Back to Table of Contents

4.0 Affected Environment and Environmental Consequences

4.1 Introduction

To begin a scientific investigation that compares alternative outcomes, it is important to establish common assumptions and assessment guidelines for each of the studies. This approach ensures that each of the subjects is treated fairly and consistently. Common assumptions and assessment guidelines followed during preparation of this chapter are described in this section.

The Native Fish Habitat Conservation Plan (NFHCP) is a programmatic plan (forest management approach) that dictates the level of impact analysis possible, and appropriate, for this Environmental Impact Statement (EIS). Because of this, and because of the size of the Project and Planning Areas, relatively broad-scale assessments were used to describe the affected environment and environmental consequences for many of the resources. For many native salmonids (Incidental Take Permit [Permit] species), impacts from the four alternatives are evaluated in terms of the direction and magnitude of change of key habitat components resulting from management actions associated with those alternatives. In most cases, given management of Project Area lands before state forest practice rules, all alternatives would generally result in greater conservation opportunity for native fish habitat over time. How much greater varies by alternative, and probably varies across the Project Area based on site-specific issues that may be present. However, our ability to document site-specific issues is limited because of the large geographic scope of this planning process. Therefore, the Services evaluated the general direction and magnitude of change in habitat quality at different levels of scale to help identify overall impacts on Permit species from the four alternatives.

How Should I Use this Chapter?

This chapter describes the affected environment and environmental consequences that would result from implementing management practices associated with the alternatives. When you read this section, it is important to start with the *Introduction* because it provides the common assumptions used to evaluate each of the resource areas. Then, you can read about each of the resource areas, including *Geology and Soils*, *Water Resources and Hydrology*, *Water Quality and Contaminants*, *Vegetation Resources*, *Fisheries and Aquatic Resources*, *Wildlife Resources*, *Land Use*, *Recreation Resources*, *Visual and Aesthetic Resources*, *Cultural Resources*, *Social Resources*, *Economic Resources*, and *Air Quality*. Each resource area section discusses the issues considered in the evaluation, identifies the issues eliminated, describes the affected environment, and discusses the consequences of the proposed NFHCP, other action alternatives, and No Action Alternative. After all of the resource areas are evaluated, the final section of this chapter describes the *Irreversible and Irretrievable Commitments of Resources*.

The proposed NFHCP consists of a set of programs (specific and generic forest management prescriptions and commitments to management procedures) designed to collectively address a group of activities that are well-defined and occur within a described geographical area or at

similar points in time. The programs contained in the NFHCP establish conservation measures, including basic guidelines and processes, and set forth planning elements that would be implemented by Plum Creek in future land management actions.

Many of the conservation measures or prescriptions are generically directed at types of habitat, settings, or conditions rather than site-specific geographic locations. Discussions of affected environment and environmental consequences are, therefore, structured primarily to provide a broad overview of the resources and the effects of the large-area NFHCP that would be used to manage lands on a multi-regional basis. The two other action alternatives and the No Action Alternative are similarly assessed at a broad scale because of their programmatic nature.

Discussions of the affected environment describe existing conditions for resources within the Project and Planning Areas that would potentially be affected by implementing the proposed management regimes. Discussions focus on those resources that would be most affected, or have a high likelihood of being affected, by the management regimes and which would, in turn, have a high likelihood of affecting fish and wildlife, especially the native salmonid Permit species and their habitat.

Discussions of environmental consequences focus on substantive beneficial and adverse effects on resources that would result from implementing the proposed management regimes. For the No Action Alternative, potential effects are discussed in terms of trends and future conditions. For the proposed NFHCP and the two other action alternatives, potential effects are discussed in terms of impacts, beneficial as well as adverse. The impact analyses focus on the proposed 30-year Permit period but also briefly address potential Permit periods of 10 and 20 years. Emphasis is placed on analyzing potential impacts on Permit species, their habitat, and other resources that would be affected by Plum Creek's NFHCP, or the other action alternatives, as well as pertinent issues raised during public scoping. Mitigation measures that would reduce or avoid the potential occurrence of certain adverse impacts are described for each resource. Any remaining unavoidable adverse impacts are identified. Irreversible and irretrievable commitments of resources for each resource topic are described in the final section of this chapter.

The impact analysis is a broad assessment of the cumulative effects of the alternatives. This approach was necessary because conservation measures that are intended to benefit Permit species would be implemented only within the Project Area (Plum Creek lands). These conservation measures mainly affect the habitat of fish species, such as riparian areas and instream habitat. It is also important, however, to address related issues that require integrated management across broad landscapes, such as effects from upland areas. Therefore, the impact analysis assesses the effects of implementing programmatic prescriptions within the 1.6-million-acre Project Area on all lands within the 16.5-million-acre Planning Area.

Descriptions of the affected environment provide an environmental baseline or benchmark for assessing potential impacts of the proposed NFHCP and alternatives. The No Action Alternative itself also provides a benchmark for comparison to

other alternatives through time. Benchmarks provide reasonable and objective reference points, or ranges, for comparing relative differences and projected changes among proposed management regimes. Environmental baseline or benchmark conditions for resources in the Project and Planning Areas are described using current, readily available information. Data for some resources are more current than others and provide a slightly better benchmark of today's conditions in the Project and Planning Areas.

Benchmark conditions for the native salmonid Permit species covered in Plum Creek's NFHCP reflect land and resource management practices as they existed up to the late 1980s and early 1990s for the following reasons:

- Today's land and resource management practices have not had sufficient time to significantly influence today's native salmonid conditions. The status of salmonid fishes today is determined largely by past land and resource management practices.
- The basis for listing bull trout as threatened was developed using information in the Administrative Record through 1997, which essentially reflects the longer-term effects of land management practices conducted prior to the early 1990s.
- Montana, Idaho, and Washington implemented new and revised state forest practices regulations by 1991 and after.
- Plum Creek developed and began implementing their Environmental Principles in 1991 and Land Use Principles in 1995.
- Federal agencies began widely applying current conservation measures on federal lands to protect native fish in the early to mid-1990s.

Environmental benchmarks provide useful platforms for National Environmental Policy Act (NEPA) evaluations of alternatives and have been used in other recent analyses in the Pacific Northwest, such as the Northwest Forest Plan and the Interior Columbia Basin Ecosystem Management Project (ICBEMP). Benchmarks are adequate for describing and comparing the expected magnitude and direction of environmental trends under different proposed management regimes.

The impact analysis evaluates the potential effects of individual prescriptions within categories of conservation commitments developed by Plum Creek for the management activities covered in the NFHCP. Covered activities addressed by these conservation commitment categories are listed in Chapter 1 and described in Chapter 2, Section 2.3.1, *Plum Creek's Land Management*. These same conservation categories were used to construct the two other action alternatives and the No Action Alternative, although individual prescriptions and commitments within conservation categories usually vary among alternatives and differ from the NFHCP, as described in Chapter 3. Plum Creek developed their prescriptions by following these general guidelines:

1. Develop prescriptions that benefit native salmonids specifically for those covered activities that could potentially and substantively affect the habitat of Permit species.

2. Do not develop prescriptions for those covered activities that have not affected, and will not affect, native salmonid habitat because of the nature or location of the activity, adequate resource protection provided by existing federal and state regulations and Best Management Practices (BMPs), or a combination of the above.

All of the covered activities listed in Section 2.3.1 were considered in aggregate in the assessment of Plum Creek management activities that could potentially affect native salmonid Permit species and their habitat. Conservation measures proposed by Plum Creek are directed at specific covered forestry activities with the intent of providing the greatest benefit to native salmonids and their habitat. NFHCP prescriptions are also intended to complement and build on resource protection presently provided by existing regulations (federal and state regulations and BMPs) and by Plum Creek's Environmental and Land Use Principles. The prescriptions also are aimed at improving those conditions that have been identified by the U.S. Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS; used together, the Services) as limiting to bull trout and contributing to this species' listing as threatened under the Endangered Species Act (ESA), as well as similar conditions for other native salmonids. For the above reasons, the impact analysis of the proposed NFHCP focuses on prescriptions that would be implemented by Plum Creek to benefit bull trout and other native salmonid habitat and on those covered management activities that could potentially affect aquatic habitat and organisms. Similarly, the impact analyses of the two other action alternatives and the No Action Alternative focus on their associated management prescriptions and geographic settings where such prescriptions would be implemented.

The effects analysis is based on acres of Plum Creek lands and miles of Plum Creek roads within the Project Area as of January 1, 1998. Comparisons show that these values are only slightly different from present values. Acres of Plum Creek lands within Tier 1 and Tier 2 watersheds on January 1, 1999, were only 0.3 percent less than 1 year earlier. This variance would not be great enough to cause differences in the effects analysis or to reach significantly different conclusions regarding implementation of management prescriptions on Plum Creek lands. The road database used in this effects analysis contains about 5 percent more total roads (existing roads plus estimated new roads) than are presently estimated. This may have resulted in a slight, but not significant, overestimation of road-related impacts in this document (a somewhat conservative, worse-case scenario). Because of these general similarities, the January 1, 1998, baseline data for acres and roads were used in this analysis.

In summary, this EIS analyzes reasonably foreseeable actions under the sets of programs comprising the NFHCP and alternatives, and within the geographic boundaries of the Project and Planning Areas. The NFHCP also addresses a process for management changes to address unforeseen and changed circumstances. The impact analysis addresses large, regional trends and major changes in environmental conditions and processes. The impact analysis relies primarily on broad-scale, readily available scientific literature and reports. However, where appropriate, conclusions from fine-scale, time-specific case studies are extrapolated to broad-scale ecological

units selected for characterization. Quantitative descriptions and comparisons are provided where such data are available. Using this approach, potential ecological implications associated with the proposed NFHCP and other alternatives provide a meaningful broad- and sometimes fine-scale analysis of the expected magnitude and direction of environmental trends for the Permit species and effects on other resources.

Benchmark regulatory conditions analyzed for Washington lands under the No Action Alternative have changed since publication of the DEIS in December 1999. That analysis continues to be valid, but it likely overestimates potential impacts under the No Action Alternative and presents a somewhat more worse-case scenario than would actually occur. The new emergency rules based on the Forests and Fish Report and implemented on March 20, 2000, generally contain more beneficial, lower-risk prescriptions than contained in the 1998 Rule Book. Potential No Action impacts using these emergency rules as benchmark conditions would therefore be less adverse but well within the range of impacts described in the DEIS. In addition, further analysis by FWS and NMFS, which is described in detail in comment response 600 in Appendix F of this FEIS, shows that expected benefits of NFHCP prescriptions for Washington lands compare favorably with those of the emergency rules recently implemented by the state.

4.1.1 Cumulative Effects

Discussions of cumulative effects occur in various contexts and throughout the analyses contained in Chapter 4, not just in those sections titled "Cumulative Impacts." These discussions reflect broad directional cumulative effects that would result from implementing prescriptions associated with the Preferred Alternative and each of the other action alternatives on the 1.6-million-acre Project Area, combined with the effects of broad management prescriptions on other lands within the 16.5-million-acre Planning Area. In addition, discussions of ecological implications of land management activities on aquatic habitat and fish presented in Chapter 4 provide the reader a sense of the cumulative effects these actions can ultimately have, or have had, on a resource. Descriptions of the affected environment, in fact, reflect the cumulative effects of past and present land management actions that have collectively shaped the condition of resources occurring in the Project Area that are assessed in this document. For purposes of reader convenience and subject relevance, much of this information is concentrated in Sections 4.6.5 and 4.6.6 of Chapter 4 where historic and baseline conditions and future effects on fish species are discussed.

Because of the extremely large size of the Project and Planning Areas and because of the nature of some of the management prescriptions for the Project and Planning Areas, discussions of cumulative effects and incremental factors contributing to cumulative effects are often necessarily programmatic in nature. Such discussions focus on comparisons of the expected magnitude and direction of change of condition anticipated for various resources among the alternatives evaluated in this document. In summary, the incremental and combined effects of past, present, and potential future actions can only be understood by reviewing all of Chapter 4 and the supporting environmental documents in their entirety, and not by referring only to those sections titled "Cumulative Impacts."

4.2 Geology and Soils

4.2.1 Introduction

This section addresses the present conditions of geology and soils and the potential for impacting them as a result of implementing management programs associated with the proposed NFHCP, other action alternatives, and No Action Alternative. The discussion and analysis focus on potential impacts in the Project and Planning Areas.

4.2.2 Issues Eliminated from Further Analysis

Geology and soil issues identified during public scoping and listed in the Scoping Report (FWS and NMFS 1998) are addressed in the impact analysis. None were eliminated from analysis.

4.2.3 Issues Addressed in the Impact Analysis

The components of geology and soil resources addressed in this document include geomorphic processes that deliver sediment to streams and provide long-term soil productivity. Management activities in the Project Area have the potential to affect geology and soils in several ways. Primarily, the effects are related to the movement of surface materials, which include soils, weathered rock, and sediment. When delivered to streams, these materials can affect water quality and fish habitat (see Section 4.4 *Water Quality and Contaminants* and Section 4.6, *Fisheries and Aquatic Resources*). The mechanisms by which geology and soil conditions change in the landscape are called geomorphic processes—importantly, erosion and mass wasting. These processes are briefly discussed below, and in greater detail in Section 4.6, *Fisheries and Aquatic Resources*, and in Plum Creek Technical Report #3 (Plum Creek 1998a).

What are the Potential Effects of the Alternatives on Soil Erosion and Sediment Delivery to Streams?

Sediment produced from erosion of exposed soil surfaces and landslides influences the amount of sediment deposited in streams. Sediment delivery from these sources is expected to be reduced over time because BMPs are applied throughout the Project Area. The proposed NFHCP, other action alternatives, and the No Action Alternative are not expected to differ significantly in their effects on geologic and soil resources. However, the proposed NFHCP does have a commitment for responding to landslides, if they occur. Benefits in the form of reduced sediment delivery to streams associated with the proposed 30-year Permit would exceed benefits associated with the optional 10- and 20-year Permit lengths.

4.2.4 Description of Area of Influence

The area of influence covers portions of western Montana, northern Idaho, and Washington in the Project Area (Plum Creek lands) and Planning Area (Plum Creek and adjacent lands) (see Map 1.3-1 in Chapter 1). Immediate areas of influence within the Project Area include types of locations where prescriptions associated with the proposed NFHCP and alternatives would be implemented during the proposed Permit period. Most of the Project Area would not be subjected to management activities associated with the alternatives during the Permit period.

Instead, they represent the universe of lands upon which the management activities could occur. These lands primarily consist of riparian habitat, lands adjacent to stream channels, roads, and other areas that may be disturbed by management activities. Portions of the Planning Area could be influenced by processes that cross property boundaries.

4.2.5 Affected Environment

This section describes the geology, major soils, and general surface characteristics within the Project and Planning Areas as they relate to the potential for sediment delivery to streams and soil productivity.

Geologic Districts

The Project Area contains numerous bedrock lithologies that are aggregated into four general geologic districts (ICBEMP 1997a; Plum Creek 1998b):

1. **Metasedimentary**. The metasedimentary geologic district is primarily derived from metamorphosed sedimentary rocks. This district encompasses about 93 percent of the Project Area, and is located in northern Idaho and western Montana. Much of this bedrock has been influenced by continental and alpine glaciation over the past 100,000 years (Alden 1953). In some areas, the underlying bedrock is covered by hundreds of feet of glacial till deposited as glaciers receded.

2. **Granitics**. The granitic geologic district comprises approximately 3 percent of the Project Area and is part of the larger Idaho Batholith. Planning Area basins with substantial amounts of granite include the Little North Fork Clearwater River basin in Idaho and the western flank of the Bitterroot River basin in Montana. Most of this geologic district in the Project Area is unglaciated.

3. **Eastern Washington Volcanics.** The underlying geology of Planning Area lands in eastern Washington was formed as a result of the Columbia River flood basalt flows. It occupies only 1 percent of the Project Area, where it has been almost entirely shaped by fluvial processes, not glaciation.

4. **Western Washington Volcanics**. This geologic district occupies 3 percent of the Project Area, and is primarily unglaciated volcanic andesite.

Soils

Soils are produced by five soil-forming factors:

- Parent material
- Topography
- Climate
- Organisms
- Time

The dominant soil types occurring in the Project and Planning Areas are metasedimentary, granitic, and volcanic, which are derived from the major geologic districts described above. Metasedimentary-derived soils vary considerably in texture, but generally have low to moderate erosion potential (Washington Forest Practices Board [WFPB]1995). Erodibility of granitic-derived soils primarily is dependent on the degree of weathering, and is generally considered to pose a moderate-to-high erosion potential. Erodibility of surficial volcanic-derived soils of the Project Area is heavily influenced by weathering and ash deposition from volcanic activity. The

erosion potential is considered moderate in both the basalt and andesite geologic areas.

Geomorphic Processes Delivering Sediment to Streams

The geology, soils, and physiography of the Project Area determine the susceptibility of areas to erosion and sediment delivery from geomorphic processes. Sediment delivery is related to the natural geomorphic processes of mass wasting (landsliding) and surface erosion. Mass wasting and surface erosion are natural watershed processes that can be influenced by ground-disturbing activities, such as forest management, grazing, and the construction, use, and maintenance of roads.

Within the Project and Planning Areas, mass wasting is a more dominant process west of the Cascades than it is in the drier areas of eastern Washington, Idaho, and Montana (Plum Creek 1998a). Over most of the Project Area, failures are often confined to specific landforms, such as steep bedrock hollows and inner gorge terrace escarpments.

The potential for surface erosion is primarily a function of soil characteristics, slope, and vegetative cover. Soil disturbances by land management activities that remove vegetative cover, disturb the ground surface, or alter overland flow of water can increase the potential for surface erosion. Activities that expose bare soil to overland flow and rainfall include road construction and maintenance, harvesting techniques that disturb the duff layer, yarding, and site preparation. These activities may allow sediments to move downslope and into water bodies at faster than natural rates.

The greatest potential for sediment production comes from road construction and maintenance, especially along streams, with most of the sediment coming directly from road surfaces (Plum Creek 1998a). In addition, cut- and fill-slopes associated with road construction can contribute to sediment production if not adequately revegetated. Heavily traveled, unsurfaced roads produce the greatest amount of sediment. The potential impacts are proportional to the miles of road, quality of construction, levels of use, and proximity to streams.

Maintaining soil attributes requires protection from excessive compaction and loss of the surface ash and organic matter components. When susceptible soils are avoided or appropriate timber harvest techniques are used, little hillslope erosion occurs. Sediments from mass wasting or erosion that enter water bodies influence water quality. However, eroded material does not always reach water bodies. In fact, harvest-related surface erosion in the Project Area is minimal, with little or no observed delivery to streams when forestry BMPs are implemented and streamside management zones are maintained (Plum Creek 1998a). Mass wasting in the form of landslides may be deposited on floodplains, glacial or alluvial terraces, or footslopes before reaching a stream.

Soil Productivity

Soil productivity is a measure of the rate and volume of vegetation growth, and the quantity and type of understory and ground cover plants. An indicator of site productivity is the site index. Site index is the yardstick by which relative productivity of forest sites is measured, and is usually expressed as the height of dominant and co-dominant trees of a stand projected to some particular standard age.

Natural and management-related factors that influence soil moisture, soil aeration, organic matter content, nutrient availability, soil biology, and sediment production contribute to soil productivity and affect site index. Long-term soil productivity is the ability of soil to maintain the natural growth potential of plants and plant communities over time (U.S. Department of Agriculture [USDA] and U.S. Department of the Interior [USDI] 1994a). The structure and function of ecosystems depend on a productive soil resource.

Undisturbed areas have the greatest probability for maintaining long-term soil productivity. Management disturbances that affect productivity include soil displacement and compaction, erosion, and alteration of nutrient status and soil biology. Also, high intensity burns can eliminate the organic material in the soil, expose large areas of mineral soil, and increase the risk of erosion. Higher risks or impacts are associated with more intensive land management.

Soil compaction and displacement in riparian areas can negatively affect infiltration capability (Fleischner 1994; Bohn 1986; Gifford 1981; Clary and Medin 1990; Meehan and Platts 1978). This reduces the capability of the riparian zone to act as a water storage facility and to reduce flooding (Elmore 1990; Platts 1981). As a result, lateral surface flows and erosion increase (Branson 1984; Meehan and Platts 1978). Also, compacted soil may impede root development of vegetation, reduce soil moisture, and increase soil temperatures, which may reduce plant vigor and lead to changes in plant communities (Clary 1995; Clary and Medin 1990; Meisner 1988; Hynes 1983).

4.2.6 Environmental Consequences

This section describes the potential impacts of the proposed NFHCP and action alternatives on geological and soil resources. Potential impacts include acute or chronic changes in geomorphic process that affect source and delivery potentials of surface materials to streams and soil productivity. Potential effects could be localized or dispersed over a wide area. The following discussion focuses on the likelihood that the rates of mass wasting and hillslope erosion would change under the proposed NFHCP and action alternatives, the effects of those changes, and on measures for mitigating or avoiding these potential impacts. Estimated effects were quantified using Plum Creek data collected from within the Project Area, unless referenced differently. The impact analysis focuses on the proposed 30-year Permit period, but concludes with brief assessments for the optional Permit periods of 10 and 20 years. Where appropriate, discussions of the proposed NFHCP and other action alternatives refer to discussions under Existing Regulations—No Action Alternative, which examines projected trends and future conditions. Consequences for water quality, aquatic habitat conditions, and biological resources are discussed in later sections.

Existing Regulations—No Action Alternative

Trends and Future Conditions. Under the No Action Alternative, Plum Creek would continue to manage its lands according to existing regulations. Sediment delivery and soil productivity would be protected only to the degree required by current regulations and as

necessary to meet the minimum requirements, which are generally set forth in state forestry regulations. Importantly, landform or bedrock geology would not be affected by this alternative or any of the action alternatives.

Under the No Action Alternative, harvest-related effects on soil productivity would remain about the same as what currently exists. Short-term effects on soil productivity would occur, but generally would not persist. Plum Creek would continue to harvest about 70 percent of the Project Area using ground-based equipment. Modern feller-bunchers would continue to reduce the number of skid trails and number of trips per trail, resulting in lower soil disturbance. Whole tree skidding would continue to reduce ground disturbance because tree limbs and tops cushion soil impacts. Soil replenishment with organic material would continue as slash is transported back to the woods and placed on skid trails to reduce soil compaction and help provide surface erosion control (McGreer 1981). Machine piling of slash in the woods and broadcast burning would continue to be almost non-existent because slash not returned to the harvest area would be concentrated and burned at landings adjacent to roads.

Other covered activities not evaluated above that could affect geology and soils include the following:

- Tree planting
- Site preparation
- Prescribed burning
- Timber harvest in upland areas
- Stand maintenance
- Gravel quarrying for road construction

These activities were described in Chapter 2, Section 2.3.1, *Plum Creek's Land Management.* These activities could affect geology and soils through increased erosion and sediment delivery to streams, and could adversely affect water quality, aquatic habitat, and native salmonids, but would likely be similar to current conditions. Possible erosion and sediment delivery from these activities is directly related to the intensity and extent of ground disturbances, and proximity to sensitive habitat components.

The likelihood of significant adverse effects on geologic resources resulting from the other covered activities listed above would be the same under the No Action Alternative as under existing conditions. In general, the likelihood is considered relatively low for two primary reasons:

1. Existing state forest practices rules and BMPs in Montana, Idaho, and Washington have been designed to minimize or avoid the potential occurrence of adverse effects from forestry and related activities on water quality and aquatic resources. State rules and BMPs essentially serve as mitigation measures that address forest management activities in upland as well as riparian areas with the intent of managing and minimizing non-point source pollution, in compliance with the Clean Water Act. The intent of various state BMPs that directly or indirectly address these other covered activities was described in Chapter 3, Section 3.3.1, *Existing Regulations–No Action Alternative.*

2. The types of silvicultural practices followed by Plum Creek further minimize the potential for these other covered activities to impact water quality and aquatic resources, as explained below.

Plum Creek's gravel pits are located away from streams; that is, near ridgetops where the best rock is generally found. State forest practice rules and BMPs in Montana, Idaho, and Washington prohibit gravel quarrying in streams or within equipment exclusion zones of riparian areas, and new gravel quarries are not permitted in Streamside Management Zones (SMZs) of perennial and connected streams. Plum Creek estimates that 25 to 50 gravel pits would be developed during the next 30 years. The need for additional gravel sites is related to ongoing road maintenance and new road construction, and a well-distributed source network to control transportation costs. These additional gravel pits will be limited in number and size, and are not be expected to cause increased sediment loading to streams compared to existing conditions because Plum Creek uses existing state forest practices rules and BMPs, Plum Creek's siting criteria for gravel pits, and standard erosion control measures.

Stand maintenance activities of precommercial and commercial thinning under the No Action Alternative would be conducted in compliance with state rules and BMPs designed to minimize ground disturbance, surface runoff, and erosion. Methods of removing logs from the forest depend on factors such as slope steepness, road access, and worker safety, as well as state requirements and guidelines for minimizing soil disturbance. Tractor-based systems are typically used on relatively flat slopes, cable yarders are used on steeper slopes, and helicopters are used where there is limited road access or very steep slopes. The amount of sediment delivered to aquatic habitats from these other covered activities would be relatively minor because they would occur farther away from stream channels, and existing forest practice rules and BMPs would be applied. This relatively low level of sediment delivery overall would be the same under this No Action Alternative as existing conditions. Based on recent state BMP audits and watershed analysis results, hillslope surface erosion associated with timber harvesting is typically a minor contribution to watershed sediment budgets when forestry BMPs (such as water bars on skid trails) are implemented and buffer strips are retained along streams (Fortunate et al. 1998; Rashin et al. 1999).

Fire can potentially cause decreased soil productivity, increased soil erosion and runoff, and a decreased effectiveness of riparian buffers (if burned) for filtering and retaining sediment from surface runoff. These adverse effects can result from large, hot broadcast burns that carry themselves across forest floors rather than from localized slash burns required by state laws to minimize fire hazards. The likelihood of these impacts occurring in the Project Area is low and the same as under existing conditions because Plum Creek no longer uses large broadcast burns as a standard management tool and often leaves mechanically-treated harvest residue and slash unburned in order to enhance habitat and eventually decay. When prescribed burns are carried out by Plum Creek, fires are ignited during fall or winter when state regulations and weather conditions permit. The amount of sediment delivered to Project Area drainages from prescribed burns would be expected to be minor and similar to existing conditions.

Upland timber harvest activities pose erosion and sedimentation risks to aquatic habitats that are similar to those of stand maintenance activities. The amount of sediment produced by this activity under the No Action Alternative would be

expected to be the same as under existing conditions. The potential for significant adverse effects on water quality and aquatic resources from upland timber harvest activities is expected to be relatively low for a number of reasons, including existing state forest practice rules and BMPs, internal Plum Creek practices, Project Area conditions, and the fact that these practices would be applied relatively farther away from stream channels. Section 3.3.1*, Existing Regulations–No Action Alternative* lists numerous state BMPs directed at reducing soil disturbances, and the potential for sediment delivery to streams, by minimizing the size and degree of the disturbance; controlling soil erosion and road drainage by providing adequate drainage and stabilizing roads and skid trails used in logging activities; and stabilizing soil slopes to reduce the potential for mass wasting.

