides on National Forest lands is also approved and may occur in portions of the Selway, Bitterroot, and Lochsa basins. In the Selway, herbicide use may occur in the portion of the subbasin upstream of Deep Creek, under the Frank Church Weed FEIS. This area is upstream of the project area covered under this DEIS. In the Lochsa subbasin, National Forest lands generally downstream of the project area, including the U.S. Hwy 12 corridor, are included under the Lochsa Weeds EIS. In the Bitterroot subbasin, National Forest lands generally downstream of the project are included under the Bitterroot Weeds EIS.

For each of the three basin areas, potential maximum acres to be treated under these planning documents, in addition to acres treated under Alternative 1, are displayed in Table 3.3-11. For the Selway, since all acres to be treated are located upstream of this project area, and no 6th code HUC watersheds are common to this project area and the Frank Church Weed EIS project area, cumulative effects are only relevant at the subbasin (4th code HUC) scale, which means only effects to the mainstem Selway River are possible. Because of the size of the subbasin, all treatment acres combined for both project areas are well below thresholds where effects to aquatic organisms would occur.

For the Lochsa and Bitterroot subbasins, assessment of cumulative effects includes effects at the 5th and 6th code HUC scales, because portions of 5th and 6th code HUC watersheds are included in this project area and the project areas included under the Lochsa Weed and Bitterroot Weed EISs.

Because no additional herbicide treatments are proposed under Alternative 1, there would be no cumulative effects to aquatic organisms from herbicide use. Other ongoing weed treatments, as described previously, would not contribute to the effects of other activities occurring in or outside of the project area because these activities themselves do not affect aquatic organisms or their habitat.

B. Alternative 2 - Proposed Action

With this alternative, no more than 1500 acres of herbicide treatment would occur per year, 10,000 acres of bio-control releases during the life of the project, and up to 100 acres of mechanical/cultural treatment per year. This alternative allows treating new invaders and established invasive plants on a designated amount of acres wherever they occur. It is important to eliminate new invaders and new colonies of established weeds before they have a chance to spread. As stated in Masters and Sheley, "Early detection followed by prompt implementation of effective control measures is essential to eliminate the invader. Without a commitment to taking swift action, the invasion process will progress into the exponential population phase and eradication of the invader will not be a realistic goal" (2001). Alternatives 2 and 5 are the only alternatives that allow for the treatment of invasive plants outside of the designated treatment area.

Direct and Indirect Effects

Mechanical/Cultural Treatment
Invasive plants commonly invade areas with vegetation that can't compete with aggressive invader species. Consequently, after weeds are controlled on a site it is beneficial to establish desirable native vegetation that would compete with invasive plants, restrict or prevent additional infestations, and help prevent soil erosion. Cultural treatments such as seeding, transplanting and fertilizing would have no impacts to water quality or aquatic organisms. Fertilizers would be applied according to Forest Service and manufacturer guidelines and runoff nutrient concentrations would not be sufficient to enrich streams.

Bio-control Releases
Release of biological controls (10,000 acres over the life of the project) would result in no direct effects to water quality or aquatic organisms. The agents would not compete with aquatic insect species since their food base is very specific and would thus not affect fish. They would probably not provide more than an incidental food source for fish.

Indirectly, the elimination of weeds could increase areas of bare ground, resulting in increased soil erosion for the short-term (1 to 3 years). In the long-term, however the reduction of weed species would help to improve native plant communities and diversity, and thus help maintain soil stability and quality. Because of the uncertainty that the elimination of weeds could leave areas of bare ground and the short duration that soil would be bare, there would be no direct or indirect effect to the soil resource.

Herbicide Treatment
Under Alternative 2, 1,500 acres of herbicide treatment is proposed. Due to comments made during the scoping process concerning the effects of herbicides, a very detailed herbicide risk assessment was conducted for this project.

There are four routes chemicals could enter water: direct application, through drift from areas treated that are near water, binding to the soil that washes off terrestrial sites, or leaching through the soil.

Direct application to surface water is most likely to introduce significant quantities of chemicals to surface waters. This would have the most pronounced effects on water quality or aquatic organisms.

Indirect application to surface waters would include drift, overland flow, and leaching. Drift from nearby spraying is similar to direct application but concentrations would be lower and the probability of impact reduced. Overland flow on bare soils could deliver herbicides to nearby waters. Leaching of herbicides through the soil profile is the least likely route for herbicides to enter water. Herbicides can be broken down

as they move through the soil profile, depending on the type of chemical. Table 3.3-9 displays a comparison of herbicide chemicals and their potential to move into waters.

Most herbicide water contamination results from point sources such as spills, leaks, storage and improper handling or equipment or chemicals. These incidents can be avoided though proper storage, handling, cleaning and transport of herbicides and equipment (project design measures, Chapter 2).

Table 3.3- 9 Potential Movement of Herbicide to Water Sources (BPA 2003)

Chemical Evaluated	Herbicide Movement Rating	Into Surface Water	Into Ground Water
Aminopyralid	Very High*	High*	High*
Clopyralid	Very High	High	High
Dicamba	Very High	High	High
Glyphosate Rodeo	Very Low	Low	Low
Glyphosate Roundup	Very Low	Low	Low
Metsulfuron Methyl	High	High	Low
Picloram	Very High	High	High
Triclopyr -TEA	Low	Low	High
Triclopyr -BEE	Moderate	Moderate	Low
2,4-D	Moderate	Moderate	Moderate

*No information regarding aminopyralid was found; assumed to have similar characteristics as clopyralid.

The potential effect of herbicide treatment on water quality and aquatic organisms is a concern. Careful analysis of herbicide spraying projects and their effects is an important consideration for fisheries and water quality protection. The potential impact of herbicides on fish and other aquatic organisms is a function of two factors: 1) the toxic characteristics of the compound, and 2) the concentration to which the organism is exposed. These factors are used to determine the risk analysis for water quality and aquatic organisms.

Three methods are references in comparing toxicity to fish and other aquatic organisms: Lethal Concentration (LC_{50}), No Observed Effect Level (NOEL) or No Observed Effect Concentration (NOEC). Although the LC_{50} is frequently used as a toxicity standard, fifty percent fish mortality is generally not acceptable. For this reason a better parameter of NOEL or NOEC was used when it was available to evaluate effects.

The herbicides proposed for use are characterized by relatively low aquatic toxicity. The effects of herbicides on fish can be quantified using the 96-hour LC_{50}. The 96-hour LC_{50} refers to the concentration that is lethal to 50 percent of the fish exposed at that level for 96 hours. The lower the LC_{50} is the more toxic the compound. The 96-hour LC_{50} for the herbicides proposed for use (plus the parent compound of 2,4-D amine) is provided in Table 3.3-10. For example, NOEL for picloram on cutthroat trout is 0.29 milligrams per liter (1mg/l = 1 part per million (ppm)). Because there are frequently no long-term test results that provide safe concentrations (NOEL), the EPA has recommended that to set a standard for concentrations to protect endangered aquatic species, divide the 96-hour LC_{50} by 20. Table 3.3-10 displays those concentrations, which are used as a benchmark to measure the significance of possible impacts. Fore more detailed information see Appendix I, Table 3).

The No Observed Effect Level (NOEL) or No Observed Effect Concentration (NOEC) was used in place of the LC_{50} when it was available from studies. If the $LC_{50}/20$ was lower than the NOEL/NOEC, this number was used (Appendix I, Table 6). These levels represent a conservative approach to evaluating the active ingredients of the proposed herbicides within each watershed.

No Observed Effect Level/Concentration is the highest concentration of toxicant to which organisms are exposed in a full life-cycle or partial life-cycle test that causes no observable effect on survival, growth or reproduction of the test population. This would mean there is no significant difference between the test solution and the control, as determined by hypothesis testing.

Table 3.3- 10 Toxic Levels of Herbicides to Fish (Syracuse: 1999:2001:2003; CDMS 2003 www.cdms.net ; Rice 1990, BPA 2003 www.efw.bpa-gov ; USDI-EPA 1995, 1998, 2005)

Herbicide (test species)	96-hour LC_{50} (milligram/liter)	LC_{50} divided by 20	NOEL (milligram/liter)	NOEC (milligrams/liter)
Aminopyralid (rainbow trout)	>100	5	Not Available	Not Available
Clopyralid (rainbow trout)	103	5.2	20	Not Available
Dicamba (rainbow trout)	135	6.8	Not Available	Not Available
Glyphosate -Rodeo (rainbow trout, salmon)	923	46	Not Available	Not Available
Glyphosate -Round up (rainbow trout)	22	1.1	Not Available	Not Available
Metsulfuron methyl (rainbow trout)	150	7.5	Not Available	Not Available
Picloram (cutthroat trout, rainbow)	0.8 - 26		Not Available	0.29 - .55
Triclopyr –TEA (rainbow trout)	199	10	Not Available	104
Triclopyr -BEE (rainbow trout)	0.25 - 0.65		Not Available	0.24
2,4-D (fish; salt formations only)	240	12	10	Not Available

The second part of the risk analysis involves determining the possible herbicide concentration in streams. Field studies of herbicide spray operations have shown that herbicide input to streams ranges from non-detectable to 6 percent of the amount applied (Monnig 1988). To determine the delivery rate of herbicides to streams it is important to distinguish between infiltration-dominated sites and runoff-dominated sites.

An assessment by Rice (1990) reviewed numerous studies of picloram runoff to streams. It was determined that a maximum of ten percent of the herbicide applied to a runoff-dominated site could reach a stream within 6 hours of a heavy rainfall event. On infiltration-dominated sites, it was found that a maximum of only one percent of the applied herbicide could reach a stream within 24 hours of a heavy storm. Rice's assessment methodology was used in the aquatics effects analysis. For cumulative effects, it was assumed that chemical from all of the upstream treatment sites would reach the same stream at the same time. This worst-case scenario is extremely unlikely.

For the purpose of the analysis, the entire herbicide application was calculated per watershed as if weeds were sprayed continuously in just one day instead of over one to two months. Continuing with the worst-case scenario, the lowest streamflow was calculated for all affected watersheds and used to determine maximum concentration of herbicides within the streams. The lowest stream flows generally occur in the middle of September prior to the fall rains. Though September flows would be the lowest, all spraying would occur between May and August when flows are higher. Streamflow data was calculated using Embry's (1981) water yield formula; his equation was used to calculate the average cubic feet per second (cfs) of water yield for a seven-day, two-year low flow (Q7L2) during September. Appendix I, Table 4 shows the data for each watershed.

Other assumptions used in completing the aquatics/herbicide analysis include:

- Treatment of all sites within the same year.
- No chemicals will be sprayed within 15 feet of perennial flowing streams, rivers, wetlands or water.
- The picloram application rate of 1.0 pounds of active ingredient per acre corresponds to 4 pints of liquid picloram per acre. This is the current maximum recommended rate; in most cases, a lesser amount would actually be used.
- All acres would be treated with herbicides. In reality, some of the acreage would be treated by mechanical or biological means.

Using this information and a review of the environmental fate and effects of each of the herbicides (SERA) shown in Table 3.3-9, the acreage capable of being sprayed with each herbicide annually was calculated in each affected subwatershed – without exceeding the lethal amount (LC_{50}/20 or NOEL or NOEC) for trout or salmon. Appendix I, Table 6 summarizes those results.

Table 3.3-11 displays the proposed treatment acres for each subwatershed by alternative. The treatment areas are much lower than the maximum allowable acres annually allowed at the NOEL/NOEC (or equivalent) acres for aminopyralid, clopyralid, dicamba, glyphosate, metsulfuron methyl, triclopyr, and 2,4–D (Appendix I, Table 6), no effect for aquatic organisms is expected. Table 3.3-11 compares the proposed treatment acres for each subwatershed compared to Picloram. Alternative 2 proposes treatment in four subwatersheds that is over the allowable annual acres. For these particular subwatersheds, other herbicides would be used or fewer acres would be treated in order to ensure that no more than the allowable amount of acres to be annually treated would occur. An explanation of the formula used to determine the acreages capable of being sprayed with the herbicide Picloram for each of the subwatersheds can be found in Appendix I, Table 5.

It should be emphasized that the effects analysis calculations represent the worst-case scenario. The likelihood of reaching the levels of chemical concentrations shown in Table 3.3-10 would be very low. In fact, it is unlikely that any herbicide would be detected in stream water as result of proposed herbicide applications because of the low level of herbicide use spread over a period of two months or more compared to the higher water yields in these watersheds over the same period of time.

For example, the spraying of picloram – applied under similar conditions as the proposed action – was monitored along a streamside in Montana (Watson et al. 1989). In this study no herbicide was detected in the stream at the one part per billion detection limit. Application of site-specific Best Management Practices (see Appendix A) and implementation of project design measures (Chapter 2) would further reduce the likelihood of herbicide being detected in stream waters.

Therefore, herbicide concentrations in streams smaller than those identified above are not expected to reach NOEL/NOEC levels.

Table 3.3- 11 Comparison of Proposed Treatment Acres per Subwatershed by Alternative For worst case scenario, it is assumed that all acres would be treated with Picloram. The subwatersheds highlighted and identified with an * are over the maximum allowable acres.

HUC 6	Subwatershed Name (HUC 6)	Watershed (acres)	Picloram Max. Acres	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Bitterroot River Subbasin - 17010205							
0201	Sheephead Creek	12,397	45	14	14	14	35
0202	Watchtower Creek	10,839	38	20	19	16	45
0203	Soda Springs Creek	15,581	56	0	38	36	61
0302	Boulder Creek	13,511	53	23	23	13	50
0304	Trapper Creek	18,196	70	30	30	30	30
0305	West Fork Bitterroot River	22,063	53	112*	111*	112*	112*
0601	Lost Horse Creek	27,803	146	119	116	119	120
0602	South Fork Lost Horse Creek	19,975	87	15	5	5	18
0803	Chaffin Creek	12,942	36	27	17	17	43
0804	Tin Cup Creek	27,052	115	41	21	0	73
0805	Rock Creek	36,735	163	48	36	6	106
1002	Roaring Lion Creek	16,120	81	4	3	0	10
1003	Sawtooth Creek	19,456	82	0	0	0	0
1004	Canyon Creek	10,030	27	0	0	0	0
1005	Blodgett Creek	18,146	94	55	44	44	105
1101	Mill Creek/Sheafman Creek	25,486	104	67	27	0	108
1102	Fred Burr Creek	15,395	69	35	25	15	58
1103	Bear Creek	17,884	91	48	47	44	53
1104	Sweathouse Creek	18,291	64	139*	137*	139*	152*
1201	Big Creek	22,510	117	53	31	12	99
1203	Kootenai Creek	20,165	97	32	30	10	80
1301	Bass Creek	9,271	44	40	20	0	69*
1304	Sweeney Creek	12,206	58	44	24	24	44
1307	One Horse Creek	9,239	41	0	0	0	0
1308	Carlton Creek	16,100	48	90*	90*	90*	90*
1407	South Fork Lolo Creek	24,881	138	0	0	0	0
Upper Selway River Subbasin 17060301							
0201	Deep Creek	36,320	113	188*	160*	145	255*
0202	Selway River-Magruder Creek	22,801	56	39	38	1	93*
0203	Indian Creek	32,106	123	7	7	4	11
0204	Selway River-Sheep Creek	15,461	41	23	22	0	58*
0205	Selway River-Bad Luck Creek	27,277	80	14	13	0	36
0301	Upper Little Clearwater River	24,590	80				
0302	Lower Little Clearwater River	20,784	61	27	24	0	61
0401	Upper White Cap Creek	35,108	173	11	9	0	28
0402	Canyon Creek	27,627	120	17	15	0	44
0403	Lower White Cap Creek	21,604	81	22	20	0	51
0502	Lower Running Creek	17,710	50	21	20	0	52
0503	Eagle Creek	16,127	47	7	7	0	14
0601	Selway River-Elk Creek	18,162	62	10	9	0	26
0602	Goat Creek	18,847	76	1	1	0	2
0603	Ditch Creek	11,573	46	11	11	0	28

HUC 6	Subwatershed Name (HUC 6)	Watershed (acres)	Picloram Max. Acres	Alt. 2	Alt. 3	Alt. 4	Alt. 5
0604	Selway River-Dog Creek	27,121	110	28	27	0	72
0605	Pettibone Creek	20,934	106	21	20	0	53
0701	Upper Bear Creek	18,018	104	71	69	0	178*
0702	Wahoo Creek	13,552	78				
0703	Middle Bear Creek	16,446	81	10	10	0	26
0704	Lower Cub Creek	17,558	88	0	0	0	1
0705	Upper Cub Creek	21,329	112	19	16	0	47
0706	Paradise Creek	18,215	79	15	15	0	38
0707	Lower Bear Creek	9,749	38	14	14	0	35
Lower Selway River Subbasin - 17060302							
0101	East Fork Moose Creek Headwaters	21,615	112	0	0	0	0
0102	Upper East Fork Moose Creek	22,470	99	0	0	0	0
0103	Cedar Creek	16,327	83	0	0	0	0
0104	Middle East Fork Moose Creek	30,759	145	34	33	14	69
0105	Lower East Fork Moose Creek	29,501	126	15	15	15	15
0106	Upper North Fork Moose Creek	17,394	87	0	0	0	0
0107	West Moose Creek	19,117	117	0	0	0	0
0108	Middle North Fork Moose Creek	10,680	63	0	0	0	0
0109	Rhoda Creek	36,396	206	0	0	0	0
0110	Lower North Fork Moose Creek	17,577	79	18	16	9	30
0111	Lower Moose Creek	11,524	49	7	5	4	11
0201	Selway River-Meeker Creek	28,276	113	25	22	0	62
0202	Marten Creek	20,988	98	33	33	13	65
0203	Three Links Creek	28,106	126	70	66	0	125
0204	Mink Creek	10,239	47	23	22	0	58
0205	Selway River-Pinchot Creek	31,829	119	14	13	0	35
0206	Otter Creek	10,518	46	58	58	0	70*
0305	Buck Lake Creek	20,745	96	0	0	0	0
0402	Gedney Creek	30,825	144	0	0	0	0
Lochsa River Subbasin - 17060303							
0102	Boulder Creek	30,023	141	24	24	0	61
0201	Upper Colt Killed Creek	24,804	139	0	0	0	0
0202	Upper Big Sand Creek	17,354	90	0	0	0	0
0203	Hidden Creek	10,578	59	0	0	0	0
0204	Lower Big Sand Creek	24,314	125	6	6	6	6
0205	Middle Colt Killed Creek	10,536	56	0	0	0	0
0207	Storm Creek	32,703	181	0	0	0	0
0401	Upper Warm Springs Creek	13,842	65	0	0	0	0
0402	Wind Lakes Creek	12,537	60	3	3	3	3
0403	Lower Warm Springs Creek	19,451	85	0	0	0	0
0503	Lake Creek	33,306	181	0	0	0	0
0505	Lochsa River - Bald Mountain	28,801	118	18	18	3	43
0701	Lochsa River - Bimerick Creek	34,479	126	0	0	0	0
0702	Old Man Creek	28,130	132	0	0	0	0
0703	Split Creek	9,995	44	0	0	0	0

Picloram Maximum Application Rate = 1 pound/acre, with a NOEL 0f 0.29 ppm

Based on the possibility that herbicides may enter a stream or other water source, herbicides may have a short term direct effect to water quality and aquatic organisms in isolated areas. Based on the worst case scenario herbicide risk assessment as described above, the proposed treatment concentrations delivered to streams in the project area would not affect water quality and would be non lethal to aquatic species. All of the subwatersheds would have treatment areas that account for less than one percent of the total subwatershed area.

Alternative 2 proposes to treat up to 358 acres within 100 feet of a water source. Restrictions on the use of herbicides near water would reduce risks associated with these chemicals moving into surface waters or leaching into ground water. Chemical-specific buffers should ensure that spray drift or herbicide runoff does not adversely affect listed aquatic species, their prey, and non-target riparian vegetation (project design measures, Chapter 2). Application procedures would follow Inland Native Fish Strategy (INFISH) Standard and Guideline RA-3 and PACFISH strategies as well as State of Idaho Best Management Practices (BMPs) guideline for herbicide use within Riparian Habitat Conservation Areas (RHCAs). Herbicide volatilization and drift are the primary mechanisms of off-target movement. Ground application minimizes drift because spray nozzles can be in close proximity to target species and ground.

Due to the limited acreage proposed for treatment as compared to total drainage area no measurable increases in runoff or sediment in surface water are expected from Alternative 2, except possibly in close proximity to treatment areas.

Removal of solid stands of invasive plants by chemical treatment may result in short-term, insignificant increases in surface erosion that would diminish as vegetation reoccupies the treated site. The speed of site revegetation and the plant composition of the new vegetation would depend on the persistence and selectivity of the herbicide used and the plant composition of the site.

Invasive plant control actions are not expected to alter the hydrologic regime or adversely impact riparian or wetland habitats. Herbicide treatment is expected to result in no measurable effect in peak/base flow, water yield, or sediment yield. No large-scale changes in land cover conversions will result from the ground-based application of herbicides.

Tables 3.3-1 and 3.3-2 show that out of the 84 subwatersheds that could be affected by proposed weed treatments, fourteen stream or river segments are on the 303(d) list of impaired water-bodies. It is expected that the Environmental Protection Measures (Chapter 2), including proper use of herbicides, would prevent adverse impacts on surface water quality, including water bodies on the 303(d) list. None of the 303(d) streams are listed for volatile organic compound or petrochemical causes, and proposed weed control activities would not risk exacerbating existing impairment conditions. All beneficial uses would be supported in all the streams within the project area.

A portion of herbicides applied to and persisting in these soils may migrate down to shallow groundwater; however, the impacts would be minor, short-term, and localized to the application areas. The project design measures (Chapter 2) would also help prevent “overloading” herbicides in soil and thus groundwater, especially limiting most herbicide applications to once per year, with some treatments occurring twice annually that is at least 30 days apart. Herbicide effects on groundwater are not expected to exceed Montana’s or Idaho’s human health standards.

Long-term beneficial effects from reduction of invasive plants and increase in desirable vegetation (e.g. native species) will result in improved watershed conditions. Beneficial effects are expected from the reduction of invasive plants encroaching on and invading riparian areas, wetlands, and streams.

C. Alternative 3

With this alternative, treatments are confined to high use areas. A total of 1806 acres are identified for herbicide treatment. All treatment would occur in designated areas, with no treatment in dispersed sites. No herbicide treatment would occur within 50 feet of water. No bio-control releases would occur. Up to 100 acres of mechanical/cultural treatment would take place per year.

Direct and Indirect Effects

Mechanical/Cultural Treatment
Alternative 3 has the same amount of mechanical/cultural treatment proposed as Alternative 1. Due to the limited area this treatment would occur on (less than one percent of project area) and the short-term disturbance, mechanical/cultural treatment would not have a direct or indirect effect to the water quality and aquatic resources.

Bio-control Releases
There is no bio-control releases proposed with this Alternative.

Herbicide Treatment
As described under Alternative 2, based on the possibility that herbicides may enter a stream or other water source, herbicides may have a short term direct effect to water quality and aquatic organisms in isolated areas. Table 3.3-11 compares the proposed treatment acres for each subwatershed compared to Picloram. Alternative 3 proposes treatment in four subwatersheds that is over the allowable annual acres. For these particular subwatersheds, other herbicides would be used or fewer acres would be treated in order to ensure that no more than the allowable amount of acres to be annually treated would occur.

Based on the worst case scenario herbicide risk assessment as described under Alternative 2, the proposed treatment concentrations being delivered to streams in the project area would not effect water quality and would be non lethal to aquatic species. All of the subwatersheds would have treatment areas that account for less than one percent of the total subwatershed area.

With this alterative, 174 acres are proposed for treatment within 100 feet of a water source. This is less than the amount proposed in Alternative 2 and no herbicides would be sprayed within 50 feet of water a greater restriction than any of the other alternatives.

D. Alternative 4

With this alternative 996 acres are identified for herbicide treatment, all outside the wilderness; 50,000 acres of bio-control release during the life of the project; and up to 100 acres of mechanical/cultural treatment per year.

Direct and Indirect Effects

Mechanical/cultural Treatment
Alternative 4 has the same amount of mechanical/cultural treatment proposed as Alternative 1. Due to the limited area this treatment would occur on (less than one percent of project area) and the short-term disturbance, mechanical/cultural treatment would not have a direct or indirect effect to the water quality and aquatic resources.

Bio-control Releases
As described under Alternative 2, release of biological controls would cause no direct or indirect effects to the soil resource.

Herbicide Treatment
As described under Alternative 2, based on the possibility that herbicides may enter a stream or other water source, herbicides may have a short term direct effect to water quality and aquatic organisms in isolated areas. Potential impacts would be less than Alternatives 2 and 3, because less area (504 acres and 810 acres, respectively) would be exposed to herbicides. Table 3.3-11 compares the proposed treatment acres for each subwatershed compared to Picloram. Alternative 4 proposes treatment in three subwatersheds that is over the allowable annual acres. For these particular subwatersheds, other herbicides would be used or fewer acres would be treated in order to ensure that no more than the allowable amount of acres to be annually treated would occur.

Based on the worst case scenario herbicide risk assessment as described under Alternative 2, the proposed treatment concentrations potentially delivered to streams in the project area would not affect water quality and would be non lethal to aquatic species. All of the subwatersheds would have treatment areas that account for less than one percent of the total subwatershed area.

With this alterative, 125 acres are proposed for treatment within 100 feet of a water source. This amount is the least amount when compared to the other alternatives.

E. Alternative 5

With this alternative a total of 4125 acres are identified for treatment with herbicides. This includes the same acres identified in Alternative 2, but with a more expanded dispersed treatment (an additional 1,500 acres). As stated under Alternative 2, the ability to treat in dispersed areas is important in order to reduce the spread of new invaders and contain existing populations of established invasive plants. This alternative also proposes 50,000 acres of bio-control releases during the life of the project and up to 100 acres of mechanical/cultural treatment per year.

Direct and Indirect Effects

Mechanical/cultural Treatment
Alternative 5 has the same amount of mechanical/cultural treatment proposed as Alternative 1. Due to the limited area this treatment would occur on (less than one percent of project area) and the short-term disturbance, mechanical/cultural treatment would not have a direct or indirect effect to the water quality and aquatic resources.
.
Bio-control Releases
As described under Alternative 2, release of biological controls would cause no direct or indirect effects to water quality and aquatic resources.

Herbicide Treatment
As described under Alternative 2, based on the possibility that herbicides may enter a stream or other water source, herbicides may have a short term direct effect to water quality and aquatic organisms in isolated areas. Potential impacts would be greatest for this Alternative. Table 3.3-11 compares the proposed treatment acres for each subwatershed compared to Picloram. Alternative 5 proposes treatment in nine subwatersheds that would be over the allowable annual acres. For these particular subwatersheds, other

herbicides would be used or fewer acres would be treated in order to ensure that no more than the allowable amount of acres to be annually treated would occur.

Based on the worst case scenario herbicide risk assessment as described under Alternative 2, the proposed treatment concentrations potentially delivered to streams in the project area would not affect water quality and would be non lethal to aquatic species. All of the subwatersheds would have treatment areas that account for less than one percent of the total subwatershed area.

With this alterative, 558 acres are proposed for treatment within 100 feet of a water source. This is the same as proposed in alternative 2, but greater than Alternatives 3 and 4.

Direct/Indirect Effects to Threatened, Endangered, and Sensitive Fish Species

As previously discussed, the Selway and Lochsa Rivers support spawning and rearing of two species listed as threatened under the Endangered Species Act, which include Snake River steelhead trout and Columbia River bull trout. These rivers also flow into waters supporting listed fall chinook salmon, which occur downstream of the project area and the mouths of these rivers. Steelhead trout and bull trout spawn and rear in the project area. The Bitterroot River subbasin supports Columbia River bull trout, listed similarly as those occurring in the Selway and Lochsa Rivers. All three river subbasins support sensitive westslope cutthroat trout, which are included as a sensitive species in Region 1 of the U.S. Forest Service. In addition, the Selway and Lochsa River subbasins support interior redband trout and Pacific lamprey, both Region 1 sensitive species.

Fall Chinook Salmon

Fall chinook salmon spawning and rearing occurs well downstream of the project area in the mainstem Clearwater River. Most spawning and rearing by this species is located downstream of the North Fork Clearwater River. Designated critical habitat extends from the mouth of the Clearwater River upstream to Greer, Idaho.

Since fall chinook salmon and habitat are located a substantial distance downstream of the project area (> 55 miles), and since fish are limited to the larger mainstem Clearwater River, none of the alternatives would affect this species, critical habitat, or recovery efforts due to distance and the dilution effect of high river flows.

Snake River Steelhead Trout, Columbia River Bull Trout, Westslope Cutthroat Trout, Interior Redband Trout, Spring Chinook Salmon, Pacific Lamprey

Snake River steelhead trout spawn and rear in most streams in the Upper Selway, Lower Selway, and Lochsa River subbasins. Species occurrence is indicated in each 6th code HUC watershed in Tables 3.3-4 – 3.3-6. Adults and juveniles are present throughout these mainstem rivers as well. Critical habitat has been designated in these areas as well. Because of uncertainty regarding the distribution of interior redband trout, they have been grouped with listed steelhead for the purpose of this analysis.

Spring chinook salmon also spawn and rear in the mainstem Lochsa and Selway Rivers and many of their larger tributaries, including those in the project area. Species occurrence is summarized in Tables 3.3-4 – 3.3-6.

Pacific lamprey have been documented in areas in the mainstem Selway and Lochsa Rivers. Little is known about occurrence in tributaries.

Herbicide use and other activities in the Bitterroot River subbasin would not affect steelhead trout, interior redband trout, spring chinook salmon, or Pacific lamprey because they do not occur there.

Implementation of Alternative 1 would not affect any of these species because level of activity for ongoing weed treatments is limited.

Westslope cutthroat trout and bull trout are found throughout the project area in the Selway, Lochsa, and Bitterroot River subbasins. Distribution of westslope cutthroat trout No critical habitat is included for bull trout in the project area or any downstream reach affected by project area streams.

For Alternatives 2, 3, 4, and 5 for all species, proposed rates of herbicide applications would be at or under threshold rates for lethal effects, and mortality of individual fish is not expected from these alternatives, given full implementation of design criteria that would reduce or eliminate the risk of accidental introduction of herbicides into streams. Herbicides would be applied following label requirements and project design criteria.

Uncertainty exists, however, from the level of herbicides that may reach the water and potential adverse sublethal effects. Sublethal effects are those that don't result in mortality but could affect elements related to the overall health and fitness of individual fish. It cannot be concluded without certainty that no herbicides would reach streams that support spawning and rearing of listed and sensitive fish species. Sublethal effects of the proposed herbicides have not been thoroughly investigated. Adverse sublethal effects may include loss of physiological or behavioral functions that could affect the survival, reproductive success, growth, or migratory behavior of steelhead trout. Information on sublethal effects for a number of the functions, however, does exist for some herbicides. This information is included in the *Biological Assessment for Herbicide Treatment of Noxious Weeds on the Nez Perce National Forest for 2004* (USDA-FS 2004), which can be found in the project file.

Other Sensitive Aquatic Biota

Herbicides may also indirectly influence fish populations by affecting the populations of other organisms upon which fish are dependent. Table 3.3-12 below provides toxicity data for other aquatic organisms.

As suggested in this table, these herbicides are generally less toxic to lower orders of aquatic taxa than to fish species. Although the species listed in the table are not the only aquatic organisms found in waters affected by the project, the U.S. Fish and Wildlife Service and EPA use them as indicators of a wide range of aquatic organisms. The acreage proposed for spraying each year under each alternative is below the lethal thresholds for these organisms.