Mass wasting from timber harvest is a potential source of fine and coarse stream sediment. Timber harvesting can reduce slope stability and contribute to mass wasting by reducing root strength in the soil and temporarily increasing soil moisture (Sidle et al. 1985). If a landslide occurs and reaches a stream, it would adversely affect that drainage's water quality and aquatic habitat (Falter and Rabe 1997). Plum Creek (1998a) reported that harvest related landslides are rare in the inland portion of the Project Area. Mass wasting is a more dominant process west of the Cascades than in the drier areas of Montana, Idaho, and eastern Washington that comprise the bulk of the Project Area. Also, mass wasting failures are often confined to specific landforms, such as steep bedrock hollows and inner gorge escarpments. Little hillslope erosion occurs when susceptible soils are avoided or appropriate timber harvest techniques are used, and eroded material does not readily reach water bodies. However, other sources (for example, MBTSG 1998) suggest that even upland timber management has the potential to affect native fish habitat by altering runoff patterns and significantly influencing the availability of sediment to streams. Removal of riparian vegetation, allowed to a degree by state forestry BMPs, can result in decreased levels of large woody debris (LWD) that can negatively affect regulation of sediment loads in certain geomorphic settings (Montana Bull Trout Scientific Group [MBTSG] 1998).

Current forest practices regulations in Washington and Idaho, and BMPs in Montana, do include some provisions for addressing slope stability. These include requirements for locating roads on stable geology, designing roads that have stable cut and fill slopes (for example, full bench construction on steeper slopes), and providing adequate road surface drainage. Additionally, the Washington Department of Natural Resources (WDNR) screens all forest practices applications for potential slope stability problems. While recent research tends to suggest that contemporary forest practice standards may be reducing landslide rates), some risk of landsliding would continue under the No Action Alternative (McClelland et al. 1997; Robison et al. 1999).

None of the other covered activities described in Chapter 2 would be expected to adversely affect geology and soils because of the nature and locations of the activities, resource protection provided by existing regulations and BMPs, and internal practices followed by Plum Creek.

Overall, under the No Action Alternative, undesirable effects on geology and soils would be reduced by complying with state

regulations, BMPs, and local ordinances that guide management planning; road construction, use, and management; restoration of disturbed areas; harvest intensity and extent; silviculture for forest health; and range management. However, sediment production would continue to occur well into the future, especially from existing roads in the Project Area that are not maintained to current BMP standards (see Section 4.6.6, *Environmental Consequences*, of *Fisheries and Aquatic Resources*, for a discussion of sediment production). Future conditions of geology and soils, under the No Action Alternative, would likely contribute to improving trend in fish habitat quality. But the magnitude of this improving trend under this alternative would be smaller, and may or may not allow for adequate conservation of Permit species.

Plum Creek's Proposed NFHCP

Impacts. Compared to the No Action Alternative, the combined effect of conservation commitments under the proposed NFHCP would significantly reduce sediment delivery to streams and reduce impacts on soil productivity in the Project Area. More than 20 of the conservation commitments Plum Creek would make under this alternative have the potential to reduce sediment delivery and benefit soil productivity. These benefits are discussed in detail in Section 4.6 and reflected in other sections of Chapter 4. As a result, sediment delivery and mass wasting improvements generally would occur across the Project Area, particularly in those areas currently affected by forestry, grazing, and roads (see Table 4.6-3). Like the No Action Alternative, the NFHCP would follow state regulations for forest roads and other upland activities.

The NFHCP additionally commits to practice forestry according to Plum Creek's Environmental Principles. One Environmental Principle for soil conservation aims to maintain soil and site productivity by minimizing soil disturbance and by recycling harvest residues for soil nutrient enhancement. In addition, the NFHCP makes mandatory Montana's non-regulatory (voluntary) BMPs during the Permit period. This commitment would remove the uncertainty regarding the implementation of non-regulatory BMPs and ensures the benefits of BMP application would be uniform and consistent across the Project Area. For more discussion of effects of this alternative on soils and fish habitat, see Section 4.6.6, *Environmental Consequences*, subsection *Plum Creek's Proposed NFHCP*.

An additional adaptive management commitment addresses the potential for sediment production on Project Area lands. The commitment requires the preparation and implementation of a site-specific plan dealing with changed circumstances (large landslides, floods, or fires) and their adverse effects (for example, sediment delivery to drainages).

Sediment delivery from other covered activities that could potentially affect geology and soils under the NFHCP would be similar to, or perhaps slightly less than, that described for the No Action Alternative. These other covered activities include silvicultural and related practices such as tree planting, site preparation, prescribed burning, timber harvest in upland areas, stand maintenance, and gravel quarrying for roads. Under the proposed NFHCP, Plum Creek would commit to complying with Montana's non-regulatory forestry BMPs. Plum Creek also would follow its stated Environmental

Principles, which include goals of meeting or exceeding state and federal standards by employing BMPs for the protection of water quality and aquatic resources, for the proposed 30-year Permit period. Strict voluntary compliance with BMPs and Plum Creek's Environmental Principles under the NFHCP could reduce sediment loading slightly compared to the No Action Alternative.

The potential for sediment loading from mass wasting would be slightly less under the NFHCP as compared to the No Action Alternative. This is mainly a result of the plan for dealing with changed circumstances and their adverse effects if a landslide occurred and entered a drainage. Although landsliding rates are low in much of the Project Area (Plum Creek 1998a), landslides can and do occur. Some can originate from or be exacerbated by forest management activities. Under the NFHCP, potential landslides between approximately 500 and 5,000 square yards in size that deliver sediment to streams would be identified as a changed circumstance. If such a changed circumstance occurred, aerial or on-the-ground investigations would be conducted, the extent and magnitude of impact on the aquatic system and on NFHCP biological goals and objectives would be determined, and a site-specific action plan would be developed and implemented to address this changed circumstance. The NFHCP is the only alternative that would require a site-specific plan for dealing with the changed circumstances brought on by landslides entering Project Area drainages.

Optional 10- and 20-Year Permit Lengths. If the Permit length is shortened to 10 or 20 years, sediment reduction benefits would still be gained under this alternative. However, continuously dealing with changed circumstances would not be guaranteed. Improved habitat conditions from reduced sediment delivery and potential cumulative benefits to native salmonids would not be as great or extend to as many generations of fish under the 10- and 20-year Permit lengths as under the proposed 30-year Permit.

Mitigation. In addition to the improved habitat conditions anticipated under the No Action Alternative, the NFHCP further avoids and minimizes geology and soil impacts through commitments that build on the Existing Regulations. The commitments for management of roads, riparian harvest, and riparian grazing provide significant mitigation in the form of reduced sediment delivery and maintenance of long-term soil productivity. To address uncertainty about the effectiveness of conservation commitments, Plum Creek would perform adaptive management projects that would be carried out during the next 30 years. For example, research in cooperation with the University of Montana would be performed on the effectiveness of grazing BMPs to provide feedback on the success of the program within 5 to10 years after plan implementation. Plum Creek would commit to modify the BMPs as needed to reduce livestock impacts to soil resources over time.

In addition to adaptive grazing management, the changed circumstances commitment requires site-specific plans to deal with the adverse effects of events that can be reasonably anticipated such as large landslides, fires, or floods if they occur.

Unavoidable Adverse Impacts. Unavoidable adverse impacts would be similar to adverse effects described for the No Action Alternative, including some

sediment delivery to downslope riparian and aquatic areas.

Cumulative Impacts. Cumulative impacts would be similar to effects in the Planning Area that were described under the No Action Alternative. There may be a cumulative benefit if the NFHCP is considered in combination with other conservation practices that have been implemented on federal lands in the Planning Area.

Internal Bull Trout Conservation Plan Alternative

Impacts. Compared to the No Action Alternative, the combined effect of the Internal Bull Trout Conservation Plan would be to reduce sediment production and reduce impacts on soil productivity in the Project Area, primarily in Tier 1 watersheds, since this alternative is focused on conserving primarily bull trout, and not other Permit species. The difference in conservation value between this alternative and the NFHCP alternative roughly represents the added value for Permit species other than bull trout in the NFHCP. As a consequence of this alternative, sediment delivery and mass wasting improvements generally would be realized by all bull trout subpopulations in the Planning Area basins currently believed to be threatened by forestry, grazing, or roads (refer to Table 4.6-5). The reduction of sediment delivery to streams and reduction of impacts on soil productivity would be less in magnitude and geographic breadth than under the proposed NFHCP. The following provisions of this action alternative have the potential to affect sediment delivery and soil productivity within the Project Area.

The Internal Bull Trout Conservation Plan is similar to the NFHCP, but focused on bull trout. The Internal Bull Trout Conservation Plan focuses on minimizing or avoiding sediment delivery where it can best benefit bull trout, and is designed by Plum Creek to specifically avoid take of bull trout. Unlike the NFHCP, which focuses on sediment management throughout the Project Area, this alternative largely limits its scope to Tier 1 watersheds.

In Tier 1 watersheds, riparian soil productivity conservation would be similar to the proposed NFHCP. In Tier 2 lands, riparian soil productivity would be similar to the No Action Alternative. Under this alternative, benefits of the Environmental Principles that provide for maintaining soil productivity would be in place, but subject to change at any time.

Like the NFHCP, this alternative would better maintain riparian soil productivity on Tier 1 watersheds because of equipment limitations in riparian CMZs compared to the No Action Alternative. However, unlike the NFHCP, this alternative would not provide better maintenance of soil productivity on Tier 2 lands than the No Action Alternative.

Unlike the NFHCP, this alternative would not provide better maintenance of soil productivity on Tier 2 lands than the No Action Alternative. Sediment delivery from other covered activities that could potentially affect geology and soils under the Internal Bull Trout Conservation Plan would generally be similar to that described for the No Action Alternative. These other covered activities would include silvicultural and related practices such as tree planting, site preparation, prescribed burning, timber harvest in upland areas, stand maintenance, and

gravel quarrying for roads. Under the Internal Conservation Plan, Plum Creek would follow forest practices rules and BMPs, but they would not commit to full compliance with Montana's non-regulatory (voluntary) BMPs, the same as for the No Action Alternative. Also, under the Internal Conservation Plan, Plum Creek would practice forestry according to their Environmental Principles, but unlike the NFHCP, these principles would be subject to change at any time during the proposed 30-year Permit period. The potential for sediment loading from mass wasting would be about the same as under the No Action Alternative. However, unlike the NFHCP, there would be no plan developed for dealing with adverse effects of the changed circumstances if a landslide occurred and entered a drainage.

Optional 10- and 20-Year Permit Lengths. The majority of conservation benefits to conserving geologic resources, and related effects on fish habitat, would be realized in the first 10 to 20 years of Internal Bull Trout Conservation Plan implementation. However, conservation actions within a shorter Permit period would achieve less sediment reduction benefits than a 30-year period.

Mitigation. In addition to the improved habitat conditions anticipated under the No Action Alternative, the Internal Bull Trout Conservation Plan further avoids and minimizes geology and soil impacts through its conservation measures that build on the existing regulations.

Unavoidable Adverse Impacts. Kinds of unavoidable adverse impacts would be similar to the adverse effects described for the No Action Alternative.

Cumulative Impacts. Cumulative impacts would be similar to effects in the Planning Area that were described under the No Action Alternative. There may be a cumulative benefit if the alternative is considered in combination with other conservation practices on federal lands in the Planning Area.

Simplified Prescriptions

Impacts. Compared to the No Action Alternative, the effect of the Simplified Prescriptions Alternative would be to reduce sediment production and reduce impacts on soil productivity in the Project Area. As a consequence, sediment delivery and mass wasting improvements generally would be realized by all bull trout subpopulations in Planning Area basins currently believed to be threatened by forestry, grazing, or roads (refer to Table 4.6-3). The following provisions of the alternative have the potential to affect sediment delivery and soil productivity within the Project Area.

Sediment delivery from other covered activities that could potentially affect geology and soils under the Simplified Prescriptions Alternative would be about the same as under the No Action Alternative. These other covered activities include the same silvicultural and related practices that were described for the NFHCP and other alternatives. Plum Creek would follow forest practices rules and BMPs under the Simplified Prescriptions Alternative, but they would not commit to full compliance with Montana's non-regulatory (voluntary) BMPs and they would not implement their Environmental Principles. The potential for sediment loading from mass wasting would be about the same as under the No Action Alternative. No plan would be

developed for dealing with the adverse effects of the changed circumstances in the event a landslide occurred and entered a drainage.

Optional 10- and 20-Year Permit Lengths. The 30-year Permit length would allow for greater reduction in sediment delivery than either the 10- or 20-year Permit lengths.

Mitigation. In addition to the improved habitat conditions anticipated under the No Action Alternative, the Simplified Prescriptions Alternative further avoids and minimizes geology and soil impacts through its commitments that build on existing regulations. The numerous substantive commitments for management of roads, riparian harvest, and riparian grazing provide significant mitigation in the form of reduced sediment delivery and maintenance of long-term soil productivity. Provisions for adaptive management that address geology and soils, and monitoring for the life of the plan, provide assurances that management prescriptions would continue to improve and that anticipated conservation benefits would be validated. Specific mitigation beyond those conservation commitments included in the alternative would not be performed or recommended.

Unavoidable Adverse Impacts. Kinds of unavoidable adverse impacts would be similar to the adverse effects described under the No Action Alternative.

Cumulative Impacts. Cumulative impacts would be similar to effects in the Planning Area that were described under the No Action Alternative. There may be a cumulative benefit when this alternative is combined with other conservation practices on federal lands in the Planning Area.

4.3 Water Resources and Hydrology

4.3.1 Introduction

This section addresses the potential for impacting water resources and hydrology by implementing management regimes associated with the proposed NFHCP, other action alternatives, and No Action Alternative. The analysis focuses on surface water resources and hydrology in the Project and Planning Areas.

4.3.2 Issues Eliminated from Further Analysis

Most water resources issues identified during public scoping were analyzed. Two issues were eliminated from analysis by the Services (FWS and NMFS 1998) for the reasons given:

- Guaranteeing minimum surface water flows to protect bull trout and other aquatic life—beyond the scope of this EIS because Plum Creek does not propose to modify surface flows.
- Prioritizing present and future water claims to minimize damage to bull trout and other aquatic life—beyond the scope of the proposed NFHCP and the Services' authorities.

4.3.3 Issues Addressed in the Impact Analysis

Water resources issues identified during public scoping and listed in the Scoping Report (FWS and NMFS 1998) are addressed in the impact analysis. Those

issues deal primarily with concerns about the effects of the proposed NFHCP on hydrologic regimes and changes in stream flows. Also, there is concern that the entire riparian area of influence needs to be addressed in the analysis.

4.3.4 Description of Area of Influence

The area of influence includes all surface water and groundwater within the Project Area and Planning Area boundaries, shown on Map 1.3-1, whose hydrologic regimes could potentially be affected by implementing the proposed NFHCP, other action alternatives, or the No Action Alternative. Such waters may be fish-bearing or non-fish-bearing, and consist of perennial rivers and streams, intermittent drainages, and lakes, ponds, wetlands and groundwater beside and beneath surface waters. Certain surface waters in the Project Area provide greater habitat support or contribute greater flow than others for bull trout or other Permit species. Also, certain surface waters flow to downstream reaches that support bull trout or other Permit species in the Planning Area. These waters are of greatest interest in this EIS/NFHCP and are depicted in Section 4.6, *Fisheries and Aquatic Resources*, for bull trout and most of the other Permit species assessed in this document.

How do Water Resource and Hydrologic Effects Compare?

This section focuses on how different management strategies affect the way water moves through surface water and ground-water hydrologic systems. For example, better grazing practices and more careful use of ground tree-skidding equipment can reduce soil compaction, which allows more rainfall to infiltrate and become groundwater instead of creating runoff and delivering more sediment to surface water systems (streams). The proposed NFHCP and each action alternative would have a similar and slightly beneficial effect on water resources and hydrology when compared to the No Action Alternative. Effects of the proposed 30-year Permit would be more beneficial than effects of the optional 10- and 20-year Permits. Effects of the No Action Alternative would be similar to existing conditions.

4.3.5 Affected Environment

Water resources include surface water and groundwater. Surface water movement is primarily influenced by the hydrologic regime, which reflects the combined effects of climate, soils, geology, topography, and vegetation on water. Surface water volume is determined by the amount of precipitation, and by the rates of evaporation and absorption. Precipitation is controlled by climate and is not significantly affected by forests or forest management. Atmospheric losses resulting from evaporation and transpiration reflect the interaction of climate with vegetation and soils, which are influenced by forest condition. Regional geology largely determines whether water percolating into the soil will return as surface flow or enter groundwater aquifers. Water movement in natural streams reflects water volume, channel geometry, and channel gradient. The most common hydrological disturbances in unmanaged forests result from trees falling into streams, and less frequently wildfire and mass wasting events. These disturbances may cause streams to be dammed to some degree, resulting in increased water depths and detention (WDNR 1996).

Groundwater includes all water beneath the ground's surface and consists of aquifers and subsurface flow. Aquifers are geologic formations capable of storing water that has percolated deep into the ground. Water movement through aquifers is generally slow and only indirectly affected by immediate precipitation. Subsurface flow is generally shallow, rapid, and more immediately affected by precipitation. Subsurface flow is often common in mountainous areas and is greatly influenced by forest condition and land management activities. Groundwater quantity is affected by the amount of water percolating through the soil, stored as subsurface flow and in aquifers, removed for domestic purposes, and entering stream channels and other surface water bodies (WDNR 1996).

The annual hydrologic regime throughout much of the Project Area is dominated by snow. As described in Technical Report #5 (Plum Creek 1996a), Technical Report #11 (Plum Creek 1998d), and MacDonald and Hoffman (1995), most peak flows in the Project Area are generated during spring snowmelt or rain during spring snowmelt. Less frequently, however, peak flows may result from mid-winter rain-on-snow events and can often trigger very large floods (MacDonald and Hoffman 1995).

Flow regimes of many streams, rivers, and lakes in the Interior Columbia River Basin (ICRB), including most Planning Area basins addressed in this EIS/NFHCP, have been extensively altered by dams, diversions, and control of lake outlets. Stream, river, and lake shorelines and bottoms have been altered by various instream and off-channel activities. Generally, changes have been greatest in larger streams, rivers, and lakes. Surface water quantity and flow rates have been affected locally by dams, diversions, and groundwater withdrawal. An estimate of the number of diversions on Project Area lands in each Planning Area basin indicated "many" in the Blackfoot, Upper Clark Fork, and Middle Clark Fork basins; "few" in the Middle Kootenai, Flathead, Ahtanum, Bitterroot, and Lower Tieton basins; and "none" in the other basins. At the broad scale, surface water volume and flows have been affected by road construction and vegetation changes associated with agriculture, silvicultural practices, and livestock grazing (ICBEMP 1997a, b).

Changes in the aquatic and riparian ecosystems in the ICRB can pose risks to key links in hydrologic cycles. Some of the more apparent changes can include soil and vegetation disturbance and compaction that can alter relationships among water infiltration, soil moisture storage, groundwater recharge, evapotranspiration, surface runoff, and stream flows. These alterations can affect water quantity and hydrologic regimes, which can in turn degrade aquatic and riparian habitat for resident and anadromous native salmonids (ICBEMP 1997a).

Hydrologic effects associated with soil and vegetation disturbance from past forest land management practices can last 3 to 4 decades or more, depending on vegetation characteristics and the intensity and extent of harvest. Decreased soil permeability and increased runoff can also result from improper grazing techniques and timber harvest activities that compact soil and cause channelized flows. Fire suppression can adversely affect hydrologic regimes by increasing evapotranspiration rates and decreasing surface runoff because of the promotion of dense vegetation. Buildup of vegetation can also contribute to high-intensity fires,

which expose soil and, in turn, cause increased runoff and soil erosion (ICBEMP 1997a, b).

Intensive vegetation manipulation over large portions of watersheds may well increase small peak flows, but it may not significantly alter flood flows that are geomorphically significant (Thomas and Megahan 1998). Headwaters that are in steep terrain have high energy to transport water, sediments, and organic matter (Grant et al. 1990; Selby 1993). Roots of trees and riparian vegetation provide stream bank and hillside stability, which is locally important for maintaining low rates of erosion from moderately to highly unstable riparian slopes (Swanson and Fredricksen 1982). In general, the higher the level of disturbance in headwater areas, the greater the risks of impacts to watershed hydrology during high flow events. Relationships between silvicultural treatments such as uneven-aged or selective harvest techniques affecting only portions of a watershed, and impacts to soil water storage and hydrologic functions in a watershed, are less clear.

Road construction can also adversely affect surface water quantity and hydrologic regimes. However, there is uncertainty regarding the effects of forest roads on the magnitude and timing of peak flows (Jones and Grant 1996; Thomas and Megahan 1998). The comparatively impermeable surfaces of roads and associated cutbanks and ditches can result in less water infiltration and more surface runoff. In addition, roadcuts can intercept subsurface flow and direct it to stream channels (ICBEMP 1997a, b).

Watersheds are the basic functioning units of hydrologic systems within the Planning Area and are natural divisions of the landscape. The Planning Area has been divided into 15 river basins or watersheds where bull trout are known to occur. Planning Area basins are depicted on Map 2.2-2 in Chapter 2, and include ten basins in Montana, three in Idaho, and four in Washington:

- Montana
  - Kootenai River (Lower, Middle, Upper)
  - Flathead River
  - Swan River
  - Blackfoot River
  - Bitterroot River
  - Clark Fork River (Lower, Middle, Upper)

- Idaho
  - Lochsa River

- Washington
  - Ahtanum Creek
  - North Riffe Lake
  - Lewis River
  - Lower Tieton River

Map 2.2-2 also depicts those watersheds and lands within the Project Area that have been categorized by Plum Creek as Tier 1 or Tier 2 watersheds based on bull trout biology. Tier 1 watersheds are the catchment areas for streams where there is known bull trout spawning and juvenile rearing. Tier 1 watersheds comprise 19 percent (301,067 acres) of the entire Project Area. Tier 2 lands are the remaining Plum Creek lands in the Project Area, including streams where bull trout may migrate and forage. Tier 2 lands comprise 81 percent (1,269,322 acres) of the entire Project Area.

The Project Area contains more than 5,000 miles of perennial and intermittent streams. Of this total, approximately 190 miles of rivers or large streams are

likely to be fish-bearing, 1,400 miles are fish-bearing intermittent streams and perennial streams (this category includes an unknown amount of non-fish-bearing perennials), 260 miles of streams are known to be non-fish-bearing perennials, and 3,200 miles of intermittent streams are non-fish-bearing. The Project Area contains 312 miles of streams that support bull trout. Of this total, 175 miles (56 percent) are in Tier 1 watersheds and 137 miles (44 percent) are on Tier 2 lands and are primarily Key Migratory Rivers (Plum Creek 1999a).

4.3.6 Environmental Consequences

Potential impacts on water resources and hydrology include substantive changes in the magnitude or timing of surface water discharges in Project and Planning Area drainages. The following discussion focuses on the likelihood of such impacts occurring under the proposed NFHCP and alternatives and, where feasible, describes measures for mitigating or avoiding potential impacts. Only those covered activities listed in Chapter 2 that could potentially affect water resources and hydrology are discussed below. The analysis focuses on the proposed 30-year Permit period, but contains brief assessments for the optional Permit periods of 10 and 20 years. Where appropriate, discussions of the proposed NFHCP and action alternatives refer to discussions under Existing Regulations—No Action Alternative.

Existing Regulations—No Action Alternative

Trends and Future Conditions. Water resources and hydrology on Project Area lands would generally be similar to existing conditions where the intent of management intent is to minimize changes in hydrologic regimes for Project Area drainages. Numerous studies have examined the impact of clearcutting on peak flows, but few have examined the influence of partial cutting in upland and riparian areas on peak flows. Partial cutting is the harvest technique currently used on approximately 90 percent of the Project Area. However, clearcutting over extensive portions of the Project Area, and related risks to watershed function, would be possible under this alternative if Plum Creek's business objectives changed. Analyses of two Tier 1 watersheds in the Swan River Basin (Plum Creek 1996a) and one Tier 1 watershed and two Tier 2 watersheds in the Thompson River Basin (Plum Creek 1998d) have not detected a harvest-related effect on watershed hydrology or fish habitat. These analyses also suggested that the present-day practice of suppressing fires has in some cases resulted in greater canopy cover than occurred historically. A denser canopy cover can cause decreased snow accumulation on the ground (because snow intercepted by the canopy is more likely to melt between storms than that on the ground) and decreased snowmelt rates in spring (because overstory reduces direct radiation and turbulent heat transfer).

Streamside management rules and hydraulic codes that have been designed to protect water resources and hydrology and are contained in existing federal and state regulations would continue to be enforced under the No Action Alternative. These regulations are intended to minimize impacts on water resources (see discussions in Chapter 3, Section 3.3.1, *Existing Regulations—No Action Alternative*).

To the extent that roads may influence basin hydrology, road-related activities that would occur under the No Action Alternative may either reduce or increase the potential for the sudden and possibly adverse discharge of water to drainages during precipitation events. These activities were described in Chapter 3 and would include, among others, constructing new forest roads according to state standards, upgrading old roads while concurrently treating hot spots, and maintaining roads. Road maintenance required by state rules that would be implemented under the No Action Alternative would be expected to reduce the flow-routing efficiency to Project Area drainages. These practices would not only minimize the amount of direct overland flow from road surfaces to streams, but also minimize the potential for subsurface flow interception routing to surface waters. New roads constructed under existing regulations could increase risk of impact on hydrologic regimes in Project Area watersheds. Road miles would increase approximately 8 percent in the Project Area under this alternative, as well as the NFHCP and Internal Conservation Plan action alternatives. However, modern road construction practices would help reduce such impacts. Under this alternative, old roads that occur on Plum Creek lands would be upgraded only as they are used to access timber, so existing impacts on hydrologic functions would not be addressed proactively as they would under the action alternatives.

Activities associated with the No Action Alternative would only be implemented on Plum Creek land and, using assumptions based on current forest land management by Plum Creek, would not result in measurable changes in the hydrologic regime or in the magnitude and timing of naturally occurring peak and low flows in the Planning Area.

Plum Creek's Proposed NFHCP

Prescriptions associated with the NFHCP would likely contribute to the maintenance of naturally occurring flow regimes in Project Area drainages. Under the NFHCP, the combination of reduced activity in the riparian zone, more intensive road management practices aimed at reducing effects on water flow, management of irrigation diversions, avoiding extensive clearcutting in upland forest areas, grazing management, and implementation of Plum Creek's Environmental Principles should provide some increased protection of water resources and hydrology. However, harvest of timber in both upland and riparian areas could impact hydrologic function of watersheds to some degree. Although road miles would increase by 8 percent under the proposed NFHCP, older roads would be upgraded or abandoned at a 2:1 ratio to new roads constructed. Because older roads may not have been designed to integrate hydrological functions to the degree that would be implemented in new road construction, the net effect should be a benefit to hydrological functions in the Project Area. The effects of roads on water resources are discussed further in Section 4.6, *Fisheries and Aquatic Resources*.

Road management prescriptions described in Chapter 3 would interact to reduce the flow of surface runoff that is delivered to streams during precipitation events. During new road construction, this would be accomplished through the use of existing regulations and enhanced BMPs, placement of turnouts to disperse road runoff and prevent sudden and artificial

pulses in stream flow, more frequent drains and ditch relief culverts, especially those close to stream channels, and conveying water from seeps and springs to the forest floor as close as possible on the other side of the road. Plum Creek commits to an enhanced BMP of installing culverts during new road construction that would be designed to accommodate at least 50-year flood flows, which would reduce the risk of catastrophic failure. Flow alteration in watersheds would also be reduced while upgrading old roads, and treating hot spots, abandoning surplus roads, and intensively maintaining roads that slope or drain directly to streams. The treatment of hot spots would be given high priority and is especially important for quickly reducing existing, high-risk hydrologic hazards. These prescriptions would prevent unnaturally high spikes or pulses in stream flows that can potentially impact channel and bank integrity, instream habitat, and seasonally sensitive life stages of salmonids and benthic invertebrates.

Retention of more riparian vegetation would likely increase the infiltration rate of overland flows into the ground. This may enhance stream flows during low flow periods by increasing the amount of water stored in stream banks, which is released as stream levels drop. Greater infiltration and reduced surface runoff, combined with increased surface roughness from vegetation retained in channel migration zones, may also slightly reduce unnaturally high peak flows or spikes in runoff so current flow regimes better match historic peaks and flow regimes. Also, limiting or eliminating harvest in channel migration zones (CMZs) would minimize or avoid potential effects on groundwater and water that flows through the gravels under the stream (hyporheic zones) that influence macroinvertebrate (insect) populations and food for fish.

Currently, over 90 percent of the timber harvest in the Project Area is by partial cutting, an alternative to clearcutting. The effects of partial cutting in upland and riparian areas on the hydrology of streams was assessed by conducting five watershed-scale hydrologic investigations in the Project Area (Plum Creek 1996a, 1998d). The watersheds included the Goat Creek and Piper Creek watersheds in the Swan River Basin; and the Beatrice Creek, Boiling Springs Creek, and Murr Creek watersheds in the Thompson River Basin. These and other studies suggest that partial cutting practiced by Plum Creek does not cause measurable peak flow increases or low flow changes. The watershed-scale investigations showed no substantive changes in peak flows through removal of forest cover, and the Thompson River Basin showed similar or decreased peak flows compared to historical conditions (Plum Creek 1996a, 1998d). Based on these findings, upland and riparian timber harvests in the Project Area under the NFHCP would likely not measurably alter or adversely affect peak or low streamflows, and the effects would be similar to existing conditions and the No Action Alternative.

Plum Creek commits under their Environmental Principles to preserve structural diversity when harvesting, which results in a significantly lower rate of clearcutting than has occurred in the past in the Project Area. Plum Creek also minimizes clearcutting because of social pressure to do so, and to favor selective harvest to allow broader future silvicultural opportunities. In addition, Plum Creek commits to minimizing clearcutting in Interface Caution Areas, which are a minimum of 150 feet from

streambanks, and to report on the amount of clearcutting they do in upland areas. These three commitments, coupled with the fact that Plum Creek owns, on average, no more than 10 to 15 percent of lands in each of the 15 Planning Area basins, would significantly reduce the risk of negative effects of clearcutting on watersheds in the Planning Area.

Because of the timber types available, the maximum potential extent of clearcutting would be 25 percent of Project Area lands. However, this extent of clearcutting would be unlikely. Based on Plum Creek's track record and their current estimates, Plum Creek expects to clearcut no more than about 3 percent of their lands east of the Cascade mountain range crest during the Permit period (Plum Creek 1999e). For example, in 1998 Plum Creek clearcut less than one-tenth of 1 percent of their total ownership east of the Cascade Crest (Plum Creek 1999e). At this rate, Plum Creek would clearcut approximately 3 percent of the Project Area over 30 years. Finally, Plum Creek commits in the NFHCP to monitor and report to the Services on the extent of clearcutting. This reporting would allow the Services to judge whether levels of clearcutting may affect the ability to meet biological goals in the future, thereby creating adaptive management opportunities. The Services could also determine if Plum Creek practices have jeopardized the existence of one or more Permit species, and thereby mandate either changing management, or Permit suspension or revocation.

In 1998, 1.5 percent of Project Area lands west of the Cascade Crest were harvested by clearcutting. Another 1.5 percent were harvested using other methods (for example, commercial thinning, selection harvest and light salvage). Over the next 20 years, Project Area lands west of the Cascades will largely be in a re-growth phase, where substantial hydrologic recovery will occur. During this 20-year period, Plum Creek harvest levels will be at similar levels to 1998, with most harvest coming from commercial thinning. After 20 years, more clearcut harvesting will occur as intermediate stands mature. While substantial hydrologic recovery will be occurring over the Permit Period, watershed hydrology will also be influenced by adjacent lands. In western Washington, federal lands encompass 68 percent of the Lewis River Planning Area basin, and 13 percent of lands in North Riffe Planning Area basin. All of these federal lands are managed under the Northwest Forest Plan and are experiencing substantial reductions in harvesting.

Grazing controls under the NFHCP would help stabilize stream banks and decrease stream width relative to depth, which should locally improve channel functions, such as depth of water, particularly during low flows. Perhaps one of the greatest potential benefits of this alternative is the commitment to riparian assessment and restoration where existing ecological functions are undesirable (see grazing discussions in Sections 4.2 and 4.6).

The NFHCP also proposes to develop a management plan to reduce or eliminate impacts on native fish caused by irrigation diversions. Plum Creek has committed to working with water rights holders to design appropriate alternatives to existing diversions that could, for example, improve low flows during critical upstream migrations in the summer and fall.

The NFHCP contains a changed circumstances commitment that requires site-specific plans to deal with the possible adverse effects on Permit species of events

that can be reasonably anticipated if they, in fact, occur. A hydrological changed circumstance that could affect Permit species includes flooding at calculated recurrence intervals of 25 and 50 years. Should floods of such magnitude occur, Plum Creek and the Services would work together to determine if impacts have occurred, and develop plans to address those impacts.

Importantly, the benefits to water resources and hydrology resulting from implementing conservation measures included in the NFHCP lie in the commitments themselves, and in the rate at which those commitments are implemented. The NFHCP commitments would be implemented, in large part, within the first half of the proposed 30-year Permit period, allowing multiple generations of bull trout and other native fish to benefit from the effects of the conservation measures.

Optional 10- and 20-Year Permit Lengths. Predicted improvements to water resources and hydrology under this alternative, which may benefit aquatic habitat and native salmonids, would not be as great or extend to as many generations of Permit species under optional Permit lengths of 10 and 20 years compared to the proposed Permit length of 30 years. The longer Permit term would allow for investigation and potential mitigation of the effects of more extensive clearcutting on hydrologic functions in watersheds, should such silvicultural practices be implemented after 10 or 20 years. Additionally, improved road management practices would be implemented in the first 10 to 15 years.

Internal Bull Trout Conservation Plan Alternative

The degree of effects from covered activities under this alternative would probably be intermediate to those described for the No Action Alternative and the NFHCP. This action alternative would employ existing regulations plus several prescriptions similar to or somewhat modified from the NFHCP, including enhanced BMPs for new road construction, provisions for road upgrades, hot spot treatments, maintenance, and road abandonment or obliteration. Hydrologic and water resource effects would generally be the same as described for the proposed NFHCP, except they would be realized primarily in drainages of Tier 1 watersheds (bull trout spawning and rearing areas) and implementation would be slower. However, some small effects may extend downstream to drainages in Tier 2 watersheds within the Project Area or to downstream waters in the Planning Area. Mitigation measures would consist largely of continued compliance with federal and state existing regulations designed to protect water resources and hydrology, but unlike the NFHCP, there would be no changed circumstances commitment regarding effects of large floods on Permit species.

Optional 10- and 20-Year Permit Lengths. Should a Permit be issued for some form of this alternative, aquatic and water resources may be protected and may continue to improve to a greater extent over the 30-year Permit period than under optional 10- or 20-year Permit periods for the same reasons as described for the NFHCP. The relative improvements in the first 10 to 15 years under this alternative would be less than under the NFHCP, because the rate at which conservation

commitments would be implemented would be slower.

Simplified Prescriptions Alternative

Overall, beneficial effects of prescriptions associated with this alternative on water resources and hydrology would probably be similar to those described for the proposed NFHCP, and greater than those described for the No Action Alternative. However, commitments under the Simplified Prescriptions would not be fully implemented until the end of the Permit period.

This action alternative should reduce potential road-related hydrology hazards throughout the Project Area since fewer new roads would be constructed, and more existing roads would be eliminated. Hydrological improvements from road upgrades would be significantly less and slower under this alternative than under the other action alternatives. Also, riparian tree retention and grazing controls in riparian areas would be slightly to moderately greater than under the NFHCP or the Internal Bull Trout Alternative. Those approaches could slightly increase infiltration rates and stream bank storage, perhaps reducing unnaturally high flow spikes and enhancing stream flow during low flow periods. Plum Creek's Environmental Principles would not be applied under this alternative and only limited BMP road enhancements would be implemented. No management plan would be developed to address impacts from irrigation diversions. Mitigation measures would consist of federal and state existing regulations plus the mitigating effects of prescriptions associated with this alternative, including minimizing or avoiding potential effects on groundwater or hyporhea. This alternative, does not provide for changed circumstances associated with potential effects of large floods on Permit species.

Optional 10- and 20-Year Permit Lengths. Should a Permit be issued under this alternative, cumulative effects on aquatic resources from potentially improved water resources and hydrology would be greater under a 30-year Permit than under a 10- or 20-year Permit for the same reasons as described for the NFHCP.

4.4 Water Quality and Contaminants

4.4.1 Introduction

This section addresses the potential for impacting water quality by implementing management regimes associated with the proposed NFHCP, other action alternatives, and No Action Alternative. The analysis focuses on surface water resources in the Project and Planning Areas.

4.4.2 Issues Eliminated from Further Analysis

All water quality issues identified during public scoping were analyzed.

4.4.3 Issues Addressed in the Impact Analysis

Water quality issues identified during public scoping and listed in the Scoping Report (FWS and NMFS 1998) are addressed in the impact analysis. The primary issues express concerns about the effects of the proposed NFHCP on the following:

- Sediment loading to streams
- Water temperature changes

- Water quality limited waters
- Overall watershed integrity

The concerns are expressed for the Project Area, as well as for cumulative effects.

4.4.4 Description of Area of Influence

The area of influence includes all surface waters within the Project Area and Planning Area boundaries, shown on Map 1.3-1, whose water quality could potentially be affected by implementing the proposed NFHCP, other action alternatives, or No Action Alternative. Some surface waters in the Project Area provide greater aquatic habitat support for bull trout or other Permit species, and their conditions may influence downstream reaches in the Planning Area where bull trout or other Permit species occur. The waters of greatest interest in this EIS/ NFHCP are depicted on maps in Section 4.6, *Fisheries and Aquatic Resources*, for bull trout and most of the other Permit species assessed in this document.

How are Water Quality Impacts Compared?

Compliance with water quality regulations is measured in terms of how well landowners comply with BMPs, because better application of BMPs leads to better water quality. The No Action Alternative depends entirely on state and federal regulations for BMP monitoring and enforcement. The proposed NFHCP requires Plum Creek to implement management that goes beyond BMP requirements and would result in better water quality in the Project Area, and perhaps the Planning Area, largely because of reduced sediment delivery to streams. Adaptive management seeks to improve BMPs more rapidly than would otherwise occur. The other two action alternatives would result in better water quality than the No Action Alternative. The overall effects of the Simplified Prescriptions Alternative would be comparable to the NFHCP. Water quality benefits under each action alternative would be greater and of longer duration over a Permit length of 30 years than over optional Permit lengths of 10 or 20 years.

4.4.5 Affected Environment

Water quality and contaminant conditions pertain to surface water, such as streams, rivers, and lakes, and to groundwater. They primarily influence two of the Four C's that native salmonids prefer: cold and clean water. Water quality in the Project Area is influenced primarily by natural factors (intrinsic conditions of the water body), as well as human-caused influences. Importantly, water quality is influenced by state water quality standards, and in some cases, the site-specific standards set to protect it.

Most streams, rivers, and lakes in the Planning Area have water quality that meets state standards. About 8 to 12 percent of stream miles are water quality limited, either by temperature (3 to 6 percent), nutrients (0 to 4 percent), sediment/siltation/turbidity (9 to 10 percent), or flow impairment (3 to 6 percent) (Lee et al. 1997). The Planning Area has been divided into 15 key river basins (Planning Area basins) where bull trout are known to occur. Six of these Planning Area basins have water quality conditions that may threaten some subpopulations of bull trout. These basins are listed below, along with their corresponding surface waters (FWS 1998a):

- **Kootenai River**—Lower, Middle, and Upper Kootenai Rivers in Montana
- **Flathead River**—Flathead River in Montana
- **Blackfoot River**—Blackfoot River in Montana
- **Bitteroot River**—Bitterroot River in Montana
- **Clark Fork River**—Lower, Middle, and Upper Clark Fork Rivers in Montana
- **Yakima River**—Ahtanum Creek drainage in Washington

Table 4.6-5 lists the bull trout subpopulations in the Project Area that may be threatened by water quality problems, as identified by states as water quality-limited waters, or as determined by the FWS.

Water temperature is regionally important, and is affected by land uses. Henjum et al. (1994), in ICBEMP (1997a), reported that on national forests in the Upper Columbia River Basin east of the Cascade Crest in Oregon and Washington, where summer air temperatures are generally much higher than 80^{o} F, many streams have lost their capability to support cold-water fish. They also reported that mortality in streams that do support salmonids is common as a result of elevated water temperatures (ICBEMP 1997a). Stream temperature is affected by eliminating stream-side shading, disrupted surface flows, reduced stream flows, elevated sediments, and morphological shifts.

Excessive sediment loads can fill pools, silt spawning gravels, decrease channel stability, and modify channel morphology. Nutrient concentrations may increase following soil disturbances, such as road construction. Runoff contaminated by livestock waste can contribute and cause increases in potentially harmful bacteria. Agricultural herbicides and fertilizers are commonly found in groundwater samples. Flow alteration has resulted from dams and irrigation diversions. Reduction in the amount of LWD in streams can reduce instream complexity. These alterations degrade aquatic integrity for resident and anadromous native salmonids (Lee et al. 1997).

Nonpoint sources of pollution include polluted surface runoff from land-based activities such as farming, ranching, forestry, mining, septic systems, urban runoff, construction, and similar activities without distinct discharge points. Non-point source water quality problems in the Planning Area include agricultural sources of pollution. The Clean Water Act does not provide for enforcement of the nonpoint source pollution control or pollution abatement. (Novotny and Olem 1994; Environmental Protection Agency [EPA] 1995; Lee et al. 1997). Nonpoint source programs are enforced under state and local laws. The pollutants generated by land use activities may cause or contribute to violations of the water quality standards issued by the states. Nonpoint source pollution is controlled through implementation of state water quality plans and use of BMPs, which are technology-based and water-based controls. States have primary responsibility for developing and implementing water quality plans.

Section 303(d) of the Clean Water Act requires states to list waters that do not meet water quality standards as impaired or threatened. States must then develop total maximum daily loads (TMDLs) for

those pollutants and waters on the list. A TMDL is a pollution reduction plan that accounts for all pollutant sources to the water and determines how much each source is allowed to contribute. The basic premise is that if existing pollutant inputs (loads) from all sources are reduced to a specified level (the maximum daily load), and a margin of safety is added, then water quality goals will be achieved. States must develop and submit (to EPA) an implementation plan for the TMDL. Point source discharges across the Planning Area are numerous, and typically associated with manufacturing and commercial sites. Point source water discharges in the Project Area are limited to forest products manufacturing sites, which were described in Section 2.3.1, *Plum Creek's Land Management*. The discharges to surface or ground waters are infrequent. Monitoring occurs to ensure that discharges conform to permit limits, which are regulated under state water quality discharge permits.

Table 4.4-1 identifies the 303(d) listed streams in the Project Area. This table was compiled using readily available information from EPA and the states of Montana (draft 2000 list), Idaho (1998 list), and Washington (1998 list). The TMDL priority of each is provided.

TABLE 4.4-1
303(d) Listed Streams for Montana, Idaho, and Washington

Stream Name	Waterbody No.	TMDL Priority	Source of Impairment	Causes of Impairment	Length in Project Area
Ashley Creek	MT76O002_020	Low	Agriculture	Dewatering	0.09
Belmont Creek	MT76F006_070	Mod	Logging Road Construction/Maintenance, Range grazing—Riparian	Siltation	8.51
Black Bear Creek	MT76F003_060	Low	Bank or Shoreline Modification/ Destabilization, Grazing related Sources	Other habitat alterations	2.06
Blackfoot River	MT76F001_031	Mod	Irrigated Crop Production	Nutrients, Thermal modifications	0.37
Blackfoot River	MT76F001_033	High	Abandoned mining, Grazing related Sources	Metals, Metals, Total toxics	5.35
Blanchard Creek	MT76F005_060	Mod	Agriculture, Pasture grazing—Riparian	Other habitat alterations, Siltation	0.46
Bobtail Creek	MT76D002_080	Low	Logging Road Construction/Maintenance, Other, Silviculture	Bank erosion, Siltation, Turbidity	2.07
Bristrow Creek	MT76D002_110	Mod	Logging Road Construction/Maintenance, Silviculture	Fish habitat degradation, Nutrients, Siltation	0.9
Brock Creek	MT76G005_100	Low	Erosion and Sedimentation	Siltation	1.92
Clark Fork River	MT76E001_010	High	Agriculture Channelization, Mill Tailings, Mine Tailings	Metals, Metals, Other habitat alterations, Riparian degradation	1.98
Clark Fork River	MT76M001_010	Mod	Mill Tailings	Cadmium, Copper	1

TABLE 4.4-1
303(d) Listed Streams for Montana, Idaho, and Washington

Stream Name	Waterbody No.	TMDL Priority	Source of Impairment	Causes of Impairment	Length in Project Area
Clark Fork River	MT76M001_020	Low	Major Municipal Point Source, Mill Tailings	Metals, Metals, Organic enrichment/Low DO	1.97
Clark Fork River	MT76M001_030	Low	Mill Tailings, Minor Industrial Point Source, Upstream Impoundment	Metals, Metals, Nutrients	0.07
Cramer Creek	MT76E004_020	Low	Abandoned mining, Range grazing—Riparian, Silviculture	Metals, Metals, Riparian degradation, Siltation	6.86
Douglas Creek	MT76F003_081	Low	Hydromodification, Range grazing—Riparian	Other habitat alterations, Thermal modifications	2.36
Dry Creek	MT76D002_020	Low	Highway/Road/Bridge Construction	Fish habitat degradation, Flow alteration	0.01
Elk Creek	MT76K003_040	Mod	Bank or Shoreline Modification/ Destabilization, Grazing related Sources, Silviculture	Other habitat alterations	3.74
Fisher River	MT76C001_010	Low	Bank or Shoreline Modification/ Destabilization, Channelization, Grazing related Sources, Highway/ Road/Bridge Construction, Highway/Road/Bridge Runoff, Silviculture	Flow alteration, Lead, Metals, Metals, Other, Salinity/TDS/chlorides, Siltation	29.92
Harvey Creek	MT76E004_042	Low	Agriculture, Bank or Shoreline Modification/ Destabilization	Flow alteration, Other habitat alterations	1.08
Hoover Creek	MT76G005_081	Low	Range grazing—Riparian, Unpaved Road Runoff	Siltation, Turbidity	1.5
Hoover Creek	MT76G005_082	Low	Agriculture, Bank or Shoreline Modification/ Destabilization, Dam Construction	Dewatering, Flow alteration, Nitrogen, Other habitat alterations	0.03
Jim Creek	MT76K003_010	Mod	Silviculture	Siltation	5.25
Keeler Creek	MT76D002_030	Low	Logging Road Construction/Maintenance, Silviculture	Fish habitat degradation, Flow alteration	0.88
Lake Creek	MT76D002_070	Low	Mine Tailings	Metals, Metals, Nitrogen	6.49
Libby Creek	MT76D002_061	High	Abandoned mining, Placer Mining, Resource Extraction	Metals, Metals, Other habitat alterations, Riparian degradation	2.91
Lolo Creek	MT76H005_010	Low	Agriculture, Source Unknown	Flow alteration	7.56
McCormick Creek	MT76M004_030	Low	Abandoned mining, Channelization, Resource Extraction	Other habitat alterations	1.32

TABLE 4.4-1
303(d) Listed Streams for Montana, Idaho, and Washington

Stream Name	Waterbody No.	TMDL Priority	Source of Impairment	Causes of Impairment	Length in Project Area
Mulkey Creek	MT76E004_050	Low	Highway Maintenance and Runoff	Siltation	1.44
Nevada Creek	MT76F003_012	High	Agriculture, Bank or Shoreline Modification/ Destabilization	Flow alteration, Nutrients, Other habitat alterations, Siltation	0.16
Piper Creek	MT76K003_062	Mod	Highway/Road/Bridge Runoff, Silviculture,	Other habitat alterations, Siltation	1.23
Poorman Creek	MT76F002_030	Low	Abandoned mining, Construction	Dewatering, Metals, Metals, Other habitat alterations, Riparian degradation, Siltation	0.2
Sixmile Creek	MT76M002_150	Low	Range grazing—Riparian, Silviculture	Other habitat alterations	1.9
South Fork Lolo Creek	MT76H005_020	Low	Agriculture	Flow alteration	0.37
Spotted Dog Creek	MT76G004_032	Low	Agriculture, Range grazing—Upland	Flow alteration	0.98
St. Regis River	MT76M003_010	Low	Channelization, Highway/ Road/Bridge Construction, Land Development	Other habitat alterations	0.61
Swift creek	MT76P003_020	High	Source Unknown	Cadmium, Mercury	5.44
Threemile Creek	MT76H004_140	Unknown	Agriculture, Irrigated Crop Production, Range grazing—Riparian	Flow alteration, Nutrients, Siltation	0.3
Union Creek	MT76F006_010	Low	Abandoned mining, Confined Animal Feeding Operations (NPS), Erosion and Sedimentation, Flow Regulation/Modification, Range grazing—Riparian	Arsenic, Copper, Other habitat alterations, Phosphorus, Suspended solids, Thermal modifications	1.36
Vermilion River	MT76N003_130	Low	Bank or Shoreline Modification/Destabilization, Silviculture	Other habitat alterations	1.11
Warm Springs Creek	MT76G005_111	Low	Highway/Road/Bridge Runoff, Silviculture	Riparian degradation, Siltation	1.17
Warren Creek	MT76F004_070	Low	Channelization, Grazing related Sources, Irrigated Crop Production	Flow alteration, Other habitat alterations	3.63
Wolf Creek	MT76C001_020	Low	Channelization, Erosion and Sedimentation, Highway/Road/Bridge Runoff	Other habitat alterations, Siltation, Thermal modifications	23.77

4.4.6 Environmental Consequences

Potential impacts on water quality and contaminant conditions could affect two of the Four C's that native salmonids prefer: cold and clean water. Impacts could include effects on the following:

- Primary impacts
  - Stream sediment and turbidity, including suspended sediment and substrate embeddedness
  - Water temperature
- Secondary effects
  - Nutrient and contaminant loading
  - Changes in dissolved oxygen
  - Instream habitat components, which are discussed in more detail in Section 4.6, *Fisheries and Aquatic Resources*.

The effects of canopy cover on water temperature, and of sediment on water quality, are discussed more fully in Section 4.6, *Fisheries and Aquatic Resources*. This discussion focuses on the likelihood of such impacts occurring under the proposed NFHCP and the other alternatives and on measures for mitigating or avoiding potential impacts. Only those covered activities listed in Chapter 2 that would potentially affect water quality or contaminant levels are discussed below. The analysis focuses on the 30-year Permit period, but contains brief assessments for the optional Permit lengths of 10 and 20 years. Because of similar assessment outcomes, discussions of the proposed NFHCP and other action alternatives refer to discussions under the Existing Regulations—No Action Alternative.

Existing Regulations—No Action Alternative

Trends and Future Conditions. Under certain circumstances, water quality in Project Area drainages could potentially be affected under the No Action Alternative. Water quality conditions that could be affected include water temperature, suspended sediment, turbidity, dissolved oxygen, nutrients, and contaminants. Covered activities that could potentially influence these parameters include silvicultural and related practices such as tree planting, site preparation, prescribed burning, timber harvest in upland areas, stand maintenance, and gravel quarrying for road construction, logging road construction, and logging road maintenance. Potential cause-and-effect relationships between management choices and water/habitat quality, as well as potential resultant adverse effects on native salmonids, are described in Section 4.6 under the heading *Ecological Implications of Land Management Activities on Aquatic Habitat and Fish.*

Activities associated with the No Action Alternative would be subject to the same federal, state, and local regulations currently used to protect the quality of U.S. and state waters. Existing regulations for forest management activities require management and minimization of nonpoint source pollution, in compliance with the Clean Water Act. There would be some likelihood, however, that individual management actions would induce changes in water quality. There are also risks that some water quality problems could go undetected.

The application and effectiveness of BMPs is shown in Idaho and Montana in Figure 4.4-1 (audit data for Washington were not available for the analysis) (1996 Forest Practices Audit Team 1997; Fortunate et al. 1998). In the case of forest BMPs, effectiveness means that BMPs that were applied worked as expected. For example, an installed road dip allowed water to run off, and not along, the road surface. Effectiveness of BMP function, in this case, is not the result of a scientific determination, but rather a visual observation that implies that impacts on streams and fish habitat function have been reduced. Research has even found that these types of visual investigations can be more reliable than in-stream monitoring for detecting sediment delivery (Corner et al. 1996). Forestry BMPs are effective in controlling sediment when they are fully and correctly applied (1996 Forest Practices Audit Team 1997; Fortunate et al. 1998; Binkley and Brown 1993b). They are effective whether implemented as enforceable requirements or as voluntary programs, although some BMPs are more effective than others in protecting water quality (Ice 1991; Novotny and Olem 1994). Re-audits conducted in Montana indicate that BMPs are effective over time when properly designed and implemented (Fortunate et al. 1998).

The potential for sediment delivery to drainages from surface erosion and mass wasting, associated with timber harvest systems and related silvicultural practices, was assessed in Section 4.2, *Geology and Soils*, and Section 4.6*, Fisheries and Aquatic Resources.* That assessment indicated state forest practices rules reduce the likelihood of sediment delivery under the No Action Alternative, and would be similar to existing conditions. Increased levels of sediment in stream gravels, elevated water temperatures, and reduced dissolved oxygen concentrations can adversely affect native salmonids. Impacts would likely be reduced from past conditions, and may be similar to current conditions.