The aquatic organisms generally have higher tolerances to toxic materials than do fish, so keeping herbicide treatment rates to the limits already discussed would result in very low risk to these organisms.

Table 3.3- 12: Levels of Herbicide Toxic to Aquatic Organisms Other Than Fish

Herbicide	Test Species	Test Results
Picloram	*Daphnia magna*	48-hr LC_{50} is 76 mg/l
Picloram	Scuds (*Gammarus fasciatus*)	96-hr LC_{50} is 27 mg/l
Picloram	Scuds (*Gammarus pseudolimnaeus)*	96-hr LC_{50} is 16.5 mg/l
Picloram	Stonefly (*Pteronarcys californica)*	96-hr LC_{50} is 4.8 mg/l
2,4-D amine	*Daphnia magna*	48-hr LC_{50} is > 100 mg/l
2,4-D amine	Seed shrimp (*Cypridopsis vidua)*	48-hr LC_{50} is 8 mg/l

Herbicide	Test Species	Test Results
2,4-D amine	Scuds (*Gammarus fasciatus*)	96-hr LC_{50} is >100 mg/l
2,4-D amine	Midges (*Chironomus plumosus)*	48-hr LC_{50} is >100 mg/l
Glyphosate	Scuds (*Gammarus fasciatus*)	96-hr LC_{50} is > 43 mg/l
Glyphosate	Midge Larvae	48-hr LC_{50} is 18 mg/l
Glyphosate	*Daphnia magna*	48-hr LC_{50} is 3 mg/l
Glyphosate	Copepod (*Nitocra spinipes*)	96-hr LC_{50} is 22 mg/l
Dicamba	*Daphnia magna*	96-hr LC_{50} is >100 mg/l
Dicamba	Sow bugs (*Asellus brevicaudus*)	96-hr LC_{50} is >100 mg/l
Dicamba	Scuds (*Gammarus fasciatus*)	96-hr LC_{50} is >100 mg/l
Dicamba	Shrimp (*Palaemonetes kadiasos*)	48-hr LC_{50} is 28 mg/l
Dicamba	Frog, tadpole (1-2 weeks)(*Adelotus brevis*)	96-hr LC_{50} is 185 mg/l
Dicamba	Frog, tadpole (*Limnodynastes peroni*)	96-hr LC_{50} is 106 mg/l
Clopyralid	Rams Horn Snail (*Helisoma trivolvis*)	No mortality after 48 hrs, 1 mg/l
Clopyralid	Green algae (*Seenastrum capricornutum*)	96-hr LC_{50} is 61 mg/l
Clopyralid	Duck weed (*Lemna minor*)	No growth reduction, 2 mg/l
Clopyralid	Daphnids (*Daphnia* spp.)	48-hr LC_{50} is 225 mg/l
Aminopyralid	*Daphnia magna*	48-hr LC_{50} is >98.6 mg/l
Aminopyralid	Northern leopard frog	96-hr LC_{50} is >95.2 mg/l
Triclopyr	*Daphnia magna*	48-hr LC_{50} is 1170 mg/l
Metsulfuron methyl	*Daphnia magna*	48-hr LC_{50} is >150 mg/l

Interrelated and Interdependent Effects

There are no known interrelated and interdependent effects other than those discussed below in the Cumulative Effects section.

Cumulative Effects for Alternatives 2, 3, 4 and 5

Cumulative effects are the incremental impacts of actions added to other past, present and reasonably foreseeable future actions. Cumulative effects include outcomes of foreseeable future federal, state, tribal, or private actions that are reasonably certain to occur in the activity area. Cumulative impacts to water are considered from both timing and spatial perspectives. For the purpose of this project, 84 subwatersheds were analyzed within or adjacent to the project area. Ten subwatersheds with less than 10 percent of the subwatershed in the project area were reviewed to determine that no activities were proposed in those subwatersheds.

Past and Ongoing Actions

Other activities occurring within the project area include fire management, maintenance and use of administrative sites, and various types of recreation (including use of designated trails, campsites, and boat launches). Outside of designated wilderness, which includes downstream portions of the Bitterroot, Lochsa, and Selway Rivers, many other activities are ongoing, including prescribed fire, timber harvest, road construction and maintenance, domestic livestock grazing, irrigation withdrawals, and various levels of land management/land development on private lands in the Bitterroot subbasin. Most of these activities would not contribute to the cumulative effects associated with herbicide use.

Designated roads, trails, campsites, and administrative sites are not considered when estimating the amount of detrimental soil impacts. Based on this, detrimental disturbance in the project area is very low and occurs in the form of user created trails and campsites. Soil disturbance is more significant outside of the project area.

Cumulative effects associated with other ongoing weed treatments are possible with each of the action alternatives.

The Bitterroot National Forest has proposed to treat approximately 430 acres with herbicides in the Bitterroot River drainage within the project area (about 50 acres/year), mostly along roads and approximately 40 acres in the Selway River drainage. The Nez Perce National Forest treats 85 acres with herbicides in the Selway River drainage annually.

During 2006, the Clearwater Forest treated 123 acres at administrative sites within the Lochsa River and Middle Fork Clearwater River drainages. The majority of the treatment (92 percent) involved the use of clopyralid. Also in 2006, the Idaho Transportation Department treated approximately 68 acres along US Highway 12 in the Lochsa River drainage. It is not known how much spraying of invasive plants is occurring on private lands adjacent to the project area.

For the Lochsa and Bitterroot subbasins, assessment of cumulative effects includes effects at the 5th and 6th code HUC scales, because portions of 5th and 6th code HUC watersheds are included in this project area and the project areas included under the Lochsa Weed and Bitterroot Weed EISs. Of the two, the Bitterroot River is at the greatest risk of cumulative effects. About 3,400 acres are projected to be sprayed annually on Forest Service lands and another 600 acres by the State of Montana and Ravalli County. Spraying on private may occur as well, most of which is infested or potentially infested with spotted knapweed and other invasive plants.

Based on the worst case scenario herbicide risk assessment as described under Alternative 2, the proposed treatment concentrations potentially delivered to streams in the project area would be non-lethal to aquatic species. Due to the small amount of area proposed for treatment (less than one percent of the project area) and with implementation of project design measures (Chapter 2) and Best Management Practices (Appendix A), the effects to water quality and aquatic organisms are expected to be very low. Beneficial uses would be supported in each of the streams in the project area and state water quality standards would be met.

Past, Present, and Reasonably Foreseeable Actions

The effects of past and present activities combined with proposed activities described under the alternatives are included in the above analysis. Additional foreseeable actions include treatment of weeds by other agencies or by private landowners within the portions of the subwatersheds outside the project area. These actions would be evaluated to determine if more than the maximum allowable acres to be treated annually are proposed for any given subwatershed. This will include land managers from the Clearwater, Bitterroot, Lolo and Nez Perce National Forests. Refer to Appendix I, Table 6 for the maximum allowable acres by watershed to be treated by a particular herbicide. Based on the information in Table 3.3-13 using Picloram allowable annual acres from Alternative 5, as the worst case scenario, subwatersheds that would need particular attention include Trapper Creek, West Fork Bitterroot River, Lost Horse Creek, South Fork Lost Horse Creek, Chaffin Creek, Tin Cup Creek, Rock Creek, Mill Creek, Sheafman Creek, Sweathouse Creek, Bass Creek, Carlton Creek, Deep Creek, Selway River-Magruder Creek, and Selway River-Sheep Creek.

The Lochsa Weeds EIS (USDA 2007) proposes to treat up to 965 acres in the Lochsa River drainage in 2007. The Bitterroot Weeds EIS (USDA 2003) proposes to treat 3750 acres per year in the entire Bitterroot River drainage. The Frank-Church River of No Return Weeds EIS (USDA 2003) plans on treating 40 acres per year in the upper Selway River watershed.

Sheafman Creek is the public water supply source for the community of Pinesdale. Likewise, Tin Cup Creek provides drinking water to Darby and Bass Creek is the source of public water in Florence and Stevensville. Further coordination will need to be conducted in these subwatersheds to ensure that other herbicides are used other than picloram or that acres of treatment are reduced to below picloram maximum acres (Table 3.3-13, Column 4). With implementation of the project design measures (Chapter 2), risk of adverse impacts on surface water quality from herbicide use to these streams would be negligible.

Table 3.3- 13 Proposed Herbicide Treatment Acres from the Bitterroot, Clearwater, and Nez Perce National Forests

HUC 6	Subwatershed Name (HUC 6)	Watershed (acres)	Picloram Max. Acres	SBW EIS 2007 Alt 5	Bitterroot EIS 2003**	Lochsa Weeds EIS 2007	FC-RONR EIS 2006
0304	*Trapper Creek	18,196	70	30	590		
0305	*West Fork Bitterroot River (Lower)	22,063	53	112	24		
0601	*Lost Horse Creek	27,803	146	120	166		
0602	*South Fork Lost Horse Creek	19,975	87	18	211		
0803	*Chaffin Creek	12,942	36	43	313		
0804	*Tin Cup Creek	27,052	115	73	116		
0805	*Rock Creek	36,735	163	106	186		
1002	Roaring Lion Creek	16,120	81	10	16		
1004	Canyon Creek	10,030	27	0	6		
1005	Blodgett Creek	18,146	94	105	6		
1101	*Mill Creek/Sheafman Creek	25,486	104	108	90		
1102	Fred Burr Creek	15,395	69	58	6		
1103	Bear Creek	17,884	91	53	64		
1104	*Sweathouse Creek	18,291	64	152	318		
1201	Big Creek	22,510	117	99	28		
1203	Kootenai Creek	20,165	97	80	26		
1301	*Bass Creek	9,271	44	69	446		
1304	Sweeney Creek	12,206	58	44	176		
1308	*Carlton Creek	16,100	48	90	138		
0201	*Deep Creek	36,320	113	255			See
0202	*Selway River-Magruder Creek	22,801	56	93	20		
0204	*Selway River-Sheep Creek	15,461	41	58			Proposed Annual Herbicide Treatment is 40 ac/yr
0205	Selway River-Bad Luck Creek	27,277	80	36			
0502	Lower Running Creek	17,710	50	52			
0205	Selway River-Pinchot Creek	31,829	119	35			
0305	Buck Lake Creek	20,745	96	0			
0402	Gedney Creek	30,825	144	0			
0102	Boulder Creek	30,023	141	61		~40	
0204	Lower Big Sand Creek	24,314	125	6		~10	
0402	Wind Lakes Creek	12,537	60	3		~5	
0505	Lochsa River - Bald Mountain Creek	28,801	118	43		~5	

*Subwatersheds requiring future coordination between the Clearwater, Nez Perce, and Bitterroot National Forest.
**Include 20 percent adaptive management areas.

Adaptive Strategy

New sites proposed for future treatment must meet the requirements of the adaptive strategy (See Chapter 2 and Appendix E). The parameters require that the combined treatments in any subwatershed would result in a concentration of herbicide in surface water lower than the lethal concentration LC50/20/NOEL/NOEC for each subwatershed within any given treatment year.

Combined with the project design criteria listed above and summarized in Chapter 2, and herbicide application guidelines in Appendix B, and coordination with other associated agencies, use of these parameters would protect aquatic resources from the potential effects of herbicide treatment. No adverse effects to soils or aquatic resources would be expected to occur from future herbicide applications under the adaptive strategy.

3.3.5 CONSISTENCY WITH FOREST PLAN AND ENVIRONMENTAL LAW

All activities proposed with this project will meet the requirements stated in the following: All State and Federal laws and regulations applicable to water quality would be applied. These include 36 CFR 219.97; the Clean Water Act; Forest Service Soil and Water Conservation Practices Handbook, FSH 2509.22 13.07-13; standards within the Clearwater, Nez Perce, Lolo, and Bitterroot National Forest Plans; PACFISH and INFISH Riparian Management Objectives (RMOs) and Riparian Habitat Conservation Areas (RHCAs); Executive Orders 12088 and 11990. Table 3.3-14 displays compliance with the Clearwater, Nez Perce, and Bitterroot National Forest Plans.

Table 3.3- 14: Forest Plan Consistency

Forest Plan Standard	Description	Compliance met by:
Clearwater National Forest Plan		
8A	Maintain the integrity and equilibrium of all stream systems in the forest.	BMPs (Appendix A) and project design measures (Chapter 2, Table 2-1) will be followed. All beneficial uses will be maintained.
8B	Manage water quality and stream conditions to assure that the National Forest management activities do not cause permanent or long term damage to existing or specified beneficial uses.	
8C	Apply Best Management Practices (BMPs) to project activities to ensure water quality standards are met or exceeded.	BMPs would be implemented as outlined in Appendix A: Best Management Practices.
8D	Manage all waters in the Forest under a basic standard (Appendix K, Section B of the Forest Plan: USDA-FS 1987).	This project would result in no measurable increase in sediment production or increase in peak flow.
8E	All watershed systems are considered for the fishery resource. This standard applies to sediment criteria.	This project would result in no measurable increase in sediment production.
8F	Monitor, analyze, and evaluate water quality within critical reaches of specified streams. This standard refers to sediment criteria.	

Forest Plan Standard	Description	Compliance met by:
8G	Design, schedule, and implement management practices at the project level that will maintain or improve water quality and fish habitat and conduct a watershed cumulative effects feasibility analysis	BMPs (Appendix A) and project design measures (Chapter 2, Table 2-1) will be followed. All beneficial uses will be maintained. A cumulative watershed analysis was completed for this project.
	Forest Plan Stipulation Agreement	This project would result in no measurable increase in sediment production.
Nez Perce National Forest Plan		
1	Apply State WQ Standards and BMPs	BMPs (Appendix A) will be followed. State water quality standards were incorporated into project design measures (Chapter 2, Table 2-1). All beneficial uses will be maintained.
2	Use R1R4 sediment and R1 water yield guidelines	These guidelines were used in the watershed environmental effects analysis. This project would result in no measurable increase in sediment production or increase in peak flow.
3	Evaluate site specific water quality effects	Water quality effects were evaluated in the environmental effects analysis.
4	Complete watershed cumulative effects analysis	A cumulative effects analysis to watershed condition was completed for this project.
8	Meet Fish/WQ Objectives in Forest Plan Appendix A	BMPs (Appendix A) and project design measures (Chapter 2, Table 2-1) will be followed.
Bitterroot National Forest Plan		
	Maintain water quality and water quantity	BMPs (Appendix A) and project design measures (Chapter 2, Table 2-1) will be followed.
	Manage riparian areas to prevent adverse effects on channel stability and fish habitat.	This project would result in no measurable increase in sediment production or increase in peak flow.
	Maintain the percentage of "hydrologically unrecovered" areas permitted in a landscape within the guidelines described in Table II-5 of the Forest Plan.	This project would result in no measurable increase in sediment production or increase in peak flow.
	Site-specific water quality effects would be evaluated and control measures designed to ensure that a project(s) meets state and Forest water quality goals.	Water quality effects were evaluated in the environmental effects analysis. Water quality standards were incorporated into project design measures (Chapter 2, Table 2-1). All beneficial uses will be maintained.
	Water conservation practices would be a part of project design and implementation to ensure protection of water resources	BMPs (Appendix A) and project design measures (Chapter 2, Table 2-1) will be followed.
	Provide special management emphasis to protect riparian areas along all tributaries of the Bitterroot River. The 1995 Inland Native Fish Strategy (INFISH) Amendment to the Forest Plan further restricts activities in riparian areas (USDA FS 1995a).	Weeds treatments would result in more natural plant species composition in riparian areas. Herbicide treatments as proposed are consistent with INFISH.
	Comply with Section 403 of Title IV of the Agricultural Credit Act of 1978 (16 USC 2201-2205)	

Forest Plan Standard	Description	Compliance met by:
	and Title 7, Code of Federal Regulations, Part 624 (7 CFR 624), the Emergency Watershed Protection Program.	
	Comply with section 303(d) of the Clean Water Act.	Water quality standards were incorporated into project design measures (Chapter 2, Table 2-1). All beneficial uses will be maintained.
Lolo National Forest Plan		
	In all projects, "land management practices shall be designed to have a minimum impact on the aquatic ecosystem, free from permanent or long-term unnatural imposed stress."	BMPs (Appendix A) and project design measures (Chapter 2, Table 2-1) will be followed.
	All threatened and endangered species occurring on the Lolo NF would be managed for recovery to non-threatened status.	Weed treatments as proposed are consistent with native fish recovery.
	Follow Inland Native Fish Strategy (USDA FS 1995a) which specifies standards and guidelines for management within Riparian Habitat Conservation Areas RHCAs).	Weeds treatments would result in more natural plant species composition in riparian areas. Herbicide treatments as proposed are consistent with INFISH.

Forest Service Manual 2670 Direction
FSM 2670 speaks to conservation of endangered and threatened species, avoidance of actions that would cause a species to become threatened or endangered, and maintaining viable populations of native and desired non-native species.

A biological assessment is in the process of being developed for this DEIS and would be completed upon selection of any of the action alternatives in the FEIS. This assessment serves as the technical analysis used for consultation under the Section 7 of the Endangered Species Act (see below) and forms the basis for assessment any effects to aquatic species viability. Based on the preceding effects analysis, however, we preliminarily expect no effects to the viability of any threatened, endangered, or sensitive fish species, or any aquatic species identified as a Management Indicator Species in the three Forest Plans.

Nez Perce, Clearwater, and Bitterroot Forest Plans
Direction provided in the three Forest Plans related to watershed and riparian management and aquatic species was previously described. All actions described in this document are consistent with this direction. Treatment of invasive plants specifically contributes to meeting direction for riparian area management and rehabilitation.

PACFISH/INFISH
Actions proposed under each of the alternatives meet direction in these documents related to riparian area management and application of herbicides. Application of herbicides as described would not prevent attainment of Riparian Management Objectives, and may contribute to attainment long-term through restoration of native plant communities. Herbicide application as described in this DEIS would avoid adverse effects on listed anadromous and inland native fish.

Endangered Species Act
Consultation as directed under Section 7 of the Endangered Species Act, with NOAA-Fisheries and the U.S. Fish and Wildlife Service would proceed if a decision is rendered for any of the four action alternatives. A preliminary Biological Assessment for listed and sensitive fish is in progress as of August

2007 and would be completed with appropriate consultation prior to release of a Record of Decision for the this project.

Recovery Plans/Conservation Agreements/Forest Plan Biological Opinions
None of these documents speaks directly to herbicide use or treatment of invasive plants. The project would meet their intent through avoidance of adverse effects on listed fish and restoration of upland and riparian native plant communities.

3.3.6 IRREVERSIBLE AND IRRETRIEVABLE EFFECTS – WATER QUALITY AND FISH HABITAT

There would be no irreversible or irretrievable effects to water quality and fish habitat under any of the alternatives.

3.4 VISUAL RESOURCES

3.4.1 AFFECTED ENVIRONMENT

The landscape character of the Project Area includes a wide variety of vegetation cover types over a rugged dissected topography both inside and outside of the Selway-Bitterroot Wilderness. The plant communities form a dynamic mosaic pattern from riverine forest along the Selway River at 2000 feet elevation to the alpine meadows in the Bitterroot Mountains above 10,000 feet (Selway Assessment 2001). The foreground, midground and background views from most of the Project Area are natural in appearance. Natural disturbances from wildfire, insect and disease mortality or windstorm damage are evident throughout the area, adding to the mosaic of color and texture patterns. Where the Project Area extends beyond the Wilderness boundary on the Lolo and Bitterroot National Forests, human disturbances (road cuts and timber harvest units) are visible from the foreground to the background depending on the viewing point.

Invasive plant infestations, primarily spotted knapweed and cheatgrass, are highly noticeable in the foreground and midground along the Selway River Wild and Scenic Corridor. These exotics dominate large expanses of grassland habitat and are abundant under open canopy Ponderosa Pine and Douglas-fir cover types. Monocultures of spotted knapweed tend to contain a higher percentage of bare soil. This can give those sites a somewhat desertified look at the post-flower senescent vegetative stage. Mainline trails in the Wilderness portion of the Project Area, such as River Trail #4, White Cap Ck Trail #24 and Bear Ck Trail #516, support invasive plant populations that are strongly evident in the foreground along extensive stretches and dominate some segments of the trail system. The spotted knapweed and cheatgrass monocultures, while conforming to the line of surrounding vegetation of open habitats, still present a different texture, color and overall appearance than native perennial bunchgrass communities. Other target species, such as Canada thistle and houndstongue, have a “weedy” unnatural appearance that looks out of place in the Project Area.

3.4.2 ENVIRONMENTAL CONSEQUENCES

A. Summary

Direct and indirect impacts on visual resources resulting from implementation of the alternatives would be short-term. The visual effects of treatment (dying, wilting, and dead plants) may adversely affect the visual experience for some people. Loss of native vegetation under the No Action Alternative would have a negative impact on the visual quality for some users.

B. Direct and Indirect Effects

Exotic plant populations primarily affect the immediate foreground and middle ground rather than the background, having both positive and negative visual effects. Negative effects of weeds are limited to the foreground, where plants may be out of scale, visually out of place, and often associated with land disturbance activities. Conversely, to those unaware they are looking at noxious weeds, the presence of flowering knapweed or oxeye daisy may appear as attractive components of the landscape. Landscape features where invasive plant impacts are of greatest visual concern are those seen by the most viewers, such as along river corridors, lakes, mainline trails, trailheads, dispersed recreation sites, roads and destination points.

C. Effects of Alternative 1 – No Action

Under this alternative, there is a high probability that invasive plants would increase their visibility in the foreground and mid-ground of many susceptible sites in the Project Area, both inside and outside the Wilderness. This will change the texture and color of affected areas from that encountered on sites dominated by native species.

Cumulative Effects
Wildfire burned sites are notably susceptible to invasion by exotics. Without a full range of treatment options available, these sites are at risk of becoming dominated by both existing and new invaders. This scenario would produce a foreground, midground and, in some cases, background appearance in texture and color that differs from the current successional vegetation.

D. Effects Common to Alternatives 2, 3, 4 and 5

Minor visual impacts would result from the manual/mechanical or cultural treatments. Biological control success on large spotted knapweed infestations would result in a change of texture and color of invaded polygons. Vegetative succession may return to a native perennial bunchgrass dominated plant community or a cheatgrass dominated community. Bare soil percentage would decrease and change the overall color of the affected polygons. Herbicide use under these alternatives could cause short-term visual impacts when the treated vegetation turns brown after dying. Some noticeable curling of leaves and stems of the target plants will occur. The use of selective broadleaf herbicides would leave non-target grass species unaffected. Colored dyes in the herbicide mix, to help mark treated plants and avoid overspraying, would be visible on the target vegetation and ground for several hours to a few days after application.

Cumulative Effects
Wildfire burned sites that hosted new invader populations would receive spot herbicide treatments with colored dye. The visual impacts of the dye would last only a few days at the most.

3.5 HERITAGE RESOURCES

3.5.1 AFFECTED ENVIRONMENT

A. Regulatory Framework

Section 101 of the National Environmental Policy Act (NEPA) requires the Federal Government to preserve important historic, cultural, and natural aspects of our national heritage. To accomplish this, federal agencies utilize a process outlined in Section 106 of the National Historic Preservation Act (NHPA). Passed by Congress two years prior to NEPA, the NHPA sets forth a framework for identifying and evaluating historic properties, and assessing effects to these properties. This process has been codified in 36 CFR 800 Subpart B. The linkage between Section 106 of the NHPA and the mandate to preserve our national heritage under NEPA is formally established in 36 CFR 800.3b and 800.8. The terminology of "*…important historic, cultural, and natural aspects of our national heritage*" found in NEPA includes those resources defined as "historic properties" under the NHPA (36 CFR 800.16(l)(1)). It is thus Section 106 and its inherent process agencies utilize to legally consider, manage and protect historic properties during the planning and implementation stages of federal undertakings.

Locally, the Bitterroot, Clearwater and Nez Perce National Forests each utilize programmatic agreements (PA) signed by Region-1 of the USFS, their respective State Historic Preservation Offices, and the Advisory Council on Historic Preservation - to implement the Section 106 process.

Future invasive plant treatment projects resulting from the current analysis will be defined and articulated in a yearly operating plan. The potential affect these annual projects may have on historic properties will be evaluated at that time using the State PAs. These PAs, in part, classify federal undertakings into categories based on their likelihood of affecting historic properties. Because of the generally benign nature of the proposed weed treatment activities, Section 106 review will likely not be required in most cases.

B. Treaty Rights

Although the Forest Service, through the Secretary of Agriculture, is vested with statutory authority and responsibility for managing resources of the National Forests such as areas within the current analysis area, no sharing of administrative or management decision-making power is held with the American Indian tribes. However, commensurate with the authority and responsibility to manage resources, is the obligation to consult, cooperate and coordinate with the Tribes in developing and planning projects on National Forest system land that may affect tribal treaty rights.

As a result of treaties with the Nez Perce Tribe and the Confederated Salish and Kootenai Tribes of the Flathead Nation elements of their culture such as tribal welfare, land, and resources were intrusted to the United States government. Trust responsibilities resulting from these Treaties dictate, in part, the United States government facilitate the execution of treaty rights and traditional cultural practices of the Tribes by working with them on a government to government basis in a manner that attempts a reasonable accommodation of their needs, without compromising the legal positions of the Tribes or the federal government. Because tribal trust activities often occur in common with the public, the Forest Service strives to manage ceded land in favor of the concerns of the Tribes, as far as is practicable, while still providing goods and services to all the people.

C. Historical Perspective

Written documentation regarding the greater analysis area began with the Lewis and Clark expedition in 1805. Following the Corps of Discovery's return to the east, fur trappers began venturing to the Interior Northwest in search of beaver. Later, the Protestant missionary, Henry Spaulding, settled the Lapwai Valley area just west of the analysis area in 1836. Encouraging news from Spaulding and other Northwest missionaries set in motion a continuous wave of immigrants from the eastern United States, to the Oregon Country, starting in the early 1840s. A portion of these immigrants later resettled to areas of the Inland Northwest following mineral discoveries around the greater analysis area during the 1860s. Despite these developments, the population of the region remained very low until the mid-20th century. This trend changed with the advent of large scale timber harvest, road construction, sawmills, and the associated development of mill towns. More recently, federal land management activities within the analysis area left historic features on the wilderness landscape such as trails, fire lookouts and ranger stations.

Both American Indian and later EuroAmerican affiliated cultural resource sites have been documented in the analysis area. Many of these sites have been determined eligible for the National Register of Historic Places, while others have not been formally evaluated for their National Register eligibility.

Archaeological investigations indicate that from the earliest occupation until contact with Europeans, the inhabitants of the region were nomadic hunters and gatherers. Most of the project area is within the Columbia Plateau culture area, however, some authors place western Montana in the Great Plains culture area. Occupation of both regions extends back as far as 12,000 years. The specifics of subsistence and life style varied according to available resources and changed over time. Several American Indian traditional territories are present in the analysis area. In Idaho, the project is in the traditional territory of the Nez Perce Indians. The Nez Perce also traveled/hunted in the upper West Fork of the Bitterroot drainage, as well as utilizing the main Bitterroot Valley en route to buffalo country on the Missouri and Yellowstone. Travel to buffalo country was often accomplished in the company of the Bitterroot Salish and Kootenai Indians. The southern Nez Perce trail traverses the southern portion of the Selway Bitterroot Wilderness and is a part of the historic landscape.

In Montana the Bitterroot River watershed is within the traditional homeland of the Bitterroot Salish of the Confederated Salish & Kootenai Tribes. During the mid- to late 1700s, the Shoshone and Bannock tribes also traveled through the Bitterroot and upper Selway watersheds.

Ethnographic studies indicate all these groups utilized the region seasonally for resource extraction and as a travel corridor. During winter they resided in the lower canyons and moved to the higher elevations as snow melted and resources became available.

Ethnographic studies indicate that plants often account for the majority of food for hunter/gatherers. Indeed the Tribes occupying the greater project area have a long history of plant utilization including non-food purposes such as medicine and clothing. Today, tribal members continue to utilize plant resources in the analysis area (Vera Sonneck 2007).

Of concern is the possibility that invasive plants could out-compete native plants which are important to the Tribes. In addition, the pathways in which invasive plants arrive, such as trailheads and trails, likely function as routes tribal members use to gather plants. Like the inadvertent spread via trails, access through areas which have invasive plants could further spread these unwanted species into traditional gathering locales. A goal of this plan is to maintain native plant populations.

3.5.2 ENVIRONMENTAL CONSEQUENCES

It is anticipated that the methods proposed in the action alternatives will have no direct, indirect, or cumulative effect to the archeological and historic sites of the analysis area. Further, the action alternatives may help prevent loss and displacement of plants utilized by American Indians for food, medicine and utilitarian purposes.

The five alternatives of the current analysis include several proposed actions including:

- Mechanical treatment
- Herbicides
- Bio-controls
- Grooming stations for livestock
- Public education concerning invasive plants
- Weed-free feed and enclosure policies for both Forest Service and public stock animals.

For the purpose of the current analysis, mechanical treatment consists of hand pulling plants. Most locales which require hand pulling are previously disturbed locations, such as trailheads. However, to avoid potential damage to the integrity of cultural properties - no mechanical treatment will be used within documented site locations.

Herbicides would be applied to areas that have invasive species such as road corridors, trailheads, trails, and campgrounds. These herbicides pose no threat to cultural properties. Insects and other bio-control agents that feed on specific invasive plant species have been released in the region, however, they pose no foreseeable threat to cultural resources either. Weed-free feed policies and education programs also have no potential to effect cultural resources.

As mentioned above another heritage resource concern is that traditional use plants will be displaced, long term, by invasive species. Ethnobotanical knowledge is sensitive to many Native Americans so specific information concerning plants and collection locations are not available, however, there are species in the project area that are still collected by tribal members. As invasive plant species continue to expand into the project area, threats to these plant populations will likely increase. Implementation of the action alternatives may help to preserve native plant species and traditional uses.

A. Native American Treaty Rights

With the possible exception of short-term localized restrictions, none of the action alternatives would interfere with any tribal member’s access to, or practice of, traditional or cultural activities within the project area. All of the alternatives considered in detail would honor Native American treaty rights.

3.5.3 IRREVERSIBLE AND IRRETRIEVABLE EFFECTS, HERITAGE

Irretrievable effects for all alternatives would be the temporary loss of native plant species, including some species of culturally important plants, that are sprayed with herbicides or uprooted by mechanical methods incidental to treating target invasive plants. These effects are reversible. See: Impacts to Native Vegetation Communities, in the Environmental Consequences portion of the Vegetation section of Chapter 3.

Irreversible and irretrievable effects of Alternatives 1, 3, and 4 would be the permanent loss of native plant communities, including culturally important plants, and associated natural ecosystem components as established invaders and new invaders advance into currently weed-free and early infestation areas of the project.

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3.6 WILDERNESS, RECREATION, INVENTORIED ROADLESS AREAS, AND WILD & SCENIC RIVERS

3.6.1 INTRODUCTION

Wilderness areas are areas of federally owned land that have been designated by Congress as wilderness, in accordance with the Wilderness Act of 1964. These areas are protected and managed so as to preserve their natural conditions which (1) generally appear to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) have outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) have at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value. A Wilderness Study analysis is conducted on candidate areas to determine an area's appropriateness, cost, and benefits for addition to the National Wilderness Preservation System.

Inventoried Roadless areas (IRA's) are areas identified in a set of inventoried roadless area maps, contained in Forest Service Roadless Area Conservation, Final Environmental Impact Statement, Volume 2 dated November 2000, which are held at the national headquarters office of the Forest Service or any subsequent update or revision of those maps. Roadless areas qualify for placement on the inventory of potential wilderness if, in addition to meeting the statutory definition of Wilderness, they contain 5,000 acres or more or if less than 5,000 acres, are manageable in a natural condition due to geographic or vegetative composition (FSH 1909.12 Chapter 7.7.17.31). Inventoried roadless units recommended as wilderness require managing agencies to maintain wilderness characteristics until a final determination on land use categorization is realized. Specific inventoried roadless units are identified with maps and narratives in Forest Plan documents.