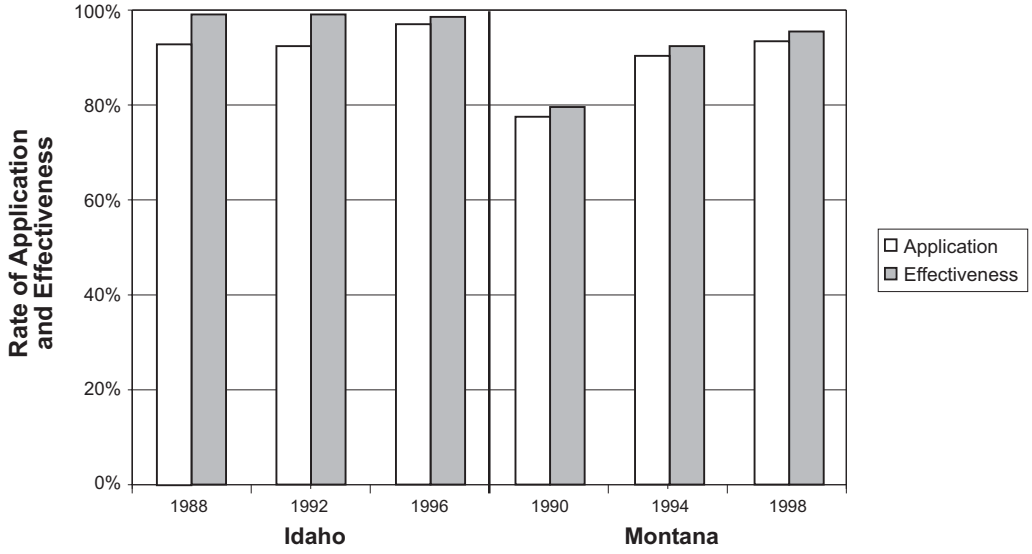

Figure 4.4-1
BMP Application and Effectiveness Rates for Idaho and Montana

BMP compliance within the Project Area is expected to be higher than the statewide averages. Since 1994, Plum Creek's compliance has averaged 97 percent (Frank 1994; Mathieus 1996; Fortunate et al. 1998). In 1998, their overall Montana BMP application rate was 97 percent compliance, and their overall BMP effectiveness rate was 98 percent compliance, with 99 percent of the streamside management zones in compliance. Plum Creek's cumulative scores since 1994 are higher than any other landowner in the state.

Improvements in water quality are predicted to occur gradually as improved existing regulations guide new road construction and maintenance, riparian area management, land use planning, and other common forestry and wood products manufacturing activities. BMPs that reduce the occurrence of channelized flows would reduce sediment loading to streams. Provisions for understory and live tree retention prescribed for various types of water bodies could potentially reduce water temperature effects.

Inputs of nutrients, such as nitrates and phosphates, are essential to the productive and proper function of aquatic systems. However, excess nutrient loading can adversely affect native flora and fauna. Under the No Action Alternative, nutrients associated with sediment in surface runoff and mass wasting events would enter drainages at rates comparable to existing conditions. Mass wasting trends are somewhat more uncertain under the No Action Alternative, but would probably improve as well with modern road construction practices (such as excavator constructed roads, full bench construction, and not incorporating slash in road fills). The likelihood of increased nutrient inputs to water bodies from these sources under the No Action Alternative would be reduced from past levels for the same reasons described for sediment delivery in Section 4.2, *Geology and Soils*, and Section 4.6, *Fisheries and Aquatic Resources*. Those reasons include state forest practices rules and BMPs that limit the amount of sediment delivered to Project Area drainages, the uncommon occurrence of mass wasting throughout most of the Project Area, and relatively small and localized prescribed burns. Grazing actions may also introduce nutrients to streams in the Project Area. Under the No Action Alternative, grazing would be reduced slightly from current levels, thereby reducing the risk of nutrient input. However, whether, or to what degree, nutrient input from grazing would impact the environment would be variable across the Project Area. For example, the Blackfoot River Planning Area basin would likely suffer the greatest impacts from grazing of all the Project Area lands because that Planning Area basin experiences the greatest amount of permitted grazing by Plum Creek.

Under the No Action Alternative, potential nutrient inputs to aquatic systems from a fourth source, chemical contaminants, would probably be the same as under existing conditions. Risk of inputs from chemical contaminants would be the same under the three action alternatives as under the No Action Alternative because they would not be a permitted activity. State forest practices rules and BMPs clearly prohibit handling, storing, applying, or disposing of hazardous or toxic materials—which include fertilizers, herbicides, insecticides, and petroleum products—in a manner that pollutes streams, lakes, or wetlands or that may cause damage or injury to humans, land, animals, or plants. Licensed applicators are required to follow label instructions

that have been prepared by the EPA for the chemical being applied. State rules further prohibit storing, mixing, or rinsing hazardous substances below the high-water mark of water bodies or where they might enter state waters. The effects are likely largely dependent on site-specific factors. The potential for the inadvertent introduction of contaminants, such as herbicides, insecticides, and petroleum products, to water bodies in the Project Area is likely variable and dependent on site-specific factors and application procedures that are used.

State forest practices rules and BMPs governing each of the other covered activities identified in Section 2.3.1, *Plum Creek's Land Management,* are listed in Table 3.3-3*, Plum Creek Management Activities Covered by Existing Regulations.* Potential effects of these activities would be reduced for several reasons. Covered activities that would not result in a product that would degrade water quality or are on sites well removed from water bodies include Plum Creek's confined forest nursery and seed orchard facilities in Montana and Washington, miscellaneous forest and land product sales (such as decorative stone, gravel, Christmas trees and boughs, tree bark and stumps, and sawdust and wood chips), and electronic facility sites at the tops of mountains in the Project Area. Some of the other covered activities would tend to be so localized and of such a small scale that if they did impact water quality that impact would not be expected to cause substantive adverse impacts on a Permit species in the Project Area. For example, non-forestry activities and special forest uses such as commercial outfitting (hunting and fishing), recreation uses (mountain bike rides on designated and maintained trails), and other small scale special forest uses. Other activities, such as forest fire suppression, may result in some temporary and localized degradation of water quality.

Other covered activities must continue to comply with appropriate state and federal regulations governing water quality standards and protection of endangered species, thereby avoiding adverse impacts on water quality and aquatic resources. Examples include the manufacture of forest products at Plum Creek facilities (sawmills, plywood plants, fiberboard plant, and remanufacturing plants) in Montana and Idaho and compliance with state water quality discharge permits through numerous practices described in Chapter 2, Section 2.3.1, *Plum Creek's Land Management*. Some of these practices consist of the avoidance of direct discharge of process waters to surface waters, the containment and reuse of process water, possibly some periodic but limited discharge of stormwater, discharge compliance monitoring, and a Spill Prevention Control and Countermeasure Plan, if required.

This alternative may result in slight improvements in lake water quality because of slightly improved conditions in inflowing tributary waters. Dissolved oxygen levels would continue to fluctuate naturally over time and, in lakes, by water depth. Through riparian area regulations, ecological processes that contribute to water quality, such as LWD and nutrient inputs, shading, and bank stability, would be improved over past conditions. Potential impacts on instream habitat conditions are addressed in Section 4.6, *Fisheries and Aquatic Resources*. Lack of specific training programs in forestry and grazing BMPs under the No Action Alternative may, however, lead to lower levels of BMP implementation and

effectiveness than could otherwise be attainable.

BMPs generally reduce rather than eliminate nonpoint source impacts on receiving water quality. Water quality monitoring by state agencies should continue to increase understanding of land management and water chemistry interactions, and identify waters of concern. Watershed management would rely on implementation of the TMDL process to clean up polluted waters. Where existing regulations are judged to be inadequate to address water quality-limited waters, TMDLs would be formulated and implemented through state law, local ordinance, or voluntary programs administered by federal agencies. State and local governments would use a variety of mechanisms to address nonpoint sources of pollution, including enforceable water quality standards, tax incentives, zoning laws, or laws that authorize governments to take increasingly stringent steps where voluntary measures fail. In addition, the EPA may require schedules for implementation of individual TMDLs.

An important consideration in future development of water quality standards and criteria would be the conduct of the consultation provisions of the ESA with the Services, and the implementation of any revisions to standards resulting from those consultations (EPA 1995). All aspects of existing and future water quality criteria and enforceable standards would be subject to consultation under Section 7 of the ESA.

Water quality in the Planning Area is expected to improve over past conditions from implementation of the No Action Alternative. Activities associated with this alternative on Plum Creek land would comply with existing regulations protecting water quality. Adjacent federal land managers should provide water conservation measures at least as stringent as Plum Creek. Watershed analysis, where it applies, may provide previously unavailable resource analyses that benefit development of actions that improve water quality. As a result, water quality in the Planning Area would be expected to be the same or better than under existing conditions.

Plum Creek's Proposed NFHCP

Under the NFHCP, conservation commitments for native salmonids that build on existing regulations generally should result in maintained or improved water quality compared to the No Action Alternative. Improvements in salmonid habitat because of reduced sediment delivery are discussed in Section 4.6, *Fisheries and Aquatic Resources*. Salmonid habitat improvements predicted because of improved riparian conditions, described in Section 4.5, *Vegetation Resources*, are also discussed in Section 4.6. NFHCP commitments would augment conservation measures for land management activities that have the greatest potential to affect water quality, or increase the rate that conservation measures would be implemented.

Enhanced BMP standards for new roads, many of which are recommended by forestry BMP audit teams, may reduce potential effects on water quality (see Section 4.6, *Fisheries and Aquatic Resources*). Other road management prescriptions should reduce sediment delivery and potential water quality hazards by treating a variety of categories of hot spots, upgrading substandard roads, and periodically maintaining roads. The NFHCP should protect the water quality of

most watersheds in the Project Area, not just bull trout spawning and rearing watersheds. Grazing and riparian management prescriptions should contribute to properly functioning riparian areas (see Section 4.5, *Vegetation Resources*), which would be expected to improve water quality. Land use planning commitments, such as setbacks from lakes and streams, would provide water quality protection that would not occur through current state or federal mechanisms, and would have a higher probability of protecting water quality than under existing regulations. The overall goal of the NFHCP approach to land use planning is that land transactions be managed by Plum Creek to stay within a pre-determined range that would be beneficial to native salmonids and their habitat, and not impair the ability of the NFHCP to function in a way that helps ensure adequate conservation of Permit species. Cooperation in multi-stakeholder watershed groups, such as those under the Montana Bull Trout Restoration Plan, Idaho's Basin and Watershed Advisory Groups, and Washington's watershed analysis units, would provide greater assurances that individual management actions would be performed within a broader management context. There would be increased opportunities in sharing water quality knowledge and mutual assistance to formulate action plans and TMDLs as needed.

The adaptive management commitments of the NFHCP, described in detail at the end of Chapter 3, consist of numerous components directed at protecting and improving water quality and salmonid habitat. These components include a definition and discussion of adaptive management context; an adaptive management decision process and implementation matrix; commitments over time to monitoring, research, and, if needed, improving conservation commitments in the NFHCP; four core adaptive management projects intended to protect and improve water quality and habitat in Project Area streams for native salmonids; and criteria for selecting demonstration areas for intensive sampling and long-term monitoring for the NFHCP. The core adaptive management projects are aimed at evaluating the effectiveness of NFHCP management prescriptions directed at improving water quality and salmonid habitat by reducing sediment delivery, increasing LWD and habitat diversity, avoiding stream temperature increases, and increasing streambank cover and complexity. These adaptive management commitments would only be implemented under the NFHCP.

Effects of other covered activities not addressed above on water quality in Project Area drainages would be similar to, or perhaps slightly less than, those described under the No Action Alternative. These other covered activities include silvicultural and related practices such as tree planting, site preparation, prescribed burning, timber harvest in upland areas, stand maintenance, gravel quarrying for road construction logging road construction, and logging road maintenance. Under the proposed NFHCP, Plum Creek would commit to complying with Montana's forestry BMPs, which are a non-regulatory program. Plum Creek would also follow their Environmental Principles, which include goals of meeting or exceeding state and federal standards by employing BMPs for the protection of water quality and aquatic resources for the proposed 30-year Permit period. Strict voluntary compliance with BMPs and Plum Creek's Environmental Principles under the NFHCP could further minimize the potential for adverse effects on water

quality compared to the No Action Alternative. Also, as noted in Section 4.2*, Geology and Soils*, the NFHCP is the only alternative requiring a site-specific plan for changed circumstances dealing with adverse effects on water quality if landslides enter Project Area drainages, or if large floods (recurrence interval between 25 and 100 years) or stand replacement forest fires (between about 300 and 5,000 contiguous acres) adversely affect Project Area waters. Additional information concerning the effects of covered activities on water quality are discussed in Section 4.6, *Fisheries and Aquatic Resources*.

Implementation of the proposed NFHCP may contribute to slightly improved water quality in downstream drainages in the Planning Area. The proposed NFHCP should not create negative cumulative impacts on water quality in the Planning area. Provisions for adaptive management that address water quality conditions and NFHCP monitoring for the life of the plan provide assurances to the Services that management prescriptions would continue to improve to ensure adequate conservation of Permit species.

Optional 10- and 20-Year Permit Lengths. Under the NFHCP, protection or improvements in water quality, and subsequently aquatic habitat and native salmonids, would be less under optional Permit lengths of 10 and 20 years than under the proposed Permit length of 30 years. Supporting rationale is provided in Section 4.3, *Water Resources and Hydrology* and Section 4.6, *Fisheries and Aquatic Resources.* The same commitments that would result in potentially greater protection or improvements to these two resource areas over a 30-year period than during a 10- or 20-year period (for example, reduced sediment delivery and other benefits from road management and grazing prescriptions) should also protect or improve water quality and aquatic habitat and for the same reasons. Commitments that could potentially protect or improve water quality would be in place for shorter periods of time under 10- and 20-year Permits than under a 30-year Permit before the Permit expires. These optional Permit lengths would not provide longer-term benefits associated with achieving NFHCP objectives throughout a 30-year Permit period and would, therefore, benefit fewer generations of bull trout and other native salmonids. There would be no guarantee that commitments in place when the 10- and 20-year Permits expire, which would have protected or improved water quality and native salmonids, could be re-negotiated and immediately implemented under a new Permit. In addition, land use planning commitments under the NFHCP are designed to examine and adjust for a desired balance in land transactions and favorable conservation certainty every 5 years. However, final adjustments would be made among transactions at the end of the 30-year period, not 10 or 20 years, to assure a resultant net benefit to aquatic resources. Protection or improvements in water quality associated with the No Action Alternative and with possible continuing improvements to existing regulations would occur regardless of the Permit length or action.

Internal Bull Trout Conservation Plan Alternative

Potential effects on water quality probably would be intermediate to those described for the No Action Alternative and the proposed NFHCP. The Internal Bull Trout Conservation Plan would reflect existing

regulations and several of the prescriptions described for the proposed NFHCP. These would generally include similar enhanced BMPs for new road construction, road upgrades, and maintenance and abandonment policies that would address management activities posing the greatest risk to water quality protection. Unlike the proposed NFHCP, protective measures would be heavily weighted to waters supporting bull trout spawning and rearing populations, rather than taking a more holistic approach to the Project Area as contained in the NFHCP. Water quality effects of riparian management would generally be similar to those under the proposed NFHCP, especially where bull trout are likely to be found. Commitments to range management improvements should result in more properly functioning riparian areas, with slight improvement to water quality. Land use planning commitments would be less rigorous than under the NFHCP, and would lack water quality protection measures that the land use conservation areas and commitment to conservation certainty would provide. Compared to the No Action Alternative, water quality under the Internal Bull Trout Conservation Plan may be slightly better in the Project Area, but the same in the Planning Area.

Effects of other covered activities not addressed above on water quality in Project Area drainages would be similar to those described for the No Action Alternative. These other covered activities include the same silvicultural and related practices that were described for the No Action Alternative and the proposed NFHCP. Under the Internal Conservation Plan, Plum Creek would follow forest practice rules and BMPs, but they would not commit to full compliance with Montana's non-regulatory (voluntary) BMPs, the same as for the No Action Alternative. Also, under the Internal Conservation Plan, Plum Creek would practice forestry according to their Environmental Principles, but these principles would be subject to change at any time during the proposed 30-year Permit period. There would be no changed circumstances provisions developed under this alternative for dealing with adverse effects on water quality if a landslide occurred and entered a drainage.

Under this action alternative, Plum Creek's Environmental Principles would provide assurances that management prescriptions would continue to be implemented, although adaptive management efforts that address effectiveness of water quality conservation measures would not be undertaken. Specific mitigation, beyond those conservation measures included in the alternative, would not be performed or recommended.

Optional 10- and 20-Year Permit Lengths. Cumulative effects on aquatic resources from potentially improved water quality conditions would be greater under the proposed 30-year Permit than under optional 10- or 20-year Permits for the same reasons as described for the NFHCP.

Simplified Prescriptions Alternative

Under the Simplified Prescriptions Alternative, the water quality of receiving waters should improve through conservation measures that focus on roads, riparian areas, and grazing. Overall, water quality would be similar to that under the proposed NFHCP, and improved over the No Action Alternative. This action alternative would result in fewer road hazards throughout the Project Area as a result of a smaller road surface area, which

should reduce acknowledged sediment sources and water quality degradation.

Riparian management prescriptions would increase riparian area tree retention, which may slightly improve some water quality parameters compared to the proposed NFHCP. However, Packer (1967) states that "observations and records indicate that most sediment from forest lands that reaches stream channels originates on logging roads." The incremental benefit of increased tree retention on reducing stream sedimentation, therefore, is expected to be relatively minor compared to expected sediment reduction benefits from NFHCP road management commitments. However, increased canopy cover (discussed in Section 4.5, *Vegetation Resources*) can be a primary contributor to temperature reduction.

Grazing-induced water quality impacts should be reduced under the Simplified Prescriptions Alternative, but would not be eliminated. Open range laws would continue to contribute to water quality impacts from grazing; however, the fencing provisions of this alternative may reduce adverse effects.

Effects of other covered activities not addressed above on water quality in Project Area drainages would be similar to those described for the No Action Alternative. These other covered activities include the same silvicultural and related practices described for the NFHCP and other alternatives. Plum Creek would follow forest practice rules and BMPs under the Simplified Prescriptions Alternative, but they would not commit to full compliance with Montana's non-regulatory (voluntary) BMPs and they would not implement their Environmental Principles. The Simplified Prescriptions Alternative would provide for the development and implementation of a site-specific changed circumstances plan for dealing with adverse water quality effects in the event a landslide occurred and entered a drainage. The likelihood of such an event occurring would be about the same as under the No Action Alternative. The Simplified Prescriptions Alternative includes provisions for adaptive management that address water quality conditions and monitoring for the life of the plan, and provides assurances that management prescriptions would continue to ensure adequate conservation of Permit species. Specific mitigation beyond those conservation commitments included in the alternative would not be performed or recommended.

Optional 10- and 20-Year Permit Lengths. Cumulative effects on aquatic resources from potentially improved water quality conditions would be greater under the Proposed 30-year Permit than under optional 10- or 20-year Permits for the same reasons as described for the NFHCP.

4.5 Vegetation Resources

4.5.1 Introduction

This section addresses the potential for impacting vegetation resources by implementing management regimes associated with the proposed NFHCP, other action alternatives, and No Action Alternative. The analysis focuses on those potential impacts on vegetation resources in the Project and Planning Areas from the alternatives. This section will also address impacts on plant species listed under the ESA and other sensitive plants that may occur in the Project or Planning Areas.

Vegetation resources provide many ecological functions for streams, including

root stability to resist bank erosion, nutrients, shade, and LWD, which benefit fish and wildlife habitat. The use of vegetation resources also provides economic revenues. The influence of the alternatives on plant composition, structure, and pattern has consequences to ecological functions.

4.5.2 Issues Eliminated from Further Analysis

None of the vegetation issues identified during public scoping were eliminated from analysis (FWS and NMFS 1998).

4.5.3 Issues Addressed in the Impact Analysis

The resource components of vegetation addressed in this document include the following:

- Riparian stand structure and composition
- Riparian forest health
- Threatened, endangered, and sensitive plant species

A number of issues related to vegetation resources were identified during public scoping and are listed in the Scoping Report (FWS and NMFS 1998). Generally, the themes suggest that the EIS should evaluate the effects of alternatives on vegetation structure (tree densities and sizes), canopy cover, generation of LWD, wildfire hazard, response to grazing, and riparian buffer widths. Also, the capability of restoring vegetation resources where habitat conditions in the Project Area are degraded should be addressed.

4.5.4 Description of Area of Influence

The area of influence covers portions of western Montana, northern Idaho, and Washington. It includes the Project Area (Plum Creek lands) and Planning Area (Plum Creek and surrounding lands) (see Map 1.3-1 in Chapter 1). Plum Creek lands account for 10 percent of the land in the Planning Area basins, compared to federal lands, which account for 58 percent. Plum Creek lands account for 13 percent of the project's Tier 1 watersheds, compared to 66 percent in federal ownership. Considering that the majority of land in the Planning Area and in bull trout spawning and rearing watersheds is federally owned, most of the vegetation resources are managed primarily for ecosystem health and integrity. Furthermore, much of the federal land in the Planning Area is wilderness or park land, or is otherwise unsuitable for timber production, and will experience little or no active riparian management. Federal lands contributing to the suitable timber base have conservative riparian management strategies consistent with federal goals, including management to promote recovery of listed species.

Immediate areas of influence within the Project Area include locations where prescriptions associated with the proposed NFHCP and other alternatives would be implemented. These primarily consist of riparian habitats adjacent to stream channels, but also may include uplands beyond riparian areas. Riparian ecosystem patterns and processes extend across ownerships in the Planning Area.

Which Land Management Practices Are Best for Vegetation Resources?

The existing regulations in the No Action Alternative offer some protection for vegetation resources by promoting BMPs for grazing, and by restricting tree harvest in riparian areas to benefit stream habitat. Each of the action alternatives adds conservation measures beyond existing regulations to boost protection for vegetation resources. The proposed NFHCP would target specific situations where vegetation resources that influence Permit species' habitat are most vulnerable to Plum Creek's land management activities. The Internal Bull Trout Conservation Plan Alternative would provide similar outcomes for vegetation, but would focus on bull trout streams. The Simplified Prescriptions Alternative would rely on wider buffers on all streams. The proposed NFHCP would include a comprehensive monitoring and adaptive management program to ensure that livestock management and timber harvest commitments are benefiting native salmonid habitat. Monitoring and adaptive management programs under the Internal Bull Trout Conservation Plan and the Simplified Prescriptions Alternative would be less rigorous than under the NFHCP. Benefits of the proposed 30-year Permit would be greater than benefits of the optional 10- and 20-year Permits.

Riparian areas are lands directly influenced by water or that influence water. They usually have visible vegetative or physical characteristics reflecting the influence of water. They are transitional between bottomlands and upland terrestrial habitats.

4.5.5 Affected Environment

Riparian Vegetation Structure

The following section describes the characteristics of the riparian forest within the Project and Planning Areas. These characteristics include the stand types, which are recognizable by distinct physical characteristics, species composition, the harvest potential, and the primary ecological functions as they relate to terrestrial and aquatic habitats.

Forest Stand Types. In this document, riparian vegetation resources on Plum Creek lands are characterized somewhat differently for each of two broad-scale regions in the Project Area: the Interior Columbia River Basin (Montana, Idaho, and Washington east of the Cascade Crest); and western Washington. Vegetation descriptions were obtained from forest inventories conducted by Plum Creek (Plum Creek 1999a). The stand types are classified either by mean tree diameter (the diameter at breast height) and density (trees per acre), or by tree size and stand width. The classification systems depict stand characteristics that influence ecological function, wildlife habitat support, and economic potential.

Interior Columbia River Basin. The forest and riparian stand types of the ICRB portion of the Planning and Project Areas are diverse in terms of species composition, average tree sizes (height and diameter), and tree density. The riparian forest classification system used by Plum Creek for Plum Creek lands within the ICRB is shown in Table 4.5-1. There are 12 classifications—9 categories for stocked forested lands, 1 for unstocked forest land (recently harvested and grazed land), 1 representing non-forested areas

TABLE 4.5-1
Characteristics of Riparian Stand Types in the Project Area

Riparian Stand Classification	Description	Number of Trees Per Acre	Range of Mean Tree Diameter (inches)	Percent of Riparian Forest in Project Area
L3	Sparse, small trees	<300	0-6	11.4
L9	Sparse, medium trees	<200	6-12	8.3
L15	Sparse, large trees	<150	12-18	3.8
H3	Dense, small trees	300-700	0-6	11.2
H9	Dense, medium trees	200-500	6-12	19.8
H15	Dense, large trees	150-300	12-18	3.3
T3	Very dense, small trees	>700	0-6	10.8
T9	Very dense, medium trees	>500	6-12	7.1
T15	Very dense, large trees	>300	12-18	3.7
Non-Stocked	Recently harvested or grazed	0	N/A	3.3
Non-Forest*	Open water, meadows, shrublands, rocky and barren lands, wetlands	0	N/A	15.5
Other	Not fitting other categories	0	N/A	1.8

(open water, meadows, shrublands, rocky and barren lands, wetlands), and 1 for other lands. The classification represents the range of riparian stand types in the Project Area.

The forest stand classification, shown in the first column of Table 4.5-1, is a letter-number code used to describe the relative tree density (letter) and average tree diameter (number) of a particular stand. The density codes, from sparse to very dense, are L-series, H-series, and T-series. The tree diameter codes in the forest type classification, from small trees to large trees, are 3-series, 9-series, and 15-series stands.

Plum Creek estimates that there are about 62,000 acres of riparian area along the 5,100 stream miles within the ICRB portion of the Project Area (Plum Creek 1999a). Approximately 49,000 acres of the riparian area are forested; that is, 3 percent of the 1.7-million-acre Project Area contains riparian forest. About 2,000 acres of riparian area are not currently forested, but some of these acres potentially could be forested through restoration practices.

The majority of the forested riparian stands in the ICRB portion of the Project Area are mostly dense stands with medium-sized trees (Figure 4.5-1). Other managed timberlands in the Planning Area are expected to contain a similar distribution of riparian forest types. Federal land in the Planning Area would be expected to have higher proportions of riparian forest with higher density stands and larger tree sizes.

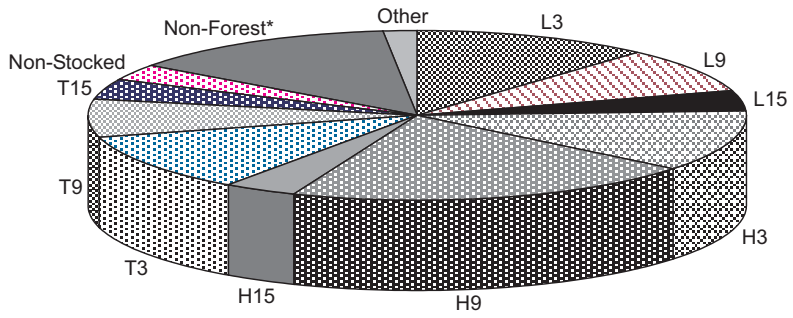

Figure 4.5-1
Relative Amount of Riparian Stand Types in ICRB Portion of the Project Area

Of the nine forested riparian stand types in Table 4.5-1, only four have sufficient numbers of larger trees to provide for a legal harvest entry: stand types H9, H15, T9, and T15 (Figure 4.5-2). Harvest potential is limited to these stands. Presently, these stand types make up about one-third (16,000 acres) of the riparian forest within the ICRB Project Area, or about 1 percent of the total Project Area.