The project area contains several streams or stream segments that are protected or have eligibility to be considered for protection under the Wild and Scenic Rivers Act (16 US1271). The Act was passed by Congress to protect free-flowing rivers possessing "outstandingly remarkable" scenic, recreation, geologic, fish and wildlife, historic, cultural, or other similar values associated with the rivers. The Act established three possible designations for rivers: wild, scenic, or recreational. Wild rivers are essentially undeveloped and inaccessible by road. Scenic rivers can be reached or even crossed by vehicles and can have limited development on the shoreline. Recreational rivers may have parallel roads and shoreline development, but still are free flowing, thus allowing nonpristine rivers to be eligible for protection. The project area contains 47 miles of the Selway River that has been designated under the Act. In addition, Moose Creek may be eligible for designation under the Act. A suitability study has been considered and preliminary discussions have taken place.

3.6.2 REGULATORY FRAMEWORK

A. National Environmental Policy Act (NEPA)

NEPA requires integrated use of the natural and social sciences in all planning and decision-making that affects the human environment. The human environment includes the natural and physical environment and the relationship of people to the environment (40 CFR 1508.14).

B. Wilderness Act

Designated Wilderness is mandated to be administered so that its community of life is untrammeled by man, its primeval character retained and naturally functioning ecosystems preserved (PL 88-577).

Wilderness areas are managed as directed by the Wilderness Act of 1964. Management actions within wilderness focus on maintaining naturally functioning ecosystems, providing access through appropriate means (typically trails) and managing some pre-existing uses, such as outfitter operations. Examples of management activities include trail maintenance and reconstruction, fire suppression or management of naturally ignited fires, removal of existing structures, noxious weed treatment, dam management, management of administrative cabin sites, and ongoing fish and wildlife management actions.

Forest Service Manual (FSM) 2323.26b allows plant control for "noxious farm invasive plants by grubbing or with chemicals when they threaten lands outside Wilderness or when they are spreading within the Wilderness, provided that it is possible to effect control without causing serious adverse impacts on Wilderness values." FSM 2109.14 (13.4) requires Regional Forester approval of pesticide use in designated Wilderness Areas.

C. Wild and Scenic Rivers Act

The Wild and Scenic Rivers Act (16 US1271) and Interagency Guidelines provided in the Wild and Scenic Rivers Reference Guide (USDA and others, 1995) provide the general direction for management of such rivers. The Act was passed by Congress to protect free-flowing rivers possessing outstandingly remarkable" scenic, recreation, geologic, fish and wildlife, historic, cultural, or other similar values associated with the rivers. The Act established three possible designations for rivers: wild, scenic, or recreational. Wild rivers are essentially undeveloped and inaccessible by road. Scenic rivers can be reached or even crossed by vehicles and can have limited development on the shoreline. Recreational rivers may have parallel roads and shoreline development, but still are free flowing, thus allowing non-pristine rivers to be eligible for protection.

D. Forest Plan Direction

General wilderness management direction for the Selway-Bitterroot Wilderness (SBW) is addressed respectively in the Bitterroot, Clearwater, Lolo, and Nez Perce National Forest Plans, which share administrative responsibility for the Selway-Bitterroot Wilderness. (Bitterroot Forest Plan, pages II-2-5 and III -53-57 (USDA 1987), Clearwater Forest Plan III-32-35 (USDA, 1987), Lolo Forest Plan, pages III-37 (USDA 1986). Nez Perce Forest Plan, pages III-24-25 (USDA 1987). In 1992, all four Forests amended their respective Forest Plans to incorporate the Selway-Bitterroot Wilderness General Management Direction.

Specific management goals provided in the Selway-Bitterroot Wilderness General Management Direction include the need to (1) preserve the integrity of the Wilderness resource to meet the purposes described in the Wilderness Act; (2) follow 36CFR 219.1(a) which directs the Forest Service to "provide for limiting and distributing visitor use of specific portions in accord with periodic estimates of the maximum levels of use that allow natural processes to operate freely and that do not impair the values for which Wildernesses were created"; and (3) prevent significant deterioration or a net degradation of the Wilderness resource.

Inventoried Roadless Lands - There is currently no specific congressional oversight of inventoried roadless lands. Weed treatments on inventoried roadless lands would not need special approval simply because of the areas roadless status.

E. Recreation Opportunity Spectrum (ROS)

The Recreation Opportunity Spectrum is a land classification system of management class categories, each being defined by its setting and by the probable recreation experiences and activities it affords. The six management classes are: urban, rural, roaded natural, semi-primitive motorized, semi-primitive non-motorized and primitive.

The project area within the Wilderness falls into the primitive and semi-primitive non-motorized classes. Portions of the project area outside the Wilderness, that fall outside the Wilderness would be classified primarily as semi-primitive, non-motorized with a small percentage falling into the roaded natural class.

3.6.3 AREA OF ANALYSIS

The analysis area is the Selway Bitterroot Wilderness and adjacent areas as shown on the project map, see Map 1-1 The analysis area is mainly on three National Forests, the Bitterroot, Clearwater and Nez Perce with limited acres on the Lolo National Forest. The Selway Bitterroot Wilderness is located within both Idaho and Montana.

3.6.4 AFFECTED ENVIRONMENT

A. Wilderness and Inventoried Roadless Areas

Geographic System (GIS) spatial data was used to determine the location of the Wilderness and Inventoried Roadless Areas relative to the proposed activities in the action alternatives. Existing condition was determined through mapping of known weed infestations from the GIS weed database. Potential types of treatments within these areas were estimated. Management activities (proposed, and past, present and reasonable foreseeable) were evaluated for their potential effects on the Wilderness attributes listed in the Forest Service Northern Region "Our Approach to Effects Analysis" for assessing the impacts on Wilderness and roadless characteristics. This method will be used for designated Wilderness and Inventoried Roadless Areas. The attributes include natural integrity, apparent naturalness, opportunities for solitude and opportunities for a primitive recreation experience. The Forest Service Handbook (FSH-1909.12, Chap. 7) discusses these attributes of wilderness, and also discusses additional attributes to be considered in evaluating potential wilderness areas. Characteristics of roadless areas are described in CFR 294.11. A cross walk between wilderness attributes and roadless characteristics is presented in Table 3.6-1. The attributes for wilderness evaluation will be used in defining existing conditions and comparing effects on inventoried lands in the analysis area.

Table 3.6- 1: Wilderness Attributes and Roadless Characteristics

Wilderness Attributes		Roadless Characteristics
Natural Integrity.	The extent to which long-term ecological processes are intact and operating	High quality or undisturbed soil, water, air. Source of public drinking water. Diversity of plant and animal communities. Habitat for threatened, endangered, candidate, proposed, and sensitive

Wilderness Attributes		Roadless Characteristics
		species dependent on large areas.
Apparent naturalness..	Environment looks natural to most people	Natural appearing landscapes with high scenic quality.
Solitude and Primitive Recreation.	Personal subjective value defined as the isolation from the sights, sounds, and presence of others and the developments of man.	Primitive, semi-primitive non-motorized, semi-primitive motorized ROS classes of dispersed recreation.
Remoteness.	Perceived condition of being secluded, inaccessible, and out of the way.	
Special Features.	Unique and/or special geological, biological, ecological, cultural, or scenic features.	Other locally identified unique characteristics. Traditional cultural properties and sacred sites.
Manageability/ Boundaries	Ability to manage a roadless area to meet the minimum size criteria (5,000 acres) for Wilderness	No criteria

The Selway-Bitterroot Wilderness spans the border of north central Idaho and western Montana. Designated with the passage of the 1964 Wilderness Act, the Selway-Bitterroot Wilderness is the third largest Wilderness area in the lower forty-eight states; encompassing 1.3 million acres, across four National Forests and six Ranger Districts. The portion of the SBW that lies on the Lolo National Forest is administered by the Bitterroot National Forest.

Opportunity Classes

The Selway-Bitterroot Wilderness is divided into four Opportunity Classes (OC) to allow for and provide a range of wilderness experiences. Opportunity Class 1 areas are the most pristine, while Opportunity Class 4 areas are the most heavily used. The following table identifies acreages by Forest and Opportunity Class in the Selway-Bitterroot Wilderness.

Table 3.6- 2: Acreages by Forest and Opportunity Class in the Selway-Bitterroot Wilderness

Forest	Opportunity Class 1	Opportunity Class 2	Opportunity Class 3	Opportunity Class 4	Total
Bitterroot	503,499	4,577	2,372	1,602	512,050
Clearwater	253,924	806	3,996	439	259,165
Lolo	9,599	105	27	36	9,767
Nez Perce	545,528	2,792	10,356	1,023	559,699
TOTALS	1,312,550	8,280	16,751	3,100	1,340,681

Table 3.6- 3: Summary of Resource and Social Setting Components for each Opportunity Class

	Opportunity Class 1	Opportunity Class 2	Opportunity Class 3	Opportunity Class 4
Resource Setting General description	Unmodified Natural Environment			Predominantly unmodified natural environment
1. Ecological Conditions	Not measurably affected by the action of users	Some sites slightly affected by the action of users	Some sites moderately affected by the action of users	Many sites substantially affected by the action of users
2. Prevalence & duration of impact	Not measurably affected by the action of users	Some sites slightly affected by the action of users	Some sites moderately affected by the action of users	Many sites substantially affected by the action of users
3. Visibility of impacts	Essentially unnoticeable to the majority of visitors	Noticeable to a few visitors	Apparent to a moderate number of visitors	Impacts are readily apparent to most visitors
Social Setting General description	Outstanding opportunity for isolation and solitude	High opportunity for isolation and solitude		Moderate to low opportunities for isolation and solitude
1. General level of encounters	Extremely rare	Very infrequent	Low	Moderate –High
2. Degree of challenge	Very high	High	Moderate	Moderate-Low
3. Interparty contacts while traveling	Extremely rare	Very few	Low	Relatively high
4. Interparty contacts at campsite	Non-existent	Very low	Low	Moderately frequent

Table 3.6- 4: Summary of Managerial Setting Component for each Opportunity Class

	Opportunity Class 1	Opportunity Class 2	Opportunity Class 3	Opportunity Class 4
Managerial Setting General description	Management strongly emphasizes sustaining the natural ecosystem			
1. Contact w/ management personnel during normal use season	Occurs by invitation, or to correct apparent potential problems. Discussion items limited to meeting visitor information requests, distributing use and achieving compliance with rules and regulations			
2. Rules/ regulations & visitor behavior	Communicated to visitors primarily outside of the Wilderness, at trailheads and boundary portals. When necessary, on site enforcement and communication of rules and regulations will be conducted			
3. Formal and informal user education programs	Initiated outside of Wilderness to inform users about what to expect and how to employ minimum impact skills			
4. Formal rules and regulations	May be necessary to achieve management objectives. Permits may be considered only when light-handed, less restrictive measures have consistently failed to achieve desired goals and objectives			
5. Presence and extent of signing	No signs permitted, except for rare instances involving federal liability or resource damage	Minimum necessary to meet federal liability, policy or provide for resource protection	Trail signs permitted. Other signs may be present for resource protection or federal liability only and will provide only minimal information	Signs will be placed to aid in distributing and dispersing use for resource protection and for federal liability
6. General level of trail management	No system trails. Existing trails will not be maintained.	Manage system trails to appropriate standard to accommodate light use	Manage system trails to appropriate standard to accommodate light to mod use	Manage system trails to appropriate standard to accommodate heavy traffic
7. Presence of administrative structures (not including trail structures)	No new structures permitted. Historically significant structures and lookouts acceptable		Allowed as described in the section “administrative Activities and Facilities-Inside Wilderness”	
8. Presence of permanent structures (corral, hitch racks etc.)	None allowed, temporary structures only			Permitted as necessary for resource protection. Native materials only
9. Presence of temporary structures	Allowed only as last resort. To be completely dismantled and removed when not in use, or if resource problem is corrected	Allowed for resource protection. Removed when not in use, or if the resource problem is corrected		Remove when not in use

The Opportunity Class system provides managers with a hypothetical framework for managing towards a future wilderness condition by outlining key components for the desired resource, social and managerial settings. (See Table 3.6-3 & Table 3.6-4: Summary of Resource, Social and Managerial Setting Components for each Opportunity Class) Within this continuum limits of acceptable change are prescribed for each designated opportunity class, providing managers with the ability to use inventory and monitoring data to identify trends and determine how social impacts affect ecological and natural processes.

General wilderness attributes of the Selway-Bitterroot Wilderness are summarized in the five attribute categories, previously identified.

1. *Natural integrity*: This term refers to the extent that long-term processes are intact and operating and is measured by the presence and magnitude of human induced change. Within the Selway-Bitterroot Wilderness many aspects related to natural integrity could be rated as high. Direct impacts of human activity are generally light. The most obvious impacts are those associated with existing administrative sites, cabins, dams, airstrips, trails, and dispersed campsites. Other factors that have diminished natural integrity are associated with fish stocking in some of the high lakes where, previous to stocking, fish did not exist and the extirpation of grizzly bears that inhabited the general area into the early part of the twentieth century. Recently, invasive plant species have begun to noticeably diminish the quality and extent of native grassland communities over an extensive portion of the project area. Wilderness managers have been inventorying and monitoring weed populations in the Bitterroot Wilderness for over 20 years. Hand control operations that include grubbing and pulling have been used, with very limited success throughout the Wilderness, in attempting to eradicate small patches of invasive plants and contain larger populations. Chemical control of invasive plants has been implemented only through site-specific NEPA (National Environmental Policy Act) decisions in the Selway Bitterroot Wilderness mainly on the Bitterroot National Forest.

Education and prevention tactics have also been important in reducing the spread and establishment of invasives within the Selway-Bitterroot Wilderness. A Special Order signed 10-8-95 established requirements for certified weed free feed within the SBW and across National Forest lands in Idaho. An additional order signed on 10-9-97 extended the requirements to National Forest lands across Montana, (36 CFR 261.50a & b).

All forest users have been required to use only certified weed free feeds. Education the public about the weed issue, and vulnerability of invasive plants in the Selway Bitterroot has been a priority for over 20 years.

The most current variety and extent of invasive plant species in the project area is discussed in vegetation section 3.1 of this Chapter.

Campsite Impacts: Visitor impacts to the Wilderness resource are also monitored through site indicators associated with each opportunity class. Areas that exceed the number of sites or impact level relative to appropriate opportunity class standards are considered "Problem Areas" that require management intervention. Impacts are evaluated using standardized procedures that measure various impacts, including; vegetation loss, soil disturbance, tree damage, development, cleanliness etc. Weed infestations are also frequently encountered at campsites and along rails leading to campsites. There are approximately 1000 campsites recorded within the Selway-Bitterroot Wilderness. Campsites are numbered according to their location in "Compartments", which are management units that may encompass a watershed or other geographic area and often include multiple opportunity class units. Of the 80 compartments that compose the Selway-Bitterroot Wilderness, 48 (60%) contain one or more "Problem areas" associated with visitor use.

2. *Apparent Naturalness:* This condition is indicated by how the environment looks to most people using the area. Even though some of the long-term ecological processes of an area may have been interrupted, the landscape of the area generally appears to be affected by the forces of nature. If the landscape has been modified by human activity, the evidence is not obvious to the casual observer, or it is disappearing due to natural processes.

Human activities are primarily confined to the administrative sites, airstrips, dams, narrow trail corridors and areas immediately adjacent to lakes and unique water features. The remaining area is topographically challenging and discourages cross country travel. Humans have had minor impacts in these areas that are topographically challenging through the suppression of some fires and factors related to the introduction and spread of invasive plant species.

Trails: The present trail system was planned for fire detection, fire control and administration. There are over 61 trailheads accessing the 1,490 miles of system trail within the Selway-Bitterroot Wilderness. Seventy percent of these trails fall within Opportunity Class 3 and Class 4 management zones, where visitor use is most concentrated within the Wilderness. Invasive plant populations are most dominant in and adjacent to these areas of higher use.

Most of the Selway-Bitterroot Wilderness lies within the Idaho Batholith, which is characterized by a predominance of coarse grained, granitic soil with a weak structure and a high susceptibility to erosion. This weak soil combined with steep trail grades, up to 40-50% on some trails, leads to quick trail erosion. Low elevation sites with good growing climates promote rapid brush growth that can quickly impede trail passage and necessitates frequent brushing maintenance. Windfalls are numerous and often large. Cross country travel through much of the area is difficult because of abundant vegetation and steep topography.

The Selway–Bitterroot Wilderness management direction states that "Trails will be managed as a tool to protect the wilderness resource by managing the movement of people and stock. The primary emphasis is on resource protection and the minimum tool principle will be applied to this end."

3. *Remoteness:* is a perceived condition of being secluded, inaccessible and out of the way. The physical factors that can create "remote" settings include topography, vegetative screening and distance from human impacts. The presence of humans is most apparent along the trail corridors and at desirable water features, such as hot springs, fishing holes and popular rapids. Increasing day use and tight canyons funneling use from Montana access portals diminishes the perception of remoteness and solitude. Access to Idaho's portals requires a longer commute to more remote jump off points.

4. *Solitude:* is a personal subjective value defined as isolation from the sight, sound and presence of others and the developments of humans. Common indicators of solitude are numbers of individuals or parties one may expect to encounter in an area during a day, or the number of parties camped within sight and sound of other visitors.

The feeling of solitude in its purest sense is not consistently available on trail corridors or at more popular lake basins and water features. However, because of the size of the Wilderness, current visitor use trends and the mountainous terrain, solitude is easy to find.

Visitor Use: Visitors to the Selway-Bitterroot Wilderness pursue a variety of activities including hiking, backpacking, horseback riding, fishing, river floating, hunting, photography, nature study, swimming, and mountain climbing. Visitor use data is collected in two ways: using trailhead registration boxes and by field-going personnel recording encounters or airstrip landings in the wilderness. The trailhead registration is a voluntary system; boxes are not located at all trailheads, have not been used until recently

on the Bitterroot NF and are not used on the Moose Creek or West Fork Districts at this time; and field personnel encounter a small percentage of visitors, therefore this information does not provide a statistically valid sample. It does offer basic information on minimum use levels and user trends, such as identifying popular destinations and day versus overnight use.

Using trailhead registration information collected primarily on the Clearwater NF and the Darby/Stevensville Districts of the Bitterroot NF, in 2005 about 1,000 groups registered information on 2,750 visitors. By 2007 that number jumped to nearly 1,700 groups and 3,877 visitors, more likely due to visitors overcoming their resistance to trailhead boxes than to actual increased use. This use data shows approximately 75% of the use originates on the Bitterroot NF (1-2% then cross over to the other Forests) and 25% on the Clearwater. It also shows about 2/3 of use is for day trips, especially on the Bitterroot NF. Wilderness Gateway on the Clearwater NF is the most popular trailhead (18-25% of all SBW registration box use data, depending on the year) and Stanley Hotsprings is the most popular overnight destination (nearly 1/3 of all SBW registering overnight users). Note that use at Moose Creek and West Fork Districts are not represented in this data.

Using field personnel encounters records from all districts (overlapping the registration box information), approximately 1,000+ visitors are contacted by field personnel annually and another 700+ landings are recorded at the three SBW airstrips.

5. *Special features and Special Places:* are those unique geologic, ecologic, cultural, historic or scenic features or those areas that cause one to visit for pleasure or their livelihood.

Special features within the Wilderness include the precipitous terrain in the "Crags" found in Montana and Idaho as well as natural hot springs located in a number of locations throughout the wilderness, waterfalls, abundant and varied rock formations.

In addition to these natural features, the Selway-Bitterroot includes a number of human built administrative sites and other features of significance. There are 16 irrigation dams currently under easements or special use permits on the Bitterroot National Forest, 3 private in-holdings (North Star Ranch, Selway Lodge and Running Ranch), and 3 public airstrips (Moose Creek, Shearer, and Fish Lake) all established prior to the 1964 Wilderness Act.

6. *Manageability/boundaries:* this element relates to the ability of the Forest Service to manage the area to meet size criteria and the elements discussed above. Changes in the shape of an area influence how it can be managed. The location of other proposed projects outside the area are also factors to be considered. Boundary management impacts relate to such factors as the need to change boundaries to terrain features that can easily be located, and the provision of access to the area. Manageability/boundaries was not a wilderness quality factor rated in RARE II, but is a factor considered since the mid-1990s in evaluating effects on roadless areas.

B. Inventoried Roadless Areas

Portions of Inventoried Roadless Areas correspond to the Selway-Bitterroot Invasive Plant EIS project boundary including approximately 478 acres of the Lolo Creek Roadless area on the Lolo National Forest as well as a significant portion 30,403 acres of the Selway-Bitterroot Roadless Area on the Bitterroot National Forest.

In the late 1990's the Clinton Administration completed a nationwide study of "roadless" lands on public, land, and maps or record included in the final rule (USDA, 2001). The final rule acknowledges that this

inventory may not be perfectly accurate, and likely included lands that no longer retained their roadless characteristics. Inventoried roadless lands are found in all the mountain ranges on all three forests and are currently allocated a wide variety of Forest Plan Management Area designations from the most protective to allocations focusing on timber and range management. A wide variety of land uses occur within these areas, from range allotments and minor mineral developments to dispersed recreation use of trails to trail-less areas.

The Inventoried Roadless Areas on the Bitterroot National Forest are described in the 1987 Bitterroot Forest Plan Final Environmental Impact Statement, (USDA FS 1986, Volume II), which contains maps, a detailed description of each area and an evaluation of each IRA's wilderness capability.

The Lolo Creek Roadless area on the Lolo National Forest is described in the Lolo Forest Plan Environmental Impact Statement, Appendix C (USDA, 1986).

C. Recreation

Regulatory Framework
The Goal of the three National Forest Plans relative to recreation is to provide a broad spectrum of recreation opportunities in a variety of Forest settings. The Forest Service Manual, FSM 2300, describes the Forest Authority, Objectives, Policy and Responsibility for recreation management. Pertinent Federal Laws are the Forest Rangeland Renewable Resources Planning Act of 1974, as amended by the National Forest Management Act, and the Wilderness Act of 1964. (See section 3.6.2)

Area of Analysis
The analysis area for recreation analysis is confined to all developed and non-developed recreation sites within the Selway Bitterroot Wilderness Invasive Plants project area.

Analysis Method
The source of information for the Affected Environment was the Forest Plan and its associated EIS. The analysis is based on the potential for proliferation of invasive plants if left untreated, and proposed weed treatment activities to impact recreational opportunities within the Selway Bitterroot Wilderness Invasive Plants project area.

Effects of Invasive Plants on Recreation
Invasive weeds can affect the recreation experience. Invading weeds such spotted knapweed, thistles, toadflax, sulfur cinquefoil, hawkweed, and oxeye daisy detract from the desirability of using recreation sites and enjoyment of the forest environment. These species diminish the usefulness of sites because of the stiff plant stalks, thorn, or toxic sap can discourage or prevent experiences by reducing the variety and abundance of native flora to observe or study and reducing forage availability for wildlife and recreational livestock.

Invasive plants are frequently spread through recreational activities, particularly along roads, trails, campgrounds, and dispersed recreation sites. The Nez Perce, Bitterroot and Clearwater National Forests provide a variety of recreational experiences including camping, hiking, hunting, fishing, mountain biking, snowmobiling, horseback riding, skiing, and driving for pleasure. Passenger vehicle roads provide primary transportation routes into and through out the forests. While these roads provide access for a variety of recreational purposes (commercial, residential, administrative), primary public benefit may be for recreational purpose. Controlling invasive plants along roads and recreational sites will reduce the tendency for recreational activities to spread invasive plants into adjacent areas.

The issue of effects of herbicides on human health is treated separately in this analysis. Please refer to the human health issue in Chapter 3 for more information.

Outfitter and Guide Services: Public access to the Wilderness is also supported by Outfitter and Guide services, which operate under special use permits. There are approximately 37 outfitters providing hunting, fishing, horse camping, day trips, backpacking, hiking, photography and river rafting opportunities within the Selway-Bitterroot Wilderness in any given year.

Outfitter and guides pay 3% of their gross revenue in use fees as part of their special use permit. A portion of these fees comes back to the Forests to fund trail maintenance and reconstruction, Wilderness education, field presence, trailhead improvements and other services that benefit both the public and outfitters alike.

Administrative Facilities: Administration of the Wilderness for the purpose for which it was established entails management of the following administrative sites within the Selway-Bitterroot Wilderness.

Note: (OC refers to the Opportunity Class where each of these facilities is located)

- **Bitterroot National Forest:**
  - St. Mary's Lookout: (OC 4) Retained and maintained for fire detection and historical significance
  - Coopers Flat Cabin: (OC 3) Retained for historical significance. EA being conducted for long-term strategy
  - Spot Mountain Lookout: (OC 2) Retained and maintained for fire detection

- **Clearwater National Forest:**
  - Horse Camp Cabin: (OC 4) Retained and maintained for administrative use and historic significance
  - Fish Lake Cabin**:** (OC 4) Retained and Maintained for administrative use and historic significance. (Adjacent to a backcountry, public airstrip)
  - Diablo Lookout: (OC 4) Retained and maintained for fire detection
  - Grave Peak Lookout: (OC 1) Retained for historic significance. Level of stabilization work to be determined
  - McConnell Lookout: (OC 2) Retained for historic significance. Level of stabilization work to be determined
  - Hidden Peak Lookout: (OC 3) Slotted for eventual removal, in conflict with current direction

- **Nez Perce National Forest:**
  - Shissler Lookout: (OC 3) Retained and maintained for fire detection
  - Gardiner Lookout: (OC 3) Retained and maintained for fire detection
  - Shearer Guard Station: (OC 4) Retained and maintained for administrative use and historic significance (Adjacent to a backcountry, public airstrip)
  - Moose Cr. Ranger Station: (OC 4) Retained and maintained for administrative use and historic significance (Adjacent to a backcountry, public airstrip)

D. Wild And Scenic Rivers

Regulatory Framework – see Section 3.6.2 (c)

Area of Analysis
The analysis area for Wild and Scenic Rivers are those streams and adjacent lands within the Selway Bitterroot Wilderness and associated Inventoried Roadless areas that are currently listed for protection under the Wild and Scenic Rivers Act.

Analysis Method
The source of information for the Affected Environment was the Forest Plans and its associated EIS. The analysis is based on the potential for the proposed weed treatment activities to impact the values inherent to rivers or streams on the Nez Perce, Clearwater and Bitterroot National Forest that are potentially eligible for protection under the Wild and Scenic Rivers Act.

3.6.5 EXISTING ENVIRONMENT

A portion of the Selway and Lochsa Wild and Scenic Rivers lie within or immediately adjacent to the project area. These rives were designated as Wild and Scenic by congress in 1968 with the enactment of the Wild and Scenic Rivers Act (PL 105-96) to preserve their free-flowing condition and to protect identified outstandingly remarkable values such as scenery, recreation, geology, fisheries and wildlife, historic, cultural or other similar values.

The Selway River is classified as Wild between Race Creek and Paradise Guard Station (Approximately 47 miles). The portion of river between Paradise Guard Station and the Magruder Guard Station is classified as Recreational. The approximately 6 mile section of the Lochsa River adjacent to the project area between Fish Creek and Old Man Creek is also classified as Recreational.

Additional stream segments within the project area have been identified as eligible Wild and Scenic Rivers in the Bitterroot, Clearwater or Nez Perce Forest Plans. Per Forest Service policy (FSH 1909.12 (8.12)) these rivers will be managed to protect their free-flowing character and outstandingly remarkable values until such time they are designated or are removed from consideration. The following streams in the project area have been identified as eligible:

Bitterroot	Clearwater	Nez Perce
Blodgett Creek	None	West Fork Gedney Creek
Lost Horse Creek		Three Links Creek
		Moose Creek
		Running Creek

Two river access portals (Paradise and Race Track), nearly 70 campsites, and about 50 miles of trail exist within the river corridor. Many have existing invasive weed populations that can detract from the aesthetic and recreation experience as well as adversely affect native plant communities which are described in greater detail in the Wildlife and Vegetation sections of this document.

A. Management Direction

Outstandingly Remarkable Values

Management Direction is contained within the enacting legislation, local Forest Plans and the Management Guides and River Plan for the Middle Fork of the Clearwater including the Lochsa and Selway. These documents did not specifically identify the outstandingly remarkable values for each river segment. Rather the legislation and plans simply list that "*the remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural and similar values associated with the river are to be protected…"* The outstandingly remarkable values of the rivers were evaluated as part of the Snake River Basin Adjudication in 2002. A Resource Assessment was compiled for each river segment that validated and provided context to the outstanding remarkable values. ORVs for the Lochsa and Selway Rivers include Scenery, Recreation, Fish, Water Quality, Wildlife, Vegetation/Botany, Prehistory, History, Cultural and Traditional Use.

B. Forest Plans

The Bitterroot, Clearwater and Nez Perce Forest Plans allocate the Wild and Scenic River corridors as follows with the identified management goals:

- Bitterroot NF: Provide a wild, scenic and recreational river system (BNF Forest Plan, Appendix O, Page O-2).

- Clearwater NF: Management Area A7 – Protect and enhance scenic values, cultural values, water quality, big game, non game, and fishery habitats with special emphasis on the anadromous fishery, and developed and dispersed recreation that will contribute to public us and enjoyment of the free flowing rivers and their immediate environment…. Manage those portions of the corridor that overlap the Selway Bitterroot Wilderness and the Lochsa RNA under the more restrictive direction…. (CWF Forest Plan, 1987, Pg III-25).

- Nez Perce NF: Management Area 8.2 – Protect and enhance aesthetic, scenic, historic, fish and wildlife, and other values that will contribute to public use and enjoyment of this free-flowing river and its immediate environment. Provide optimum recreational enjoyment consistent with protection of environmental quality. Manage all uses on those portions of the river within the Selway Bitterroot Wilderness to preserve the wilderness resource (NPF Forest Plan, 1987, Pg III-19).

Within each Forest Plan are additional standards for management actions. None of these standards directly apply to the management of invasive species.

The Forest Plans also indicate that for those portions of the Wild and Scenic Rivers within the Selway Bitterroot Wilderness that the more restrictive management direction for the Wilderness would apply.

The Selway Bitterroot General Management Direction provides goals and standards for management of vegetation, including invasive plant species discussed in greater detail in the vegetation section starting on page D-1.

All three Forest Plans make reference to more detailed direction contained within the Management Guides and River Plan for the Middle Fork Clearwater including the Lochsa and Selway.

C. The River Plan

The Management Guides and River Plan for the Middle Fork Clearwater including the Lochsa and Selway Rivers provide no direction for management of invasive plants within the Wild and Scenic River corridors.

3.6.6 ENVIRONMENTAL CONSEQUENCES

A. Direct and Indirect Effects

Invasive plants can affect the recreation experience. Invading invasive plants such as spotted knapweed, tansy, scotch thistle and yellow starthistle detract from the desirability of using recreation sites and enjoyment of the wilderness. These species diminish the usefulness of sites because the stiff plant stalks, thorns, or sharp bristles can discourage or prevent walking, sitting or setting up a camp. Invasive plants also detract from the recreation experiences by reducing the variety and amount of native flora to observe or study and reducing forage available of wildlife and recreational livestock.

The Wilderness Act and additional regulatory policy as described below, guides the following disclosure of environmental consequences of direct or indirect effects. For each alternative, effects will be disclosed for the following elements of wilderness character: Natural integrity, apparent naturalness, remoteness, solitude or a primitive recreation experience. However, there are different interpretations of what it means to manage for wilderness character. At the crux of the different interpretations of the act's definition of wilderness is whether the act allows managing for naturalness or managing for wildness. Peter Landres of the Leopold Institute explains: "According to this Act, wilderness should support both the attributes of naturalness and wildness." He adds, ". . . 'naturalness' describes an ecological condition. . . ." and "wildness represents . . . [a] social condition, one in which an area is untrammeled and free from human control, regardless of preexisting conditions or future consequences." His conclusion: "Managing for naturalness may sometimes conflict with managing for wildness. . . . [because] a dilemma arises when managers consider manipulating wilderness ecosystems and trammeling the wilderness in order to restore natural conditions, in effect assuming that the ends (natural conditions) justify the means (trammeling)."

Direct and Indirect Effects, Alternative 1 (No Action), Wilderness and Inventoried Roadless Areas

Invasive plant control in Wilderness is currently accomplished by hand grubbing and pulling. Manual (hand grubbing and pulling) control projects have been typically done by wilderness rangers, weed crews, volunteers, river rangers, trail crews or contractors. The Forests currently has no blanket authority to use herbicides for weed control in Wilderness. The Bitterroot National Forest has completed site-specific environmental assessments that allow some spraying up certain trail corridors (approximately 10 acres per year). Additionally, less than 10 acres per year have been treated in the past with herbicides to control various weeds at administrative sites. Many scattered heavily used camp sites along main line trails and the Selway River are treated each year in Wilderness using manual control methods. Such manual control methods would typically be less than 100 acres per year, total. Focused information and education programs, manual control projects, strict controls on weed free feed requirements for recreational livestock have all had limited success in controlling the advancement of noxious weed infestations in Wilderness. Monitoring over the last several decades proves that weed populations are expanding despite

these efforts at education and hand eradication. Under the no action alternative no new effort in monitoring or manual control would be funded. No new assignment of personnel (contract, volunteer or Forest Service) or stock inside the Wilderness would occur. No stock-related effects on vegetation would occur.

Limited weed control efforts using herbicides, manual control methods, and biological controls are occurring in the roadless portions of the Forest

Natural Integrity and Apparent Naturalness
"Nonnative invasive plants invade wilderness and other natural areas throughout North America and invasive organisms as a group are now considered the second worse threat to bio diversity, behind only habitat loss and fragmentation"(Randall, 1999). Weed invasions increase erosion, reduce water quality, and effect indigenous wildlife (Asher, 195).

Expanding weed populations negatively affect the natural integrity of a landscape by displacing native vegetation. Species composition change has a ripple effect throughout the ecosystem. As a weed monoculture develops natural diversity of plant species is drastically reduced, a direct effect to natural integrity. The effect of unchecked advancing invasive plant species is the interference with natural processes and the replacement of native plant communities with exotic species introduced into the environment largely by humans. The effects of invasive weeds on the natural integrity of a wilderness area are, in many ways, consistent with the definition of the term, trammeling.

Under the No Action Alternative invasive plants would spread at varying rates depending on the weed species, competing vegetation, disturbance history, and presence of vectors (water, recreationists, animals and vehicles). Under this alternative, it is likely that invasive plants would eventually infest most suitable habitats within Wilderness, including sites that are presently weed-free. In roadless lands, spread would also go largely unchecked, though there is currently limited authority for herbicide control outside of Wilderness. Unchecked spread of invasive plants would result in the unavoidable deterioration of the natural condition of the Wilderness and adjoining land diminishing the recreational experience and wildland values. Backcountry travelers who are knowledgeable about plant communities would be aware of the changing landscape, and would not meet their expectations for experiencing an intact ecosystem. The intent of the Wilderness Act is to maintain natural integrity and preserve naturally functioning ecosystems.

Remoteness and Solitude
Effects to remoteness and solitude under this alternative would be limited to backcountry recreationists encountering weed control crews who were primarily treating invasive plants with manual methods. In some cases recreationists may encounter crews applying herbicides using stock or trail vehicles outside of Wilderness, which could influence a user's sense of remoteness or solitude. These effects would be short term, limited to a few days in the summer. There would be no long term effects to remoteness or opportunities for solitude using either hand control methods, or limited chemical treatments outside of Wilderness.

Direct and Indirect Effects, Alternative 1 (No Action), Dispersed and Developed Recreation Areas outside Wilderness and Inventoried Roadless areas

Under the no-action alternative the effects to natural integrity, apparent naturalness, remoteness and solitude are not evaluated for recreational areas outside wilderness and inventoried roadless areas although many of these effects also occur on dispersed and developed recreational areas. The spread of

invasive plants could negatively impact the recreational use and enjoyment of visitors using developed and dispersed recreation areas outside the wilderness and inventoried roadless areas. For many people the presence of invasive plants is evidence of negative human impact and negligence in stewardship of natural resources and under the no-action alternative the spread of invasive plants would continue to spread. On these lands, as in wilderness and inventoried roadless areas, invasive plant occurrence first occurs along roads, trails and adjacent to campsites. Focused information and education programs, manual control projects, strict controls on weed free feed requirements for recreational livestock have all had limited success in controlling the advancement of noxious weed infestations in these areas. Monitoring over the last several decades proves that weed populations are expanding despite these efforts at education and hand eradication. Limited weed control efforts using herbicides, manual control methods, and biological controls are occurring in these recreational areas. Unchecked by treatment, invasive plant populations would continue to increase in density and spread out to adjacent landscapes.

Direct and Indirect Effects, Alternative 2, Wilderness and Inventoried Roadless Area

Natural Integrity and Apparent Naturalness

Where weed treatment is effective, there will be short-term evidence 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, and spraying was marked with dye, some people may recognize the weed were sprayed, which may not appear natural.

This alternative would be aggressive and effective in controlling invasive plants in Wilderness and roadless areas, because of the multi-faceted treatment options (including herbicides and bio-controls), and the larger number of acres treated. This alternative would help improve natural integrity by restoring native vegetation to weed infested sites.

In Wilderness, up to 1129 acres of herbicide could occur initially which includes treating up to 70 acres of boating sites along the Selway River. An additional 500 acres could be treated as target species are found at dispersed sites. Approximately up to 996 acres could be treated outside of Wilderness. This alternative is constrained to a total herbicide treatment of less than 1500 acres per year from all treatment methods. The effects on natural integrity would be an overall improvement of these areas as invading invasive plants are excluded from wildlands and replaced with native plants (see vegetation section). Apparent naturalness of treatment areas will improve as the evidence of invasive plants decreases and is replaced with native vegetation. See effects discussions under Chapter 3, Vegetation, Wildlife, and Watershed and Fish sections, for an estimate of the direct effects to these resources.

Herbicide treatment would decrease establishment and expansion of aggressive species in wildland areas, and reduce weed related impacts. The visual impact of spraying would be temporary and on most sites only last a few hours or less. Odors emitted by herbicides may cause anxiety in persons unaware of their presence. Dying and wilting weed plants following herbicide treatment could be apparent. However, this appearance would be short-lived as surrounding vegetation would screen dead plants or blend in with native vegetation, as it grew dormant. Some desirable native vegetation could be killed along with invasive plants depending on the type of herbicide used.

Biological control with insects on established weed patches could occur over 10,000 acres and would likely not be noticeable. Some people may notice areas where invasive plants were pulled, but would likely not affect the apparent naturalness of the areas.

Remoteness and Solitude
The public may encounter weed crews during hand spraying operations in Wilderness, or adjacent lands, which may affect some people's sense of remoteness or their opportunity for solitude. Approximately 70% to 75% of the monitoring and treatment work (or about 600 to 650 person days) will occur on Designated treatment areas such as trails, campsites and administrative sites. The crews will spend about 25% to 30% of their time, or about 220 to 270 person days, near Dispersed treatment areas such as susceptible grassland, riparian, or open timber habitat types in more remote areas. The overall potential for encounters between the public and work crews would increase in Designated and Dispersed treatment areas but remain within allowable standards by Opportunity Class as defined in the Selway Bitterroot Wilderness General Management Direction. (See Table 3.6.5 at the end of this section.)

Direct and Indirect Effects, Alternative 3, Wilderness and Inventoried Roadless Areas

Natural Integrity and Apparent Naturalness
Under this alternative no new bio controls would be used within Wilderness and treatments would be confined only to high use areas. Manual treatments would continue in the Wilderness but the ability to treat new invaders in areas other than high use sites (approximately 861 acres) would not be possible. More pristine areas which typically don't have the high use such as Opportunity Class 1 areas would be more at risk if invasive plants were found. There would be no ability to go in and treat them when they are a manageable size. No sites along the Selway River could be treated other than by mechanical means. Outside of Wilderness 945 acres could be treated with herbicide. No new bio-controls in Wilderness could occur.

The effects on natural integrity would be an improvement within these high use sites as invading invasive plants are excluded from wildlands and replaced with native plants (see vegetation section) but the ability to catch new invaders in the moderate or low use areas would be eliminated. Thus, natural integrity in other areas could diminish. Apparent naturalness of treatment areas will improve as the evidence of invasive plants decreases and is replaced with native vegetation but once again in those areas where treatment methods are not allowed. There would be a decrease in apparent naturalness. In most cases these areas of low to moderate use also have less invasive plants. If new invaders start to occur and our ability to treat them is not possible it could be perceived by recreationists the diminishment on natural integrity and apparent naturalness is larger now that invasive plants are present where once there were none. See effects discussions under Chapter 3, Vegetation, Wildlife, and Watershed and Fish sections, for an estimate of the direct effects to these resources.

Herbicide treatment would decrease establishment and expansion of aggressive species in wildland areas, and reduce weed related impacts. The visual impact of spraying would be temporary and on most sites only last a few hours or less. Dying and wilting weed plants following herbicide treatment would be apparent. However, this appearance would be short-lived as surrounding vegetation would screen dead plants or blend in with native vegetation, as it grew dormant. Some desirable native vegetation could be killed along with invasive plants depending on the type of herbicide used.

Remoteness and Solitude
The public may encounter weed crews during hand spraying operations in Wilderness, or adjacent lands, which may affect some people's sense of remoteness or their opportunity for solitude. The crews would spend about 580 person days near Designated treatment areas. The overall potential for encounters between the public and work crews would increase within Designated treatment areas only, and would

remain within allowable standards by Opportunity Class as defined in the Selway Bitterroot Wilderness General Management Direction. (See Table 3.6-5 at the end of this section.)

Direct and Indirect Effects, Alternative 4, Wilderness and Inventoried Roadless areas

Under this alternative no herbicide would be used within Wilderness, and more acres (50,000) could be treated with biological controls over the life of the project. Manual treatments would continue in the Wilderness but would be compromised because herbicides would not be used to suppress the established invasive plants. Outside of Wilderness approximately 996 acres would be treated with herbicide.

The deliberate introduction and establishment of natural weed enemies (biological controls) are designed to reduce the plant's competitive or reproductive capacities. Its purpose is generally not eradication, but rather a reduction in densities and rate of spread kept at an acceptable level. It has been argued that introduction of an exotic insect into a Wilderness setting is a human manipulation of a natural process. Biological controls have a different magnitude of effect on the resource than do encroaching invasive plants. The invasive plants affect everything in a naturally functioning system from wildlife populations, to water runoff patterns. The exotic insects only directly affect the host weed species. This method is most effective on dense weed infestations over large areas.

Natural Integrity and Apparent Naturalness
This alternative has the potential to have the largest negative effect on naturally functioning ecosystem, and apparent naturalness in Wilderness and roadless lands. Invasive plant species in wilderness would only be treated with manual or biological controls in this alternative, both of which have limited applications for some species. Invasive plant species would eventually occupy all suitable habitats, significantly changing the natural integrity of these lands and their apparent naturalness. See the Vegetation section of this chapter for a thorough discussion of uncontrolled weed population direct effects on the ecosystem and the discussion under Alternative 1. Areas outside of Wilderness would be treated the same as Alternative 2, 3, and 5.

Remoteness and Opportunities for Solitude
Effects to remoteness and solitude under this alternative would be limited to backcountry recreationists encountering weed control crews who were primarily treating invasive plants with biological methods and monitoring results. The crews would spend about 100 person-days in areas that are currently heavily infested with invasive plants, mainly in association with high use areas and face drainages along the Selway River and major tributaries. The overall potential for encounters between the public and work crews would increase slightly but remain within allowable standards by Opportunity Class as defined in the Selway Bitterroot Wilderness General Management Direction. (See Table 3.6-5 at the end of this section.)

Direct and Indirect Effects, Alternative 5, Wilderness and Inventoried Roadless Areas

This alternative would be the most aggressive and effective in controlling invasive plants in Wilderness and roadless, because of the multi-faceted treatment options (including herbicides), and the larger number of acres treated. This alternative would create the most improvements in natural integrity by restoring native vegetation to weed infested sites.

In Wilderness, 1129 acres of herbicide could occur initially which includes 70 acres of boating sites along the Selway River being treated. In addition 2000 more acres could be treated in a dispersed manner if

necessary, as target species are found in areas that are currently weed free or where infestations are in the initial stages. Approximately 996 acres could be treated outside of Wilderness, thus a total herbicide treatment of 4125 acres annually could be done. The effects on natural integrity would be an overall improvement of these areas as invading invasive plants are excluded from wildlands and replaced with native plants (see vegetation section). Apparent naturalness of treatment areas will improve as the evidence of invasive plants decreases and is replaced with native vegetation. See effects discussions under Chapter 3, Vegetation, Wildlife, and Watershed and Fish sections, for an estimate of the direct effects to these resources.

Herbicide treatment would decrease establishment and expansion of aggressive species in wildland areas, and reduce weed related impacts. The visual impact of spraying would be temporary and on most sites only last a few hours or less. Dying and wilting weed plants following herbicide treatment could be apparent. However, this appearance would be short-lived as surrounding vegetation would screen dead plants or blend in with native vegetation, as it grew dormant. Some desirable native vegetation could be killed along with invasive plants depending on the type of herbicide used.

Biological control with insects on established weed patches could occur over 50,000 acres and would likely not be noticeable. Some people may notice areas where weed were pulled, but would likely not affect the apparent naturalness of the areas.

Remoteness and Solitude

The public may encounter weed crews during hand spraying operations in Wilderness, or adjacent lands, which may affect some people's sense of remoteness or their opportunity for solitude. Approximately 42% to 47 % of the monitoring and treatment work, or about 1000 to 1100 person days, will occur near Designated treatment areas such as trails, campsites or administrative sites. The crews will spend about 51% to 55% of their time, or about 1100 to 1300 person days, in Dispersed treatment areas such as susceptible grasslands, riparian or open timber habitat types in more remote areas. The overall potential for encounters between the public and work crews would increase to the highest level among the action alternatives, but remain within allowable standards by Opportunity Class as defined in the Selway Bitterroot Wilderness General Management Direction. (See Table 3.6-5, below.)

Table 3.6- 5: Implementation Activity Levels by Site Type in Wilderness

Implementation Activity Level	Alternative 2		Alternative 3		Alternative 4	Alternative 5	
	Design-ated	Dis-persed	Design-ated	Dis-persed	Infested Area	Design-ated	Dis-persed
Person Days	650	250	580	---	130	1000	1340

Table 3.6-5 above, displays the estimated crew personnel that would be necessary to implement all aspects of the alternatives (monitoring, mapping and/or treatment). All action alternatives (Alternatives 2-5) fit within the allowable standards for site and social indicators by Opportunity Class as shown in Table B-1, Selway Bitterroot Wilderness General Management Direction, page B-2 (1992 Updated).

The distribution of potential encounters over the entire operating field season and across all eligible trails, Designated and Dispersed treatment area acres will dilute any social effects. In addition, signage at trailheads would identify general areas in which weed crews will likely be working allowing visitors to choose destinations where encounters with workers would be least likely.

Direct and Indirect Effects, Alternatives 2 thru 5 (Action Alternatives, Dispersed and Developed Recreation Areas outside Wilderness and Inventoried Roadless areas)

Invasive plants in dispersed and developed recreation areas would not be treated with aerial applications of herbicides in any action alternatives in this decision).

Under these action alternatives the effects to natural integrity, apparent naturalness, remoteness and solitude are not evaluated for recreational areas outside wilderness and inventoried roadless areas although many of these effects also occur on dispersed and developed recreational areas. All action alternatives identify integrated treatment programs that would decrease, to varying degrees, the likelihood of the spread of non-native vegetation in these dispersed and developed recreation areas, thus reducing the invasive plant impact on recreation. Action alternatives 2 through 5 were developed primarily to disclose effects to the wilderness resource.

Often campsites in dispersed and developed recreational areas occur within riparian areas due to visitors being attracted to ponds, lakes, streams and rivers. In Alternative 3, where chemical treatment would not occur in riparian areas, invasive plants which become established through visitor use of roads, trails and campsites may proliferate and spread across the landscape more rapidly than in Alternatives 2 and 5.

Alternative 4 would not use chemical treatments anywhere in the Wilderness and would, therefore, be less likely to produce a noticeable short-term change in the presence of weeds in high use recreation areas.

Alternatives 3 and 4 would not treat invasive plants outside of areas of high recreation use (Designated treatment areas), allowing established invasive plants and new invaders to spread to areas where weeds currently are not known to exist or where invasive plant populations currently exist but at low levels. This would ultimately affect recreation activities in additional areas in the future.

Treatments themselves, under all action alternatives, could affect recreational users, particularly during the short period of time during which treatment would occur on these sites. Visual impacts of some mechanical and chemical treatments would be temporary. Once the invasive plant is removed or sprayed, they would begin to yellow and wither. This process would not look much different from the natural wilting of plants. For road or trailside treatment the visual effects would be greatest..

The signs posted at recreation sites and along trails and roads, informing forest visitors of herbicide use at the site, may disturb some visitors who do not like or understand the application of herbicides.

B. Cumulative Effects to Wilderness, Inventoried Roadless Areas and Recreation

Spread of invasive plants and recreational activity will continue to increase, inside and outside of the Wilderness. Within the Wilderness, recreational activity is not as likely to increase the spread or introduction of invasive plants as outside the Wilderness due to the type of recreation occurring. Within the Wilderness, cumulative effects resulting from implementation of Alternatives 2 and 5 and a lesser extent to Alternative 3 and 4, would be the protection of adjacent non-infested areas and preservation of intact plant communities within the Wilderness. Cumulative effects of this increased recreational use are likely to create overall increase in the potential for introduction and spread of invasive plants in the Wilderness and a corresponding reduction in natural integrity.

Under all alternatives, previous bio-control releases outside of wilderness may eventually make their way into wilderness as long as their habitat (invasive plants) exists.

Recreation use is currently on an increasing trend. Increasing recreation pressure from all types of users including hikers, horseback riders, mountain bikers, and off-highway vehicle enthusiasts contribute to a decreased sense of solitude and remoteness and could contribute spreading invasive plants. Travel management decisions to be made in the near future will affect these use patterns to a degree. Those effects are unknown at this point, as a decision on new travel regulations have yet to be made. The current pattern of increasing motorized recreation use of Forest trails has lead to user conflicts and issues relating to remoteness and opportunities solitude in Inventoried Roadless areas. Comments received during scoping for the Bitterroot Forest Travel Plan and forest plan revision indicates that spread of invasive plants, decreasing opportunities for solitude and maintaining primitive recreation opportunities are issues for many users.

Weed spread, continued disturbance and increasing recreational activity are the main activities that contribute to cumulative effects on recreation outside of the Wilderness. Recreational experiences will change due to invasive plants from these factors. Alternatives 2, 3, and 5 have the best chance of reducing the overall impacts on recreation from invasive plants. Alternatives 1 and 4 would be least effective in controlling invasive plants and would lead to a decrease in the quality of the recreation experience.

Management of wildlife, Wildland Fire for Resource Benefits and prescribed fire also has potential cumulative effects on the natural integrity of the Wilderness and Inventoried Roadless Areas. Fire, in whatever form, creates ready seedbeds for invasive plants to become established. Several large wildfires have burned across the project area in the last 5 years. The areas affected by these fires are ripe for expanding weed infestations. Fire control practices themselves can exacerbate weed problems at camps and staging areas. Prescribed burning can have a similar effect. In addition, fuels are often pretreated in prescribed burn areas, which negatively affect the apparent naturalness of the area by leaving unnatural stumps and slash. Many forms of fire have the beneficial effects of returning fire – a natural disturbance process – to a landscape that is dependent on fire, helping regenerate healthy stands of native vegetation.

Prevention and education programs whether with the general public, or with special uses permittees have beneficial effects on limiting the spread of invasive plants on public lands. Some special use activities may have a negative effect on apparent naturalness, the sense of remoteness, opportunities for solitude, and natural integrity in the Wilderness or Inventoried Roadless areas.

3.6.7 CONSISTENCY WITH FOREST PLANS AND OTHER REGULATORY DIRECTION

All alternatives are consistent with management direction found in all three Forest Plans and Interim directives, The Wilderness Act, and the proposed Roadless Area Conservation Rule and all alternatives would maintain recreational opportunities meeting Forest Plan standards.

3.6.8 ENVIRONMENTAL CONSEQUENCES - WILD AND SCENIC RIVERS

This section evaluates the effects of the proposed alternatives in relation to Wild and Scenic River values. Evaluation of the project is made in relation to management direction found in the Bitterroot, Clearwater, and Nez Perce Forest Plans, the Management Guides and River Plan for the Middle Fork Clearwater including the Lochsa and Selway and the Wild and Scenic Rivers Act.

A. Direct and Indirect Effects to the Wild and Scenic River Corridors

The Outstandingly Remarkable Values considered in this analysis are: Scenery, Recreation, Fish, Water Quality, Wildlife, Vegetation/Botany, Prehistory, History, Cultural and Traditional Use.

Scenic Values
This project would primarily affect the more open hillsides that would, under natural conditions, be dominated by bunch grasses, forbs, and low growing shrubs. Most of these areas along the Selway River corridor are in an advanced infestation stage where invasive weeds, primarily spotted knapweed, extend from the riverbanks to the tops of the open hillsides. None of the project alternatives would propose to eradicate these established invaders in advanced stages of infestation. The scope of the project is limited to contain the spread of invasive weeds in these areas from moving into new areas. Therefore, visual changes in areas of advanced infestation are expected to be negligible under all alternatives within the Wild and Scenic River corridors.

In areas categorized as "weed free" or "early infestation," natural vegetation dominates hillsides adjacent to designated or eligible Wild and Scenic River segments. Alternatives 2 and 5 propose treatments that would maintain the natural plant composition currently existing on these slopes where possible. Alternative 4 would apply only to areas currently in an advanced infestation condition and would not propose chemical treatments to control or eradicate new infestations in areas that are weed free or in the early infestation condition. Alternative 3 would only treat invasive plants along existing trails and associated camps and would not prevent invasive plants from infesting and possibly dominating new areas, over the next few decades, which are currently in a natural or near natural condition.
The visual changes associated with advancing infestations, expected under Alternatives 3 and 4 would likely be noticeable to the keen observer. However, the existing balance between areas with closed conifer canopies and open hillsides would be maintained with minor shifts in color and texture so that the visual changes to the overall scenic values would be negligible within the Wild and Scenic River corridors.

Recreation Values
Visitors using established trails and campsites would be minimally affected by this project due to vegetation treatment related activities near the sites. These affects would be expected to decrease over time (after the first 2-3 years of aggressive implementation) as invasive plants are brought under control in these priority treatment areas.

Alternatives 2, 3, and 5 are similar in the amount of acres treated with herbicide in, or adjacent to, the river corridors (primarily limited to heavily used trails and camps). Alternative 3 differs from Alternatives 2 and 5 by not using herbicides to treat invasive plants at river camps along the Selway River or within fifty feet of any live water. The effects in question for these three alternatives would be localized evidence of plants sprayed with herbicide, associated notification signs, and chance encounters with workers conducting treatments. These effects would decrease after the first few years. Following the initial control period, recreationists could also expect invasive plant densities along trails and at campsites to decrease.

Alternative 4 would use no herbicides within the Selway Bitterroot Wilderness, relying instead on the use of bio-control agents, in the Wilderness, to reduce densities of specifically targeted invasive plants. Bio-controls, themselves, would be unnoticeable to all but the trained observer and the chances of encounters with workers dispersing the bio-control agents would be extremely rare.

The overall adverse effects of all action alternatives on recreational values would be short-term and minor within the Wild and Scenic River corridors. Positive effects of fewer invasive weeds along trails and at campsites would accrue over the life of the project.

Fish, Wildlife, Water Quality Values
All alternatives include protection measures, as specified in the Design Criteria listed in Chapter 2, to meet Forest Plan direction, including PACFISH/INFISH criteria for riparian dependant resources and anadromous as well as resident salmonids. Based on the Design Criteria, effects to fish, wildlife, and water quality are expected to be negligible within the Wild and Scenic River corridors.

Vegetation/Botany Values
This project would protect native plants and ecosystems where possible. Alternatives 2 and 5 offer the greatest range of tools and treatment areas with which to protect native species. Alternatives 3 and 4 are much more limited in terms of available treatments and/or treatment areas (Refer to previous discussion under "Scenic Values").

The potential adverse effects to vegetation derived from Alternatives 2, 3, and 5, which propose to use herbicides, are mainly associated with the short term reduction of native forbs and grasses that may be incidentally weakened or killed as a result of herbicide application to target invasive plants. This would be a localized effect of short duration as conditions for the reestablishment of native species improves with the reduction in non-native invaders.

Overall adverse effects to vegetation and botany values would be localized, short term, and minor within the Wild and Scenic River corridors.

Prehistory, History, Traditional and Cultural Use Values
The project area has been evaluated for pre-historic and historic properties and evaluated for effects to these properties where they exist. No effect to cultural properties is anticipated.

Traditional and cultural plants may exist in the project area. Design Criteria, Chapter 2, involve and inform Native Tribes regarding the annual program of work and opportunities to discuss general information needs for tribal members. With the possible exception of short-term localized restrictions none of the action alternatives would interfere with any tribal member's access to, or practice of, traditional or cultural activities within the Wild and Scenic River corridors.

B. Cumulative Effects to the Wild and Scenic River Corridors

As indicated in the section above, direct and indirect effects from all alternatives considered in detail are expected to be localized, limited in scope, and/or of short duration and not expected to have a cumulative effect on Outstandingly Remarkable Values (ORV's) associated with stream segments classified or eligible for classification under the Wild and Scenic Rivers Act such that current or potential classification would be affected.

C. Consistency with the Wild and Scenic Rivers Act

The Wild and Scenic Rivers Act requires designated rivers and their immediate environment to be administered in such a manner as to protect and enhance the values which caused the river to be included in the Wild and Scenic Rivers system. The rivers comprising the Middle Fork Clearwater system were designated as a Wild and Scenic River in 1968. The Middle Fork Clearwater system includes the Lochsa

and Selway Rivers. Within the project area the river is classified as recreational and wild. Specific Sections of the Wild and Scenic Rivers Act are discussed below:

Section 7
No activity is proposed to occur within the normal high water mark of the Lochsa or Selway Rivers that would alter the free-flowing character of these rivers. Therefore no evaluation of effects to free flow as required under section 7 of the WSRA is necessary.

Section 10
Section 10 of the WSRA compels each administering agency to administer designated rivers in such a manner as to protect and enhance the values which caused the river to be included in the Wild and Scenic Rivers system. Each of the identified ORVs for the Selway and Lochsa Rivers have been addressed in the previous section and no adverse effect to any of these resources is anticipated. The ORVs would be protected.

D. Consistency with Forest Plans

The Bitterroot, Clearwater and Nez Perce Forest Plan are silent regarding direction for management of invasive species with the Wild and Scenic River corridors. Compliance with the Selway Bitterroot General Management Direction is discussed in the vegetation section starting on page D-1.

E. Consistency with the Management Guides and River Plan

The Management Prescriptions from the Management Guide and Coordinating Requirements specified in the River Plan are too numerous to duplicate here and none specifically address management of invasive species. By default the project is entirely consistent with the Management Guides and River Plan.

Summary

The Selway Bitterroot Invasive Plant Management project considers a range of alternatives that would reduce, contain, or remove populations of invasive plant species in order to protect or facilitate the restoration of native plant communities and natural ecosystems (Refer to the Alternative summary in Chapter 2 and in previous sections of this chapter).

Evaluation of project implementation methods and desired outcomes indicate the project is consistent with all management direction, mentioned above, and the Wild and Scenic Rivers Act and that all relevant ORV's would be protected.

3.6.9 Irreversible and Irretrievable Effects, Wilderness, Recreation, and Wild and Scenic Rivers

Irretrievable effects to Wilderness for all alternatives would be the temporary loss of native plant species that are sprayed with herbicides or uprooted by mechanical methods incidental to treating target invasive plants. These effects are reversible. See: Impacts to Native Vegetation Communities, in the Vegetation – Environmental Consequences section of this chapter.

Irreversible and irretrievable effects of Alternatives 1, 3, and 4 would be the permanent loss of native plant communities and associated natural ecosystem components as established invaders and new invaders advance into currently weed-free and early infestation areas of the project.

An irreversible effect of Alternatives 2, 4, and 5 would be the establishment, if successful, of non-native bio-control agents within the project area.

There would be no irreversible or irretrievable effects to Recreation or Wild and Scenic Rivers.

3.7 WILDLIFE

3.7.1 INTRODUCTION

This analysis will address the existing condition of selected wildlife species that reside or have potential habitat within the project area, and the potential effects to the species from the proposed invasive plant species control project activities and the alternatives to the proposed action.

3.7.2 REGULATORY FRAMEWORK

This analysis of effects to wildlife species and habitats responds to direction contained in the National Forest Management Act (NFMA), and its implementing regulations at 36 CFR 219; the National Environmental Policy Act (NEPA); the Endangered Species Act (ESA), and conforms with direction in the National Memorandum of Understanding # MU-11130117-028, which addresses Neotropical Migratory Landbird management.

Additionally, FSM 2670 directs that all federal departments and agencies shall seek to conserve endangered and threatened species and shall utilize their authorities in furtherance of the Endangered Species Act and to avoid actions that may cause a species to become threatened or endangered. FSM 2670 also requires the Forest Service to maintain *viable* populations of all native and desirable non-native wildlife, fish, and plant species in habitats distributed throughout their geographic range on system lands.

Direction more specific to wildlife habitats in the project area is contained in the Forest Plans for the Nez Perce, Clearwater, Bitterroot, and Lolo National Forests.

3.7.3 AREA OF ANALYSIS

This analysis will address potential effects to terrestrial wildlife habitats and associated wildlife species from project activities within the project area. Effects to wide-ranging species that may be important in a larger subbasin or national forest context, will also be addressed.

3.7.4 EXISTING CONDITION

The entire project area is approximately 1,400,000 acres in size. Most of it lies within the Selway-Bitterroot Wilderness Area, a 1.35 million acre contiguous tract of wilderness administered by three national forests. The project area also includes 31,000 acres of Inventoried Roadless Area and the remainder is general national forest lands. This large, undeveloped area provides habitat or potential habitat for many species dependent on remote environments with relatively little human disturbance including grizzly bear, wolverine, lynx, wolves, bighorn sheep, mountain goats, and harlequin ducks.

Terrestrial environments within the project area are diverse and provide habitat for an estimated 190 avian species, 61 mammalian species, 8 reptilian species, and 6 amphibian species. The landscape is mountainous and highly dissected with deeply incised stream canyons. It varies from the dry, low-elevation Selway River canyon characterized by ponderosa pine, shrublands, and bunchgrass communities, to subalpine fir and whitebark pine habitats in cold, alpine elevations that range to above 9,000 feet and are interspersed with lake basins.