Western Washington. Riparian forest inventory data for western Washington that are directly comparable to ICRB data are unavailable because Plum Creek's forest sampling methods vary in that portion of the Project Area. Instead, classification of riparian stands in western Washington follows a five-class system:

- **Class WW1**: Immature trees up to 150 feet from the stream.
- **Class WW2**: Mixture of immature and mature trees (approximately 50 years old); mature trees up to 25 feet from the stream and immature trees beyond.
- **Class WW3**: Mixture of immature and mature trees; mature trees up to 50 feet from the stream and immature trees beyond.
- **Class WW4**: Mixture of immature and mature trees; mature trees up to 100 feet from the stream and immature trees beyond.
- **Class WW5**: Mature trees up to 150 feet from the stream.

The Services assume that the range in average tree diameters and densities in western Washington would be similar to the ICRB if comparable inventory data were available; however, trees reach greater heights and stands tend to be even-aged in western Washington. Assuming riparian forests in western Washington comprise a similar proportion (3 percent) of the Project Area as they do in the ICRB, approximately 2,000 acres of the 68,000-acre portion of the Project Area in western Washington are riparian forest. Relatively high stream densities in western Washington make this a minimum riparian area estimate. Typically, only Class WW5 stands in western Washington have sufficient value for potential harvest, and less than 1,000 acres of riparian forest would be harvested during the next 30 years.

Insert Figure 4.5-2
Visual Representation of Nine Dominant Riparian Stand Types in the Interior Columbia River Basin

Riparian Vegetation Composition. The riparian forest species composition varies within and among stands (Table 4.5-2; Plum Creek 1999a). Generally, riparian stands in Montana and Idaho include a mixture of Douglas fir, alpine fir, western red cedar, grand fir, and Englemann spruce. In Washington, Pacific silver fir often replaces the Englemann spruce component. Associated minor species include western larch, lodgepole pine, mountain hemlock, western white pine, and black cottonwood. Stands may contain only a single species or a species mixture.

Vegetation composition may affect litter quality (needles, leaves, and small branches) and nutrient flows. Concentrations of nitrogen, phosphorus, calcium, magnesium, and potassium in plant litter vary. Most plant litter reaches streams by either directly falling into them or by being borne by the wind from distances up to about 100 feet.

Ecological Processes of Riparian Areas. Riparian corridors provide habitat for terrestrial wildlife and contribute to aquatic habitat for fish. Fish and wildlife habitat functions are influenced by the vegetation conditions. The effectiveness of riparian corridors for performing ecological processes such as sediment trapping, attenuating or reducing high stream flows by aiding water infiltration into the soil, alleviating low flow conditions by providing water to streams from storage in bank soils, and contributing nutrients to the stream system through leaf litter are at least partly controlled by vegetation characteristics. Riparian zones that provide the full spectrum of structures and functions are necessary for maintaining and restoring productive aquatic ecosystems (Reeves and Sedell 1992). LWD provides direct instream habitat, such as areas of cover for use by fish, and also shapes the channel to create pool habitat. Canopy cover is an

TABLE 4.5-2
Distribution of Tree Species Within Riparian Stand Types in the Planning and Project Areas

Common Name	Scientific Name	Distribution
Douglas fir	*Pseudotsuga menziesii*	MT, ID, WA
Alpine fir	*Abies lasiocarpa*	MT, ID, WA
Western red cedar	*Thuja plicata*	MT, ID, WA
Grand fir	*Abies grandis*	MT, ID, WA
Englemann spruce	*Picea englemanii*	MT, ID
Pacific silver fir	*Abies amabilis*	WA
Western larch	*Larix occidentalis*	MT, ID, WA
Lodgepole pine	*Pinus contorta*	MT, ID, WA
Mountain hemlock	*Tsuga mertensiana*	MT, ID, WA
Western white pine	*Pinus monticola*	MT, ID
Black cottonwood	*Populus trichocarpa*	MT, ID, WA

indicator of the amount of sunlight that is blocked from soil and water surfaces by vegetation, and the protection of atmospheric conditions under the forest canopy that can contribute to maintenance of stable water temperatures for fish. Both LWD and canopy cover are addressed in more detail in Section 4.6, *Fisheries and Aquatic Resources*.

Riparian Forest Health

The major natural and human-caused disturbances in Pacific Northwest forests that affect forest health and vegetation resources include the following (Lujan et al. 1992b):

- Fire
- Wind (storm events)
- Insects
- Disease
- Floods and mass soil failures
- Land management

Forest ecosystems in the Planning Area have developed as a result of natural disturbance processes (Everett et al. 1994; Ice et al. 1988; Ice 1995). Some of these disturbance processes, such as floods and mass failures, are concentrated within riparian areas, causing riparian areas to be particularly dynamic, heterogeneous, and disturbance-based. All can affect the ecological functions and processes of vegetation resources, including the provision of LWD and shade to streams. Wildfire regimes in the Planning and Project Areas range from infrequent (less than once every 100 years) to very frequent (occurring every few years), and from low-intensity surface fires that have only minor effects on canopy trees to stand-replacement fires (Agee 1981, 1991). The wildfire regimes vary by the severity of damage to vegetation (Agee 1991). For the Planning Area, three levels of fire severity are recognized (Lujan et al. 1992):

- **High severity fire**—Kills most of the vegetation in a stand (70 to 80 percent of the basal area)
- **Moderate severity fire**—Kills 20 to 70 percent of the basal area
- **Low severity fire**—Kills less than 20 percent of the basal area

Wildfires may cause changes in the composition and structure of vegetation, and, consequently, the ecological functions that are provided. Susceptibility to wildfire is influenced by an array of factors that include stand type and species composition, as well as landscape pattern. Fire exclusion policies have caused many forested areas of the Planning Area to become unnaturally dense, with species composition shifted toward fire intolerant species and heavy accumulations of fuels. Natural fire regimes often provide an important mechanism for recruitment of LWD. LWD recruitment is altered by fire suppression and riparian harvest to reduce accumulation of fuels.

Trees and stands vary in their tolerance to wind. Western hemlock and Pacific silver fir are generally prone to blowdown, western red cedar and Sitka spruce may be wind-firm, and Douglas fir may be both wind-tolerant and wind-sensitive (Boe 1965; Moore and MacDonald 1974; Henderson et al. 1989). In general, dominant trees in a stand are often more wind-firm than intermediate crown-class trees (Boe 1965; Gordon 1973). Also, healthy, vigorous trees are less susceptible to windthrow than unhealthy trees. Incidences of prior fire, insect, or disease disturbances, as well as management

history, influence the predisposition of forest stands to windthrow.

Insects are endemic to forests in the Planning and Project Areas. However, only a few insect species have the potential to cause catastrophic impacts on the ecological processes of vegetation resources. In general, insects are categorized by their behavior in the forest:

- Defoliators
- Terminal miners
- Bark beetles
- Aphids and scale insects
- Wood borers

Insect infestations in western Washington generally are less severe than infestations in the ICRB. In western Washington, disturbances from insect infestations are smaller, but on occasion, large epidemics of defoliators occur, mainly in old growth hemlock stands (Furniss and Carolin 1977). Defoliators, such as the Douglas fir tussock moth and spruce budworm, and beetles, such as the mountain pine beetle, red turpentine beetle, and pine engraver beetle, are particularly important in the ICRB, where infestations can cause tree mortality over thousands of acres (Furniss and Carolin 1977). Insect damage to vegetation resources, like wildfire, may cause changes in the composition, structure, and pattern of vegetation, and, consequently, the ecological services that are provided. Susceptibility to wildfire is influenced by insect damage.

Forest diseases in the Planning and Project Areas are caused mainly by fungi and dwarf mistletoe. Bacteria, viruses, and nematodes also cause diseases but their effect on forested areas is usually minor (Lujan et al. 1992). The major tree diseases are categorized as follows:

- Foliage disease
- Heart rot or bole decay
- Root rot
- Cone and seed disease
- Stem and branch disease (such as canker, rust, and dwarf mistletoe)

In western Washington forests, root rot, stem decay, and dwarf mistletoe are more important in terms of disturbance to forested stands than insects. Foliage disease, stem canker, and rust play only a minor role in vegetation disturbance (Lujan et al. 1992). In the ICRB forests, root disease, dwarf mistletoe infection, and foliage disease are occasionally important in all-age stands. In older stands, butt rot and decay fungi increase in importance. These diseases have considerable influence on forest succession and biological diversity, and diseases can cause a change in species composition in an affected stand (Lujan et al. 1992).

Mass failures concentrate within riparian areas when avalanche-type failures move downslope into stream channels where they can trigger in-channel dam-break failures and debris torrents that scour streams, in some cases for several miles (Ice et al. 1988; O'Connor and Cundy 1993).

The success of fire suppression practices, combined in some cases with the selective logging of ponderosa pine, western larch, and white pine, has resulted in major shifts in forest composition and density in many areas of the Planning Area. Extensive areas have shifted in composition from historically open-grown stands with heavy to dominant seral species components of ponderosa pine, western larch, or white pine, to stands with dense understories of Douglas fir and grand fir, and heavy accumulations of dead and living fuels (Mutch et al. 1993; Danielson and

Sampson 1995; Arno 1976; Fellin 1980). These forests have become increasingly subject to forest health problems, including insect epidemics and chronic root disease, which leads to high rates of mortality (O'Laughlin et al. 1993; Mutch et al. 1993). As a result, where frequent low-intensity surface fires once maintained open-grown forests, high-intensity wildfires now consume significant portions of entire forests, with extreme effects upon soils, vegetation, fish and wildlife habitat, air quality, and other valued resources (Mutch 1994; Kaczynski 1994; Arno 1996).

Land management activities can influence the productivity, health, composition, structure, and pattern of vegetation resources. Activities resulting in soil compaction, such as some types of log skidding, make the development of effective vegetation root structures more difficult, which reduces plant vigor and may lead to changes in the plant community from desirable to less desirable species (Clary 1995; Clary and Medin 1990). Soil compaction also may result in reduced soil moisture and increased soil temperatures, which can adversely affect plant vigor (Meisner 1988; Hynes 1983). Timber harvest affects stand composition and structure. Livestock grazing can affect vegetation resources through browsing, trampling, and soil compaction (Elmore and Beschta 1987). Rates of vegetation recovery from disturbance depend on current physical and hydrological conditions, existing plant communities, potential and desired plant communities, topography, hydrology, and climate (Ehrhart and Hansen 1997). If the soil and hydrological characteristics are severely degraded, restoration may take longer (Platts and Raleigh 1984; Hubert et al. 1985). However, vegetation recovery can be relatively rapid, particularly on less disturbed sites (Elmore and Kauffman 1994). For example, recovery of riparian vegetation after exclusion of cattle may occur within years or decades.

Endangered, Threatened, and Sensitive Vegetation

No plants that are listed as endangered under the ESA are suspected to occur in the Project Area, nor are plants that are proposed to be listed or candidates for listing (FWS 1998a). However, three plant species listed federally as threatened, and 14 federal species of concern, may be present in the Project Area. These species, their status, likelihood of occurrence, habitat preferences, and wetland affinity are summarized in Table 4.5-3.

Plants Listed Federally as Threatened. Information about the habitat, range, population, and likelihood of occurrence of three plants listed federally as threatened is described below. Only water howellia is known to occur in the Project Area. Currently available information suggests that the other two federally listed species are not likely to occur in the Project Area (Table 4.5-3).

Macfarlane's four o'clock. This perennial herb occurs on steep, unstable slopes within upland shrubland and grassland communities. The plant associations in which this species is found range from cheatgrass-dominated communities to forsellesia shrublands and hackberry woodlands (Moseley 1989b, 1993). The distribution of the Macfarlane's four o'clock ranges from west central Idaho to western Oregon and consists of a population of approximately 1,000 individuals (FWS 1996). It is unlikely that this species occurs in the Project Area, but surveys have not been conducted to verify presence or absence on Plum Creek lands.

TABLE 4.5-3

Endangered, Threatened, and Sensitive Plant Species that May Occur in the Project Area

Common Name	Scientific Name	FWS Listing Office[a]	State Status[b]	Likelihood of Occurrence	Primary Habitat	Wetland Affinity[c]
Federal Threatened						
Macfarlane's four o'clock	*Mirabilis macfarlanei*	SRB	ID: GP2	Unlikely	Upland	NL
Ute ladies'-tresses	*Spiranthes diluvialis*	SRB, MT	ID: GP2 MT: S1	Unlikely	Wet Meadow	NL
Water Howellia	*Howellia aquatilis*	SRB, UCRB	ID: GP2 MT: S2 WA: T	Confirmed in Swan Valley, MT	Riparian	OBLW
Federal Species of Concern						
Bartonberry	*Rubus bartonianus*	SRB	ID: GP2	Unlikely	Riparian	FACW
Broad-fruit mariposa	*Calochortus nitidus*	SRB	ID: GP3 WA: T	Unlikely	Upland	NL
Clustered Ladies Slipper	*Cypripedeium fasiciculatum*	SRB, UCRB	ID: GP3 MT: S2	Possible in MT and ID	Upland	FACU
Hapeman's sullivantia	*Sullvantia hapemanii var. hapemanii*	SRB	ID: GP3 MT: S2	Possible in MT and ID	Riparian	NI
Hazel's prickly phlox	*Leptodactylon pungens ssp. hazeliae*	SRB	ID: GP1	Unlikely	Upland	NL
Howell's gumweed	*Grindelia howellia*	SRB	ID: GP3	Likely in MT and ID	Upland	NL
Idaho douglasia	*Douglasia idahoensis*	SRB	ID: GP2 MT: S2S3	Possible, but unlikely	Upland	NL
Jessica's aster	*Aster jessicae*	SRB	ID: GP2 WA: E	Unlikely	Upland	NL
Palouse goldenweed	*Haplopappus liatriformis*	SRB	ID: GP2 WA: T	Unlikely	Upland	NL
Payson's milkvetch	*Astragalus paysonii*	SRB	ID: GP3 WA: E	Likely in ID	Upland	NI
Salmon River fleabane	*Erigeron salmonensis*	SRB	ID: GP3	Possible in ID	Upland	NI
Spalding's silene	*Silene spaldingii*	SRB	ID: GP2 MT: S1 WA: T	Unlikely	Upland	NL
Tobia's saxifrage	*Saxifraga bryophora var. tobiasiae*	SRB	--	Unlikely	Stream/ Upland	NL

TABLE 4.5-3

Endangered, Threatened, and Sensitive Plant Species that May Occur in the Project Area

Common Name	Scientific Name	FWS Listing Office[a]	State Status[b]	Likelihood of Occurrence	Primary Habitat	Wetland Affinity[c]
Triangular-lobed moonwort	*Botrychium ascendens*	SRB	ID: GP3 MT: S1	Likely	Wet Meadow/ Wetland	NL

[a]SRB = Snake River Basin; MT = Montana; UCRB = Upper Columbia River Basin
[b]ID = Idaho rankings
GP1 = Critically imperiled rangewide
GP2 = Imperiled rangewide
GP3 = Rare or uncommon, but not imperiled rangewide
MT = Montana rankings
S1 = Critically imperiled (5 or fewer)
S2 = Vulnerable to extirpation (6 to 20)
S3 = Rare or uncommon (21 to 100)
WA = Washington rankings
E = Endangered; may become extinct or extirpated
T = Threatened; likely to become endangered
[c]Wetland indicator status (Reed 1993):
OBLW = Obligate wetland
FACW = Facultative wetland
FACU = Facultative upland
NI = No indicator (insufficient information available to determine indicator status)
NL = Not listed (assumed to be upland obligate)

Ute ladies'-tresses. This perennial orchid is generally found in wet meadows fed by groundwater discharge; in alkaline, open intermontane valley bottoms, often with marl; along meandered wetlands; and in seeps (FWS 1995b; Mancuso 1997a). Ute ladies'-tresses have been found in Utah, Colorado, eastern Wyoming, Montana, Nebraska, Idaho, and Washington. In 1997, the population of Ute's ladies'-tresses in Idaho's Snake River canyon was estimated at over 1,000 individuals (Moseley 1998). It is unlikely that Ute ladies'-tresses occurs in the Project Area, but surveys have not been conducted to verify presence or absence.

Water howellia. The water howellia is an annual, aquatic herb found in shallow wetlands and along edges of small ponds and lakes in western Washington, western Oregon, northern Idaho, and western Montana. Most of these occurrences are clustered in two areas: one in the vicinity of Spokane, Washington; and the other in the Swan River Valley of the Project Area in northwestern Montana (Lake and Missoula Counties). Howellia grows in firm, consolidated clay and organic sediments that occur in wetlands associated with ephemeral glacial pothole ponds and former river oxbows (Shelly and Moseley 1988; Lesica 1992). These habitats are filled with spring rains and snowmelt runoff, and depending on temperature and precipitation, exhibit some drying during the growing season.

Although the plant grows under water, water howellia seeds sprout only if exposed to air. Therefore, it only grows in wetlands that occasionally dry up to some degree. Typically, little other vegetation grows around water howellia. However, it grows near sedges, bur-reed, mannagrass, and in ponds containing downed woody debris or snags (Montana Natural Heritage Database 1999; Shelly and Moseley 1988). Water howellia is known to occur on 10 sites in the Swan Valley of the Project

Area, distributed among Condon Creek (4 sites), Elk Creek (1 site), and Moose Bayou (5 sites).

Plant Species of Federal Concern.

Information about the habitat, range, population, and likelihood of occurrence is provided for the 14 federal plant species of concern that may occur within the Project Area. Of the 14 plants (Table 4.5-3), 7 are not likely to occur in the Project Area based on a review of currently available information. Of the seven that may occur within the Project Area, five are exclusively found in uplands. As a result, only two species of concern, Hapeman's sullivantia and Triangular-lobed moonwort, are likely to occur within riparian habitat that is being addressed in this document.

Bartonberry. This endemic plant occurs in Hell's Canyon, located in Adams and Idaho Counties, Idaho, and Wallowa County, Oregon (Moseley 1989b). It is found in riparian communities along streams and in rockslides on lower canyon slopes. It is one of Idaho's rarest plants (Moseley 1989b). It is unlikely that bartonberry occurs in the Project Area, but surveys have not been conducted to verify presence or absence.

Broad-fruit mariposa. This perennial herb is found in Palouse grasslands and moist swales between adjacent hills in eastern Washington (WDNR 1999). In Idaho, this species is found in open woodlands bordering Palouse grasslands. It is unlikely that broad-fruit mariposa occurs in the Project Area, but verification surveys have not been conducted.

Clustered Lady's Slipper. This perennial herb occurs in mixed conifer forests. In Idaho and Montana, it occurs in western hemlock and western red cedar habitat types (Lichthardt 1995). In northwestern Montana, it is found in lodgepole pine habitats, and in the Clearwater Mountains of Idaho, this species is found in western red cedar habitat types. The distribution of the clustered lady's slipper includes Montana, California, Washington, Utah, Idaho, Oregon, and Wyoming. It is widely dispersed and often occurs in groups of one to several individuals (Lichthardt 1995). It is possible that the clustered lady's slipper occurs in the Montana and Idaho portions of the Project Area, but surveys have not been conducted to verify presence or absence.

Hapeman's sullivantia. This perennial herb is found on moist calcareous outcrops and boulders in shady canyons and streams. The species' range includes southern Montana, north central Wyoming, and central Idaho. It is possible that Hapeman's sullivantia occurs in Montana and Idaho portions of the Project Area, but surveys have not been conducted to verify occurrence (Wyoming Rare Plant Field Guide 1999).

Hazel's prickly phlox. This perennial is found on near-vertical to overhanging, westerly-facing rock outcrops in Hell's Canyon in Idaho and Oregon (Moseley 1989b). Four populations of this species are known to occur in the Hell's Canyon National Recreation Area (two in Oregon, two in Idaho). It is unlikely that Hazel's prickly phlox occurs in the Project Area, but verification surveys have not been conducted.

Howell's gumweed. This perennial is found within open, grassy bluffs surrounded by mixed conifer forest. The species is endemic to northern Idaho and western Montana (Lorain 1991). The entire population of Howell's gumweed has been estimated to be between 13,000 and

15,000 individuals. It is likely that Howell's gumweed occurs in Montana and Idaho portions of the Project Area, but surveys have not been conducted to verify it.

Idaho douglasia. This perennial herb is found in open-grown whitebark pine-subalpine fir woodlands and scree slopes in avalanche chutes (Moseley 1988, 1990). This species' distribution is limited to central Idaho on the Boise and Payette National Forests. Approximately seven populations are known to occur in central Idaho. It is possible but unlikely that Idaho douglasia occurs in the Project Area; however, surveys have not been conducted to verify presence or absence.

Jessica's aster. This perennial herb occurs in Palouse grasslands and prairie forest/transition zones in association with small drainages (WDNR 1999). It is locally endemic to southeastern Washington and adjacent western Idaho, and limited to small populations within its distribution area. It is unlikely that Jessica's aster occurs in the Project Area, but surveys have not verified this.

Palouse goldenweed. This perennial herb is endemic to the Palouse Prairie and is associated with Idaho fescue (Mancuso 1997b). It is found in the Palouse Prairie region of eastern Washington and western Idaho. Within its limited range, most populations only consist of approximately 100 individuals. It is unlikely that this species occurs in the Project Area, but surveys have not verified this.

Payson's milkvetch. This perennial herb occurs in older roadcuts and edges of openings in clearcuts that have been burned (Lorain 1990). It is regionally endemic to northern Idaho and southeastern Wyoming. Approximately 15 populations of individual species, ranging in numbers from 1 to 10, are known in the Payson's milkvetch distribution range (Lorain 1990). It is likely that this species occurs in Idaho portions of the Project Area, but surveys have not been conducted to verify presence or absence.

Salmon River fleabane. This perennial is restricted to steep, north-facing cliffs, where it grows on ledges and mossy crevices (Moseley 1989a). This species is endemic to Idaho and found on the Salmon National Forest in central Idaho. Only two populations of Salmon River fleabane are known. It is possible but unknown whether this species occurs in Idaho portions of the Project Area.

Spalding's silene. In Idaho, this perennial herb occupies the Palouse Prairie habitat, made up of Idaho fescue habitat types and mesic canyon grassland communities near lower treeline or scattered ponderosa pine trees in northwestern Idaho. It is associated with undisturbed slopes in swales and drainages, upper canyon slopes, and in small strips of vegetation surrounded by cultivated fields. This herb occurs in northwestern Montana, eastern Washington, and northeastern Oregon. The species' population throughout its range is estimated at 14,000 individuals (Idaho Native Plant Society 1999). It is unlikely that Spalding's silene occurs in the Project Area, but verification surveys have not been conducted.

Tobia's saxifrage. This diminutive annual is found in subalpine forest communities on and around earth cores pushed into snow tunnels by pocket gophers (Moseley 1989c). This species is also common on snow runoff channels and is endemic to the western Salmon Mountains of Idaho. Five populations of Tobia's saxifrage have

been identified on the Payette National Forest in central Idaho. It is unlikely that this species occurs in the Project Area, but surveys have not been conducted to verify presence or absence.

Triangular-lobed moonwort. This primitive fern occurs in mesic to moist meadows and shrub/conifer dominated wetlands in British Columbia, Alberta, Ontario, Alaska, California, Montana, Oregon, Wyoming, and Idaho (Vanderhorst 1997). Known populations include six plants in Montana, two in Idaho, one in Washington, and hundreds in Oregon. It is likely that this species occurs in the Project Area, but surveys have not been conducted to verify presence or absence.

4.5.6 Environmental Consequences

The following discussion focuses on potential environmental consequences of the proposed NFHCP and alternatives on vegetation composition and structure, forest health, noxious weeds, and threatened, endangered, and sensitive plants. Each of the four alternatives contains commitments or provisions that could affect vegetation resources. Potential impacts on vegetation resources might affect aquatic habitat conditions that native salmonids prefer through influencing three of the Four C's—cold, clean, and complex water. Vegetation changes primarily could affect water temperature, sediment filtration and bank stabilization, organic loading, and LWD inputs to create instream habitat structures.

The impact analysis focuses on the 30-year Permit period, but concludes with brief assessments of the optional Permit periods of 10 and 20 years. Where assessment outcomes are similar, discussions of the proposed NFHCP and action alternatives refer to discussions under the Existing Regulations—No Action Alternative.

Covered activities listed in Chapter 2 that could adversely affect Permit species and their habitat by directly impacting vegetation resources are assessed in Section 4.6, *Fisheries and Aquatic Resources*. Other covered activities described in Chapter 2 that are not addressed below would not directly impact vegetation resources. Potential effects of covered activities on aquatic habitat, or other water quality characteristics, are discussed in Sections 4.2, *Geology and Soils*; 4.3, *Water Resources and Hydrology*; 4.4, *Water Quality and Contaminants*; and 4.6, *Fisheries and Aquatic Resources*.

Stand structure and canopy cover changes over time under each alternative are predicted using vegetation growth models, including the Forest Vegetation Simulator (FVS) and customized computer models. Forecasts of vegetative conditions were made using a combination of published and unpublished models. The results of these modeling efforts were included in Plum Creek Technical Report #7 (Plum Creek 1999a), which was independently reviewed by other scientists. This model was used to project changes in stand structures by decade during the planning period. It assumes that three tree harvest prescriptions represent the range of forest management effects under the alternatives:

- State forest practices BMPs
- Constrained harvest at moderately-sensitive CMZs in Tier 1 watersheds and high-sensitivity streams without CMZs

- No harvest

The model runs for each alternative realistically account for the frequency that each prescription would be applied, proportional variation in forest stand types, differences in riparian area prescriptions by stream sensitivity, changes in stand merchantability as trees grow over time, and the effect of adjacent stand conditions on merchantability. The evaluation assumes that the projected vegetation effects for fish-bearing streams are representative of overall vegetation effects in the Project Area. Estimated effects were quantified by Plum Creek, unless referenced differently.

Existing Regulations—No Action Alternative

Trends and Future Conditions. Under the No Action Alternative, existing regulations would be applied throughout the 30-year planning period. Federal, state, and local regulations—forest practices regulations and BMPs in particular—impose limits on land management activities affecting vegetation resources. The intent of the regulations is to maintain, restore, and enhance forest vegetation to provide important ecological functions. Although the No Action Alternative addresses vegetation in all topographic settings, many regulations target riparian vegetation specifically by promoting plant communities that provide protection for streams, habitat support for fish and wildlife, nutrient cycling, temperature modification, pollution buffering, useful products for people, and the building blocks for recovery from disturbances. Evidence in state forest practices audit reports suggests that compliance with BMP regulations is high. Biological effects of state-regulated riparian buffers have not been completely evaluated.

Vegetation Structure. Most forestland within the Project and Planning Areas is actively managed for commodity production or other uses. Exceptions are primarily federal lands that are passively managed for reserves, refuges, wilderness, and other non-consumptive use values. Active vegetation management, including silvicultural practices, can influence all aspects of vegetation resources, including stand structure, species composition, landscape pattern, ecological functions, forest health, and special status plants. Management intensity influences the amount and frequency of change. Generally, vegetation resources within the Project Area are managed more intensively than vegetation in the Planning Area, largely because of the public land component of the latter.

According to the Plum Creek model described above, vegetation structure in riparian stands in the Project Area would remain about the same or would slowly improve under this alternative as greater portions of the landscape are brought under improved BMPs. Refer to Table 4.5-1 for current conditions.

Generally, the structures of riparian forest would change as follows:

- Unstocked forest would grow into stocked forest
- Forest with mostly small trees would be reduced (dense stands would be thinned or grow into stands with intermediate-sized trees)
- Forest with intermediate-size trees would increase by 50 to 150 percent

- Forest with large trees would remain about the same (but would shift towards less dense types).

More specifically, the greatest structural changes in stand types after one decade would be as follows (see Figure 4.5-2 for an illustration of stand types):

- L3 and H3 stands would decrease by about 50 percent
- H9 stands would increase by about 50 percent
- T15 stands would transition to H15 stands

After two decades, the greatest structural changes would be as follows:

- Non-stocked forest would be eliminated
- H3 and T3 stands would be reduced by about 67 percent
- L9 would increase by 25 percent
- H9 would continue to increase
- T9 would increase by 100 percent

After three decades, the following changes would occur:

- L3 stands would decrease by about 67 percent
- H3 and T3 stands would transition to larger sizes
- H9 stands would increase by about 150 percent
- T9 stands would increase by about 50 percent
- L15 stands would double

Riparian plant communities damaged from livestock grazing would remain about the same; that is, 25 percent moderately disturbed and 10 percent severely disturbed (Plum Creek 1999c). Vegetation structure in non-forested, unstocked, and other land without merchantable trees would remain about the same or slowly improve as increased controls are placed on rangelands and sensitive habitats.

Vegetation Composition. The species composition of plant communities in the Project and Planning Areas would remain about the same under this alternative as current conditions. Plant species in the Project Area would be favored for commodity production, and management would emphasize native and early seral species that are appropriate to their sites and reproduce naturally. Plant community representation, species richness and diversity, and susceptibility to noxious plant establishment would remain about the same. Vegetation management activities along streamside areas would be expected to remain relatively unchanged from existing timber harvesting and grazing practices, and similar vegetation composition would be retained.

Prevalence of noxious plants, which are non-native, aggressive invaders of disturbed ground, would be about the same as current conditions. Although state regulations identify noxious weeds and prescribe control measures, noxious weeds would continue to persist and spread by wind, water, and vehicles. Roadsides and disturbed areas would continue to be most susceptible (Potash 1991; Smith-Kuebel and Lillybridge 1993).

Vegetation composition in the Planning Area would remain about the same, but would vary somewhat from the Project Area as a result of greater emphasis on

later seral species, less frequent disturbance regimes, and a different mix of site types more characteristic of public lands.

LWD and canopy cover issues are discussed in Section 4.6, *Fisheries and Aquatic Resources*. Under all alternatives, the vast majority of the Project Area would be managed for timber harvest, and the variation and risks to forest health among the alternatives is low. For riparian areas, relative differences among alternatives in effects on forest health may be greater; however, the biological consequences of these differences are variable.

Endangered, Threatened, and Sensitive Vegetation. Land management activities associated with the No Action Alternative would be subject to the same federal, state, and local regulations currently used to document and protect threatened, endangered, and sensitive plants in the Project and Planning Areas. The ESA does not prohibit take of listed plants on non-federal lands, so Plum Creek would not be required to avoid take of listed plants on their lands. The No Action Alternative would not be expected to change potential threats to threatened, endangered, or sensitive plants from what currently exists. There would be some likelihood of occasionally encountering and potentially disturbing threatened, endangered, or sensitive plants, including some within riparian areas. However, this likelihood would be about the same as under existing conditions, and would likely be relatively low because of the limited occurrence of such vegetation in the Project Area. The only plant species listed under the ESA that occurs in the Project Area is water howellia, which is a palustrine wetland-dependent plant species. Plum Creek actions are unlikely to result in disturbance of water howellia plants or habitat.

In conclusion, timber harvest would continue under this alternative, resulting in human-caused impacts on vegetation resources similar to current conditions. Negative impacts on vegetation resources in the Project Area would be avoided or minimized by complying with state regulations, BMPs, and local ordinances that guide management planning, restoration of disturbed areas, intensity and extent of harvest, and silviculture for forest health. In particular, impacts would be minimized in sensitive riparian areas within stream and river corridors.

Plum Creek's Proposed NFHCP

Impacts. At a broad scale, vegetation resources in the Project and Planning Areas would probably be similar under the NFHCP to conditions described for the No Action Alternative. Riparian prescriptions in the proposed NFHCP would affect less than 1 percent of riparian areas in the Planning Area. Riparian prescriptions in the proposed NFHCP would affect less than 10 percent of the Project Area. Therefore, most vegetation resources in the Project Area would not be affected by implementation of the NFHCP. Impacts from timber harvest and associated activities covered under this alternative are not widespread. However, the affected riparian areas are the part of the vegetative landscape that most directly influences aquatic habitat quality (MBTSG 1998).

At a fine scale, differences in vegetation resources among the proposed NFHCP and other alternatives may be more apparent, and may translate to differences in effects on riparian and aquatic habitat conditions. Where they would be implemented, the riparian and grazing

management commitments of the NFHCP have the greatest potential to affect riparian stand structure, riparian forest health, and threatened, endangered, and sensitive plants. To a somewhat lesser degree, land use planning and legacy management commitments also have the potential to affect vegetation resources. Upland forest management commitments and additional commitments in areas adjacent to riparian areas could result in significant effects on vegetation resources. These and other vegetation-related conservation commitments include provisions for riparian tree retention and buffers in fish-bearing and non-fish-bearing streams, upland and riparian Interface Caution Areas (ICAs), riparian harvest deferrals in sensitive fish-bearing watersheds, commitments to minimize clearcutting in upland areas, rangeland protection and riparian restoration, and development of setbacks from sensitive aquatic sites. They also include a pre-determined goal of conservation certainty associated with land transactions beneficial to native salmonids and their habitat, and changed circumstances, watershed analysis, and adaptive management prescriptions. Overall, there would be lower impacts on vegetation resources under the NFHCP alternative than under the No Action Alternative.

Vegetation Structure. Generally, vegetation structure within the Project Area would be more diverse and less intensively harvested than under the No Action Alternative. The dynamic mosaic of patch patterns and seral stages would be similar to existing conditions, but riparian areas and corridors would be less disturbed or manipulated. Where forest management activities occur in the landscape, the NFHCP's ICAs would moderate changes to forest structure by prescribing minimum tree retention, regeneration stocking requirements, and a number of other conservation guidelines. These would influence disturbances and transitions outside riparian management zones to be less intense and less abrupt. Finally, the reduced likelihood of clearcutting in upland areas under this alternative (see Section 4.3, *Water Resources and Hydrology*) would contribute to a relatively more natural vegetative condition than under the No Action Alternative.

According to the Plum Creek model, the changes in riparian forest structures, by decade, would be nearly identical to those under existing regulations, with each structure type varying by 1 percent or less (refer to Table 4.5-1 for current stand structure conditions). Like the No Action Alternative, unstocked forest would grow into stocked forest, forest with mostly small trees would transition to stands with larger trees, forest with intermediate-size trees would increase by 50 to 150 percent, and forest with large trees would remain about the same (but would shift to less dense types).The proposed NFHCP would include Plum Creek's grazing BMPs, which have performance standards for riparian vegetation conditions along all streams within grazing allotments. Regular opportunities for monitoring and improving degraded vegetation would be summarized in annual range management plans and practiced by lessees. Along Tier 1 streams and Key Migratory Rivers severely impacted by livestock, cattle would be excluded by fencing. The combined effects of grazing management prescriptions would be to restore all grazed stream reaches to a properly functioning condition within the 30-year Permit period (Figure 4.5-3). Not illustrated in the figure is a proposed NFHCP commitment to evaluate the status of vacated leases before renewal of

grazing leases. If riparian conditions are unacceptable and riparian function does not meet performance standards, lease renewal may be deferred and benefits would be similar to those of fenced riparian exclosures. If riparian vegetation is severely impacted, leases may never be renewed. The rate of riparian area recovery from grazing shown in Figure 4.5-3 is considered a conservative estimate because additional conservation measures would be implemented that are not readily modeled.

Vegetation Composition. Under the NFHCP, the composition of plant communities in the Project and Planning Areas would be about the same as under the No Action Alternative. Vegetation management activities along streamside areas, such as range management plans and riparian restoration action plans, would result in a more desirable plant community composition over time. The proposed NFHCP relies on the same existing regulations as the No Action Alternative to guide management of noxious weeds in the Project Area; however, vegetation restoration projects may reduce weed distribution. Vegetation composition in the Planning Area would remain about the same.

LWD and canopy cover are discussed in Section 4.6, *Fisheries and Aquatic Resources*.

Endangered, Threatened, and Sensitive Vegetation. Threatened, endangered and sensitive plants would benefit from riparian, grazing, legacy management, land use planning, and other conservation commitments proposed under the NFHCP. Known and unknown populations of threatened, endangered, and sensitive plants occurring in CMZs and stream buffers, on protected rangelands, restoration project sites, and land use conservation areas, would receive additional protection indirectly as a result of NFHCP conservation measures intended for Permit species.

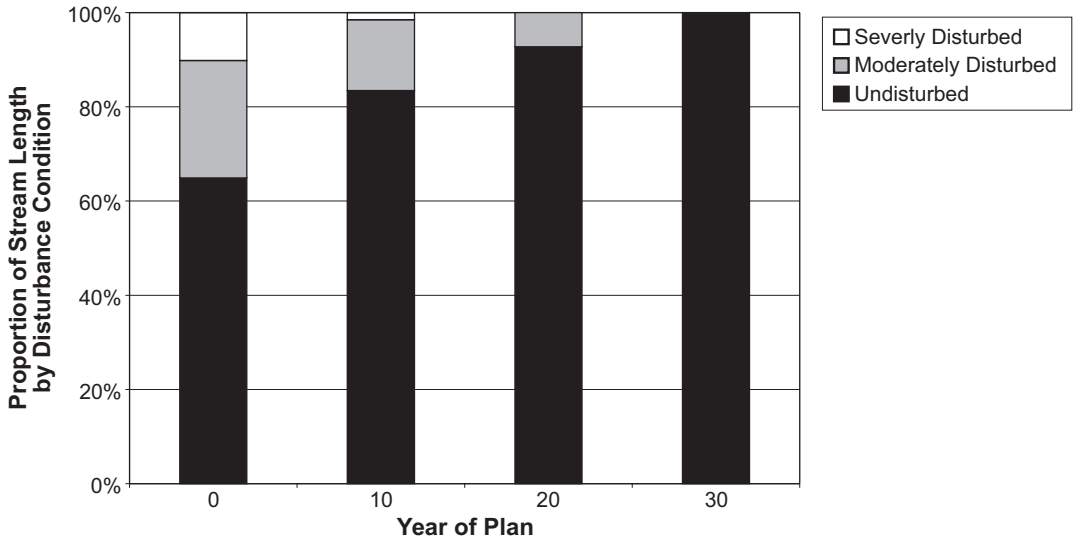

Figure 4.5-3
Proportion of Project Area Stream Length by Decade Expected to be Classified as Undisturbed by Grazing Under the Proposed NFHCP

Optional 10- and 20-Year Permit Lengths. Vegetation structure would become more desirable during the 30-year Permit. Management actions would improve stands to include more balanced structural diversity and to conserve riparian corridors. Vegetation composition and health is expected to become more desirable throughout the Permit period. The benefits of these management prescriptions, such as increasing the width of riparian buffers beyond what is required by existing regulations, are expected to be cumulative and extend beyond the Permit period. If a 10- or 20-year Permit length is selected, fewer management actions to augment existing regulations would be guaranteed.

Grazing BMPs are estimated to eliminate all severely and moderately disturbed areas in 30 years, returning these areas to a more functional condition. At 20 years, two-thirds of impact reduction would be achieved. At 10 years, one-third of impact reduction would be achieved (see Figure 4.5-3) (Plum Creek 1999c; Plum Creek 1999g). These trends are rough estimates of rates of recovery of riparian habitat function. Because of these, Plum Creek has made adaptive management commitments to develop appropriate methods for evaluating and implementing the restoration of riparian function.

Mitigation. The proposed NFHCP further avoids and minimizes vegetation impacts beyond the No Action Alternative through commitments that build on the existing regulations. Commitments for managing riparian areas, livestock grazing, land use changes and transactions, and riparian assessment and restoration could provide significant mitigation through improved or more desirable vegetation structure, composition, and health. To address uncertainty about the effectiveness of conservation commitments, Plum Creek would perform four core adaptive management projects in demonstration watersheds to monitor and determine if management practices should be revised to improve NFHCP performance. Three of these core projects focus on anticipated vegetation resource function and benefits. They include evaluating the effectiveness of riparian management on woody debris loads and fish habitat diversity, NFHCP effectiveness at maintaining or reducing stream temperature increases (for example, canopy cover effects), and long-term effectiveness of the grazing BMPs. Provisions for adaptive management that address vegetation conditions, and NFHCP monitoring for the life of the plan, ensure that management prescriptions would continue to improve and that anticipated conservation benefits would be validated. Changed circumstances commitments for large or intense fires, floods, and landslides that could adversely affect vegetation resources, and subsequently Permit species, provide additional opportunities for conservation certainty. Specific mitigation beyond those conservation commitments included in the proposed NFHCP would not be performed or recommended.

Unavoidable Adverse Impacts. No unavoidable adverse impacts would result from this alternative relative to the No Action Alternative.

Cumulative Impacts. The proposed NFHCP would not create negative cumulative impacts on vegetation resources in the Planning Area relative to the No Action Alternative. Cumulative effects would be similar to those described for the Planning Area under the No Action Alternative. A cumulative benefit may

occur when the NFHCP is combined with other conservation practices in the Planning Area. For example, federal land management policies anticipate and account for private land practices in the Planning Area, such as Plum Creek's. Federal lands, which account for 59 percent of the Planning Area and 72 percent of Tier 1 watersheds, would be managed consistently with the goal of native salmonid recovery. Plum Creek's conservation package would complement these efforts.

Internal Bull Trout Conservation Plan Alternative

Impacts. Overall, effects on vegetation resources in the Project Area would result in slightly less disturbance than under the No Action Alternative. The vegetation conditions would be similar to, but slightly less improved, than those under the proposed NFHCP. This action alternative includes prescriptions for vegetation management in several conservation categories that parallel some of the commitments of the NFHCP. These conservation measures include provisions for riparian tree retention and buffers, rangeland protection and restoration, conservation-oriented land transactions, and discretionary riparian restoration projects. This action alternative lacks provisions for ICAs where vegetation conditions outside of the riparian management zones are managed, and provides less rigorous management of land use transactions than the NFHCP. Also, this alternative does not include riparian harvest deferrals in selected sensitive watersheds or watershed analysis and further prescription development in selected drainages with native fish assemblages, and it does not contain specific adaptive management projects or changed circumstances commitments.

Vegetation Structure. The Internal Bull Trout Conservation Plan Alternative proposes riparian management prescriptions similar to the proposed NFHCP. Consequently, impacts on vegetation resources resulting from timber harvest would be about the same as under the NFHCP. Vegetation resources along streams important to bull trout would receive slightly greater attention than other streams in the Project Area. The only exception is high and moderate sensitivity CMZs on Tier 2 lands, where existing regulations would apply instead of the proposed NFHCP's minimum tree retention of 88 trees per acre (or 50 percent of trees greater than 8 inches in average diameter) within the CMZ and about 50 feet beyond.

Generally, the changes in riparian forest structures, by decade, would be nearly identical to those under the No Action Alternative and the proposed NFHCP, with each structure type varying by about 1 percent or less. Tree harvesting would not result in appreciable differences among Tier 1 and Tier 2 watersheds.

Like the proposed NFHCP, the Internal Bull Trout Conservation Plan Alternative would implement Plum Creek's Grazing BMPs in Tier 1 watersheds, which aim to achieve more properly functioning conditions. Also, along severely impacted Tier 1 streams and Key Migratory Rivers in Tier 2 watersheds, the Internal Bull Trout Conservation Plan would implement fenced riparian exclosures, which would restore vegetation structure in many riparian situations. Like the proposed NFHCP, the combined effect of applying riparian and grazing management prescriptions would be to restore (within

the 30-year planning period) all grazed stream reaches in Tier 1 watersheds and along Key Migratory Rivers in Tier 2 watersheds to a properly functioning condition (Figure 4.5-4). However, in Tier 2 watersheds, the structure of streamside plant communities would be unchanged under continuing livestock-induced disturbances, the same as under the No Action Alternative.

Vegetation Composition. The composition of plant communities in the Project and Planning Areas would be about the same as under No Action and the proposed NFHCP alternatives. Vegetation management activities along streamside areas, such as range management plans and riparian restoration action plans, would result in more desirable plant community composition over time.

Existing regulations would guide management of noxious weeds under this alternative.

LWD and canopy cover are discussed in Section 4.6, *Fisheries and Aquatic Resources*.

Endangered, Threatened, and Sensitive Vegetation. In addition to the limited protection provided under the No Action Alternative, special status plants would further benefit from riparian and grazing management commitments proposed under the Internal Bull Trout Conservation Plan. Known and unknown populations of threatened, endangered, and sensitive plants occurring in CMZs and on grazing lands with fenced exclosures in Tier 1 watersheds would receive additional protection.

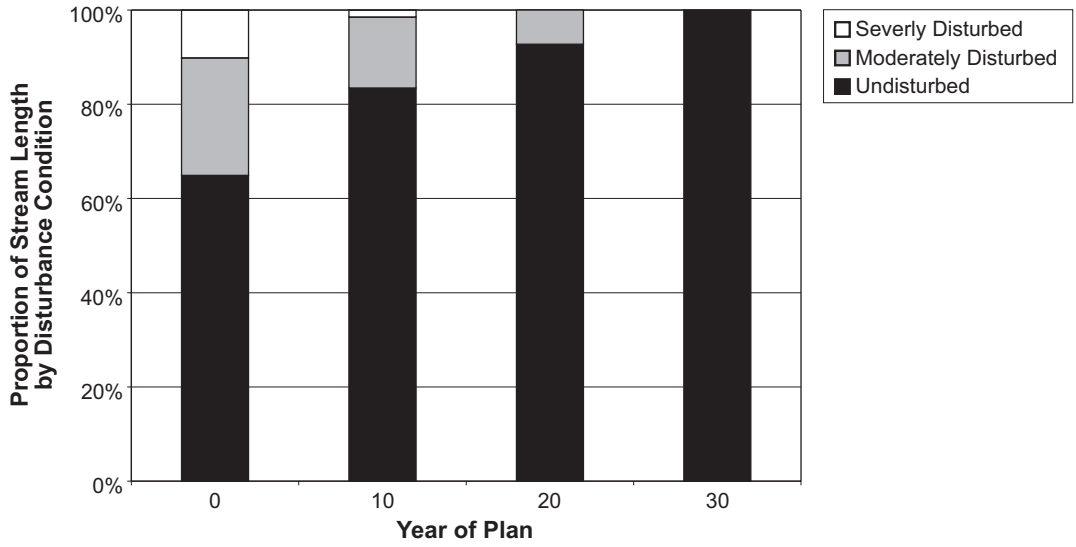

Figure 4.5-4
Proportion of Project Area Stream Length by Decade Expected to be Classified as Undisturbed by Grazing Under the Plum Creek Internal Bull Trout Conservation Plan Alternative

Optional 10- and 20-Year Permit Lengths. The effects of implementing a 10- or 20-year Permit would be similar to those described under the proposed NFHCP. The long-term success of measures to improve the structure, composition, and health of vegetation is more likely if the measures are implemented over a longer period of time, such as 30 years.

Mitigation. In addition to the improved resource conditions anticipated under the No Action Alternative, the Internal Bull Trout Conservation Plan would further avoid and minimize vegetation impacts through its conservation measures that build on existing regulations. The substantive provisions for management of riparian areas, livestock grazing, and land use changes would provide significant mitigation in the form of improved or more desirable vegetation structure, composition, and health. Provisions for BMP audits, supplemental internal audits of Plum Creek's Environmental Principles, and federal oversight and reporting requirements in the event the Services issue a Permit for this alternative would provide assurances that management prescriptions would continue to be implemented and effective. Adaptive management efforts would consist of possible revisions of HCP practices based on compliance monitoring. Specific mitigation, beyond those conservation measures included in the alternative, would not be performed or recommended. Unlike the NFHCP, changed circumstances commitments would not be part of this alternative.

Unavoidable Adverse Impacts. No unavoidable adverse impacts would result from this alternative, relative to the No Action Alternative.

Cumulative Impacts. This action alternative would not create negative cumulative impacts on vegetation resources in the Planning Area. A cumulative benefit may occur when the alternative is combined with conservation practices on federal lands in the Planning Area.

Simplified Prescriptions Alternative

Impacts. The riparian and grazing management conservation commitments of this alternative have the greatest potential to affect stand structure and composition, riparian forest health, and special status plants among all the alternatives. These commitments include provisions for riparian tree retention and buffers and rangeland protection.

Vegetation Structure. The Simplified Prescriptions Alternative would provide more and larger trees at greater distances from stream channels than under any of the other alternatives. Expanded riparian management zones along streams creates conditions more favorable to fish and other aquatic and terrestrial organisms associated with riparian zones (Reeves and Sedell 1992). Studies by Erman et al. (1977) and Erman and Mahoney (1983) in Northern California demonstrated that buffer strips of approximately 30 meters on each side of a stream resulted in macroinvertebrate (insect) populations and stream physical characteristics after timber harvest that were indistinguishable from unlogged streams.

Generally, the changes in riparian forest structures, by decade, would be similar to those under the other action alternatives and the No Action Alternative. Most structure types are nearly identical. Only four types—H9, H15, T9, and T15—vary

by as much as 3 to 11 percent. Compared to the No Action Alternative, this alternative would result in a smaller 30-year increase in stand types with intermediate-size trees—H9 stands would be about 11 percent less and T9 stands would be about 3 percent less. On the other hand, there would be more stands with large-size trees—H15 stands would be about 11 percent greater and T15 stands would be about 3 percent greater—than under the No Action Alternative.

The Simplified Prescriptions Alternative would eliminate or greatly reduce grazing and its effects on vegetation structure in the Project Area. However, the open range law would mean that trespass cattle would continue to use at least some portions of the Project Area, even though managed grazing would be eliminated or greatly reduced. The Simplified Prescriptions Alternative would require fenced exclosures of impacted streams where grazing occurs under open range law. The result of this management strategy would be to restore vegetation structure in all grazed stream reaches to a properly functioning condition within a 20-year period (Figure 4.5-5), roughly 10 years sooner than under the proposed NFHCP.

Vegetation Composition. The composition of plant communities in the Project and Planning Areas would be about the same as under other alternatives. Increased passive management of riparian areas would favor shade-tolerant and woody species over shade-intolerant and non-woody species. Existing regulations would guide management of noxious weeds under this alternative, and new introductions of weeds to riparian areas would be less frequent.

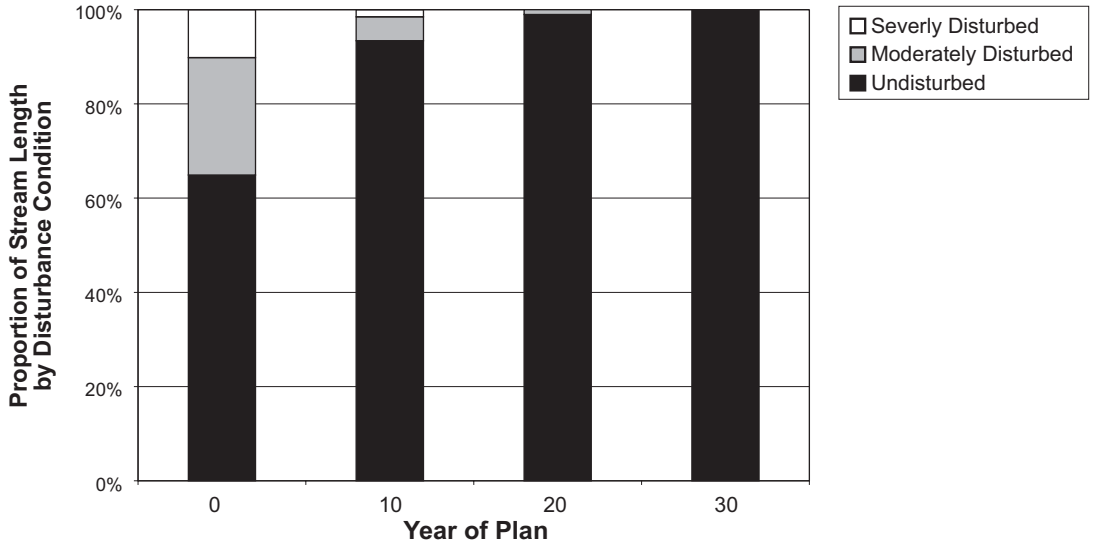

Figure 4.5-5
Proportion of Project Area Stream Length by Decade Expected to Be Classified as Undisturbed by Grazing Under the Simplified Prescriptions Alternative

Endangered, Threatened, and Sensitive Vegetation. In addition to the limited, indirect protection provided under the No Action Alternative, special status plants would further benefit from riparian and grazing management commitments proposed under this alternative. Known and unknown populations of threatened, endangered, and sensitive plants occurring in CMZs or the area extending 50 feet from CMZs along fish-bearing streams and on grazing lands with fenced exclosures would receive additional protection.

Optional 10- and 20-Year Permit Lengths. The effects of implementing a 10- or 20-year Permit would be similar to those described under the proposed NFHCP. The long-term success of measures to and improve the structure, composition, and health of vegetation is more likely if the measures are implemented over a longer period of time, such as 30 years.

Mitigation. In addition to the improved resource conditions anticipated under the No Action Alternative, the Simplified Prescriptions Alternative further avoids and minimizes vegetation impacts through commitments that build on existing regulations. Numerous, substantive commitments for management of riparian areas, livestock grazing, and land use changes provide significant mitigation in the form of improved or more desirable vegetation structure, composition, and health. Provisions for adaptive management that address vegetation resources, and NFHCP monitoring for the life of the plan, ensure that management prescriptions would continue to improve and that anticipated conservation benefits would be validated. Specific mitigation beyond those conservation commitments included in the alternative would not be performed or recommended. Unlike the NFHCP, changed circumstances commitments would not be a part of this alternative.