Fire is a prominent and integral influence in defining the Selway-Bitterroot Wilderness landscape and the native species that evolved with its influence. Fire maintains mosaics of vegetative diversity that provide early seral communities and sustain old growth by periodically reducing fuel accumulations. Climatic variations within the subbasin also contribute to the area's biological diversity. A warm and moist maritime, climatic influence belt along the Selway River canyon is responsible for an array of coastal disjunct species, including western red cedar and Coeur d'Alene salamander.

A. Threatened and Endangered Species

This analysis responds to the requirement that federal agencies address effects to listed threatened, endangered, and proposed species during project planning under the Endangered Species Act of 1973 as amended (P.L. 96-159 1531(c)).

Threatened and endangered species selected for this analysis are consistent with U.S. Fish and Wildlife Service Species list 2007-SL-0098 dated December 1, 2006. This update lists the Canada lynx, grizzly bear, and gray wolf, as federally listed species that may occur or whose habitat may occur within the Nez Perce, Clearwater, Lolo and Bitterroot National Forests. No “proposed” wildlife species are currently listed.

Canada Lynx (Lynx canadensis)
The Canada lynx is listed under the Endangered Species Act by U.S. Fish and Wildlife Service as a “Threatened” species.

Review of historic and current records indicate that lynx sightings are rare but do infrequently occur in the Selway Bitterroot Wilderness and adjacent national forest lands. Historic records indicate lynx were trapped and killed for many years within the Moose Creek Ranger District in the Wilderness. Lynx may have been numerous in Lynx Creek at some point in time. But the only documented, historic account found estimates 30 lynx in Moose Creek in 1946 (*Moose Creek Ranger District Historical Information Inventory and Review, Nez Perce National Forest* USFS, 1988).

Lynx utilize Engelmann spruce, subalpine fir, or lodgepole pine habitats that provide a mosaic of forest age classes. They require early successional habitats for foraging and forested habitats for security, cover, and denning. Early successional habitats or forest age classes of approximately six years or older, occurring in at least 20 to 25 acre patches provide optimum lynx foraging habitat. Foraging habitat can best be evaluated by assessing snowshoe hare habitat. Koehler (1990) found that lynx prey almost exclusively on snowshoe hares.

Gray Wolf (Canis lupus)
Historically, gray wolves were known to range throughout Idaho and Montana until the mid to late 1800's. They were largely eliminated in the central Idaho and western Montana by the 1930's (Hansen 1986) due to conflicts with mining and livestock operations, along with a reduction in their prey base. As wolf populations grew in Canada, they began to migrate into Montana. Gray wolf reproduction was again evident in western Montana by the 1980’s. In January of 1995 and 1996, gray wolves were reintroduced into central Idaho as an "experimental/nonessential" population under provision 10J of the Endangered Species Act. Since the initial reintroduction, populations have steadily increased.

In December 2002, the Northern Rocky Mountain wolf population attained the established population recovery goal of 30 breeding pairs of wolves well distributed throughout the states of Idaho, Montana, and Wyoming for 3 consecutive years (USFWS et al. 2003). Wolf populations continue to increase since

recovery goals were met. At the end of 2006, the Northern Rockies population was estimated at 1300 wolves (USFWS et al. 2007).

Ungulate winter range is believed to be the most important habitat component available to wolves in the Wilderness. East Fork Moose Creek, a tributary of the Selway River, is known as a historically important wolf travel corridor between the Selway and the Bitterroots.

Invasive plant species encroachment can reduce the quality and availability of suitable forage for ungulate populations wolves depend on for food. Fire exclusion has reduced early seral ungulate prey habitat conditions that were historically maintained by natural fire regimes. Climax meadow and early seral habitats at both low and higher elevations, once maintained by fire, have decreased, resulting in reduced forage for elk, deer, and other ungulate prey.

Grizzly Bear (Ursus arctos horribilis)

The grizzly bear is federally listed by the USFWS as a threatened species. Historically, the grizzly bear was common in the Bitterroot Mountains until the early 1900's. Lewis and Clark found grizzlies more often than black bear in their travels along the Clearwater River. William Wright's 1909 accounts of his grizzly hunting expeditions in the west documented numerous grizzly encounters in the Selway and Bitterroot country. Accounts include grizzlies killed at Elk Summit and in Moose Creek (Wright, 1913). Based on conservative estimates, Bud Moore (1986) concluded that trappers harvested 25 to 40 grizzlies annually in the Selway Bitterroot Mountains near the turn of the century. By the 1950s grizzly bears were virtually extirpated from the Bitterroots and much of the west due to intensive hunting, trapping, predator control programs, and the decline of anadromous fish runs (USFWS, 2000).

Evidence of grizzly bear presence was verified east of the Bitterroot divide between the Bitterroot Valley in Montana and the Nez Perce National Forest in the fall of 2002. As evidenced through radio tracking, grizzly bears are moving westward from occupied areas in Montana in recent years (personal communication. James Jonkel, MDFWP, 2003).

Grizzly bears are considered to be wilderness dependent because of their large space requirements and need for remote habitats with minimal disturbance. The more than one million acres of the Selway-Bitterroot Wilderness provide extensive roadless security to grizzly bears.

Optimum grizzly habitat is thought to include extensive timbered areas that provide security cover adjacent to or continuous with grassland-herbland, shrubland, or other open-site feeding areas. Daybeds, used for resting between feeding periods, are usually located in relatively open timber stands immediately adjacent to open area feeding sites (Knight, 1977; Craighead and Craighead, 1972).

Potential threats to grizzly bears in the project area include risks of direct human caused mortalities, bear baiting, artificial foods and attractants associated with dispersed camps and campgrounds, outfitter camps, administrative sites, and private wilderness inholdings. Potential indirect impacts affecting grizzly habitat include fire suppression and invasive plant species encroachment that impacts forage and availability of the ungulate carrion food source.

Officially, the USFWS does not consider any portion of the project area to be permanently occupied by breeding populations of grizzly bears at this time.

B. Sensitive Species

The Northern Regional Forester of the U. S. Forest Service has designated as "sensitive" those species for which population viability is a concern on each national forest within the region.

The designated “sensitive species” which occupy or may have habitat within the Selway-Bitterroot Wilderness include: peregrine falcon, black-backed woodpecker, black swift, common loon, flammulated owl, harlequin duck, mountain quail, northern goshawk, pygmy nuthatch, white-headed woodpecker, fisher, fringed myotis, wolverine, northern bog lemming, Townsend’s big-eared bat, Coeur d’Alene salamander, northern leopard frog, western toad, and ringneck snake.

Sensitive species known (K) or suspected (S) to occur on the four national forests having lands within the Selway-Bitterroot Wilderness Area, are denoted in Table 3.7-1. below. Priority habitats for each species is also noted.

Table 3.7- 1 Sensitive Species

Species	Priority Habitat	Nez Perce	Clearwater	Bitterroot	Lolo
Birds					
Bald eagle *(Haliaeetus leucocephalus)*	Prominent, large trees in close proximity to water	K	K	K	K
American Peregrine falcon *(Falco peregrinus anatum*)	Cliffs in proximity to water	K		K	K
Black-backed Woodpecker *(Picoides arcticus)*	Dead-dying trees/ Fire- landscape disturbance	K	K	K	K
Black Swift *(Cypseloides niger)*	Cliffs associated with waterfalls	S			
Common Loon *(Gavia immer)*	Lakes				K
Flammulated Owl *(Otus flammeolus)*	Xeric forest/ Late seral-old forest	K	K	K	K
Harlequin Duck *(Histrionicus histrionicus)*	Aquatic/Riparian	K	K		K
Mountain Quail *(Oreortyx pictus)*	Ponderosa pine/ Riparian shrub	K			
Northern Goshawk *(Accipiter gentilis)*	Late seral / Old forest	K	K	K	K
Pygmy Nuthatch *(Sitta pygmaea)*	Ponderosa pine/ Old forest	K	K		
White-headed Woodpecker *(Picoides albolarvatus)*	Ponderosa pine/ Old forest	K			
Mammals					
Fisher *(Martes pennanti)*	Mesic late seral/ Old forest/ Security	K	K	K	K

Species	Priority Habitat	Nez Perce	Clearwater	Bitterroot	Lolo
Fringed Myotis *(Myotis thysanodes)*	Snags/ ponderosa pine	K	K		
North American Wolverine *(Gulo gulo luscus)*	Remote lake basins, talus	K	K	K	K
Northern Bog Lemming (Synaptomys borealis)	Wet meadows, fens, bogs			K	K
Townsend's Big-Eared Bat (Corynorhinus townsendii)	Caves, abandoned mines, structures/ Douglas fir, ponderosa pine, lodgepole pine habitats	S	S	K	K
Amphibians					
Coeur d'Alene Salamander (Plethodon idahoensis)	Rock/water interface zones	K	K	K	K
Northern Leopard Frog (Rana pipiens)	Wetlands, often with few or no trees			S	S
Western toad (Bufo boreas)	Wetlands	K	K	K	K
Reptiles					
Ringneck Snake (Diadophis punctatus)	Low elevation shrubs	S	S		
K = Known S = Suspected					

Xeric Habitats and Associated Species

The analysis area includes xeric habitats, which are warm and dry ponderosa pine, Douglas fir, and grand fir habitat associations including grasslands and shrublands.

Trees in these habitats are typically open grown with bunchgrass and shrub understories. The xeric habitats primarily occur at low elevations on south and west aspects. Some slopes in the drier habitats are steep.

Key habitat features of the xeric aggregation include open ponderosa pine/ Douglas fir forest and important low elevation bunchgrass communities that provide available winter forage for ungulates.

Winter range integrity has diminished in the project area as a result of fire suppression and invasive plant species encroachment. These changes have important habitat implications for ungulates, including bighorn sheep, elk, and mule deer, and carnivores that prey on them.

Sensitive species associated with xeric habitats in the project area include peregrine falcon, white-headed woodpecker, flammulated owl, mountain quail, and pygmy nuthatch, fringed myotis, Townsend's big-eared

bat, and ringneck snake. A summary of the ecology and status in the project area for each of these species, relevant to proposed project activities, is presented below.

American Peregrine Falcon (Falco peregrinus anatum)
The peregrine falcon was classified as Endangered, but was delisted in 1999. It is now treated as a sensitive species in the Northern Region. Rangewide status of peregrine falcon is vulnerable at the subspecies level (G4T3) and statewide status indicates imperiled breeding (S2B) from Idaho CWCS September 2005 draft (IDFG 2005).

The subspecies of peregrine falcon (*Falco peregrinus anatum*) occurring locally underwent the most dramatic decline from 1950 to 1970, likely as a result of contamination of prey by persistent residue organic compounds (especially DDT). Banning the use of DDT has improved the nesting success of peregrine falcons, but cannot entirely explain the decreases observed with peregrine falcons in the past. What little data exists on peregrines indicate a slight declining trend in the West as a whole (Dobkin 1992). However, in Region One there has been an apparent population increase.

Peregrine falcons use cliffs taller than 150 feet for nesting. Their prey base consists of small to medium-sized birds.

White-headed woodpecker (Picoides albolarvatus)
White-headed woodpeckers use a variety of forest types, but are primarily associated with open-canopies of mature to old growth ponderosa pine. They may also occasionally be found in mixed pine/Douglas-fir forests. Fire-climax forests characterize these communities. White-headed woodpeckers forage in open ponderosa pine forests where they rely heavily on pine seeds during the winter months and insects during the summer (Ligon 1973). Both of these resources are typically more abundant on mature or older ponderosa pine, than in younger forests. Home range sizes are relatively small and vary in size depending on the degree of forest fragmentation, but may range from 64-297 hectares (Ligon 1973:862-869; Blair et al. 1995.

Fire exclusion in old pine forests throughout the project area has accelerated fuel accumulation with increased risk for stand replacing fire events and has facilitated encroachment of shade tolerant tree species that reduces ponderosa pine habitat.

Current white-headed woodpecker population status in the project area is unknown.

Flammulated owl (Otus flammeolus)
Flammulated owls prefer old growth and occupy older ponderosa pine and Douglas-fir, and mixed coniferous forests. Their preference for ponderosa pine and/or Douglas-fir forests has been linked to prey availability. Stands used by flammulated owls also tend to be relatively open (Goggans, 1986). The presence of cavities and snags is important in habitat selection (Reynolds and Linkhart, 1992).

The largest component of the flammulated owl diet consists of nocturnal lepidopteran moths, which it gleans from the open branches of ponderosa pine trees. Roosting habitat, in the form of scattered dense conifer patches, is rarely limiting.

Although limited survey work has been done in the project area, the owl has been documented in the lower and upper Selway River canyon (Shepherd and Servheen, 1992) and is known to occur on all four national Forests associated with this analysis.

Mountain quail (Oreortyx pictus)
Mountain quail populations have been significantly reduced throughout most of their historic range. The remaining mountain quail population nucleus in Idaho occurs in the Little Salmon River, the Salmon River, and the Snake River canyons of west-central and north-central Idaho (Heekin, 1994). One mountain quail observation, at the Fenn Ranger Station, was recorded in 1974. An account of a mountain quail at the site once occupied by Three Links Ranger Station, was documented in the 1950s. Both of these accounts occurred on the Moose Creek Ranger District of the Nez Perce National Forest.
Potential mountain quail habitat in the project area and vicinity occurs in the Selway River canyon, and xeric tributaries including White Cap, Indian, Deep, and Three Links Creeks. Current population status in the project area is unknown.

Mountain quail are closely associated with steep, shrubby riparian areas and associated uplands. Mountain quail are known to have seasonal preferences. Except in mild winters, mountain quail move down in elevation inhabiting riparian shrub/tree and mountain shrub cover types. Mountain quail usually move to higher elevation breeding areas that support either riparian shrub/tree cover types, conifer/shrubs cover types, or mountain shrub cover types adjacent to conifer/shrub cover types.

Foraging habitat consists of the edge interface between grasslands and shrub or conifer/shrub communities. Nesting can occur between March and August depending on local climate conditions and may re-nest if a nest is destroyed (Robertson 1989:6-7; Heekin 1991:8; Heekin and Reese 1995:20-21; Vogel and Reese 1995:28).

Loss of ponderosa pine breeding and brood rearing habitat through advancement of succession in the absence of fire has diminished mountain quail habitat throughout most of its range in Idaho. Invasive plant species encroachment has probably influenced availability of native forage species and restricted the quail's ability to move through its habitat.

Pygmy nuthatch (Sitta pygmaea)
The pygmy nuthatch ranges from southern interior British Columbia, northern Idaho, western Montana, central Wyoming, and southwestern South Dakota, south to northern Baja California, southern Nevada, central and southeastern Arizona, central New Mexico, extreme western Texas, extreme eastern Oklahoma, and south in mountains to central Mexico.

Pygmy nuthatches are snag dependent and show a strong and almost exclusive preference for ponderosa pine forests. Their geographic range is almost co-extensive with that of ponderosa pine (*Pinus ponderosa*), Jeffrey pine (*Pinus jeffrey*), and similar species (Kingery and Ghalambor, 2001). They are found at elevations up to 9600 feet.

Because the pygmy nuthatch nests primarily in dead pines and live trees with dead sections, it prefers mature and undisturbed forests that contain a number of large snags (Szaro and Balda 1982).

Insects, primarily weevils, leaf and bark beetles, are the predominant food in the summer, especially of the young. During winter, their diet includes many seeds.

Past fire suppression has been detrimental to potential pygmy nuthatch habitat. Pygmy nuthatches may prefer ponderosa pine in the large tree size class for nesting and feeding.

Ringneck snake (Diadophis punctatus)
In Idaho, ringneck snakes can be found in disjunct areas over much of the state. They are known to inhabit forested shrublands or open hillsides that have rocks or other debris for them to hide in, and they may use microhabitats that are moist (Storm and Leonard, 1995).

The diet of the ringneck snake consists of earthworms, slugs, other small invertebrates, and small salamanders, frogs, lizards, and snakes.

The project area contains potential habitat for ringneck snakes in the forested shrublands within the xeric habitats. There are no known records of ringneck snakes in the project area but they have been documented locally in the Middle Fork Clearwater canyon and the Salmon River canyon.
Risks from fire suppression and invasive plant encroachment are likely detrimental to ringneck habitat.

Townsend's big-eared bat (Corynorhinus townsendii)
Big-eared bats occur in a wide variety of habitat types and forage in many areas, including grasslands, shrublands, vegetated stream corridors, forests, and along roadways that provide easy flight "tunnels" through forested habitat. They use snags, caves, buildings and rock crevasses for daily roosting and for maternity roosts, and are very susceptible to disturbance at those sites. Open water is also important habitat for bats.

The project area provides foraging habitat and large diameter snags for roosting. There are no known winter summer roosting, summer roosting, or summer maternity sites identified within the project area. Large diameter snags that are hollow may provide alternative roost sites.

Fringed myotis (Myotis thysanodes)
The fringed myotis is found in montane habitats in Idaho and Montana. The species is irregular and local in distribution and is generally uncommon at the edges of its range. Many aspects of the species ecology and abundance are poorly understood. The fringed myotis prefers dry coniferous forests and usually at elevations of 4,000 to 8,000 feet. Maternity colonies, day roosts, and night roosts for the fringed myotis are found in underground mines, caves, buildings, bridges, rock crevices and large tree cavities. Roost trees are usually large diameter snags in early to medium stages of decay. The species forages for insects in riparian and wetland areas (Genter, 1989 and Wisdom, et al., 2000)

A 1998 bat survey at the Moose Creek Ranger Station documented fringed myotis and
potential habitat is available in the xeric types, throughout the project area, especially large diameter snags.

Mesic Habitats and Associated Species

Mesic wildlife habitats in the project area are represented by mesic, mixed conifer habitats, including grand fir, lodgepole pine, subalpine fir, and western red cedar.

Sensitive species associated with mesic habitats in the project area include northern goshawk, black-backed woodpecker, and fisher.

Fire suppression has reduced early seral habitat conditions. Climax meadow and early seral habitats at both low and higher elevations, once maintained by fire, have decreased, resulting in reduced forage for ungulates. Shrublands have also declined. Mesic old growth generally better represented across the project area than in presettlement times as a result of fire suppression. Patch size diversity has sharply declined and canopy densities have changed in some cases. Recently burned habitats that provide unique elements like insect infestations, standing and down dead wood components, and early seral forage are absent due to fire exclusion.

A summary of the ecology and status in the project area for each of these species, relevant to proposed project activities, is presented below.

Northern goshawk (Accipiter gentilis)
The northern goshawk is found throughout North America (DeGraaf et al. 1991, p. 79). It is a large forest raptor and is considered a late-seral or old growth dependent species.

Northern goshawk habitat in the western United States is characterized by mature to old growth forest with dense canopy cover. Typical goshawk nesting habitat in western Montana and northern Idaho is mature to overmature conifer forest with a closed canopy on a moderate slope facing north, at or near the bottom of a slope (Hayward and Escano 1989).

Goshawks have been observed and have been documented across the Nez Perce, Bitterroot, and Clearwater, and Lolo National Forests.

Invasive plant encroachment may impact goshawks indirectly by limiting the native plant food supply their prey species depend on.

Black-backed woodpecker (Picoides arcticus)
Black-backed woodpeckers evolved with and have become dependent on natural landscape disturbances, particularly fire. The habitat that offers the greatest potential benefit to black-backs is lodgepole pine forest. They are also somewhat nomadic and will move opportunistically to large areas with fire-killed dead and/or dying trees infected with bark and wood-boring beetles. Although black-backed woodpeckers are a resident species, over much of their range they exhibit irruptive dispersal in response to beetle outbreaks cause by forest disturbances (Dixon and Saab, 2000).

Threats to black-backed woodpeckers in the project area are primarily associated with wildfire suppression.

Fisher (Martes pennanti)
Fishers prefer mature to old growth coniferous forests containing a diversity of habitat types and successional stages. Fisher are closely associated with forested riparian areas which are used extensively for foraging, resting, and travel corridors (Heinemeyer and Jones 1994). They prefer mature to old growth grand fir forests and utilize stands containing Pacific yew with large diameter spruce and Douglas-fir particularly in the summer (Jones 1991). Home ranges vary between 0.61 and 15 square miles. Jones also found that fishers are not strict old growth obligates but instead prefer young to medium aged forest during the winter months.

Fisher populations declined significantly in the early 1900s. The decline is largely attributed to habitat loss through settlement and logging, over-trapping, and predator poisoning, and the extensive fires that burned in the Bitterroot Mountains between 1910 and 1934 (Jones, 1991). Western populations remain at low levels.

Several fisher observations over the years have been documented in and adjacent to the project area.

Riparian and Aquatic Habitats and Associated Species

Bald Eagle (Haliaeetus leucocephalus)
In Idaho, and western Montana, bald eagles tend to winter near open water (USDI 1986).
Carrion from large ungulates is the primary food source for these eagles, and they use large, open-branched ponderosa pine as perch and roost trees, which allow good visibility of large ungulate carcasses.

No existing or historic bald eagle nesting activity has been documented in the project area to date. Bald eagles are winter residents along the major rivers in and adjacent to the project area and can be found from October through April. Peak numbers occur between November and February.

Prominent, large trees in close proximity to winter foraging areas characterize perch sites. Roost sites often are wind-sheltered, dominant trees in river canyon bottoms. Bald eagles inhabit areas adjacent to and within close proximity to water sources providing an abundance of prey species, such as waterfowl, anadromous fish, and ungulates on winter ranges, which provide a source of carrion.
Invasive plant species encroachment, fire suppression, and public uses that may impact the productivity or availability of winter ranges by native ungulates, also may indirectly impact bald eagles by reducing carrion food sources.

Harlequin duck (Histrionicus histrionicus)
Harlequin ducks (Histrionicus histrionicus) are sea ducks that winter in coastal areas and breed along swift-flowing mountain streams. Harlequins nest in riparian areas of relatively undisturbed, low-gradient mountain streams in mature to old growth forests. Breeding habitat includes second order or larger streams with an average gradient between one and seven percent, riffle habitat, clear water, gravel to boulder-sized substrate, and forested bank vegetation (Cassirer et al. 1996). Additional characteristics that may increase likelihood of use by harlequin ducks include hiding cover along the stream, absence of human disturbance, and lack of access by road or trail. Harlequins feed on aquatic insect larvae such as midges, blackflies, caddisflies and stoneflies.

The entire Idaho population is less than 100 birds on about 30 streams in northern Idaho. Eighty-nine percent of known and probable breeding occurrences and 93 percent of known and probable breeding streams in Idaho are on lands managed by the Forest Service.

The draft *Harlequin Duck Habitat Assessment and Conservation Strategy*, (Cassirer et al., 1996) prepared for the Forest Service and the Bureau of Land Management lists the Selway River as a known harlequin duck breeding stream and Bear Creek as a stream with documented sightings but with unknown breeding status. Moose Creek, and White Cap Creek, within the project area, are streams listed as being potential harlequin duck breeding streams because of suitable habitat. In 1989, harlequins on the Selway River and a pair in Bear Creek were reported. Harlequins also occur in the adjacent Lochsa River, a tributary of the Middle Fork Clearwater River, and in the South Fork of the Clearwater River.

Harlequin ducks can be displaced by instream river use, particularly on narrow streams. Instream recreational activities like boating and angling may be more disruptive when occurring during the pre-nesting and early brood rearing season from May through July, than when occurring later in the breeding cycle from August through September. Large-scale rafting operations in the breeding period may cause chronic disturbance in heavily used river stretches.

Human activities along the banks, including hiking, angling, and camping, may also displace ducks and indirectly impact reproduction. Adult harlequins are relatively tolerant of low levels of disturbance. Areas chronically disturbed are eventually abandoned. Harlequins sometimes flush in response to approaching boats, depending on the size of the craft, width of the stream, and water levels. All streams in the subbasins where harlequin ducks have been observed and where potential habitat is thought to exist are in wilderness.

Coeur d' Alene salamander
The Coeur d' Alene salamander is designated a sensitive species by the Forest Service Northern Region and the Bureau of Land Management in Idaho. It is known to occur on all four national forests associated with this analysis. It is designated a state species of special concern in Idaho and Montana because it is a

regional endemic, known only from northern Idaho, northwestern Montana, and southern British Columbia, and because of its specific habitat association with seeps, streams, and waterfalls.

The Coeur d' Alene salamander is one of only four salamander species known to occur in Idaho and Montana, and is the only lungless salamander known from the northern Rocky Mountains. Eighty-five percent of the sites of occurrence for Coeur d' Alene salamanders in the U. S. have been documented in northern Idaho. The Selway River drainage bounds the southern limit of its known range in Idaho.

Coeur d'Alene salamanders, like all plethodontid salamanders, are lungless and respire through their moist skin. They lose water to the environment through evaporation and are therefore restricted to cool, damp environments. They spend most of their life underground and are usually only above ground at night during moist weather in the spring and fall, and sometimes in summer with favorable moisture conditions. They may spend up to 7 months of the year underground in cool, moist interstitial spaces between rocks to avoid desiccation in summer and freezing in winter.

Coeur d' Alene salamanders have been found in three major types of habitats: springs or seeps, waterfall spray zones, and edges of streams. Most known locations are associated with seeps, probably because of the relative ease of surveying roadside seeps.

Coeur d'Alene salamander occurrences are generally located in coniferous forests, but are not restricted to a particular overstory species or aspect. Populations have been found in areas with ponderosa pine (*Pinus ponderosa*), Douglas-fir (*Pseudotsuga menziesii*), western larch (*Larix occidentalis*), western red cedar (*Thuja plicata*) and western hemlock (*Tsuga heterophylla*) overstories (Groves 1988, Groves et al. 1996) at all aspects.

A Coeur d' Alene salamander population discovered along the lower Selway River in 1998 was on a steep, south facing, rocky slope devoid of tree cover but was associated with seeps. Many of the individuals were found under fallen rock at the bottom of the slope in the road ditch where water had accumulated.

Coeur d' Alene salamanders exist as small, isolated populations with low reproductive rates that are vulnerable to extinction from catastrophic events like fire and floods, and from loss of genetic diversity that could restrict the species' ability to respond to changing environmental conditions. These factors may have significant implications for long-term viability of the species.

There is rising global concern about declining amphibian populations. Amphibians are sensitive bioindicators of environmental change because of their highly permeable skin, trophic positions, and occurrence in fragmented but interconnected populations. The status of salamander populations is one indicator of the overall health of an ecosystem.

Improper application of herbicides used for weed control could directly impact salamanders as well as through contamination of water. (Cassirer et al. 1995).

Western toad (Bufo boreas)

The western toad is widely distributed in Idaho and Montana and can be found in appropriate habitat throughout most of the two states. They are largely terrestrial but are generally found within a fair proximity to water. Habitats range from mountain meadows to desert shrub flats.

Habitats used by boreal toads in Montana and Idaho include low to high elevation streams, ponds, marshes, lake shores, potholes, wet meadows, fens, and tarns at or near treeline (Rodgers and Jellison 1942). Forest cover in or near encounter sites is often unreported, but toads have been noted in open-canopy ponderosa pine woodlands and closed-canopy dry conifer forest.

In the northwest, larvae filter suspended plant material, or feed on bottom detritus. Adults eat flying insects and spiders, crayfish, sowbugs, and earthworms. Birds and garter snakes prey on adults, and predatory insect larvae feed on young.

Western toads appear to be declining in the Greater Yellowstone Ecosystem and in other parts of the western United States.

Northern leopard frog (Rana pipiens)
Northern leopard frogs are suspected to occur on the Bitterroot and Lolo National Forests.

Habitats used by northern leopard frog in Montana are similar to those reported for other regions, and include low elevation and valley bottom ponds, spillway ponds, beaver ponds, stock reservoirs, lakes, creeks, pools in intermittent streams, warm water springs, potholes, and marshes (Brunson and Demaree 1951, Mosimann and Rabb 1952, Black 1969, Miller 1978, Dood 1980, Reichel 1995, Hendricks and Reichel 1996, Hendricks 1999). There is no evidence that this species in Montana has ever occupied high elevation wetlands, in contrast to Wyoming and Colorado (Baxter and Stone 1985, Hammerson 1999).

More specifically, northern leopard frogs require a mosaic of habitats to meet annual requirements of all life stages. Generally separate sites are used for breeding and overwintering, but this may occur in the same pond in some cases. They occupy a variety of wetland habitats of relatively fresh water with moderate salinity, including springs, slow streams, marshes, bogs, ponds, canals, flood plains, beaver ponds, reservoirs, and lakes, usually in permanent water with rooted aquatic vegetation. Habitats are often with few or no trees, but in Alberta and Colorado forested areas may be used. In summer, adults and juveniles commonly feed in open or semi-open wet meadows and fields with shorter vegetation, usually near the margins of waterbodies, and seek cover underwater; taller, denser vegetation seems to be avoided.

Eggs are laid and larvae usually develop in shallow warm and still water, generally in areas well exposed to sunlight. Generally eggs are attached to vegetation just below the surface of the water.

Timing of reproduction appears variable, and depends on the year and location. Calling males have been reported in April and May. Eggs and tadpoles have been reported at breeding sites across eastern Montana during early April to late July, with a peak in May and June; sometimes tadpoles are observed in August and September (Reichel 1995, Hendricks and Reichel 1996, Hendricks 1999, Hossack et al. 2003).
Eggs hatch in about 1 to 2 weeks; the larval (tadpole) period is about 10 to 12 weeks (58 to 105 days). Hatching may occur over several weeks at a single site. Recently metamorphosed juveniles appear in late June and early July at lower elevations, and in mid-July to September at higher elevations (Hammerson 1999). Aquatic larvae usually metamorphose in summer, but they may overwinter as tadpoles in some areas (Baxter and Stone 1985). Females are sexually mature usually in two years in most areas, three years in high elevation populations.

Black swifts (Cypseloides niger)
Black swifts are suspected to occur on the Nez Perce National Forest. In Idaho, the black swift prefers higher elevation mountains. Black swifts forage over forests and in open areas. They nest behind or next to waterfalls and wet cliffs (Michael 1927, Knorr 1961, Foerster and Collins 1990), on sea cliffs and in sea caves (Vrooman 1901, Legg 1956), and occasionally in limestone caves (Davis 1964). Nests are located in dark, inaccessible sites with an unobstructed flight path (Knorr and Knorr 1990). Nest site persistence and tenacity is almost absolute (Knorr and Knorr 1989). The nest is a cup-like structure of mud, mosses and algae.

Black Swifts feed on insects (e.g., flying ants, caddisflies, mayflies, beetles, flesh flies, hymenopterans). They catch insects in the air, often at great heights and often forage with other swifts at the leading edges of rainstorms (Costa Rica) (Stiles and Skutch 1989).

Information from areas within the black swifts' range indicates they nest in small colonies. Nest site persistence and tenacity are almost absolute. A single egg is laid in June to July. The nestling is altricial and fledges in approximately 45 days.

Five factors found present at nest sites include water, high relief, inaccessibity, shade, and unobstructed flyways (Knorr 1961).

Common loon (Gavia immer)
In Montana, spring migration begins in early to mid-March. Fall migration starts in late August and may continue through October in Montana. Transient sightings occur throughout the state during spring migration, especially between April and June, and fall migration, between September and November. The species is not known to remain on breeding lakes throughout the year, although there are observations of common loons remaining in Montana throughout the winter.

Generally, common loons dive from the surface and feed mainly on fishes but are opportunistic and will eat any suitable prey they can readily see and capture (McIntyre 1988) including amphibians and various invertebrates (Terres 1980). Their primary food on breeding lakes is yellow perch (*Perca flavescens*), followed byother shallow, warmwater fish and minnows (Cyprinidae) (Olson and Marshall 1952, Palmer 1962, Barr 1973, McIntyre 1986).

Salmonids are taken on lakes that have low populations of other fish species (McIntyre 1988). Crustaceans, especially crayfish (Decapoda), are commonly taken, and plant material is occasionally eaten (Palmer 1962, McIntyre 1988). On lakes without fish, loons have been reported feeding on molluscs, insects, amphipods and amphibians (Munro 1945, Parker 1985). Young birds have a diversified diet consisting primarily of small fish and minnows, aquatic insects and crayfish (McIntyre 1988).