Unavoidable Adverse Impacts. No unavoidable adverse impacts would result from this alternative relative to the No Action Alternative.

Cumulative Impacts. The Simplified Prescriptions Alternative would not create negative cumulative impacts on vegetation resources in the Planning Area relative to the No Action Alternative. A cumulative benefit may occur when this alternative is combined with conservation practices on federal lands in the Planning Area.

Click here for Section 4.6, Fisheries and Aquatic Resources

4.7 Wildlife Resources

4.7.1 Introduction

This section addresses the potential for impacting various wildlife resources by implementing prescriptions associated with the proposed NFHCP, other action alternatives, and No Action Alternative. The analysis focuses on impacts on wildlife in the Project and Planning Areas.

4.7.2 Issues Eliminated from Further Analysis

All wildlife resource issues identified during public scoping were analyzed. None were eliminated from analysis.

4.7.3 Issues Addressed in the Impact Analysis

Wildlife resource issues identified during the public scoping process and listed in the Scoping Report (FWS and NMFS 1998) include the following:

1. Under certain conditions, logging may displace elk populations

2. Identifying migratory birds in the HCP planning area is important

Potential effects on elk habitat are addressed in the lifeform analyses. In response to scoping comments, migratory birds anticipated or known to occur within the riparian habitats influenced by this project are identified and grouped into functional ecological units for lifeform analysis. In addition to the comments addressed as a result of scoping, the following analysis emphasizes changes in riparian habitat through the proposed 30-year life of the Permit and its potential influence on wildlife and species of special concern.

How are Wildlife Impacts Measured?

The effects of the alternatives on wildlife resources are evaluated based on the changes in habitat expected to result from implementation of the various management plans. Wildlife species with similar habitat requirements are grouped into **lifeform** categories. Then, the management plans are modeled for each lifeform type in riparian vegetation communities, and the habitat within these communities is shown to increase, decrease, or stay the same. Based on this analysis, the impacts on terrestrial wildlife habitat are expected to be about the same for all alternatives, including the No Action Alternative. For most lifeforms, amounts of primary and secondary habitat would be greater after 30 years (proposed Permit length) than after optional Permit lengths of 10 or 20 years for the three action alternatives.

4.7.4. Description of Area of Influence

The area of influence covers wildlife habitats in western Montana, northern Idaho, and Washington. It includes the Project Area (Plum Creek lands) and Planning Area (Plum Creek and adjacent lands). Immediate areas of influence within the Project Area include general types of locations where prescriptions associated with the proposed NFHCP and alternatives would be implemented. These primarily consist of riparian habitat, lands adjacent to stream channels, and existing roads on Plum Creek lands.

4.7.5 Affected Environment

This section provides an overview of wildlife resources in the Planning and Project Areas. Emphasis is placed on wildlife that use and rely on riparian habitats since these species would be most influenced by forest stand modifications resulting from the alternatives. Wildlife resources are grouped into general fauna and special emphasis species. The description of general fauna (*Wildlife Lifeform Types*) arranges species with similar ecological feeding and breeding niche requirements into groups based on their required habitat structures. These groups are called **lifeform types**. Special emphasis species (*Special Emphasis Wildlife Species*) are discussed individually. These species are grouped by the status of their listing, such as endangered, threatened, proposed, or species of concern.

Because of the large number of wildlife species and extensive size of the Planning Area, wildlife fauna are presented and analyzed as groups of species with similar habitat requirements (lifeforms) that use riparian habitats to satisfy those requirements. A matrix was developed that included all species found within the Planning Area within each lifeform. A list of all wildlife species by lifeform type likely to occur within the riparian stand types in the Planning Area is presented in Appendix E. Riparian stand types are described in Section 4.5, *Vegetation Resources*, and pictured in Figure 4.5-2. Existing wildlife habitat relationship databases (Thomas 1979; Brown 1985), other published general sources (Ingles 1965; Nussbaum et al. 1983; Kaufman 1996), and unpublished reports (Lundquist and Hicks 1995) were consulted to assign habitat use descriptions to wildlife species.

These habitat use descriptions include the following:

- **Primary breeding habitat** for a species is defined by Thomas (1979) as the relationship between a species and a habitat condition that reflects a dependence on such habitat; a relationship that is strong and predictable. Brown (1985) defines primary habitat as a preferred or optimal habitat that predictably supports the highest population density of a species; that habitat upon which a species is essentially dependent for long-term population maintenance.

- **Secondary breeding habitat** is defined by Brown (1985) as habitat that is used by a species, but is clearly less suitable than primary habitat as indicated by a lower population density or less frequent use. Habitat may be designated secondary where it is known to be used by a species but data are insufficient to clearly identify it as a primary habitat.

- **Non-breeding habitat** is not used by wildlife species for breeding.

Each species was assigned a primary breeding, secondary breeding, or non-breeding habitat for each riparian stand type based on an analysis of the sources cited above and additional, more specific sources. After the habitat use of the riparian stand types was defined for each species in a lifeform type, a composite habitat use was determined for each lifeform to characterize common patterns of use by these species with similar habitat needs. This combined habitat use for the lifeform includes the summed distribution of both primary and secondary habitats for the species within the lifeform.

As an example, the primary breeding habitat used by the tailed frog in the Planning Area includes four riparian stand types: H9, T9, H15, and T15. This species prefers to breed in dense, mature forest stands. This use of primary habitat covers the entire range of stand types for all eight members of the frog and salamander group (lifeform 2). The composite pattern of primary habitat use for this group is one species using H9, one species using T9, three species using H15, and three species using T15. No species of lifeform 2 use stand types NF, L3, H3, T3, L9, or L15.

The composite habitat use for each lifeform indicates patterns of spatial distribution through riparian forest stands at any one time. It is also used to identify modifications in habitat conditions for wildlife lifeforms over time, as the amounts and distributions of the riparian stands within forested riparian areas grow, mature, and are harvested. For this analysis, riparian stand type data were projected for each decade from Year 0 to Year 30. Results from Years 0, 10, 20, and 30 were analyzed because of the proposed (30-year) and optional (10- and 20-year) Permit lengths. Areas adjacent to streams that are currently not forested and are not likely to develop into a forested riparian stand type (such as meadows, rocks, and brushfields) were not included in the analysis because these areas are not expected to change significantly during the next 30 years and, therefore, would not be affected by any of the alternatives.

Wildlife Lifeform Types

A summary of 16 typical lifeform types for the Planning Area follows. It includes the feeding and breeding habitat characteristics of the lifeform species. Ten of the 16 lifeform types within the Planning Area consist of fish and wildlife species that are closely associated with riparian areas and are analyzed in this EIS, as shown in Table 4.7-1. The lifeform types considered in the EIS include a total of 194 species (Appendix E).

TABLE 4.7-1
Faunal Lifeform Types in the NFHCP Planning Area

Type Number	Faunal Lifeform Type	Number of Species	Reproduction Habitat	Feeding Habitat	Considered in EIS?
1	Fish	17	In water	In water	Yes
2	Frogs, salamanders	8	In water	On ground, in bushes, or in trees	Yes
3	Turtles, ducks	45	On ground near water	On ground, in bushes, trees, and water	Yes
4	Falcons, goats	~17	In cliffs, caves, rimrock, or in talus	On the ground or in the air	No
5	Grouse, hares, lynx, elk	37	On ground without specific water, cliff, or rock association	On the ground	Yes
6	Warblers, porcupine	8	On the ground	In bushes, trees, or in the air	Yes

TABLE 4.7-1
Faunal Lifeform Types in the NFHCP Planning Area

Type Number	Faunal Lifeform Type	Number of Species	Reproduction Habitat	Feeding Habitat	Considered in EIS?
7	Sparrows, thrushes	27	In bushes	On the ground, in water, or in the air	Yes
8	Warblers, flycatchers	~7	In bushes	In trees, bushes, or in the air	No
9	Waxwings, grosbeaks	5	In deciduous trees	In trees, bushes, or in the air	Yes
10	Squirrels, tanagers	~12	Primarily in conifers	In trees, bushes, or in the air	No
11	Vireos, hawks	~28	In conifers or deciduous trees	In trees, in bushes, on the ground, or in the air	No
12	Herons, eagles, osprey, owls	6	On thick branches	On the ground or in the water	Yes
13	Woodpeckers	~14	In own holes excavated in trees	In trees, in bushes, on the ground, or in the air	No
14	Bats, owls, bluebirds	32	In cavity made by another species or in natural cavity	On the ground, in water, or in the air	Yes
15	Shrews, voles	~36	In burrow underground	On the ground or underground	No
16	Kingfishers, beavers	9	In burrow underground	In the air or in the water	Yes

Lifeform 1: Fish. This lifeform type was addressed in Section 4.6, *Fisheries and Aquatic Resources*, and is not considered further in this wildlife habitat assessment.

Lifeform 2: Frogs and salamanders. Lifeform 2 includes eight species that breed in water and feed on land, in shrubs, or in trees. These species occupy wetland, pond, riverine, and stream habitats as primary breeding areas. Since most species in this group breed exclusively in water, adjacent upland conditions have less of an impact on breeding habitat than riparian conditions. Breeding use of riparian stand types near aquatic habitat is most likely to occur in dense, late-successional stand types.

Lifeform 3: Ducks and turtles. This lifeform consists of 45 species that breed on the ground near water, and feed on the ground, in shrubs, trees, or water. Most wildlife in this lifeform use aquatic and riparian habitats without any particular association with upland forest structure. Only seven species within the lifeform are influenced directly by upland forest structure and most of these breed in early-successional brushy habitats. The harlequin duck generally nests in more mature forest (sometimes in a tree cavity).

Lifeform 4: Goats and falcons. This lifeform type includes wildlife that breed in caves or on cliffs, rimrock, or talus and feed on the ground or in the air. Because the species characterized by this lifeform primarily breed and feed in upland habitats not normally associated with forested areas or affected by any of the alternatives, the species and this lifeform are not addressed further in this document.

Lifeform 5: Grouse and elk. Lifeform 5 is composed of species that breed and feed on the ground without any specific water, cliff, talus, or rimrock association. This lifeform includes 37 species, and is dominated by species that find primary breeding habitat in edges, logs, and some wetland and riparian habitats. Most of these species breed in early-successional and open mid-successional habitats, although the relationship between cover and forage is important for many of these species.

Lifeform 6: Warblers and porcupines. Lifeform 6 includes eight species that breed on the ground and feed in bushes, trees, or in the air. Most of these species breed in brushy early-successional and open mid-successional habitats, although some breed in dense mid-successional and late-successional habitats.

Lifeform 7: Sparrows and thrushes. Lifeform 7 includes 27 species that breed in bushes and feed on the ground, in water, or in the air. This lifeform is dominated by species that find primary breeding habitat in early-successional and open mid- to late-successional habitats.

Lifeform 8: Warblers and flycatchers. Lifeform 8 is composed of species that breed in bushes and feed in trees, bushes, or in the air. Species characterized by this lifeform primarily breed and feed in upland habitats. Because there would likely be adequate amounts of upland habitats available to these species under any of the alternatives, and since the effects on these species would likely be similar under any of the alternatives, these species and this lifeform are not addressed further in this document.

Lifeform 9: Waxwings and grosbeaks. Lifeform 9 includes five species of birds that breed in deciduous trees and feed in trees, bushes, or in the air. It is dominated by species that find primary breeding habitat in open early-successional stages and dense late-successional stages.

Lifeform 10: Squirrels and tanagers. Lifeform 10 includes mammals and birds that breed primarily in conifers and feed in trees, bushes, on the ground, or in the air. Species characterized by this lifeform primarily breed and feed in upland habitats. Because there would likely be adequate amounts of upland habitats available to these species under any of the alternatives, and since the effects on these species would likely be similar under any of the alternatives, these species and this lifeform are not addressed further in this document.

Lifeform 11: Vireos and hawks. Lifeform 11 is composed of species that breed in coniferous or deciduous trees and feed in trees, bushes, on the ground, or in the air. Species characterized by this lifeform primarily breed and feed in upland habitats. Because there would likely be adequate amounts of upland habitats available to these species under any of the alternatives, and since the effects on these species would likely be similar under any of the alternatives, these species and this lifeform are not addressed further in this document.

Lifeform 12: Herons and eagles. This lifeform type includes six species that breed on thick branches and feed on the ground or in the water. It is dominated by species that find primary breeding habitat in late-successional stages.

Lifeform 13: Woodpeckers. Lifeform 13 is composed of species that breed in a tree cavity excavated by the species. They feed in trees, bushes, on the ground, or in the air. Species characterized by this lifeform primarily breed and feed in upland habitats. Because there would likely be similar amounts of upland habitats available to these species under any of the alternatives, and since the effects on these species would likely be similar under any of the alternatives, these species and this lifeform are not addressed further in this document.

Lifeform 14: Bats and owls. Lifeform 14 consists of 32 species that breed in natural cavities or cavities made by other species and feed on the ground, in water, or in the air. This lifeform is dominated by species that find primary breeding habitat in late-successional stages.

Lifeform 15: Shrews and voles. Lifeform 15 is composed of species that breed in a burrow underground and feed on the ground or underground. Because of the limited influence of riparian habitats on habitat selection of species within this lifeform and the similar effect each alternative would have on this lifeform, the species and this lifeform are not addressed further in this document.

Lifeform 16: Kingfishers and beavers. Lifeform 16 includes nine species that breed in a burrow underground and feed in the air or in the water. The primary breeding habitat for these species is in early-successional stages.

Special Emphasis Wildlife Species

Based on input from four field offices in Washington, Idaho, and Montana, the FWS identified 48 species of terrestrial wildlife, including mammals, birds, reptiles, amphibians, and snails, as species that should be emphasized in this EIS and that potentially could occur on or near Project Area lands (Burch 1998). These species are listed in Appendix D and include five federally listed endangered species, three federally listed threatened species, and one species proposed for listing as threatened. The remaining 39 species are species of concern and are monitored by federal agencies. The distribution, ecology, and threats, if any, for each special emphasis wildlife species are briefly described below.

Federally Protected Species. The five federally protected wildlife species are described below, with their federal protective status identified.

Gray wolf (*Canis lupis*)—Endangered. Gray wolves are found in western and south central Montana, northern and central Idaho, northeastern Washington, and possibly in the North Cascades of Washington. In Montana and Idaho, gray wolf populations range within the Planning Area and are likely to occur in the Project Area. The population south of Interstate Highway 90 is considered "experimental, non-essential" by the FWS. In the Washington portion of the Planning Area, any populations of gray wolves would most likely occur in the Plum Creek Cascades HCP project area.

Gray wolves use a variety of habitats across a broad spectrum of land types. The most important components of wolf habitat are an abundance of natural prey and low human-caused mortality (FWS

1980; MDFWP 1995). Roads and human access also have an important influence on habitat quality and use by gray wolves within the Project Area.

Selkirk Mountains woodland caribou (*Rangifer tarandus caribou*)—Endangered. The woodland caribou population in the contiguous United States consists of two herds in northern Idaho and northeastern Washington (FWS 1993b). Although woodland caribou may occur within the Planning Area, they do not occur within the Project Area. Woodland caribou are generally found at elevations between 4000 and 6200 feet in Engelmann spruce/subalpine fir and western red cedar/western hemlock forest types (FWS 1993b). Because woodland caribou are not present within the Project Area, impacts on this species are not expected from any of the alternatives and are not addressed further in this document. Should woodland caribou occur in the Project Area in the future, Plum Creek would be required to avoid take of the species under each of the alternatives.

Whooping crane (*Grus americana*)—Endangered. Only three wild populations of whooping cranes are currently known. One flock is in the Grays Lake National Wildlife Refuge in Idaho (FWS 1993a). Although whooping cranes may occur within the Planning Area, they do not occur within the Project Area. Whooping cranes primarily use shallow wetlands, wet meadows, and adjacent upland sites; preferred sites have minimal human disturbance (FWS 1993a). Because whooping cranes are not present within the Project Area, impacts on this species are not expected from any of the alternatives, and are not addressed further in this document.

Marbled murrelet (*Brachyramphus marmoratus marmoratus*)—Endangered. The marbled murrelet is a small seabird that ranges across the North Pacific from Japan through the coastal states and provinces to California. The species is at least partially migratory and, during the winter, additional birds are known to move into Washington, especially the northern coastal areas (Speich et al. 1992). In spring, murrelet occurrence at inland sites increases and, as a result of breeding activities, reaches a peak level of activity in late summer. Murrelets appear to be semi-colonial in their nesting habitats. Although murrelets in Washington have been observed up to 50 miles inland, 98 percent of the species observed have been recorded between 10 and 40 miles inland.

In Washington, murrelet sightings generally increase when available old-growth forests make up more than 30 percent of the landscape. During the past 20 years, only eight nests have been found in Washington; all have been found in old-growth trees greater than 32 inches in diameter. Current information suggests that 30- to 40-year-old second-growth stands, regenerated after clearcutting, do not provide the structural characteristics required for nesting by marbled murrelets (Quinlan and Hughes 1990). Most nests are located high above ground, on large or deformed tree branches with a moss cover, in stands dominated by Douglas fir.

Marbled murrelet use of the western portion of the Planning Area is likely to be at a low level, based on a combination of the following factors:

- Relatively low murrelet populations in southern Puget Sound

- Lack of suitable habitat in the Planning Area west of the Cascade Crest

- Low numbers of observed murrelets in the Planning Area, based on current site-specific surveys and strategic radar work.

Reductions in the amount of mature forests in the Planning Area west of the Cascade Crest may be one of the primary factors impeding greater murrelet use of the area. The Service designated potions of 10 sections (about 6,800 acres) as critical habitat within the Green River Basin. Murrelets were subsequently discovered by Plum Creek Timber Company and their contractors in two separate stands occurring on two of the sections designated as critical habitat.

If any marbled murrelets occur within the Project Area, they would likely be rare. This area has a long history of timber harvest, and mature or old-growth stands necessary for suitable murrelet nesting habitat are lacking. This has been recognized by the state of Washington, which requires murrelet surveys on lands state resource agency biologists deem suitable for murrelet nesting. State biologists have not identified the need for murrelet surveys in the Project Area. Even though it is highly unlikely that murrelets occur in the Project Area, if a murrelet were found in an area proposed for harvesting, Plum Creek's internal guidelines require that site-specific harvesting would cease to avoid the potential for take. Since Plum Creek would avoid take of murrelets under each of the alternatives, and there would be no differences in effects on murrelets among the alternatives, effects on this species are not discussed further in this document.

Grizzly bear (*Ursus arctos horribilis*)—Threatened. Four of six grizzly bear recovery zones occur within the Planning Area:

- Northern Continental Divide Ecosystem in western Montana

- Bitterroot Ecosystem in western Montana

- Cabinet-Yaak Ecosystem in western Montana

- North Cascades Ecosystem in Washington

The two remaining recovery zones, the Selkirks and Greater Yellowstone Ecosystems, are outside the Planning Area. In Montana, grizzly bears in the Northern Continental Divide and Cabinet-Yaak Ecosystems are likely to occur within the Project Area. The only occurrence of grizzly bears in Washington near Plum Creek lands was documented within the Cascades HCP planning area, which is outside the NFHCP Planning Area.

To ensure that their operations fulfill the obligations of a private landowner under the ESA, Plum Creek employs BMPs on their lands within grizzly bear habitat that has been identified as important by the FWS and U.S. Forest Service (FS). The Plum Creek BMPs were developed through critical review of the scientific literature and peer-reviewed by experts in grizzly bear ecology. These BMPs are evident in the Swan Valley Grizzly Bear Conservation Agreement, which involves conservation planning among federal and state agencies and Plum Creek for 369,299 acres, including 82,718 acres managed by Plum Creek. Grizzly bears benefit from this effort in several ways. Human interaction and disturbance is reduced by

reducing miles of roads open to the public. Through selective harvesting, riparian cover is maintained for bear security and to retain important bear foods. For similar reasons, forested cover is maintained around preferred grizzly bear habitats such as wetlands and wet meadows. Also, harvest activities are rotated throughout the Swan River Basin to ensure long periods of inactivity (at least 6 years) after disturbance in areas where grizzly bears forage. Grizzly bear BMPs also include limiting the size of clearcuts to provide bears access to effective hiding cover, and timing harvest activities to the least biologically important periods for bears.

Grizzly bears use a variety of habitats and exploit a variety of food sources (Interagency Grizzly Bear Committee [IGBC] 1987). Levels of human disturbance, primarily through access routes, influence grizzly bear habitat use and mortality rates (Mace et al. 1987; McClellan and Shackleton 1988; Mace and Manley 1993). Grizzlies are primarily associated with early-successional habitats for foraging, although they also prefer areas with adequate cover. When grizzlies do use openings, they forage most often along forest edges (Skinner 1986; Mattson and Knight 1992). Preferred habitats such as berry fields, avalanche chutes, and riparian areas are seasonally important to grizzly bears. Wetlands and low elevation riparian areas are important preferred habitats that are generally limited because of human development.

Bald eagle (*Haliaeetus leucocephalus*)—Threatened. The bald eagle is found throughout North America and is protected under the ESA and Bald and Golden Eagle Protection Act. On July 6, 1999, the FWS published a proposed rule to remove the bald eagle from the list of threatened and endangered species in the lower 48 states. The species breeds and winters in the Pacific Northwest and Rocky Mountain states (FWS 1986). Bald eagles occur within the Planning Area and Project Area. In Washington, Idaho, and Montana, resident bald eagles are most common along lakes and rivers. There are 11 known bald eagle nest sites on Plum Creek lands in the Project Area. All of these sites are in Montana.

In Washington, breeding territories are located in predominantly coniferous, uneven-aged stands with old-growth components (Anthony et al. 1982). In Idaho and Montana, breeding territories are located in coniferous stands with large residual trees, predominantly ponderosa pine, and in cottonwood galleries along major rivers. Bald eagles typically build large stick nests, used over successive years, in mature or old-growth trees. The three main factors affecting the distribution of nests and territories follow (Stalmaster 1987):

- Nearness to water and availability of food
- Suitable trees for nesting, perching, and roosting
- The number of breeding-aged eagles

Wintering bald eagles generally concentrate in areas where food is abundant and disturbance is minimal. Bald eagles use perches near feeding areas during the day. These perches are typically isolated areas in old-growth and mature stands that have trees larger than the surrounding trees, which makes foraging areas visible. Sufficient, consistent, accessible, and noncontaminated food resources may be the most important component of winter and breeding habitat for bald eagles (FWS 1986; Stalmaster

1987). Important food items include carrion such as spawned-out salmon and winter-killed deer, anadromous and warm-water fishes, small mammals, waterfowl, and seabirds (Anderson et al. 1986; FWS 1986).

Plum Creek monitors bald eagle nesting activities on its lands. There are no nesting eagles on Plum Creek lands outside Montana. In Montana, 11 known nesting sites have been identified. These sites are primarily in the northwestern part of the state and are surveyed annually. Bald eagles are known to winter in the Swan Valley around Flathead Lake and in other Montana valleys, as well as in Washington. Wintering areas are diffuse with no defined concentrations. Also, no known bald eagle roosting areas are associated with Plum Creek-managed lands in Montana or Washington. These data correspond with state monitoring information. The state of Washington carefully documents eagle winter activity.

Northern spotted owl (*Strix occidentalis caurina*)—Threatened. The northern spotted owl, one of three subspecies of spotted owls, is found primarily in northern California and the Pacific Northwest (American Ornithologists' Union [AOU] 1988). In the Planning Area, this species occurs in the central Washington Cascades, ranging east to the edge of the Palouse prairie. Although spotted owls are found throughout the western edge of the Planning Area, their breeding distribution is restricted to forest communities, including lower-elevation ponderosa pine forests. Within or near the Project Area for Plum Creek's Cascades HCP, 107 site centers for breeding pairs of spotted owls were recorded, but only 67 of these site centers are on Plum Creek lands (Raedeke Associates, Inc., 1995). In western Washington's Lewis County, the Washington Department of Wildlife's database indicates that 21 spotted owl planning circles (a circle with a 1.8-mile radius surrounding a spotted owl site center) touch Plum Creek lands. This suggests these areas include spotted owl nesting, roosting, and foraging habitat since these Plum Creek lands have had a long harvest history. No northern spotted owls have been observed or documented on Plum Creek lands east of the Cascades outside of Plum Creek's Cascades HCP project area lands.

Densities of spotted owls vary considerably across the species' range according to habitat type, quality, and quantity (Thomas et al. 1990). They are known to nest, roost, and forage in a wide variety of habitat types and forest stand conditions. The species appears to prefer mature or old-growth forest stands and foraging (Thomas et al. 1990). However, it is unclear how strong the causal link is between mature or old-growth forest stands and nesting, roosting and foraging habitat, and spotted owl reproductive success.

Summaries by Forsman (1988) and Thomas et al. (1990) suggest the structural characteristics of suitable habitat for spotted owls include the following:

- A multi-layered, multi-species canopy cover open enough to allow owls to fly within and beneath it
- An overstory dominated by conifers greater than 30 inches diameter breast height (DBH) and understory of shade-tolerant conifers or hardwoods
- Trees with features such as cavities, broken tops, or dwarf mistletoe growth
- Numerous large snags

- Ground cover of logs and wood debris

In the western Washington Cascades Region, spotted owls prey mainly on northern flying squirrels, but east of the Cascades, bushy tailed woodrats are also a common prey item.

Lynx (*Felis lynx canadensis*)—Threatened. Lynx range throughout boreal Canada and into the western Montana and northern Idaho portions of the Planning Area, where they likely occur in the Project Area, and into northeastern and north-central Washington.

The lynx is a wide-ranging upland species that may be influenced by forest management activities. There is little information describing the use or importance of riparian areas for this species. Lynx require early-successional habitats that contain high numbers of prey (especially snowshoe hares) for foraging and late-successional forests that contain cover (especially deadfall) for denning kittens (Brittell et al. 1989; Koehler and Brittell 1990). Mid-successional stages may serve as travel cover for lynx, providing connectivity within a forested landscape since lynx appear to avoid large openings (Brittell et al. 1989). Foraging habitat is characterized by dense young forests that provide functional habitat for hares during the winter (Koehler and Aubry 1994). Denning habitat is characterized by dense, mature forest habitats that contain large woody debris, such as fallen trees or upturned stumps, that provide security for kittens (Koehler 1990; Koehler and Brittell 1990).

Species Proposed for Listing. No species proposed for listing are discussed in this EIS.

Wildlife Species of Concern. Terrestrial wildlife species that are not federally protected but whose populations may be declining are described below.

Pygmy shrew (*Sorex hoyi*). The pygmy shrew is found primarily in northern boreal forests but has a disjunct population in northeastern Washington, northern Idaho, and northwestern Montana. It occurs within the northwestern-most section of the Montana portion of the Planning Area, where it likely occurs within the Project Area. The pygmy shrew is found in a wide range of habitat types associated with boreal forests that include marsh, bog, fen, and shrub thickets as well as deciduous and coniferous forests (Wrigley et al. 1979, Hoffman and Pattie 1968). This shrew is primarily an upland species and has been recorded in a variety of structure stages and forest types in Montana (Pearson 1995). Because the alternatives analyzed focus on riparian areas, the upland habitats and forest wetlands associated with pygmy shrews would not be greatly influenced by any of the alternatives; therefore, effects on this species are not discussed further in this document.