If nesting on a small lake, they may use an adjacent lake for supplementary foraging (Johnsgard 1987). In Ontario, loons attempting to raise a chick on a fishless, acidic lake fed the chick benthic algae and possibly benthic invertebrates, but flew to other lakes to feed themselves (Alvo et al. 1988). They feed usually in waters less than 5 m deep.

Northern bog lemming (Synaptomys borealis)
Northern bog lemmings in Montana have been found in at least nine community types, including Engelmann spruce, subalpine fir, birch, willow, sedge (*Carex*), spike rush (*Eleocharis*), or combinations of the above, often occurring in wet meadows, fens, or bog-like environments. Wright (1950) captured lemmings in a swampy area containing spruce trees, timothy, alder and other moist-site plants (Wright 1950). The Upper Rattlesnake Creek specimen was captured in a wet-sedge/bluejoint meadow near subalpine fir (Adelman 1979). Areas with extensive moss mats, primarily sphagnum, are the most likely sites in which to find new populations (Wright 1950, Reichel and Beckstrom 1994, Reichel and Corn 1997, Foresman 2001a).

Throughout their range a variety of habitats are occupied, especially near the southern edge of the global distribution, and include sphagnum bogs, wet meadows, moist mixed and coniferous forests, montane sedge meadows, krummholz spruce-fir forest with dense herbaceous and mossy understory, alpine tundra, mossy streamsides, and even sagebrush slopes in the case of *S. b. artemisiae* in British Columbia (Clough and Albright 1987). Typically, occupied habitat has high moisture levels. The northern bog lemming

occupies burrow systems up to a foot deep, and also surface runways. Young are born in nests that may be underground or on the surface in concealing vegetation.

Northern bog lemmings feed on grasses, sedges, and other herbaceous vegetation, but also snails, slugs, and other invertebrates (Foresman 2001a). In Montana, diet (7 stomachs from 7 sites) includes at least 17 moss species, making up an average 59% of the stomach contents (Reichel et al. in preparation).

Alpine Habitats and Associated Species

Alpine habitats are the least common habitat aggregation in the project area. They occur on the high elevation, rock dominated divides that separate the Selway River from the Lochsa, Bitterroot, and Salmon Rivers, and on other high elevation ridges within the project area. Key habitat features in the alpine aggregation include whitebark pine communities, montane meadows, massive rock formations and talus, and high lakes environments.

Alpine habitats are characterized by cold and moderately dry subalpine fir and cold whitebark pine and subalpine fir. Alpine habitats are dominated by open stands of whitebark pine, lodgepole pine, alpine larch, subalpine fir, and Engelmann spruce. Understories consist of grouse whortleberry and smooth woodrush.

Current Departures from Historic Conditions
Whitebark pine has been significantly diminished and is a key component of grizzly bear habitat. Fire suppression and blister rust disease are the major factors in the decline. Montane park has significantly increased, also due to fire suppression. Native amphibian populations are at risk or obliterated at lakes stocked with introduced fish, especially brook trout. Some roads and trails with motorized vehicle use access alpine habitats and species. Disturbance sensitive species, including mountain goats and wolverines, may be influenced by the concentrated human activity.

Spotted knapweed has been observed above 8,000 feet at Bailey Mountain in the Wilderness. Although dominance of invasive plant species is less in the alpine settings compared to the lower elevations, distribution for some species does extend there.

Wolverine (Gulo gulo)
Wolverine range extends from Labrador, east to Alaska, and south to mountainous regions of the western United States. In Idaho, wolverine distribution includes mountainous areas from the South Fork of the Boise River, north to the Canadian border (Groves, 1988). Wolverines were nearly extinct in Montana during the early 1900's and have been increasing in numbers and range since. Recovery originated in northwestern Montana and subsequently spread to its current range (Newby and Wright 1955, Newby and McDougal 1964).

The wolverine is considered a sensitive species by the Forest Service Northern Region. It is illegal to kill wolverines in the state of Idaho but Montana. trapping regulations allow for one wolverine to be taken per person each season in the state.

Wolverine sightings are rare, but occasionally occur in alpine lake basins in summer and at lower elevations in winter. Wolverines have been reported in and adjacent to the Selway-Bitterroot Wilderness.

Hatler (1989) believed wolverines are not dependant on any particular vegetative habitat type. Banci (1986) reported "habitat requirements appear to be large, isolated tracts of wilderness supporting a diverse prey base, rather than specific plant associations or topography." South of the boreal forest, most habitat

descriptions in the literature agree with Grove's (1988) characterization of "large, mountainous, and essentially roadless areas."

In Montana, Hornocker and Hash (1981) found most wolverine use in medium to scattered timber, while areas of dense, young timber were used least. Wolverines avoided clearcuts and burns, crossing them rapidly and directly when they were entered at all. Hash (1987) reported wolverines in the Northern Rocky Mountain region were associated with fir, pine, and larch. Aspen stands were also used, as were cottonwoods in riparian areas. Ecotonal areas appeared to be important habitat components (Hash 1987).

Wolverines feed on a variety of roots, berries, small mammals, bird eggs, fledglings, and fish. They may attack moose and deer hampered by deep snow. Small and medium size rodents and carrion, especially ungulate carcasses, comprise a large percentage of the diet. Carcasses of mule deer and elk were the primary ungulates in the diet of wolverines in Montana (Hornocker and Hash, 1981 in Ruggiero, 1994).

Hornocker and Hash (1981) found that individual wolverines ranged widely. Average yearly ranges were 163 square miles for males and 58 square miles for females. Male wolverines have been found to disperse at sexual maturity for distances up to 115 miles. Because of the large home range requirements of wolverines, scales for wolverine habitat analysis must also be large.

Incidental non-target trapping and hunting mortality is the primary mortality factor for wolverines. The persistence of wolverine populations in Montana despite years of unlimited trapping and hunting has been attributed solely to the presence of designated wilderness and remote, inaccessible habitat (Hornocker and Hash, 1981).

C. Management Indicator Species

Management indicator species are designated by national forests to serve as “bellwethers” that are sensitive to and reflect a range of changes in environmental and ecological conditions and processes on each forest. Management indicator species (MIS) are designated for the four national forests associated with the project analysis area Several of these MIS species are also designated as “sensitive”, “threatened, or “endangered”, and have been previously discussed in those sections in this analysis. These species include Canada lynx, gray wolf, bald eagle, and grizzly bear; all listed as “threatened or endangered”. Those MIS species also listed as “sensitive” include the peregrine falcon, northern goshawk, and fisher.

The remaining MIS species that will be discussed in this section include American marten, pileated woodpecker, Rocky Mountain bighorn sheep, Shiras moose, Rocky Mountain elk, white-tailed deer, and belted kingfisher.

American marten (Martes Americana)

Marten are inhabitants of dense, mesic coniferous forests that support abundant vole populations (Koehler and Hornocker 1977, Patton and Escano 1990, Buskirk and Ruggiero 1994). Rarely do marten use open, xeric, coniferous forests and those that lack structure near the ground (Koehler et al. 1975, Buskirk and Ruggiero 1994). They prefer higher elevation, mature subalpine fir/Engelmann spruce forests with large woody debris, and well developed canopy cover (Koehler and Hornocker 1977, Campbell 1979, Kujala 1993). Marten avoid large openings where they are less than 150 feet from cover. Home ranges vary from 0.5 to 6 square miles.

Based on monitoring results, marten are common to this part of Idaho and Montana.

Pileated woodpecker (Dryocpus pileatus)
The pileated woodpecker (Dryocpus pileatus) is a fairly common resident in Idaho and Montana coniferous forests and has been documented throughout the Nez Perce, Clearwater, Lolo, and Bitterroot National Forests. Pileated woodpeckers are large cavity nesting birds that inhabit dense, coniferous and mixed forests that contain large, old trees and numerous snags, and in second growth forests that have large residual snags and down wood (Bull and Jackson 1996). The pileated woodpecker has large territorial requirements of 300 or more acres per breeding pair.

The pileated woodpecker nests in large snags and decadent live trees in mature and old growth forests. Stand conditions around the nest have been described as mature trees with signs of decadence, high canopy closure, and multi-layered structure (Bull et al. 1986). Pileateds use large trees and snags for roosting and rely on decadent trees and logs as a foraging substrate. These attributes are characteristic of late successional forests. Feeding habitat for pileated woodpeckers is highly dependant on the availability of carpenter ants which comprise the majority of their diet (Bull et al. 1986, Aney and McCelland 1990).

Rocky Mountain bighorn sheep (Ovis canadensis)
Bighorn sheep may once have been the most common ungulate in mountainous regions of North America (Toweill and Geist, 1978). The Nez Perce Indians told Lewis and Clark of large numbers of bighorns in the Bitterroots with the greatest density along the main divide.

Currently, the largest concentration of bighorns in the analysis area is in the upper Selway canyon in winter, between Magruder Mountain and Sheep Creek. The upper Selway herd's summer and fall range is on the east side of the Bitterroot Mountains. The herd migrates to the Selway winter and spring range in late fall.

Bighorn sheep depend on open bunchgrass communities for foraging and prefer south slopes and cliffs in winter. Peek (1988) assessed habitat characteristics of three areas in the Selway drainage that have been historically occupied by bighorn sheep. These are the Eagle Rock and Elevator Mountain area, the 62 Ridge area, and lower Meadow Creek, adjacent to the project area.

Winter range condition is a critical factor influencing bighorn sheep survival. Domestic sheep grazed the Selway bighorn winter range prior to 1927 until 1942. Cattle grazed the Montana summer range between 1943 and 1967 (Klaver, 1978). Carrying capacity for bighorns was probably reduced to some extent through grazing by other ungulates.

Klaver found the Selway winter range to be diminished due to fire exclusion and subsequent forest succession, resulting in poor range condition due to overgrazing by bighorns. Overgrazing can stress sheep and initiate a population crash due to lungworm pneumonia (Demarchi, 1975 in Klaver, 1978).

Fire suppression could also reduce or eliminate montane and subalpine meadows that bighorns depend on for summer range. Bighorns depend on open habitat with long sight distances to avoid predators. The absence of fire in xeric grasslands has facilitated reductions in open habitats as tree cover encroaches.

Invasive plant species encroachment is a significant impact to Selway bighorn winter range. Infestations have diminished native bunchgrass forage and reduced the ability of fire to restore bighorn habitat.

Shira's moose (Alces alces)
In Idaho and Montana, moose occur mainly in mountainous conifer forest. Abundant moose habitat is available within the analysis area. Favored browse species utilized year-round include willow, menziesia, mountain maple, serviceberry, and Pacific yew (Pierce and Peek 1984). Forest vegetative types used by moose include grand fir and subalpine fir. Pacific yew occurs as a major subdominant species in old

growth grand fir/ginger habitat type, occurring as a subdominant canopy beneath the overstory canopy and creating a double-canopied forest overstory.

Climax meadows associated with lakes and other water sources in the analysis area also provide important moose habitat.

Rocky Mountain Elk (Cervus elaphus)
The Rocky Mountain elk is a habitat generalist and uses a wide variety of habitats and forest structural types. Elk are found across the Forest and are common in the project analysis area. They are hunted as a big game species and are economically important to local communities and the state of Idaho. They also provide an important food source for predators.

Winter foraging is an important habitat limiting factor for elk. The south-facing slopes along the Selway River and major tributaries provide critical winter forage for a significant portion of the elk population in the analysis area. Characteristics associated with the suitability of the area for wintering habitat include low elevation and the warm southwest-west aspect that provides relatively snow free winter conditions. Trees in these habitats are typically open grown with bunchgrass and shrub understories. The xeric habitats primarily occur at low elevations on south and west aspects. Some slopes in the drier habitats are steep. These xeric, open habitats also provide more bunchgrass and shrub forage than more densely forested areas in the uplands. These areas are typically the most vulnerable to infestation by invasive plants.

Past fire suppression in the area has resulted in encroachment of more shade tolerant trees and subsequent reduction in foraging areas. Invasive plant species invasions in the area have also affected native bunchgrass populations and winter forage availability.

Invasive plant species encroachment in xeric, winter range habitats has diminished the availability of native bunchgrass forage for elk. Aggressive species like spotted knapweed, sulfur cinquefoil, and cheat grass have invaded subbasin winter range. Yellow starthistle is common in lower Middle Fork and Clear Creek, downstream from the project area, and can be expected to advance into the Selway canyon winter range.

White-tailed deer (Odocoileus virginiana)
White-tailed deer can be found in various habitats from forests to fields with adjacent cover and especially in riparian habitat and shrubby, often wet, bottomlands. In Idaho and Montana, they prefer low to intermediate elevations and dense, deciduous, woodlands and shrubs, as well as marshy areas near water.

The white-tailed deer diet is dominated by grasses in spring forbs in early summer, leafy green browse in late summer, acorns and other fruits in fall, and evergreen woody browse in winter. Where winters are severe they often herd up in lowland areas with dense coniferous cover in areas called “yards.”

White-tailed deer home range varies from 40 to 300 acres, depending on conditions. Annual home range of sedentary populations averages 145 to 1350 acres.

Invasive plant encroachment may limit the white-tail deer diet in spring due to competition with spring grass forage.

Belted kingfisher (Megaceryle alcyon)
The belted kingfisher is found primarily along water (both freshwater and marine), including lakes, wooded creeks and rivers, seacoasts, bays, and estuaries.

The kingfisher primarily eats fishes, but will also eat various other vertebrates and invertebrates, including mollusks, crustaceans, insects, amphibians, reptiles, young birds, small mammals, even berries (Hamas 1994).

This bird obtains food by diving into water from air or perch. The kingfisher usually nests in burrow constructed in bank near water and its fishing territory. Nesting has been observed from April 17 to June 4. In some areas, availability of foraging sites may be more limiting than availability of nest sites.

D. Neotropical Migratory Birds

Neotropical migrant birds use coniferous forest habitats of the U.S during the summer breeding season but migrate to southern latitudes to spend winters in habitats as far south as Mexico, and South America. Tropical deforestation and other environmental effects related to bird wintering grounds are thought largely responsible for declines in some neotropical migrant bird populations that summer in the eastern forests of the U.S.

Forest landbirds include all the avian species, sometimes collectively termed 'neotropical migratory birds' and 'resident songbirds.' This group of birds is not treated separately by species, because they are an extremely diverse group of species, with widely disparate habitat requirements.

Timber harvest and fire suppression have altered the natural landscape of western forests (Dobkin 1994 p.5). Fragmentation of nesting habitat is theorized to increase rates of migrant bird nest predation and brood parasitism by other species. Small, isolated forest patches, particularly in forests of the Eastern U.S., are considered at greatest risk. In contrast, natural fire regimes and topographic diversity in the west combined historically to produce a temporally dynamic, naturally fragmented landscape compared with the previously extensive and relatively homogenous eastern deciduous forest.
Despite these changes, neotropical migrant populations in the western U.S., are recognized as faring better than eastern North American populations. A comprehensive review of Breeding Bird Survey data from 1966-85 found that western neotropical migrants as a group were not declining overall.

The entire project analysis area provides potential breeding habitat for neotropical migratory birds. Species identified as high priority in 'The Idaho Bird Conservation Plan' (Idaho Partners in Flight, 2000) and that are known to occur or suspected to occur in the project area, are listed below in Table 3.7-2. in association with their primary breeding habitat.

Table 3.7- 2 IPF High Priority Species Potentially Occurring in the Project Area.*

Neotropical Migrant Species	Associated Habitats
Three-toed woodpecker (moderate conservation priority), olive-sided flycatcher, Hammond's flycatcher	High-elevation mixed conifer
Sharp-shinned hawk, northern goshawk, black-backed woodpecker, brown creeper, varied thrush, Townsend's warbler, western tanager	Low-elevation mixed conifer
Flammulated owl, white-headed woodpecker	Ponderosa pine
Lazuli bunting (moderate conservation priority)	Mountain shrubs
Western meadowlark	Grassland

Neotropical Migrant Species	Associated Habitats
Rufous hummingbird, willow flycatcher, black-billed magpie, American dipper, yellow warbler, MacGillivray's warbler	Riparian
Cinnamon teal, redhead, sandhill crane, killdeer, American avocet	Non-riverine wetlands (marshes, lakes, ponds)**

*All data and habitat type descriptors from IDPIF (2000).
**Most Non-Riverine Wetland species have been sighted as seasonal migrants and may not breed in the project area.

Most of the project area is designated wilderness or roadless and provides optimal habitat for many migrant landbirds, although some potential threats may be important. Factors associated with potential loss of breeding habitat in the project area include fire suppression and invasive plant species infestations. Invasive plant infestations and fire suppression have the most influence in xeric habitats in the analysis area.

3.7.5 ENVIRONMENTAL CONSEQUENCES

A. Proposed Action

The proposed project treatment area totals approximately 1,400,000 acres, which includes about 1,350,000 acres of designated wilderness. Approximately 109, 000 acres of this area are currently infested with invasive plant species.

The emphasis of the treatments would be to eradicate new invaders as they are discovered and to contain the spread of established non-native plants. These actions would be designed to help maintain the natural conditions of the Wilderness, in accordance with the intent of the 1964 Wilderness Act.

Priority treatment areas include areas that are most vulnerable to seed introduction and dispersal due to human traffic patterns; areas where weeds currently exist and may expand their range; and areas that are highly susceptible to invasion by new or uncommon invasive plants. The proposed treatment areas currently infested include transportation corridors, including trails and roads, dispersed campsites, administrative sites, airstrips, and private inholding buffer areas. In addition, susceptible habitats at high risk of invasion by new or uncommon invasive species, or currently weed free have been identified and total approximately 150,000 to 200,000 acres.

The amount of land surface receiving actual chemical or other treatment within the "areas of operation" will be less than the above acreages and dependent on treatment objectives.

Approximately 500 to 1500 acres annually are proposed for physical treatments including chemical treatments, hand pulling, and revegetation with native plants. Most of these acres would be treated through the use of spot chemical application and all treatments and applications would be ground-based. Biological control organisms would be applied to approximately 10,000 additional acres within the project area.

Ecological settings and associated wildlife habitats most susceptible to invasive plant encroachment are xeric grasslands, ponderosa pine-Douglas fir habitats that are indicative of the dry, low elevation, canyonlands. Invasive plant treatments would be focused primarily in these habitats, although not entirely.

Chapter 2 contains detailed descriptions of the 5 proposed treatment alternatives that will be evaluated in this wildlife effects analysis.

B. General Effects of Invasive Plant Treatments

Successful control of invasive plant infestations provides long-term benefits by restoring and preventing further loss of native wildlife habitat. Treatment of larger infestations may create more disturbances for longer periods than small infestations, but the specific amount and duration is largely dependant upon specific treatment method.

Wildlife species may be adversely affected in the short term by invasive plant treatment methods. All treatment methods have the potential to disturb, temporarily displace, or directly harm various wildlife species.

The effects of the invasive plant treatment are also relative to the size and locations of existing and future invasive plant infestations. Proposed project treatments of infestations along disturbed trails, roadsides, administrative sites, campsites, and airstrips are not likely to substantially affect terrestrial wildlife populations, since this vegetation type does not provide essential habitat for native wildlife species, and they consist of linear areas spread over large distances and discrete spot applications. No large areas will be treated, except for the ongoing and gradual spread of biological control organisms. Broadcast spraying would be limited. Design criteria detailed in chapter 2 provide conservation measures that reduce potential impacts.

Tenets of relevant policy related to maintaining native wildlife habitat and natural conditions in Wilderness support invasive plant species control. The 1964 Wilderness Act defines wilderness as a place where the earth and community of life are “untrammeled” by man, retaining its primeval character and influence, protected and managed so as to preserve its natural condition, and administered for the use and enjoyment of the American people in such a manner as will leave it unimpaired.

Forest Service policy direction is to maintain wilderness in such a manner that ecosystems are unaffected by human manipulation and influences so that plants and animals develop and respond to natural forces (FSM 2320.2).

In general, and for most species, effects of the proposed invasive plant treatments can be evaluated in four main categories:

1. Effects to species from invasive plant reduction.
2. Effects of exposures to toxicity levels in chemicals being evaluated
3. Effects of additional biocontrol introduction
4. Potential disturbance from project implementation activities including chemical treatments, manual control, and native revegetation.

The four proposed treatment methods for invasive plant species control are discussed below. These include:

1. Manual hand pulling of plants
2. Biological control additions
3. Revegetation with native plants
4. Herbicide application to invasive plants

Because of the relatively low risk and obvious benefits to wildlife habitat associated with the hand pulling, biological control, and native plant revegetation activities, they are discussed briefly. Following is a much lengthier discussion on the proposed herbicide applications, due to the risks associated with chemical toxicity.

1. Manual Hand Pulling

Manual treatments included in the project proposal would be relatively benign in terms of effects to wildlife. In some cases, they may result in incidental disturbance caused by human presence. Project design criteria include measures for camp sanitation to prevent habituation of wildlife. Because of the small number of workers anticipated at any work site, lack of motorized equipment, camp sanitation practices, and a general low level of disturbance, effects to wildlife would be negligible.

The degree of disturbance would depend on the number of workers and duration. Because manual techniques are slower than mechanical or chemical methods, the duration of disturbance may be longer in the treatment area.

2. Biological Control Supplementation

This proposed method would entail supplementing existing populations with additional releases and accelerating spread of organisms. Biological control methods generally would not directly affect native wildlife species, However, recent studies have found that rodents may take advantage of the food source provided by biological control agents (Pearson et al., 2000). In some cases, rodent populations may have increased as a result of an increase in food supply. Biological control methods that reduce invasive plant populations, increase native plant populations, and provide a supplemental food source can benefit wildlife. Approved biological control agents have undergone a rigorous screening process by APHIS to ensure they will not effect non-target, native plant species, and thus would not impact native wildlife habitat.

3. Revegetation with Native Plants

Revegetation with native plants is necessary, in some situations, to restore ground cover where removal of invasive species is successful. There is a risk that invasive species would establish in unvegetated areas before native species would naturally re-establish.
Native species revegetation would benefit wildlife generally, although there could be some minor short-term disturbance associated with human presence. The anticipated disturbance situation would be the same as described in the manual hand pulling description above and disturbance effects to wildlife would be negligible.

4. Herbicide Treatments

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 wildlife can be reduced by choosing herbicides with lower potential for toxic effects when exposure may occur. Exposure of wildlife to herbicides can be greatly reduced or increased depending on site-specific implementation techniques and timing used in herbicide application projects. Exposure can be reduced by such methods as streamside buffer zones, timing applications to avoid sensitive seasons, varying application methods used, and combining herbicide treatments with non-herbicide treatments to reduce overall use. These project design features, or criteria, are included in chapter 2 and would reduce potential exposures to wildlife.

The hazards associated with each herbicide active and inert ingredients, impurity or metabolite, were determined by a thorough review of available toxicological studies. For a background discussion of all toxicological tests and endpoints considered in Forest Service Risk Assessments, (SERA 2001).
All of the action alternatives (alternatives 2-5) propose herbicide treatments at various acreage levels. Effects to wildlife species from herbicide exposures are evaluated using several indicators, including rate of application or pounds per acre of active ingredient. This indicator is the same for all alternatives, with the exception of total acres proposed for treatment, and so effects to species related to proposed herbicide applications will also be the same for all alternatives. However, there may be slight variations for cumulative effects.

A detailed analysis of the effects of the proposed herbicide applications to wildlife species that are known or expected to reside in the project area is found in Appendix M.

Summary of Herbicide Effects to Mammals and Birds

Results of toxicity analyses for Chlorsulfuron, Imazapic, and Metsulfuron show no adverse effects to mammals and birds at project application rates, even in the worst case exposure scenarios described previously.

However, potential adverse effects for some species groups at project application rates in worst case exposure scenarios are indicated for Clopyralid, Dicamba, Glyphosate, Picloram, 2,4-D, and Curtail, a blend of 2,4-D and Clopyralid. These effects are summarized below.

Clopyralid
Clopyralid indicates potential adverse effects, at the highest project application rate, to large herbivorous mammals and small insectivorous mammals. The high project application rate of 0.5 pounds active ingredient per acre is higher than the typical application rate of .35 pounds per acre. This higher rate would only be used for spot applications for yellowstar thistle, musk thistle, and Canada thistle. In all other situations, a rate 1/3 less would be used and also spot sprayed.

The exposure risks indicated are worst case scenario effects as described previously in this document. There is a very low probability for this level of exposure because of the restricted extent of spraying in spot applications. However, the consequences of yellowstar thistle invasions without aggressive control are far greater in terms of species habitat.

Dicamba
Dicamba indicates potential adverse effects at the project application rate of 1.5 pounds per acre to small mammals directly sprayed, large herbivorous mammals, small insectivorous mammals and small insectivorous birds. The project application rate is higher than the typical application rate of 0.3 pounds per acre. Dicamba will only be used to spot spray a single species- tall buttercup. Therefore, the risk of adverse effects indicated by worst case exposure scenarios is remote.

Glyphosate
Glyphosate indicates potential adverse effects to small insectivorous birds at the typical application rate of 2 pounds per acre. The proposed project application rate is 1.5 pounds per acre. This herbicide will only be used for cheatgrass. Based on the lower project application rate than the one analyzed and the limited use, the risk of adverse effects indicated by the worst case exposure scenario for small insectivorous birds is remote.

Picloram
Picloram indicates potential adverse chronic effects to small insectivorous mammals and birds at the typical application rate of .35 pounds per acre. This rate is lower than the actual proposed project application rate of 1.0 pounds per acre.

The worst case chronic exposure scenario for the 20g (mouse size) mammal, such as a bat, is described as consumption of contaminated food equal to 20 percent body weight for 90 days. Since treatment areas, in most cases, will be limited to linear road and trail corridors, spot applications, and a few small acreage polygons, these exposure scenarios are highly unlikely. Species evaluated in this analysis that may occur in treated areas and that are included in these two animal exposure groups include fringed myotis bat, Townsend's big-eared bat, flammulated owl, white-headed woodpecker, mountain quail, and pygmy nuthatch.

The risk of adverse effects indicated by the worst case exposure scenario for small insectivorous birds is unlikely. However, picloram is proposed for use on spotted knapweed and sulfur cinquefoil. Spotted knapweed is the most widespread invasive plant species in the project area. It is possible that exposure could affect individuals.

2,4-D
2,4-D indicates potential adverse effects, at the highest proposed project application rate, to all bird and mammal groups except for large, fish eating birds. The high project application rate of 1.0 pounds active ingredient per acre is the typical application rate. A higher rate of 1.5 to 1.9 pounds per acre would be used for spot applications for tall buttercup, Dalmatian toadflax, and yellow toadflax.

The exposure risks indicated are worst case scenario effects as described previously in this document. There is a very low probability for this level of exposure because of the restricted extent of spraying in spot applications.

Although there is a chance that some individuals could be affected by exposure, the risk is low.

Curtail (combination of 2,4-D and Clopyralid)
The proposed project application rate of the Clopyralid component of .19 pounds per acre shows no adverse affects for the worst case exposure scenario. It is less than the typical application rate of .35 pounds per acre.

The proposed project application rate of the 2,4-D component of 1 pound per acre is the same as the typical and high application rate. At this application rate, there are indications for adverse affects to all bird and mammal groups except for large, fish eating birds.

This herbicide combination would be used for spot applications for yellowstar thistle, diffuse knapweed, Russian knapweed, hawkweeds, musk thistle, and Canada thistle. It will also be used for spotted knapweed in somewhat broader applications along trails, roadsides, and small acreage polygons.

Although the risk for worst case exposure scenarios, described earlier, is low, some individuals may be affected by exposure.

Effects of Proposed Herbicide Application to Amphibians and Reptiles

Amphibians

Amphibians analyzed in this document include Coeur d'Alene salamander, northern leopard frog, and western toad.

Information on the effect of pesticides on amphibian populations is limited, and the studies that are available often focus on the most toxic compounds like insecticides (e.g. Taylor et al. 1999, Bridges and Semlitsch 2000, Boone and Semlitsch 2001, Relyea and Mills 2001). Some herbicides are known to have adverse effects on amphibians (e.g. Hayes 2002, Wojtaszek 2005).

To date, atrazine is the only herbicide active ingredient that has been implicated in overall amphibian declines (Hayes 2002). This herbicide is not proposed for use in this project.

Relyea (2005) implicate the glyphosate formulation Roundup in amphibian decline, but the formulation studied contains a surfactant known to be toxic to aquatic organisms. Numerous previous studies have attributed the toxicity of this formulation to the surfactant and not the glyphosate active ingredient (e.g. Mann and Bidwell 1999; Perkins et al. 2000). Since Relyea (ibid) did not conduct or report results for the aquatic formulation of glyphosate, without the toxic surfactant, the results of his study cannot be attributed to the herbicide.

The pesticides investigated (e.g. carbaryl, PCB's, atrazine) all have much higher propensity to accumulate in the fatty tissues than the herbicides proposed in this document. There is a substantial data gap regarding effects of the herbicides included in this analysis and the potential for effects to amphibian populations, but current data on these herbicides do not suggest a risk to amphibian populations because they do not accumulate in animal tissues and are less persistent, less mobile, and less widely used than pesticides that have been implicated in amphibian declines.

Project design criteria have been proposed that respond to uncertainty about effects to amphibians from herbicide exposure. These project design criteria include buffers that prohibit broadcast spraying, specify selective application methods, and limit the herbicides that can be used within certain distances of amphibian habitat.

Herbicides proposed for use in the project area have little potential to adversely affect amphibians and contribute to amphibian decline because of either their low toxicity to amphibians or the very low exposures likely to occur. Low exposures are due to either, the application rates and physical properties of the herbicides, or use restrictions (PDF's) required for all alternatives.

Reptiles

The ringneck snake is the only reptile included in this analysis. Although no data was found specific to herbicide toxicity for snakes, it seems reasonable to assume that many of the same risks associated with species with similar diets, including the carnivorous mammals and predatory bird groups, evaluated in the tables above, also apply to ringnecks. These include species that feed on invertebrates, amphibians, and other reptiles that ringnecks consume.

C. Project Effects Conclusions

As noted earlier, the four proposed invasive plant treatment methods are manual hand pulling of plants, biological control agent supplementation, revegetation with native plants, and herbicide application. As

discussed previously, all methods indicate very low risk or are advantageous to wildlife except for herbicide application, which has both potential risks and potential benefits. These effects were discussed in detail for each herbicide in the above section.

1. HERBICIDE EFFECTS SUMMARY FOR MAMMALS AND BIRDS

Chlorsulfuron, Imazapic, and Metsulfuron show no adverse effects to mammals and birds at project application rates, even in the worst case exposure scenarios described previously. Clopyralid, Dicamba, Glyphosate, Picloram, 2,4-D, and Curtail did indicate potential adverse effects for some species groups at project application rates in worst case exposure scenarios.

Clopyralid, Dicamba, and 2,4-D will only be used in limited spot applications and risk for worst case scenario exposures to any animal group is extremely low.

Because of data limitations, worst case scenario for Glyphosate was determined at a rate much higher than the project application rate. And Glyphosate will be used at only half the project rate in some cases. Even so, at the higher analyzed rate, adverse effects were indicated for only the small insectivorous bird group. Exposure risk for this group at the highest proposed project application rate is considered to be extremely low.

There is somewhat more concern for Picloram because it will be used on spotted knapweed, which is more widespread than the other invasive plants. However, only risk for chronic exposure, for small insectivorous mammals and birds, is indicated for worst case scenario. The risk of chronic exposure occurring to animals in the project area is extremely low.

Curtail, a combination of 2,4-D and Clopyralid, presents the highest exposure risk of all the herbicides proposed. Although the Clopyralid component shows no adverse effects, the 2,4-D component shows potential adverse effects to all species groups except the large fish eating birds. The use of Curtail in spot applications for most invasive species presents very low risk for adverse exposure effects. However, Curtail will also be used for spotted knapweed broader applications, although still limited in extent. The risk for worst case exposure scenarios is greater than for Picloram, also proposed for broader application on spotted knapweed, but remains relatively low.

General project design criteria (Table 2.3, Chapter 2) provide environmental protection measures that address proper storage, mixing, handling, and application of herbicides. More specific criteria address measures that protect water quality and aquatic and riparian associated species. More specific criteria prohibit direct spraying of animals and sensitive habitats including sites with large logs and leaf litter, natal areas, and potential bald eagle and peregrine falcon nest sites. These are addressed in more detail below.

Although in worst case scenarios, some individuals could be adversely affected, the risk of effects to mammals and birds is low due to the relatively low toxicity of most herbicides proposed and the design criteria that restrict herbicide use.

2. HERBICIDE EFFECTS SUMMARY FOR AMPHIBIANS

Amphibians analyzed in this document include Coeur d'Alene salamander, northern leopard frog, and western toad.

Most of the herbicides proposed for use in the project pose a low risk of mortality to amphibians, including chlorsulfuron, clopyralid, imazapic, metsulfuron methyl, and picloram. Data is unavailable to evaluate risk

from Dicamba, Imazapic, 2,4-D, and Curtail, but it is assumed that risks would be similar to those evaluated for the fisheries resource. However, formulations of glyphosate that contain POEA surfactant, e.g., Roundup, are much more toxic to aquatic organisms than aquatic-labeled formulations, which do not contain POEA. Project design criteria prohibit Glyphosate with POEA surfactant from being broadcast sprayed within RHCA's, or spot sprayed within 100 feet of stream/lake/wetland habitat of. These measures make it highly unlikely that this version of glyphosate would reach the water bodies and create concentrations of concern.

In addition, design criteria required in all alternatives minimize the amount and type of herbicide to which amphibians could be exposed by restricting application methods and buffer distances. These measures restrict the use of herbicides along streams, ponds, and lakes and in wetlands.

Adult amphibians could also be dermally exposed to herbicides as they move through treated vegetation or soil, although this would be unlikely because most are highly aquatic. However, western toads would be more likely to travel greater distances from water. There is insufficient data to quantify dose received from dermal exposure to contaminated vegetation or soil, but it is likely to be much less than if the amphibian was in contaminated water and could easily absorb the solution through its skin. It is assumed for this analysis that risk from exposure to contaminated water adequately encompasses risk from all types of herbicide exposure for amphibians.

There is a low likelihood of disturbance to amphibian eggs, larvae or adults during invasive plant treatments, although some disturbance could occur to adults moving overland. Due to the relatively low toxicity of most herbicides proposed, the low concentrations in water that would occur under normal operations (i.e. low exposures), and the design criteria that restrict herbicide use in or near amphibian habitat, adverse effects from herbicide exposure are unlikely.

3. HERBICIDE EFFECTS SUMMARY FOR REPTILES

As noted previously, this reptile analysis addresses only the ringneck snake. Since data is not available specific to herbicide toxicity for snakes, species with similar diets, including the carnivorous mammals and predatory bird groups are used as surrogates to evaluate risks to ringnecks. As stated above in the effects summary for mammals and birds, although some individuals could be adversely affected, the risk of effects is low due to low toxicity of most herbicides proposed and the design criteria that restrict herbicide use.

D. Cumulative Effects

Cumulative effects are those effects on the environment which result from the incremental impact of each action when added to other past, present, and reasonably foreseeable future actions.

Invasive plant treatments involve relatively small, well-defined spatial areas. Most treatments are confined to linear areas along travelways and small acreage patches infested with invasive plants, leaving other native vegetation intact. Native wildlife habitat is not removed, modified, or degraded, nor are any hydrologic regimes affected. Treatments would occur one, and possibly up to three times a year, generally from late spring to mid-fall. Treatments are low intensity and of small magnitude and generally short duration (one day or less). Given the spatial and temporal scale of invasive plant treatments and the design criteria that reduces disturbance and exposure risk, potential for cumulative effects is low.

Cumulative exposure to herbicides could only occur for animals that move between National Forest System lands and other ownerships. Because the herbicides proposed for use in this project are rapidly excreted, do

not bioaccumulate or biomagnify, and pose low risk to wildlife, even if exposures occurred from multiple ownerships, they are unlikely to result in any cumulative toxic effect.

Amphibians are most affected by herbicide exposure because of rapid absorption through their skin. However, herbicides proposed for use have a low likelihood of causing effects to amphibians due to their low toxicity and design criteria limiting exposure. Amphibians that may be exposed to very low levels of herbicide within the project area are not likely to be exposed to herbicide use from some other additive source because they are somewhat limited in their movements. Because the herbicides proposed for use in this project are rapidly excreted, do not bioaccumulate or biomagnify, and pose low risk to amphibians, significant cumulative effects from herbicide exposure are unlikely.

All action alternatives would comply with Forest Plan standards and environmental laws and regulations.

E. Alternative Comparison Related to Wildlife Species Effects

Detailed descriptions of all alternatives can be found in Chapter 2. The following table summarizes the 5 alternatives and provides a comparison for each of the action alternatives.

Table 3.7- 3 Alternative Summary and Comparison
Note: Treatment acres are an estimate, not a constraint.
Constraints are specified in each alternative and/or project design criteria.

Alternative Number	New Biocontrol Introductions (Acres Over Project Life)	Designated and Dispersed Herbicide Treatment Non-SBW (Acres/Yr.)	Designated Herbicide Treatment SBW*** (Acres/Year)	Dispersed Herbicide Treatment SBW (Acres/Yr.)	Total Herbicide Treatment (Acres/Yr.)	Additional Herbicide Treatments within 100' H2O (Acres/Yr.)
Alt. 1*	0	50	<20	0	<70	0
Alt.1 Comparison	Existing condition. Allows for existing control methods – no new methods.					
Alt 2**	10,000	996	1,129	500	<1,500	358+
Alt.2 Comparison	Of action alts., alt. 2 proposes less biocontrol than alts. 4 and 5, more than alt. 3. More herbicide treatment than alts. 3 and 4, less than alt. 5. More herbicide near water than alts. 3 and 4 but less than alt. 5.					
Alt. 3	0	945	861	0	1,806	174
Alt.3 Comparison	No biocontrol. Less herbicide than alt. 2 and 5 but more than alt. 4. Less herbicide near water than alts. 2 and 5 but more than alt. 4.					
Alt. 4	50,000	996	0	0	996	125
Alt.4 Comparison	More biocontrol than alts. 2 and 3 but the same as alt. 5. Least total herbicide acres and least near water. Only action alt. with no herbicide treatments in wilderness.					
Alt. 5	50,000	996	1,129	2,000	4,125	558+

Alt.5 Comparison	Most biocontrol, most herbicide use, most acres near water.					

*No new activities, beyond those currently authorized or permitted, are considered under the "No Action" Alternative.

**The Proposed Action is constrained to a total herbicide treatment of less than 1500 acres per year from all categories comprising the total acres identified in Alternative 2.

***Designated Herbicide Treatment Areas for Alternatives 2 & 5 include 70 acres of boating sites along the Selway River. Specific design criteria involving types of herbicides, their use and transport apply to these treatments.

+ The total includes Designated Treatment Areas and up to 10% of the Dispersed Treatments that may also occur w/in 100 feet of live water.

Habitats most influenced by invasive plant encroachment are characterized by low elevation, south and west facing slopes with grasslands and open tree canopies of ponderosa pine and Douglas fir. Species that inhabit these areas and most affected by the habitat changes would also be most affected by project activities.

These species include Rocky Mountain bighorn sheep, Rocky Mountain elk, gray wolf, American peregrine falcon, ringneck snake, pygmy nuthatch, fringed myotis, Townsend's big-eared bat, mountain quail, flammulated owl, white-headed and woodpecker. Since the bald eagle is currently only a winter resident, it would benefit from habitat improvement but would not be influenced by project activities that would occur in summer months.

Alternative 1 represents the existing condition and would not include the additional herbicide treatments and biocontrol releases proposed in the action alternatives. Although, there would be no increased toxicity risk to species with this alternative, there would also be no additional habitat improvement as a result of accelerated weed control for those species currently impacted by invasive plant encroachment.

The action alternatives, 2-5 propose various levels of herbicide application and biological control supplementation, although alternative 3 proposes no biological control supplementation. For all of the action alternatives, in general, there would be benefits from herbicide use for accelerated habitat improvement but also some risk, although minor, associated with toxicity. There would be no identified risk from biocontrol supplementation but habitat improvement would result in benefits to species.

There are additional herbicide treatments proposed at various acreages, by alternative, within 100 feet of water. Alternative 3 that proposes the least acres of herbicide treatment near water would have less toxicity risk to amphibians and riparian associated terrestrial species. These include boreal toad, Coeur d'Alene salamander, northern leopard frog, common loon, harlequin duck, fisher, fringed myotis, Townsend's big-eared bat, northern bog lemming, mountain quail, Shira's moose, and belted kingfisher. Priority neotropical migrant species for the state of Idaho that are associated with aquatic and riparian habitats include rufous hummingbird, willow flycatcher, black-billed magpie, American dipper, yellow warbler, MacGillivray's warbler, Cinnamon teal, redhead, sandhill crane, killdeer, and American avocet.

The following table summarizes the effects of the 5 alternatives on the wildlife species analyzed.

Table 3.7- 4 Summary of the Effects of the 5 Alternatives on the Wildlife Species Analyzed

	Species	Priority Habitat	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5
Threatened and Endangered Species	Canada Lynx	Mesic high elevation/Early-Late Seral a	No Effect	May affect, but not likely to adversely affect –less toxicity risk than alt. 5	May affect, but not likely to adversely affect- less toxicity risk than alts.2 and 5	May affect, but not likely to adversely affect –least toxicity risk of alts. 2-5	May affect, but not likely to adversely affect- alt with most toxicity risk, but still minor considering design criteria.
	Gray Wolf	Xeric Early Seral	Not likely to jeopardize; would not improve wolf prey habitats.	May affect, but not likely to adversely affect –less toxicity risk and less potential for prey habitat improvement than alt. 5	May affect, but not likely to adversely affect- less toxicity risk and less potential for prey habitat improvement than alts.2 and 5	May affect, but not likely to adversely affect –least toxicity risk and least potential for prey habitat improvement of alts 2-5	May affect, but not likely to adversely affect- alt with most toxicity risk, but still minor considering design criteria. Most potential for prey habitat improvement.
Sensitive Species	Bald Eagle	Riparian/Early Seral	May impact individuals or habitat; continued habitat decline likely	May impact individuals or habitat – less toxicity risk and less potential for prey habitat improvement than alt. 5.	May impact individuals or habitat t- less toxicity risk and less potential for prey habitat improvement than alts.2 and 5	May impact individuals or habitat – least toxicity risk and least potential for prey habitat improvement of alts 2-5	May impact individuals or habitat - alt with most toxicity risk, but still minor considering design criteria. Most potential for prey habitat improvement
	Northern Goshawk	Late Seral / Old Growth	No impact	*May impact individuals or habitat... less toxicity risk than alt. 5	*May impact individuals or habitat… less toxicity risk than alts.2 and 5	*May impact individuals or habitat.. alt. with least toxicity risk of alts. 2-5	*May impact individuals or habitat… alt with most toxicity risk, but still minor considering design criteria.
	American peregrine falcon	Cliffs in proximity to water	*May impact individuals or habitat - continued habitat decline likely	*May impact individuals or habitat - less toxicity risk and less potential for prey habitat improvement than alt. 5.	*May impact individuals or habitat -- less toxicity risk and less potential for prey habitat improvement than alts.2 and 5	*May impact individuals or habitat– alt. with least toxicity risk and least potential for prey habitat improvement of alts. 2-5	*May impact individuals or habitat - alt with most toxicity risk, but still minor considering design criteria. Most potential for prey habitat improvement

	Species	Priority Habitat	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5
	Boreal Toad	Riparian/Aquatic	No impact	*May impact individuals or habitat - less toxicity risk than alt. 5	*May impact individuals or habitat -- less toxicity risk than alts.2 and 5	*May impact individuals or habitat– alt. with least toxicity risk of alts. 2-5	*May impact individuals or habitat - alt with most toxicity risk, but still acceptable considering design criteria.
	Coeur d'Alene salamander	Rock-water interface zones	No impact	*May impact individuals or habitat - less toxicity risk than alt. 5	*May impact individuals or habitat -- less toxicity risk than alts.2 and 5	*May impact individuals or habitat– alt. with least toxicity risk of alts. 2-5	*May impact individuals or habitat - alt with most toxicity risk, but still acceptable considering design criteria.
	Northern leopard frog	Wetlands, often with few or no trees	No impact	*May impact individuals or habitat - less toxicity risk than alt. 5	*May impact individuals or habitat -- less toxicity risk than alts.2 and 5	*May impact individuals or habitat– alt. with least toxicity risk of alts. 2-5	*May impact individuals or habitat - alt with most toxicity risk, but still acceptable considering design criteria.
	Ringneck snake	Low elevation shrubs	No impact	*May impact individuals or habitat - less toxicity risk than alt. 5	*May impact individuals or habitat -- less toxicity risk than alts.2 and 5	*May impact individuals or habitat– alt. with least toxicity risk of alts. 2-5	*May impact individuals or habitat - alt with most toxicity risk, but still acceptable considering design criteria.
	Black swift	Cliffs associated with waterfalls	No impact	*May impact individuals or habitat - less toxicity risk than alt. 5	*May impact individuals or habitat -- less toxicity risk than alts.2 and 5	*May impact individuals or habitat– alt. with least toxicity risk of alts. 2-5	*May impact individuals or habitat - alt with most toxicity risk, but still minor considering design criteria.
	Common loon	Lakes	No impact	*May impact individuals or habitat - less toxicity risk than alt. 5	*May impact individuals or habitat -- less toxicity risk than alts.2 and 5	*May impact individuals or habitat– alt. with least toxicity risk of alts. 2-5	*May impact individuals or habitat - alt with most toxicity risk, but still minor considering design criteria.

	Species	Priority Habitat	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5
	Pygmy nuthatch	Old ponderosa pine forest	No impact	*May impact individuals or habitat - less toxicity risk than alt. 5	*May impact individuals or habitat -- less toxicity risk than alts.2 and 5	*May impact individuals or habitat– alt. with least toxicity risk of alts. 2-5	*May impact individuals or habitat - alt with most toxicity risk, but still minor considering design criteria.
	Harlequin Duck	Riparian/Aquatic	No impact	*May impact individuals or habitat - less toxicity risk than alt. 5	*May impact individuals or habitat -- less toxicity risk than alts.2 and 5	May impact *individuals or habitat – alt. with least toxicity risk of alts. 2-5	*May impact individuals or habitat - alt with most toxicity risk, but still minor considering design criteria.
	Fisher	Late seral/Old Growth/Riparian	No impact	*May impact individuals or prey - less toxicity risk than alt. 5	*May impact individuals or prey -- less toxicity risk than alts.2 and 5	*May impact individuals or prey–alt. with least toxicity risk of alts. 2-5	*May impact individuals or prey - alt with most toxicity risk, but still minor considering design criteria.
	Fringed myotis	Snags/ ponderosa pine	No impact	*May impact individuals or prey - less toxicity risk than alt. 5	*May impact individuals or prey -- less toxicity risk than alts.2 and 5	*May impact individuals or prey–alt. with least toxicity risk of alts. 2-5	*May impact individuals or prey - alt with most toxicity risk, but still minor considering design criteria.
	Townsend's big-eared bat	Caves, abandoned mines, structures in Douglas fir-ponderosa pine-lodgepole pine habitats	No impact	*May impact individuals or prey - less toxicity risk than alt. 5	*May impact individuals or prey -- less toxicity risk than alts.2 and 5	*May impact individuals or prey–alt. with least toxicity risk of alts. 2-5	*May impact individuals or prey - alt with most toxicity risk, but still minor considering design criteria.
	North American wolverine	Remote lake basins, talus	*May impact individuals or prey habitat - continued habitat decline likely	*May impact individuals or prey –less toxicity risk and less potential for habitat improvement than alt. 5.	*May impact individuals or prey -- less toxicity risk than alts.2 and 5	*May impact individuals or prey–alt. with least toxicity risk of alts. 2-5	*May impact individuals or prey - alt with most toxicity risk, but still minor considering design criteria.

	Species	Priority Habitat	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5
	Northern bog lemming	Wet meadows, fens, bogs	No impact	*May impact individuals or habitat - less toxicity risk than alt. 5	*May impact individuals or habitat -- less toxicity risk than alts.2 and 5	*May impact individuals or habitat – alt. with least toxicity risk of alts. 2-5	*May impact individuals or habitat - alt with most toxicity risk, but still minor considering design criteria.
	Mountain Quail	Xeric early seral/Riparian shrub	*May impact individuals or habitat - continued habitat decline likely	*May impact individuals or habitat – less toxicity risk and less potential for habitat improvement than alt. 5.	*May impact individuals or habitat - less toxicity risk and less potential for habitat improvement than alts.2 and 5	*May impact individuals or habitat – least toxicity risk and least potential for habitat improvement of alts 2-5	*May impact individuals or habitat - alt with most toxicity risk, but still minor considering design criteria. Most potential for habitat improvement.
	Flammulated Owl	Xeric Ponderosa Pine	*May impact individuals or habitat	*May impact individuals or habitat – less toxicity risk and less potential for habitat improvement than alt. 5.	*May impact individuals or habitat - less toxicity risk and less potential for habitat improvement than alts.2 and 5	*May impact individuals or habitat – least toxicity risk and least potential for habitat improvement of alts 2-5	*May impact individuals or habitat - alt with most toxicity risk, but still minor considering design criteria. Most potential for habitat improvement
	White-headed Woodpecker	Xeric Ponderosa Pine	*May impact individuals or habitat	*May impact individuals or habitat – less toxicity risk and less potential for habitat improvement than alt. 5.	*May impact individuals or habitat - less toxicity risk and less potential for habitat improvement than alts.2 and 5	*May impact individuals or habitat – least toxicity risk and least potential for habitat improvement of alts 2-5	*May impact individuals or habitat - alt with most toxicity risk, but still minor considering design criteria. Most potential for habitat improvement
	Black-backed Woodpecker	Forest landscape disturbance/Fire-Insects	*May impact individuals or habitat	*May impact individuals or habitat - less toxicity risk than alt. 5	*May impact individuals or habitat -- less toxicity risk than alts.2 and 5	*May impact individuals or habitat– alt. with least toxicity risk of alts. 2-5	*May impact individuals or habitat - alt with most toxicity risk, but still minor considering design criteria.

	Species	Priority Habitat	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5
Management Indicator Species	Elk	Xeric early seral	Low winter habitat effectiveness	Less toxicity risk and less potential for winter habitat improvement than alt. 5	Less toxicity risk and less potential for winter habitat improvement than alts.2 and 5	Least toxicity risk and least potential for winter habitat improvement of alts 2-5	Alt with most toxicity risk, but still minor considering design criteria. Most potential for winter habitat improvement.
	Shira's Moose	Mesic late seral-old growth	No measurable impacts	Less toxicity risk than alt. 5	Less toxicity risk than alts.2 and 5	Alt. with least toxicity risk of alts. 2-5	Alt with most toxicity risk, but still minor considering design criteria.
	Pileated woodpecker	Late seral/Old Growth	Potential for indirect reductions of preferred nest tree species	Less toxicity risk than alt. 5	Less toxicity risk than alts.2 and 5	Alt. with least toxicity risk of alts. 2-5	Alt with most toxicity risk, but still minor considering design criteria.
	American Marten	High elevation late seral-old growth	No measurable effects	Less toxicity risk than alt. 5	Less toxicity risk than alts.2 and 5	Alt. with least toxicity risk of alts. 2-5	Alt with most toxicity risk, but still minor considering design criteria.
	Rocky Mountain bighorn sheep	Xeric early seral	Low winter habitat effectiveness	Less toxicity risk and less potential for winter habitat improvement than alt. 5	Less toxicity risk and less potential for winter habitat improvement than alts.2 and 5	Least toxicity risk and least potential for winter habitat improvement of alts 2-5	Alt with most toxicity risk, but still minor considering design criteria. Most potential for winter habitat improvement
	White-tailed deer	Forest/Shrublands/Riparian	No measurable impacts	Less toxicity risk than alt. 5	Less toxicity risk than alts.2 and 5	Alt. with least toxicity risk of alts. 2-5	Alt with most toxicity risk, but still minor considering design criteria.
	Belted kingfisher	Forested streams and rivers/Lakes	No measurable impacts	Less toxicity risk than alt. 5	Less toxicity risk than alts.2 and 5	Alt. with least toxicity risk of alts. 2-5	Alt with most toxicity risk, but still minor considering design criteria.
	Neotropical Migratory Birds	Ponderosa pine/Old growth (priority)	Potential for indirect reductions of preferred ponderosa pine and grassland habitats	Less toxicity risk than alt. 5	Less toxicity risk than alts.2 and 5	Alt. with least toxicity risk of alts. 2-5	Alt with most toxicity risk, but still minor considering design criteria.

*** "May impact individuals or habitat**…. but would not likely result in a trend toward federal listing or reduced viability for the population or species"

3.7.6 IRREVERSIBLE AND IRRETRIEVABLE EFFECTS

Irreversible and irretrievable effects of Alternatives 1, 3, and 4 would be the loss or degradation of habitat quality and quantity for native wildlife species due to the permanent loss of native plant communities and associated natural ecosystem components as established invaders and new invaders advance into currently weed-free and early infestation areas of the project.

An irreversible effect of Alternatives 2, 4, and 5 would be the establishment, if successful, of non-native bio-control agents within the project area and the associated adaptations of native fauna.

3.8 HUMAN HEALTH

3.8.1 REGULATORY FRAMEWORK

Safety standards for herbicides use are set by the Environmental Protection Agency, Occupational Health and Safety Administration, Code of Federal Regulations (40 CFR part 170), and individual states. In addition, several sections of the Forest Service Manual (FSM, 1994) provide guidance to the safe handling and application of herbicides. These include:

Preparation of a safety plan for all pesticide use projects (FSM 2150);

- Consultation of pesticide handling requirements set forth in the Forest Service Health and Safety Code Handbook (FSM 6709.11) and (FSM 2156);
- Pesticide-Use Management and Coordination Handbook that requires the Forest to review pesticide use proposals in terms of human health (FSM2109.13.2);
- Recommendation to complete risk assessments prior to pesticide use to ensure public safety (FSM 2109.14);
- Completion of project work plans prior to implementation, including a description of personal protective clothing and equipment required (FSM 2109.14.3);
- Safety planning the requires development of a safety plan to protect the public and employees from unsafe work conditions when pesticides are involved (FSM 2109.16, FSM 2153.3);
- Safety and Health Hazard Analysis that requires completion of a Job Hazard Analysis (Form FS-67007-7) to determine hazards on the project and identify ways to eliminate them (FSM 2109.16.2, FSM 6700, FSH 6709.11).

Finally, FSM 2109.16.3 states the requirement for, and defines Pesticide Risk Assessment as “Another method of helping to ensure safety in pesticide use is to conduct risk assessments. Analyses estimate the possible pesticide dose to workers and the public who may be affected by a pesticide application; and the potential effects on fish, wildlife, and other non-target organisms. These estimated doses are then compared with levels of no observed effects based on tests of laboratory animals.”

3.8.2 AFFECTED ENVIRONMENT

The project area and the human health environment are situated in remote portions of Ravalli County, in Montana, and Idaho County, in Idaho on the Bitterroot, Nez Perce, Lolo, and Clearwater National Forests. The Selway Bitterroot Wilderness comprises ninety-six percent of the project area.

Effects are related both to the impacts of invasive plants on humans and the impacts of weed control. For invasive plants (weeds), concerns are related to the impacts from exposure to pollens and plant chemicals. For weed control, concerns are related to the exposure to toxicants found in the herbicides used in ground applications.

The human populations affected by the weed control actions in the alternatives include the workers applying the herbicide, recreationists walking through treated areas (e.g. trails, roadsides, trailheads, camp sites, airstrips, etc.), berry-pickers or plant gatherers using areas that have been sprayed, and private landowners that may use areas adjacent to national forest lands that have been treated.

3.8.3 METHOD OF ANALYSIS

The Forest Service contracted with Syracuse Environmental Research Associates (SERA) to evaluate ecological and toxicological data and human health effects based on Environmental Protection Agency (EPA) studies and other current peer-reviewed scientific literature. Human health and safety risks for the use of herbicides in this analysis are based on SERA Human Health and Ecological Risk Assessments (RAs) and other documents. The SERA RAs are incorporated into this analysis, are summarized in this chapter and can be found at http://www.fs.fed.us/foresthealth/pesticide/.

RAs have been prepared for all these herbicides except for aminopyralid. Aminopyralid is a herbicide recently reviewed and registered (August 10, 2005) for use under the Reduced Risk Pesticide Initiative of the U.S. Environmental Protection Agency. This designation is reserved for compounds that demonstrate lower risk to the environment and humans than marketplace standards. Decisions on which herbicides to use for weed control are based not only on their effectiveness on weeds, but also on the risks associated with their use. Toxicity information was reviewed to determine the levels of these chemicals that would be harmful to human health. The herbicides proposed for use in this analysis and common product names are listed below in Table 3.8-1.

As part of each risk assessment, a set of general exposure scenarios was developed based on the normal use of the herbicides. For workers, projected exposures are calculated from the amount of the herbicide handled per day and an estimate of possible exposure via various routes. Estimates of probable worker doses are based on empirical relationships of absorbed dose to pesticide exposures (Durkin 2005; training manual, p.3-32). For the general public, three general exposures scenarios are considered: walking through a sprayed area shortly after treatment, the consumption of ambient water from a sprayed watershed, and the consumption of sprayed fruit or fish.

Some, if not all, of these general exposure scenarios for the general public are very conservative. For example, in most cases, compounds are applied in relatively remote areas. Thus, under most situations, it is not likely that members of the general public would be exposed to substantial levels of any of these herbicides or treated plants right after application. (As an additional precaution, signs informing of herbicide use are and would continue to be placed at access points to treatment areas prior to initiating treatment.) The scenarios however, include exposure right after application to address exceptions to applications in remote areas.

Similarly, the estimates of longer-term consumption of contaminated water are based on estimated application rates and monitoring studies that can be used to relate levels in ambient water to treatment rates in a watershed. In most herbicide applications, however, substantial proportions of a watershed are not likely to be treated.

Finally, the exposure scenarios based on longer-term consumption of contaminated vegetation assume that an area of edible plants is inadvertently sprayed and that these plants are consumed by an individual over a 90-day period.

The most common wild food collected in large quantities on the Forest would be huckleberries. The invasive plants listed as threats to the Selway Bitterroot Wilderness, in Chapter 1, do not commonly occur among huckleberry shrubs. In addition, if huckleberry plants were sprayed, it would occur along roadsides, a site type pickers may tend to avoid because of the dust and dirt associated with roads. Treated huckleberries would have to be collected and stored to be available for the 90 day time frame. Treated plants fruit, in the field after spraying, would look wilted and would rapidly become unappealing to

foragers. Also, it would not remain fresh and available for the 90 days. Finally, treated areas would be posted so that pickers entering the area would know that the site or roadside had been sprayed.

In addition, a set of accidental exposure scenarios are also assessed in case of gross over-exposure associated with a spill or mishandling of a chemical (Durkin 2005; training manual, p.3-33). The worker exposure scenario involves immersion of the hands for a 1-minute period and wearing contaminated gloves for an hour. Accidental exposures of the general public are evaluated in three scenarios:

- A naked child is sprayed directly with a pesticide as it is being applied and no steps are taken to remove the pesticide from the child for 1 hour
- A woman is accidentally sprayed on her feet and legs
- One in which there is an accidental spill into a small pond and a young child consumes contaminated water shortly after the spill

Although these scenarios may seem unlikely, they are useful as a uniform comparison among herbicides and as an indicator for concern; i.e. if the 'naked child' scenario indicates no basis for concern, other dermal spray scenarios with lesser exposure will also pose little basis for concern.

3.8.4 ENVIRONMENTAL CONSEQUENCES

A. Comparing Direct and Indirect Effects – All Alternatives

Risks To Workers And The Public From Manual And Mechanical Treatment Methods

All alternatives include incidental amounts of manual and mechanical weed treatments such as pulling and mowing. Human health and safety risks for manual and mechanical weed control is based on review of job hazard analyses, consideration of the specific actions involved in these activities and the tools and machines involved.

Manual (hand) and mechanical (power mowers) treatments pose hazards to weed control workers. Adverse weather and terrain commonly create unfavorable working conditions and increased hazards. Hazards associated with adverse weather conditions include extreme heat and cold, which can be exacerbated by very dry and very wet conditions. Other hazards include: falling objects; tripping or slipping on hazards on the ground; protruding objects such as branches and twigs; poisonous plants and insects, dust inhalation and dangerous wildlife such as yellow jackets.

Tools and equipment present inherent hazards such as sharp edges on the tools, dust generation and the hazardous nature of fuels and lubricants used in mechanized equipment. Manual and mechanical methods present potential ergonomic hazards related to lifting and carrying equipment, and pulling vegetation.

Injuries can vary from minor cuts, sprains, bruises, and abrasions to respiratory impairment (from dust or fumes) to major arterial bleeding, compound bone fractures, serious brain concussions, and death. Workers are subject to heat-related illness or hypothermia when working in extreme weather conditions, and may incur musculo-skeletal injuries related to improper body mechanics. Equipment operators could be injured from improperly operating the equipment or losing control of equipment on steep or slippery terrain. Operators, nearby workers and the public may suffer hearing damage or be struck by flying debris around some equipment.

The potential for hazard exposure, i.e. risk of injuries, may be exacerbated when workers are fatigued, poorly trained, or poorly supervised, and do not follow established safety practices. Appropriate training, together with monitoring and intervention to correct unsafe practices, would minimize risk of worker injury and illness. Compliance with safety standards and regular review and discussion of the Job Hazard Analysis along with agency, industry and manufacturers' recommendations reduces the potential exposure and risk of injury to workers. Members of the public are usually not at risk from manual and mechanical methods unless they are too close to machinery that is producing flying debris during treatment.

Comparison Of Effects Between Alternative 1, 2, 3, 4, And 5
Since mechanical and manual weed control is a minor component of all alternatives, effects of the alternatives would be essentially the same.

Risks to Workers and the Public from Biological Controls

Release of biological control agents may have potential effects on human health. Pearson et. al. (2004) reported that release of the knapweed seed head gall fly (*Urophora affinis* and *U. quadrifaciata)* may increase deer mouse (*Peromyscus maniculatus*) abundance and the prevalence of Hantavirus. This may increase the risk of humans contracting this disease.

However, more recent results from the release of other spotted knapweed predators indicates that a suite of biocontrol agents, particularly involving the root mining weevil (Cyphocleonus achates), can combine to reduce large monocultures of spotted knapweed and may result in the long term reduction of the gall fly as a food source for deer mice (Story, personal communication). This in turn could result in no potential net increase of hantavirus threat.

Biological control agents may change ecosystems on a large scale in ways that have unknown potential effects on human health. These changes may occur on a similar scale to how weeds change ecosystems.

Comparison Of Effects Between Alternatives 1 And 3, And Alternatives 2, 4, And 5
There would be no increased bio-control related risks associated with Alternative 1 and 3 because neither proposes to use such agents. Alternatives 2, 4, and 5 include the release of biological control agents and may present slightly elevated risks as described above.

Risks to the General Public and Workers from Weeds

Some weeds can cause allergies and minor skin irritations in humans. Weeds such as thistles, cause minor scrapes and irritations. Other complications may result from hand pulling. For example, leafy spurge contains a latex-bearing sap that irritates human skin and rarely causes blindness in humans upon contact with the eye (Callihan et al. 1991).

Allergic individuals can have serious complications when exposed to allergens (weeds or pollen), including constriction of the airway and anaphylactic shock, the significance of which should not be underestimated since forest workers are often working some distance from medical assistance.

Approximately 10 to 15 percent of the U.S. population suffers from allergy symptoms associated with weed species such as knapweed. Knapweed contains a common and powerful allergen that peaks in August (Gillespie and Hedstrom 1979). Allergies to weeds such as knapweed may complicate or trigger asthma. It may take up to two years after getting a person's allergies under control to see a benefit in reduced asthma symptoms (Nielson 1999).

In 1992, a man in northern Idaho reported cuts on his hand after pulling spotted knapweed. The cuts eventually developed into what doctors called a very aggressive benign tumor. The man eventually had to have his little and ring fingers removed (Neihoff 1997).

After this incident, the Bureau of Land Managements National Applied Resource Sciences Center (BLM 1997) followed up and researched the topic. They reported that many plants are poisonous in one way or another. Some plants are poisonous on ingestion to livestock or humans. Other plants cause inflammation (irritation or dermatitis) on contact. The physical type from spines is called either skin irritation or is sometimes called contact dermatitis; whereas the chemical type via allergy or sensitization (e.g., poison ivy, poison oak) is called allergic contact dermatitis.

Several knapweeds occur throughout the west. Spotted knapweed is found in the project area while Russian knapweed, diffuse knapweed, and yellow starthistle occur on lands near to and hence are considered threats to the project area. Persons pulling weeds are advised to wear leather work gloves to protect the hands from abrasions and blisters when pulling weeds.

Comparison of Effects Between Alternatives

None of the alternatives would eradicate existing invasive plant populations from the entire project area or totally eliminate any associated potential threats to human health due to allergies and reactions to plant-based irritants. Alternatives 2, 3, and 5 allow for the reduction and/or elimination of established invasive plants in high use areas and eradication of new invasive plants inside the project area, thus reducing the potential for direct contact between visitors and potentially harmful non-native plants over the short and long terms.

Alternative 1 (No Action) would continue currently authorized activities within the project area. These actions include approximately 70 acres of herbicide treatment per year plus additional small amounts, less than 100 acres, of mechanical and cultural treatments. This alternative would do the least to reduce the human health impacts of invasive weeds.

Alternative 2 (Original Proposal) is constrained to a total of 1500 acres of herbicide treatment per year for the project area. Additionally, 10,000 acres of bio-control treatment is proposed over the life of the project (10-15 years). **Alternative 3** would not allow bio-controls, or herbicide use outside of Designated Areas in the Wilderness, and would not allow herbicide use within 50 feet of any live water or wetland. A total of 1800 acres would be treated with herbicide in this alternative. Alternatives 2 and 3 do more to reduce the human health impacts of weeds than Alternative 1 and 4, but less than Alternative 5.

Alternative 4 would treat nearly 1000 acres with herbicides, outside of the Wilderness and rely on bio-controls to reduce weed densities in currently infested areas within the Wilderness. This Alternative proposes 50,000 acres of bio-control treatments over the life of the project. This alternative would do more than Alternative 1 to reduce the human health effects of weeds but less than Alternatives 2, 3, and 5.

Alternative 5 (Preferred Alternative) proposes the highest level of herbicide use at 4100 acres, or 0.3 percent of the project area. Additionally, 50,000 acres of bio-control treatment is proposed over the life of the project (10-15 years). This alternative is considered the most effective alternative for slowing the spread of weeds and protecting native plant communities and natural ecosystems in the SBW. This alternative would provide the greatest reduction in human health impacts from invasive weeds. It also has the highest potential for encounters between weed-workers and SBW visitors.

Risks to the General Public and Workers from Herbicides

All alternatives would include use of the herbicides shown in Table 3.8-1, below. Only herbicides reviewed and registered by the EPA would be used and label directions (which include such things as hazard identification, potential health effects, first aid, handling and storage precautions, exposure guidelines, personal protective equipment and toxicological information) would be strictly followed. The herbicides included are displayed below.

Table 3.8- 1: Herbicides Included

Common Name	Selective?	Common Product Names
Aminopyralid	Yes	Milestone, ForeFront R&P
2,4-D	Yes	Formula 40, Hi-Dep, Weedar 64
Chlorsulfuron 4-11	Yes	Telar
Clopyralid	Yes	Transline
Dicamba	Yes	Banvel, Veteran 10-G
Glyphosate	No	Roundup, Rodeo, Accord
Imazapic	Yes	Plateau
Imazapyr	Yes	Arsenal, Chopper, Contain
Metsulfuron methyl	Yes	Escort, Ally
Picloram	Yes	Tordon
Triclopyr	Yes	Garlon
Adjuvants	N/A	In Place, LI-700, MSO, Preference, R-11, Stay Put, Syltac
Dyes	N/A	SPI Max, Hi-Light, Dye marker

The EPA develops Reference Doses (RfDs) for chronic exposures (which are an estimate of a daily dose over a 70 year lifespan) that a human can receive without an appreciable risk of deleterious effects. RfDs include a “safety factor” where the No Observed Effect Level is divided by a factor, usually 100 fold, to account for uncertainty and hypersensitive individuals. The 100 value is derived by including a safety margin of 10 for using the results from mammals other than humans, and another safety factor of 10 for variation in the population to a particular compound. The chronic RfD is a very conservative toxicological threshold in relation to this analysis because it assumes **daily exposure** over a 70 year lifespan. Actual potential environmental exposures for the projects in this analysis for both workers and the general public would not be every day for 70 years. The chronic RfD is used to error on the side of caution and display potential effects if a person was exposed daily for a 70 year lifespan. Actual chronic effects are less if exposure is less.

RAs were used to evaluate whether worker or public exposure scenarios could potentially exceed the RfD. A background discussion of RA hazard identification, exposure assessment, dose-response assessment risk characterization considered in Forest Service RAs is included in the project file (Durkin / SERA, 2005).

Herbicide application workers are exposed to many of the same hazards as manual workers when working in an outdoor wildland environment. The RA scenarios consider only risks associated with the herbicides themselves. Risk assessment scenarios are discussed above under “Methods of Analysis”.

The human health hazards associated with each herbicide active ingredient were evaluated with a thorough review of relevant toxicological studies. In all SERA RAs developed since 2000, the EPA’s Confidential Business Information files were accessed and this literature was cited where legal to do so in the

assessments. The EPA develops Reference Doses (RfDs) to serve as a benchmark for estimating risk of health effects from a lifetime exposure to herbicides. These RfDs generally reflect the most conservative (health protecting) No Observed Adverse Effect Level (NOAEL) or No Observed Effect Level (NOEL) (used in lieu of a NOAEL) and are made even more conservative by the application of precautionary factors which further increase conservatism in these estimates. The precautionary factors also consider and account for data uncertainty and other factors representing corrections for both intra- and inter-species variability. The FS/SERA RAs normally adopt EPA's RfD values unless compelling evidence exists indicating that the EPA erred in its selection of NOAEL or NOEL. For the purposes of the chemicals evaluated in this EA, EPA's evaluations for RfD are used in all cases.

Judgments about the potential hazards of herbicides to humans are 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 FS/SERA RAs, refer to SERA, 2001.

Detailed discussion of the toxicity endpoints evaluated and a review of relevant toxicological literature is presented in the cited SERA documents which are available to the public at www.fs.fed.us/foresthealth/pesticide. No information of concern is presented in these documents relating to carcinogenicity, mutagenicity or teratogenicity. All other toxicity endpoint discussion for the variety of possible scenarios described above is subsumed in the RA which combines the herbicides inherent hazard, an estimate of exposure, and a dose-response assessment modeled together to generate an estimate of risk for each scenario for each chemical – referred to as the Hazard Quotient (HQ). The herbicides that would be available for invasive plant treatment under each alternative are compared based on the HQ, which is the ratio between the estimated dose (the amount of herbicide received from a particular exposure scenario) and the RfD. When a predicted dose is less than the RfD, then the HQ (estimated dose/RfD) is less than 1.0, and significant toxic effects are unlikely for that specific herbicide application.

Since any RA is based on a number of assumptions, readers and decision-makers should not make the conclusion that the risk values are absolute. If the assumptions are changed, the risk values change. However, the relative risk among herbicides or application methods should remain the same unless new toxicity data becomes available.

Public Potential Health Risk

For the typical application rates, only two of the herbicides (2,4-D and dicamba) and NPE in R11 exceeds a HQ of 1. All eight of the problem scenarios are acute exposures and result from direct spray of a naked child who does not wash off the herbicide for 1 hour (2,4-D), an adult female eating 1 lb. of sprayed fruit (2,4-D), a child drinking l liter of water from a pond where 200 gallons of mixed herbicide was spilled (2,4-D, dicamba and Nonylphenol Polyethoxylate -NPE), a child drinking 1 liter of water from a stream contaminated by runoff or percolation (2,4-D) and an adult male recreational angler and subsistence population member eating fish from a pond after a herbicide spill (2,4-D). The plausibility of these scenarios is low because applicators are unlikely to both encounter and spray a naked child and in the event of a pond spill, precautions would be taken to prevent public access following a spill (reducing the chance of drinking the water and fishing). Protection measures are described in Chapter 2 make runoff or percolation contamination unlikely.

In the NPE scenario, the HQ>1 was for a child drinking contaminated water after a spill of herbicide and surfactant containing NPE at 25 ounces/acre (Baake 2003, p.35). This scenario is highly unlikely because typical rates of the surfactant used are 1 ounce or less/acre.

Consumption of sprayed fruit may be slightly more plausible. Huckleberries are the most commonly collected wild fruit in the project area. Weed infestations do not typically occur on aspects, elevations and habitat types where huckleberries are found. Sprayed areas would be posted and fruit contaminated with 2,4-D would look wilted and have an unusual odor that is affiliated with 2,4-D. In the event a wild fruit gatherer did not notice the posting, wilting of the plant and odor of 2,4-D, the fruit would have an uncharacteristic taste that would make it unlikely the woman in the scenario would consume 1 lb. of fruit.

The worst case scenarios include the acute exposure scenarios described above plus an acute exposure in which a woman is directly sprayed on her lower legs and feet and does not wash for 1 hour. Again, as stated above, applicators are instructed in situational awareness and never spray a person. The one chronic worst case scenarios not described above results from a woman eating 1 lb. of contaminated wild fruit per day for 90 days. Posting the site, and the appearance and taste of sprayed wild fruit would make this scenario unlikely.

Potential Worker Effects

For aminopyralid, a recently EPA registered herbicide, a potential exposure scenario was analyzed based on treatment of vegetation around campgrounds or other recreation areas. An analysis of a short-term post-application incidental oral exposure for infants and children via hand-to-mouth transfer of residues and ingestion of aminopyralid-contaminated grass and soil resulted in an exposure estimate that is 150 times below the acceptable limit.

No other scenario presenting a greater potential exposure to the general public is expected. There were no general public scenarios with HQs greater than 1 for imazapyr. Triclopyr had four general public worst case scenarios with HQs greater than 1. These scenarios were direct spray of a naked child who does not wash off the herbicide for 1 hour, a woman being directly sprayed on her lower legs and feet and not washing it off for 1 hour, a child drinking l liter of water from a pond where 200 gallons of mixed herbicide was spilled and a woman walking through a recently sprayed area wearing shorts for 1 hour and not washing for 24 hours. The plausibility of the first three scenarios is discussed above. The fourth scenario may be more plausible. Treated areas would be posted (that herbicides will be applied) as a protection measure to reduce the likelihood of this scenario occurring. The HQ of this worst case scenario was relatively low, 1.3 however, indicating that while it may be plausible, protection measures would reduce the likelihood and in the event of it occurring, the HQ is low, indicating the exposure is very close to the conservative EPA RfD.

Five of the herbicides: chlorsulfuron, imazapic, imazapyr, sulfometuron methyl and picloram have a HQ of less than one for all scenarios. A HQ less than one indicates significant toxic effects are unlikely for these herbicide scenarios.

Worker Potential Health Risk

For the typical application rates, only one of the herbicides (2,4-D) exceeds a HQ of 1. All three of these HQs are also relatively low and close to one. All three of the problem scenarios are chronic exposures. These scenarios are for general exposure for backpack (HQ = 1.3), ground (HQ = 2) and aerial (HQ = 1.5) application. Chronic exposures in these scenarios assume an applicator applies this herbicide every day for a 70 year lifespan. These scenarios are mitigated and unlikely to occur because applicators will apply herbicides, at most, 30 to 40 days a year (usually less) for a maximum 20 to 30 year career. In addition workers will wear personal protective equipment and observe safe herbicide handling practices.

The worst case scenarios include the chronic exposure scenarios described above plus several acute exposure scenarios. These acute exposure scenarios are a worker wearing contaminated gloves for 1 hour (HQ = 1.7) and a worker spilling herbicide on their lower legs and not washing it off for 1 hour I HQ = 2). Both of these scenarios have relatively low HQs that are close to 1. The likelihood of these scenarios

occurring is low because applicators carry clean wash water on the job, and are instructed to wash immediately upon contamination or spilling herbicide on themselves.

Seven of the herbicides: chlorsulfuron, clopyralid, glyphosate, imazapic, imazapyr and sulfometuron methyl and picloram have HQs of less than one for all scenarios. A HQ less than one indicates significant toxic effects are unlikely for these herbicide scenarios.

Impurities and Metabolites

Formulated herbicides as applied in Forest Service weed treatments may contain additional compounds besides the active herbicide ingredient that are called impurities or inert ingredients. Other additives, called surfactants or adjuvants, 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 herbicide formulation chemicals in their physiologic systems, they may be transformed into other compounds called metabolites.

In addition to the analysis of potential hazards to human health from each herbicide active ingredient, Forest Service/SERA RAs evaluate any available scientific studies of potential hazards of these other substances associated with herbicide applications: impurities, metabolites, inert ingredients, and adjuvants. While there is often less information available on these substances because they are not subject to the extensive testing that is required for the herbicide active ingredients under Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), it must be noted that testing of formulated products is relatively common, and where it is done, the test results include the effects of the additives which are included in the formulated product (inert ingredients, surfactants, penetrants or other chemicals added to enhance product efficacy). In some cases, additional information is available concerning inerts and adjuvants if they have been tested to comply with other federal laws, such as the Federal Food, Drug, and Cosmetic Act.

Toxicity studies generally account for impurities in the active ingredient, except in the case of carcinogens associated with the following impurities:

- Hexachlorobenzene (HCB) in both clopyralid and picloram
- Ethylene oxide in NPE (nonylphenol polyethoxylate)-based surfactants
- 1,4-dioxane in some formulations of glyphosate containing NPE-based surfactants

Analyses of the carcinogenic risk of these three impurities are presented in the corresponding FS/SERA or Bakke RA. In addition to carcinogenic risks, acute and other chronic risks from exposure to HCB are also specifically analyzed. In Bakke (2003) the risk of cancer from exposure to ethylene oxide in NPE-based surfactants was considered negligible for workers, based on the EPA standard of acceptable risk of less than 1 in 1 million. Ethylene oxide is not analyzed further in this human health RA.

Borrecco and Neisess (1991) found the risk of cancer from exposure to 1,4-dioxane in glyphosate was considered negligible for workers, based on the EPA standard for acceptable risk of less than 1 in 1 million. 1,4-dioxane is not analyzed further in this human health RA.

Similar to impurities, the potential health effects of herbicide metabolites are often accounted for in the available toxicity studies on the herbicide active ingredient, assuming that the toxicological effects of metabolism in the test animal species would be similar to the toxicological effects in humans. Uncertainties in this assumption are encompassed in the precautionary uncertainty factor used in calculating the RfD and may sometimes influence the selection of the study used to derive the RfD.

The herbicide triclopyr presents a special case: its principal metabolite, called TCP, is also a metabolite of chlorpyrifos, an insecticide. The risks for direct, indirect, and cumulative effects of human exposure to TCP from both sources are discussed in the SERA triclopyr herbicide RA (SERA 2003e).

Comparison of Alternatives for impurities and metabolites
The effects are the same for all alternatives.

Inert Ingredients

FS/SERA RAs analyze the human health risks of inert ingredients and full herbicide formulations by the process described below:

- Comparison of acute toxicity data between the formulations (that include inert ingredients) and the active ingredients alone to address whether the inert is likely to constitute a substantial fraction of the formulation toxicity
- Disclosing whether or not the formulated products have undergone chronic toxicity testing
- Identifying, with the help of EPA and the herbicide registrants, ingredients of known toxicological concern in the formulated products and assess the risks of those ingredients

Researchers who have studied the relationships between acute and chronic toxicity have found that relationships do exist and acute toxicity data can be used to give an indication of overall toxicity (Zeise, et al., 1984). The court in **NCAP v. Lyng**, 844 F.2d 598 (9th Cir 1988) decided that this method of analysis provided sufficient information for a decision maker to make a reasoned decision. **In SRCC v. Robertson**, Civ.No. S-91-217 (E.D. Cal., June 12, 1992) and again in **CATs v. Dombeck**, Civ. S-00-2016 (E.D. Cal., Aug 31, 2001) the district court upheld the adequacy of the methodology described above for disclosure of inert ingredients and additives.

The EPA has categorized approximately 1,200 inert ingredients into four lists. Lists 1 and 2 contain inert ingredients of known or suspected toxicological concern. List 4 contains nontoxic substances such as corn oil, honey and water. List 3 includes substances for which EPA has insufficient information to classify as either hazardous (List 1 or 2) or non-toxic (List 4). Use of formulations containing inert ingredients on List 3 and 4 is preferred for weed treatment under current Forest Service policy and in the alternatives considered in the EIS.

Much of the information about inert ingredients that is submitted to EPA for pesticide registration is classified as “Confidential Business Information” (CBI). CBI is not generally released or available for public review. SERA risk assessors, however, have reviewed the identity and data on inerts in the CBI files when preparing all herbicide RAs except 2,4-D (which RA predates their clearance to review the data). This RA is being revised to include CBI materials available to our assessor at the present time. If significant changes are made in the assessment of risk based on this review, the new information will be used to reevaluate conclusions drawn in this document.

All publicly released information from herbicide registrants and Freedom of Information Act requests to EPA has also been reviewed for its relevance in Forest Service/SERA risk analyses. Comparison of acute toxicity (LD50 values) data between the formulated products (including inert ingredients) and their active ingredients shows (due to dilution when incorporated into less toxic carrier liquids or granulating materials) the formulated products are generally less acutely toxic than their active ingredients (even as concentrated formulated products are poured from the container). Further dilution generally is done prior to loading the herbicide into the tank of the application tool which further reduces the inherent hazard per unit of volume

of the chemicals being applied. Forest Service/SERA RAs review the acute toxicity comparisons, the EPA's review, of the toxicity information on inert ingredients in each formulated product.

Comparing Alternatives for inert ingredients

The effects are the same for all alternatives. For all formulations containing inert ingredients that have been reviewed in the FS /SERA RAs, the reviews have concluded that the formulations do not significantly increase the risk to human health and safety over the risks identified for the active ingredients. Further, in all cases (where both separate information on the active ingredient and formulation inert ingredients toxicology are known, and there is information available concerning the formulated products toxicological profile) in the formulated product data accurately portrays the toxicology spectrum predicted from assessing a hypothetical equivalent mixture (of appropriate proportion) of the two separate components. That is, a model which considers the active ingredient and the inerts separately and adds projected HQs for the two in proportions equivalent to the formulated product for which data is available, yields HQs equivalent to those projected using the data developed concerning the formulated product.

Comparing Alternatives for surfactants

The effects are the same for all alternatives. Surfactants, or surface-acting agents, are a broad category of activator adjuvants that facilitate and enhance the absorbing, emulsifying, dispersing, spreading, sticking, wetting, and/or penetrating properties of herbicides. Surfactants are most often used with herbicides to aid spread and penetration over the waxy cuticle (outer layer) of a leaf or to penetrate through the small hairs present on the leaf surface. Because of the high surface tension of water, spray mixture droplets can maintain their roundness and sit on the leaf hairs or waxy surface without much of the herbicide actually contacting the leaf. The primary purpose of a surfactant is to reduce the surface tension of the spray solution and allow more intimate contact between the spray droplet and the plant surface. They may also change the permeability of the leaf surface.

Most surfactants used with herbicides are considered non-ionic surfactants. This means that these compounds have no electrical charge. There are cationic (positive charge) and anionic (negative charge) surfactants, but they are not as commonly used, with the exception of the cationic surfactant in the Roundup® formulation of glyphosate. Surfactants have the physical characteristics of both oil and water. Most surfactant molecules contain a water-loving (hydrophilic) head and an oil-loving (lipophilic), long-chain hydrocarbon tail.

The surfactants proposed for use in association with this project include: In Place, LI 700, Mentholated Seed Oil, Preference, R-11 and Syl-tac. None of these contain ingredients found on U.S. EPA's inerts list 1 or 2 (Baake 2002 and http://www.epa.gov/opprd001/inerts/lists.html). (Additional adjuvants may be considered for use with this project after evaluation to assure comparable safety). This is either based on the identified ingredients, or if these ingredients are not sufficiently identified, by information given by the manufacturers. The assessment of hazards for these adjuvants is limited by the proprietary nature of the formulations, and also by the simple fact that study of their toxicity is not required under the current version of FIFRA. Unless the U.S. EPA classifies a compound in the formulation as ether an active ingredient or as hazardous, the manufacturer is not required to disclose its identity. At the current time, the disclosure of whether a material is hazardous is based primarily on acute toxicity. All of the adjuvants discussed here are no more than slightly toxic when ingested, inhaled, or absorbed through the skin (ibid).

The primary summary statement that can be made is that the more common risk factors for the use of these adjuvants are through skin or eye exposure. These adjuvants all have various levels of irritancy associated with skin or eye exposure. Thus emphasizes the need for good industrial hygiene practices while utilizing these products, especially when handling the concentrate during mixing. Chemical resistant gloves and goggles are used at all times during application, but especially while mixing products and loading equipment.

Of the surfactants proposed for use, only surfactants containing NPE (nonylphenol polyetholxylate) have been tested and data produced that identifies specific and quantifiable hazards to human health. NPEs are also used in products designed for human exposure (such as cosmetics and spermacides). NPE is often referred to as nonoxynol (Bakke 2003). The FS RA (USDA FS 2003) identified that NPE may contain nonylphenol, an EPA List 1[1] inert, which has potential for toxic effects. The potential for toxic effects from use in the Selway Bitterroot Invasive Plant Management project area were analyzed for public and workers scenarios.

Comparing Alternatives for Additive or Synergistic effects from Herbicide Mixtures
The effects are the same for all alternatives. Synergistic effects are those effects resulting from exposure to a combination of two or more chemicals that are greater than the sum of the effects of each chemical alone (additive). No indication of potential synergisms among the chemicals in the alternatives, or between these chemicals and other environmental pollutants has been seen in the literature relating to these chemicals, with a single exception. Picloram in combination with 2,4-D is known to produce a mild skin rash (unpredicted from the behavior of either chemical alone) in a limited percentage of individuals. There have also been no reports of xenoestrogenic response in these chemicals.

Effects on Sensitive Individuals

The uncertainty factors used in the development of the RfD take into account much of the variation in human response. The uncertainty factor of 10 for sensitive subgroups is sufficient to ensure that most people would experience no toxic effects. “Sensitive” subgroups are those that might respond to a lower dose than average, such as women, children or hypersensitive or allergic persons. The National Academy of Sciences (NAS), 1993, the quantitative differences in toxicity between children and adults are usually less than a factor of approximately one order of magnitude (10-fold). Human susceptibility to toxic substances can vary by two to three orders of magnitude, so an uncertainty factor of 10 for sensitive subgroups may not cover every individual who may be unusually sensitive to herbicides. Unusually sensitive individuals may experience effects even when the HQ is equal to or less than 1. Individual susceptibility to the herbicides in the alternatives cannot be specifically predicted. Factors affecting individual susceptibility include diet, age, heredity, pre-existing diseases, life style, and other environmental factors.

There is anecdotal information (case histories) suggesting that some individuals may be sensitive to 2,4-D. These individuals report neuropathy as impaired nerve function after exposure to 2,4-D at levels that are not expected to cause adverse health effects in the general population. The effects reported in the case studies are debilitating, and recovery may be prolonged and incomplete. On the other hand, no case study to the present has been scientifically definitive; the case studies do not rule out the possibility that the neuropathy was caused by other unidentified agents.

There is no information to suggest that specific groups or individuals may be especially sensitive to the systemic effects of chlorsulfuron, clopyralid, imazapic, imazapyr, metsulfuron methyl, picloram, or sulfometuron methyl.

The only identified sensitive subgroup for dicamba appears to be children. Since the RfD for dicamba explicitly considers the increased sensitivity of children with an additional safety factor and since exposure assessments for children are conducted in the risk assessment, this sensitive subgroup is adequately addressed in the SERA risk assessment of dicamba. (SERA 2004e, 2004f)

Because triclopyr may impair blood filtration, individuals with pre-existing kidney diseases are likely to be at increased risk. Women of childbearing age have been recognized by EPA as a particularly sensitive subgroup for acute exposures to triclopyr by reducing the RfD from 1.0 mg/kg/day to 0.05 mg/kg/day.

There is limited information to suggest that specific groups or individuals may be especially sensitive to the systemic effects of NPE-based surfactants. NPE can cause increases in kidney and liver weight, and effects to kidney function and structure. Thus, individuals with preexisting conditions that involve impairments of the kidney or liver may be more sensitive to this compound. There is some indication that sensitive individuals may develop contact allergies. People with a history of skin allergic reactions to soaps and detergents may be especially sensitive to dermal exposures of NPE-based surfactants.

The potential of NPE to induce reproductive effects should be considered low. Based on the available dose/duration/severity data, it appears that exposure levels below those associated with the most sensitive effect (i.e., kidney effects) are not likely to be associated with reproductive toxicity. However, as shown in the exposure scenarios, there is the potential for acute exposures to be in the range (considering a 100X safety factor) where effects to the developing fetus may occur; therefore, pregnant women could be considered a sensitive population.

Persons who are chemically sensitive usually know that they are. The protection measure in Chapter 2 to post sites that will and have been treated with herbicides provides sensitive individuals the opportunity to avoid sprayed areas and avoid adverse effects. Use of herbicide dyes can further identify treated areas and aid those who wish to avoid such areas.

B. Cumulative Effects

All Alternatives

The use of herbicides could result in cumulative doses of herbicides to workers or the general public. Cumulative doses from the same herbicide may result from (1) additive doses via various routes of exposure resulting from a single invasive plant treatment project and (2) additive doses if an individual is exposed to other herbicide treatments. Possible exposure scenarios are described and analyzed in this chapter. Additional sources of exposure include: use of herbicides on lands adjacent to the project area or home use by a worker or member of the general public.

Forest Service risk assessments consider the effects of both single (acute) and repeated (chronic) exposure(s) by assessing the exposure levels for each herbicide. Chronic long term exposure scenarios are based on a lifetime of repeated doses from consuming contaminated water, fruit, or fish and repeated exposure to herbicides and direct spray.

This analysis specifically considers the effect of repeated exposure in the chronic exposure scenarios and through the use of the chronic RfD as an index of acceptable exposure. Where individuals could be exposed by more than one route, the cumulative risk of such cases can 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. Consequently, repeated exposure to levels below the toxic threshold should not be associated with cumulative toxic effects.

Similar scenarios can be developed with the other herbicides. Since these herbicides persist in the environment for a relatively short time (generally less than 1 year), do not bioaccumulate in humans and are rapidly eliminated from the human body, no significant cumulative health effects from repeated treatments in the past, present or foreseeable future are predicted. The herbicides clopyralid, picloram, and sulfometuron methyl persist in the environment for more than one year; however, re-treatment in the following year is not expected; thus, no additive doses from re-treatment are predicted.

Hexachlorobenzene, an impurity found in herbicide formulations containing clopyralid and picloram (trade names include Transline and Tordon), was evaluated for cancer risk based on long term exposures. The scenarios which include consumption of contaminated fruit, fish, and water resulted in exposures at least 100 times below the level of concern (a cancer risk of 1 in 1 million).

Estrogenic effects (a common toxic action, and a form of endocrine disruption) can be caused by additive amounts of nonylphenol (NP), NPE (an ingredient in R-11, one of the surfactants used on the Forest), and their breakdown products. In other words, an effect could arise from the additive dose of a number of different xenoestrogens (estrogens from outside the body), none of which individually have high enough concentrations to cause effects, except perhaps in especially sensitive or allergic individuals. This can also extend out to other xenoestrogens that biologically react the same. Additive effects, rather than synergistic effects, are expected from combinations of these various estrogenic substances.

When assessing cumulative effects of exposure to NP and NPE, there must be some consideration of the contribution from other sources, such as personal care products (skin moisturizers, makeup, deodorants, perfumes, and spermicides), detergents and soaps, foods, and from the environment away from the forest herbicide application site. In addition to xenoestrogens, humans are exposed to various phytoestrogens, which are hormone-mimicking substances naturally present in plants. In all, more than 300 species of plants in more than 16 families are known to contain estrogenic substances, including beets, soybeans, rye grass, wheat, alfalfa, clover, apples, and cherries.

The Forest Service, Pacific Southwest Region, recently analyzed the risks of cumulative estrogenic effects from proposed Forest Service use of NPE, plus worst-case environmental background and consumer product exposures (USDA FS 2002). Adding together the cumulative contributions from the worst-case background environment and consumer products, the risk assessment estimated that backpack applicator exposure would add from 0.1 (typical rate) to 10 (maximum rate) to the cumulative HQ, which ranged from 3 (low dermal exposure assumptions) to 270 (high dermal exposure assumptions). For the public chronic exposures at the maximum application rate, the doses of NPE would add 0.00002 to 0.2 to any HQ. These may be negligible depending upon the background exposures, lifestyles, absorption rates, and other potential chemical exposures that are used to determine overall risk to environmental xenoestrogens.

The potential for cumulative human health effects from any herbicide use proposed in this EIS, combined with other potential herbicide applications in the analysis area, is encompassed in the chronic exposure scenarios, which consider the effect of repeated exposures. The risk of toxic health effects from repeated exposure to any of these herbicides at doses that are less than the chronic toxicity benchmark (chronic RfD) is low for all alternatives.

Past, present and reasonably foreseeable activities that may have cumulative effects on human health include weed control efforts on adjacent private and public lands. Based on the results of risk assessments performed by the Forest Service, the ongoing and future activities are not expected to result in exposures to workers and the general public at doses that exceed the reference dose. Therefore, under all alternatives, no cumulative adverse health effects are anticipated for workers and the general public, provided herbicides are applied in accordance with the label as proposed. There are no anticipated cumulative health effects associated with biological, mechanical, or cultural treatment of weeds.

3.8.5 REGULATORY FRAMEWORK CONSISTENCY

All alternatives are consistent with Environmental Protection Agency, Occupational Health and Safety Administration, and Forest Service regulations regarding pesticide use and worker safety.

CHAPTER 4

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Idaho Department of Parks and Recreation
Idaho Department of Fish and Game
Montana Department of Fish, Wildlife, and Parks
Montana Department of Environmental Quality

Selway Bitterroot Foundation

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Ravalli County Board of Commissioners
University of Idaho Library
Moscow City Library
Lewiston City Library
University of Montana Library
Bitterroot Public Library

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US Environmental Protection Agency, Washington DC
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