Myotis bat species: California myotis (*M. californicus*); Long-eared myotis (*M. evotis*); Small-footed myotis (*M. cilolabrum*); Fringed myotis (*M. thysanodes*); Long-legged myotis (*M. volans*); and Yuma myotis (*M. yumanensis*). *Myotis* bat species are distributed throughout the western United States in a variety of habitats within the Planning Area and likely occur within the Project Area. Specific habitat requirements are not well known for most *Myotis* species; however, they exhibit similar patterns of general habitat usage and interspecific associations are common. The most common western *Myotis* species,

the little brown bat (*Myotis lucifugus*), is not a special emphasis species. However, it frequently occurs in colonies of other *Myotis* species, such as California *Myotis*, Yuma *Myotis*, and long-legged *Myotis* (Pearson 1995). *Myotis* generally forage in forest openings and over water bodies. They roost in a diversity of structures including buildings, rock crevices, caves, under the bark of mature trees, and in snags (Jones et al. 1973; Fitch and Shump 1979; Fenton and Barclay 1980; Lunde and Harestad 1986; Manning and Jones 1989; Simpson 1993; Pearson 1995). Telemetry data from Oregon indicated that long-legged *Myotis* roosted in large Douglas fir snags, averaging 97 centimeters (38 inches) DBH; however, this species does not appear to select for older seral forest stages (Ormsbee and McComb 1998).

Although *Myotis* bats forage and roost in a wide range of habitat conditions, potential impacts may occur on roosting habitat during forest management activities, such as the removal of large trees and snags. This is especially true in areas with limited amounts of accessible buildings, rock features, and caves.

Townsend's big-eared bat (*Plecotus townsendii*). Townsend's big-eared bats occur in the western United States, but only a few breeding sites are known in the Washington Cascades. This species is uncommon and localized within Montana and only a few maternal colonies and hibernation sites have been identified (Pearson 1995). Although the current distribution of Townsend's big-eared bat is not well known within the Planning Area, they likely occur within all portions of the Planning Area and may occur within the Project Area. Townsend's big-eared bats roost almost exclusively in upland areas, including buildings, bridges, caves, and mines where potential maternity roosts, solitary roosts, and hibernation sites have been identified (Perkins and Levesque 1987; Christy and West 1993). Food habit studies showed that the bats did not specialize on prey items but fed on a variety of insects (Whitaker et.al. 1977, 1981). Because the alternatives analyzed focus on riparian areas, upland habitat for Townsend's big-eared bats would not be greatly influenced by any of the alternatives; therefore, effects on this species are not discussed further in this document.

Wolverine (*Gulo gulo luteus*). The wolverine occurs in high forested habitats through western Montana, north and central Idaho, and along the Washington Cascades (Banci 1994). Wolverines likely occur within the Montana and Idaho portions of the Planning Area and Project Area. Wolverines may occur in the Washington portion of the Planning Area, but this species is rare and elusive and its current distribution is not well documented. Generally, wolverines are restricted to boreal forests, tundra, and western mountains (Banci 1994). They occupy a variety of habitats, but areas with stable wolverine populations are characterized by remoteness from humans and human developments. Carrion is a key element of the wolverine diet. Large sources of carrion, including deer, antelope, sheep, and goats, are important food sources. Salmon carcasses may also be an important food source (Banci 1994). Because the alternatives analyzed focus on riparian areas, habitat for wolverines would not be greatly influenced by any of the alternatives; therefore, effects on this species are not discussed further in this document.

Pacific fisher (*Martes pennanti*). In the Pacific Northwest, fishers range along the

Pacific coast through Washington. Fishers also range from Canada through north and central Idaho and into western Montana (Powell and Zielinski 1994). Although the current distribution is not well documented, this species probably occurs in the Washington, Idaho, and Montana portions of the Planning Area and may occur within the Project Area.

Fishers are found in or near dense coniferous and mixed coniferous and deciduous forested habitats with continuous overhead cover (Powell 1982; Allen 1983). Although second-growth forests with good cover may be used, mature and old-growth stands are generally thought to be preferred as a result of the increased availability of cover and den sites, as well as habitat for prey species (Aubry and Houston 1992; Powell and Zielinski 1994). Fishers also use wetland and riparian areas disproportionally more than their occurrence (Powell 1982; Aubry and Houston 1992). Fishers are opportunistic, primarily feeding on small to medium-sized mammals, birds, and carrion (Strickland et al. 1982). Showshoe hares are the most common prey and have been reported in fisher diets in virtually all food habit studies (Powell and Zielinski 1994). Maternal dens are usually located high in hollow trees and adults use a variety of temporary shelters and sleeping sites including hollow logs, tree cavities, brush piles, snow dens, and burrows of other animals (Strickland et al. 1982; Allen 1983; Buck et al. 1983). Fishers prefer closed-canopy forest, generally in later-successional stages.

Harlequin duck (*Histrionicus histrionicus*). The harlequin duck summers in western Montana, northern Idaho, and western Washington, and winters along the Pacific coast (Kaufman 1996). This species occurs within the Planning Area and likely occurs within the Project Area. Harlequin ducks are generally found in mountainous areas beside fast-moving mountain streams, where they nest on the ground or in holes in cliffs or trees (Kaufman 1996). Loafing sites are usually dense shrubby habitats or timber and shrub mosaics on stream banks (Cassirer and Groves 1989). After hatching young, harlequin ducks move from fast-moving, higher elevation streams to low elevation, low gradient streams that support an abundant macroinvertebrate fauna (Bengton and Ulfstand 1971, Kuchel 1977, Wallen 1987, Cassirer and Groves 1989). During winter, harlequin ducks forage and loaf in saltwater habitats along boulder-strewn shores, points, gravel bars, and kelp beds (Rodrick and Milner 1991).

Northern goshawk (*Accipter gentilis*). Northern goshawks are permanent residents of western Montana, northern Idaho, and the forested regions of Washington. This species occurs within the Planning Area and likely occurs within the Project Area. Goshawks use a variety of forest types, forest ages, structural conditions, and successional stages (Reynolds et al. 1992). Since the relatively large body of northern goshawks can hinder movement, they seldom use dense, young forests (Fischer 1986). Because the alternatives analyzed focus on riparian areas, habitat for northern goshawks would not be greatly influenced by any of the alternatives; therefore, effects on this species are not discussed further in this document.

Mountain quail (*Oreortyx pictus*). Mountain quail are found along the Cascade Range in the Washington portion of the Planning Area where they may also occur in the Project Area. Mountain quail are most often found in dense brush in wooded

foothills and mountains and may be common in areas of second-growth brush after fires or clearcuts. Mountain quail require dense, low thickets for cover and are rarely found more than a mile from water during hot weather (Kaufman 1996). Because the alternatives analyzed focus on forested riparian areas, habitat for mountain quail would not be greatly influenced by any of the alternatives; therefore, effects on this species are not discussed further in this document.

Upland sandpiper (*Bartramia longicauda*). The upland sandpiper's range includes the plains regions of eastern Montana and disjunct locations in eastern Washington where small populations have been observed. Upland sandpipers are found in native grassland habitats, open meadows, and fields (Kaufman 1996). They likely occur within the Planning Area, although it is unlikely they occur in the Project Area. Because the alternatives analyzed focus on forested riparian areas, and upland sandpipers are not likely to occur in the Project Area, upland sandpipers would not be greatly influenced by any of the alternatives; therefore, effects on this species are not be discussed further in this document.

Long-billed curlew (*Numenius americanus*). Long-billed curlews range throughout the high plains and rangelands of western North America (Kaufman 1996). They are found in eastern Washington, southern Idaho, and eastern Montana within the Planning Area; however, they are unlikely to occur within the Project Area. Long-billed curlews breed mostly in native grassland and sagebrush prairie where they may favor areas with some damp low spots nearby that provide better feeding areas for the young (Kaufman 1996). Because the alternatives analyzed focus on forested riparian areas, and long-billed curlews are not likely to occur in the Project Area, long-billed curlews would not be greatly influenced by any of the alternatives; therefore, effects on this species are not discussed further in this document.

Black tern (*Chlidonias niger*). Black terns winter along tropical coasts, migrate north, and nest in prairie sloughs and marshes across the northern plains. They are a typical component of freshwater marsh birds in western Montana and eastern Washington (Kaufman 1996). Because the alternatives analyzed focus on forested riparian areas, habitat for black terns would not be greatly influenced by any of the alternatives; therefore, effects on this species are not discussed further in this document.

Flammulated owl (*Otus flammeolus*). The flammulated owl occurs throughout the western United States during the summer. This species is found in southwestern and some portions of western Montana, in central Idaho, and along the eastern side of the Washington Cascades (Kaufman 1996). Flammulated owls occur in the southern portions of the Planning Area in Montana and Idaho and in the eastern portions of Washington, where they likely inhabit the Project Area. Flammulated owls are associated primarily with open, mature and old-growth ponderosa pine stands (Bull and Anderson 1978; Guenther and Kucera 1978; Goggans 1986; Reynold and Linkhart 1987, 1992). Breeding occurs in mid- and late-successional stages of open coniferous forests containing pines (McCallum 1994). The owl's apparent preference for upland ponderosa pine or Douglas fir dominated forests has been linked to prey availability (Reynolds and Linkhart 1992). Because the alternatives analyzed focus on riparian areas, habitat for flammulated owls would not be greatly

influenced by any of the alternatives; therefore, effects on this species are not discussed further in this document.

Northern pygmy-owl (*Glaucidium gnoma*). Northern pygmy-owls range throughout western Montana, northern Idaho, and most of Washington (Kaufman 1996). The species occurs within the Planning Area and likely occurs within the Project Area. The northern pygmy-owl has been documented in a variety of forest types, but is found most often in the lower strata of dense upland, pine-oak forests (Erlich et al. 1988). Because the alternatives analyzed focus on riparian areas, habitat for northern pygmy-owls would not be greatly influenced by any of the alternatives; therefore, effects on this species are not discussed further in this document.

Great gray owl (*Strix nebulosa*). Great gray owls occur within the western Montana and northern Idaho portions of the Planning Area, where they likely occur within the Project Area. In the Planning Area, great gray owls prefer mixed coniferous forests below 2,800 feet that have meadows interspersed with denser, mature forest stands (Bull and Duncan 1993). Great gray owls will use logged areas if some large diameter trees are left as perches (Bull and Duncan 1993). This species seems to be affected by human disturbance and tends to nest in forest stands in large trees away from clearcut areas (Bull and Duncan 1993). Because the alternatives analyzed focus on riparian areas, habitat for great gray owls would not be greatly influenced by any of the alternatives; therefore, effects on this species are not discussed further in this document.

Boreal owl (*Aegolius funereus*). Boreal owls occur in northern boreal regions and are associated with high elevation forests in the Rocky and Cascade Mountains (Hayward 1994). They are found in western Montana, northern Idaho, and western Washington (Hayward 1994). Boreal owls occur in the Planning Area, and likely occur in the Project Area. Boreal owls in the western United States generally use subalpine forest habitats dominated by subalpine fir and Engelmann spruce. In Montana and Idaho, some preference for nesting in mature and old-growth forests was observed (Hayward et al. 1993). Because the alternatives analyzed focus on riparian areas, habitat for boreal owls would not be greatly influenced by any of the alternatives; therefore, effects on this species are not discussed further in this document.

White-headed woodpecker (*Picoides albolarvatus*). White-headed woodpeckers are permanent residents, although uncommon, throughout Idaho (Blair 1993). White-headed woodpeckers are likely found in the Idaho portion and the easternmost parts of the Washington portion of the Planning Area, and likely occur within the Project Area. White-headed woodpeckers are seldom found away from pines, and favor those species with large cones or prolific seed production such as Coulter, ponderosa, Jeffrey, and sugar pines (Kaufman 1996). White-headed woodpeckers use large, decayed snags and forage mainly in large ponderosa pines over 24 inches DBH (Jackman and Scott 1975; Thomas 1979). Because the alternatives analyzed focus on riparian areas, habitat for white-headed woodpeckers would not be greatly influenced by any of the alternatives; therefore, effects on this species are not discussed further in this document.

Black-backed woodpecker (*Picoides arcticus*). Black-backed woodpeckers

range throughout boreal Canada and into western Montana, northern Idaho, and eastern Washington (Kaufman 1996). This species occurs in the Planning Area, and likely occurs in the Project Area. Black-backed woodpeckers favor areas of dead or dying coniferous trees, and concentrate at burned areas with many standing dead trees (Kaufman 1996). Because the alternatives analyzed focus on riparian areas, habitat for black-backed woodpeckers would not be greatly influenced by any of the alternatives; therefore, effects on this species are not discussed further in this document.

Three-toed woodpecker (*Picoides tridactylus*). Three-toed woodpeckers range throughout boreal Canada and into the Planning Area of western Montana, northern Idaho, and eastern Washington (Kaufman 1996). They probably also occur in the Project Area. The three-toed woodpecker is closely related to the black-backed woodpecker, and has similar habitat requirements. The species inhabits burned conifer forests, especially spruce stands (Erlich et al. 1988). Because the alternatives analyzed focus on riparian areas, habitat for three-toed woodpeckers would not be greatly influenced by any of the alternatives; therefore, effects on this species are not discussed further in this document.

Olive-sided flycatcher (*Contopus borealis*). Olive-sided flycatchers range into the Planning Area in western Montana, northern Idaho, and western Washington, where the species likely occurs within the Project Area (Kaufman 1996). Olive-sided flycatchers are commonly found along the edges of open areas, including wetlands, ponds, and clearings (Kaufman 1996). Olive-sided flycatchers are most often found in mixed conifer forest cover types and secondarily in spruce/fir forest cover types. In these upland forest stands, they usually are observed in structurally diverse, early-successional stages, such as seed tree and shelterwood stands, and in disturbed mid- to late-successional stages (Hutto 1995). Olive-sided flycatchers also commonly use burned areas (Hutto 1995; Kaufman 1996). Because the alternatives analyzed focus on forest riparian areas, typical habitat for olive-sided flycatchers would not be greatly influenced by any of the alternatives; therefore, effects on this species are not discussed further in this document.

Little willow flycatcher (*Empidonax trailii brewsteri*). The willow flycatcher is distributed in the Planning Area in western Montana, northern Idaho, and Washington. It also likely occurs in the Project Area. Willow flycatchers are found predominantly in riparian shrub, marsh, and deciduous types, but also inhabit mixed conifer stands and some ponderosa pine and grassland habitats (Hutto 1995). Willow flycatchers breed in riparian habitats, especially areas with highly developed understories, such as willow thickets. They also breed in shrub fields and upland deciduous stands (Kaufman 1996).

Pygmy nuthatch (*Sitta pygmaea*). Pygmy nuthatches range through the Planning Area in the western mountains of Montana and Idaho. They likely occur in the Project Area. Pygmy nuthatches forage and nest in ponderosa pine and Douglas fir forest types and in some mixed conifer stands with a ponderosa pine component (Kaufman 1996). Because the alternatives analyzed focus on riparian areas, habitat for pygmy nuthatches would not be greatly influenced by any of the alternatives; therefore, effects on this species are not discussed further in this document.

Loggerhead shrike (*Lanius ludovicianus*). Loggerhead shrikes range throughout the plains regions of eastern Montana, southern Idaho, and eastern Washington and may occur in the Planning Area. It is unlikely that they occur in the Project Area because the species is found in semi-open country with a few scattered trees, large shrubs, manmade posts, or wire fences (Kaufman 1996). Because the alternatives analyzed focus on riparian areas, habitat for loggerhead shrikes would not be greatly influenced by any of the alternatives; therefore, effects on this species are not discussed further in this document.

Northern alligator lizard (*Elgaria coerulea*). The northern alligator lizard ranges widely throughout the Cascades and on the western slope of the Rocky Mountains and has a localized distribution in northwestern Montana. The species occurs throughout the Planning Area and likely occurs within the Project Area. Northern alligator lizards are most abundant along the margins of coniferous forests, or in open, harvested areas under logs and rocks or in talus (Nussbaum et al. 1983). The northern alligator lizard is primarily an upland species that has been found in a variety of forest structural stages with downed logs (Reichel and Flath 1995). In the Cascades, Bury and Corn (1988) found northern alligator lizards in moderate to dry old-growth forests and clearcuts, but not in mature, young, or riparian forests. Reichel and Flath (1995) found this species in dry, open forests and moister, cool forests near streams in open areas. Because the alternatives analyzed focus on riparian areas and the habitat for this species is primarily upland, the habitat for northern alligator lizards would not be greatly influenced by any of the alternatives; therefore, effects on this species are not discussed further in this document.

Ringneck snake (*Diadophis punctatus*). The ringneck snake is widely distributed in the United States, including southwestern Washington, and has been documented from several disjunct populations in the inland Rocky Mountains. Ringneck snakes occupy a wide range of habitats from sea level to 7000 feet. Ringneck snakes have been detected in central Idaho and may occur within the Planning Area; however, it is less likely that they occur within the Project Area. Ringneck snakes are common in wooded regions, but also occur in open, grassy or brushy areas and in relatively open, rocky canyons where they are found under rocks and rotting logs in talus (Nussbaum et al. 1983). Because the alternatives analyzed focus on riparian areas, the drier upland habitat for ringneck snakes would not be greatly influenced by any of the alternatives; therefore, effects on this species are not discussed further in this document.

Coeur d'Alene salamander (*Plethodon idahoensis*). Coeur d'Alene salamanders maintain a disjunct distribution at elevations up to 5000 feet in northern Idaho and northwestern Montana (Groves et.al. 1996). This species occurs within the Planning Area and likely occurs within the Project Area. Although little is known about Coeur d'Alene salamanders, data suggest they are primarily found in forested environments near highly fractured rock formations, typically near springs, seeps, waterfall spray zones, and edges of headwater streams (Reichel and Flath 1995). Because the alternatives analyzed focus on vegetated riparian areas and the actions analyzed would have little influence on the geologic features associated with habitat for this salamander, habitat for Coeur d'Alene salamanders would not be greatly influenced by any of the alternatives;

therefore, effects on this species are not discussed further in this document.

Larch mountain salamander (*Plethodon larselli*). The larch mountain salamander occurs in disjunct populations in the Washington portion of the Planning Area. This species is found in several locations in the central Cascade Range near Mount St. Helens and Mount Rainier, as high as 3,400 feet (Leonard et al. 1993). Most known populations of larch mountain salamanders are found on steep talus slopes kept moist by a covering of moss and a dense overstory of coniferous or deciduous trees (Larson and Schaub *in* Rodrick and Milner 1991). However, they also occur in late-successional forest stands associated with piles of bark slabs around large trees. Because the alternatives analyzed focus on riparian areas and generally would not affect talus slopes, habitat for larch mountain salamanders would not be greatly influenced by any of the alternatives; therefore, effects on this species are not discussed further in this document.

Tailed frog (*Ascaphus truei*). Tailed frogs are distributed from sea level to above 3000 feet and from the Cascades and coastal mountains to the western slope of the Rocky Mountains in northwestern Montana and northern Idaho. Tailed frogs occur within the Planning Area and within some permanent streams in the Project Area. Tailed frogs are found in and along small, swift, permanent, mountain streams with rocky substrates and low water temperatures buffered by dense vegetation (Nussbaum et al. 1983; Reichel and Flath 1995; Daugherty and Sheldon 1982). Streams supporting tailed frogs primarily occur in mature (Aubry and Hall 1991) or old-growth coniferous forests (Bury 1983; Bury and Corn 1988). More tailed frogs were observed in older Douglas fir-dominated, mixed conifer/hardwood forests near cold, clear, fast-flowing streams than in younger forests with the same type streams (Welsh 1990). In the Coast Range of western Oregon, Corn and Bury (1983) found tailed frogs were more common in dense, moist, and young and mature forests, and absent from recent clearcuts. Tailed frogs tend to avoid wetlands, marshes, ponds, lakes, and slow, sandy-bottom streams (Daugherty and Sheldon 1982).

Spotted frog (*Rana pretiosa*). The spotted frog is found in disjunct populations in the Cascade Mountains east through central Washington and Idaho to western Montana. The species occurs in the Planning Area, and may also be present in the Project Area. It has been recorded from sea level to elevations of approximately 6400 feet. It is a highly aquatic species that seems to prefer perennial, non-stagnant ponds, lakes, and slowly moving streams with backwater areas. Spotted frogs occur around water bodies with dense vegetation and marshy edges of streams and ponds, and are often associated with non-forested wetlands and non-woody plant communities (Leonard et al. 1993).

Cascades frog (*Rana cascadae*). The Cascades frog occurs in the Cascade Mountains of Washington, normally between elevations of 2000 feet and 6550 feet (Leonard et al. 1993). Since the species occurs in the Planning Area in Washington, it may be present in the Project Area. Cascades frogs are most common in small pools adjacent to streams flowing through subalpine meadows. They also occur around marshy edges of streams and ponds, seasonally flooded and forested wetlands, small lakes, sphagnum bogs, and fens (Leonard et al. 1993). The abundance of adult Cascades

frogs has been observed to increase with stand age; since older stands tend to have higher moisture understories, this species may favor stands with moderate moisture (Aubry and Hall 1991).

Idaho banded mountainsnail *(Oreohelix idahoensis).* This species is restricted to a few colonies along the lower Salmon River in Idaho County, Idaho. It occurs only on low to middle elevation limestone and calcareous schist outcrops and talus, usually in sage scrub, and typically in rather dry, open terrain. Threats to this species include grazing, gold mining, talus and limestone quarrying, and range fires (Frest and Johannes 1995). *O. idahoensis* does not occur within the Project or Planning Areas, would not be affected by any of the alternatives, and, therefore, is not addressed further in this document.

Boulder pile mountainsnail *(Oreohelix jugalis).* This species occurs along the lower Salmon River from Riggins, Idaho, to about river mile 20, mostly in Idaho County. It is found at open, low elevation sites in rock taluses and boulder piles. Threats to this species include livestock grazing, road construction and maintenance, talus mining, and gold prospecting and mining (Frest and Johannes 1995). *O. jugalis* does not occur within the Project or Planning Areas, would not be affected by any of the alternatives, and, therefore, is not addressed further in this document.

Whorled mountainsnail *(Oreohelix vortex).* This species is found primarily in a few isolated colonies along a short reach of the lower Salmon River. It is restricted principally to low areas in large basalt taluses on relatively dry and open sites. This species is often associated with and faces the same threats as *O. jugalis,* described above (Frest and Johannes 1995). *O. vortex* does not occur in the Project or Planning Areas, would not be affected by any of the alternatives, and, therefore, is not addressed further in this document.

Lava rock mountainsnail *(Oreohelix waltoni).* This species is found in four sites near Lucile and John Day Creek in the central, lower Salmon River valley, Idaho. It is associated with basalt or schist/alluvium in rather dry, open areas of sage scrub vegetation. Threats are the same as described above for *O. jugalis* (Frest and Johannes 1995). *O. waltoni* does not occur in the Project or Planning Areas, would not be affected by any of the alternatives, and, therefore, is not addressed further in this document.

Carinated striate banded mountainsnail *(Oreohelix strigosa goniogyra).* This species occurs in a few remnant colonies in the Race Creek drainage of the lower Salmon River Valley, Idaho. It was originally reported from several sites on the Nez Perce National Forest in the Selway River drainage, Idaho, but was not found there during recent visits. This species is found primarily on forested outcrops varying from schist to limestone, usually with some completely closed canopy. Threats include grazing, road location and modifications, clearcutting, and forest fires (Frest and Johannes 1995). Like the four previous species of *Oreohelix*, *O. s. goniogyra* does not occur in the Project or Planning Areas, would not be affected by any of the alternatives, and, therefore, is not addressed further in this document.

4.7.6 Environmental Consequences

Potential impacts on wildlife resources under any of the alternatives include modifications in forest and riparian vegetation structural characteristics as a result of human-induced disturbances, including tree harvesting. Under all the alternatives, these modifications may affect the quantity and quality of wildlife species' habitats, simultaneously increasing habitat for some species groups and decreasing habitat for others. Additional impacts on some species may occur from varying types of road management under the alternatives that would allow for human access to wildlife habitats. Species potentially sensitive to increased or decreased human access include, among others, grizzly bears, lynx, and elk.

Grazing within the Project Area is widespread and at least some would continue under each of the alternatives because of the open range law. As discussed in Section 4.2, *Geology and Soils*, and Section 4.5, *Vegetation Resources*, and Section 4.6, *Fisheries and Aquatic Resources,* grazing surveys on Plum Creek lands indicate that approximately 65 percent of the grazed riparian stream corridors show no sign of disturbance, 25 percent indicate moderate grazing effects, and 10 percent suggest severe grazing pressure (Plum Creek 1998f). Grazing can negatively impact wildlife habitat directly by modifying and disturbing vegetation structure and composition, particularly in sensitive habitats such as riparian areas.

From a wildlife resources perspective, land management activities for the proposed NFHCP and the other alternatives would be similar, resulting only in differing relative proportions of stand structures and types for wildlife habitat. All alternatives focus on riparian stand types, but the proposed NFHCP includes conservation measures that extend beyond riparian management zones. None would substantively change landscape patterns, although all the alternatives would promote the connectivity of riparian corridors. The proposed NFHCP and alternatives would comply with all state and federal regulations that affect wildlife, including avoiding take of species listed under the ESA. The following discussion focuses on changes in forest habitat characteristics, and the associated impacts, for wildlife lifeform types and special emphasis species that would result from forest stand modifications under the proposed NFHCP and each alternative. Impact analyses focus on the proposed 30-year Permit period, but contain brief assessments for the optional Permit periods of 10 and 20 years.

Impact analyses for *Special Emphasis Wildlife Species—Protected Species* are reported in this document with a similar level of detail as for other wildlife species. Additional, and more detailed, impact analyses for species currently listed under the ESA will be completed and reported in a Biological Opinion that will be issued concurrently with a decision by the Services on Permit issuance. The additional analysis will be performed as required under Section 7 of the ESA.

Existing Regulations—No Action Alternative

The following sections emphasize expected wildlife trends and future conditions within the Project Area under the No Action Alternative and focus on

changes in riparian forest habitats for wildlife. The effects of these trends and conditions on these species and their habitat are discussed.

Wildlife Lifeform Types. Impacts on wildlife lifeforms are assessed as changes in the relative amounts of primary and secondary habitats as defined in Section 4.7.5, *Affected Environment*, for the majority of those lifeform species. Once habitat use of the riparian stand type was defined for each species in the lifeform, a composite habitat definition was determined based on habitat use attributes of the majority of the species within the lifeform. The composite habitat definition assesses changes in primary and secondary riparian habitat conditions for wildlife. These changes are assessed over time and are related to the proportion of the riparian stand type within forested riparian areas at each decade over the 30-year planning period from Year 0 to Year 30. The non-forest riparian stand type in this analysis is defined as all stands that temporarily do not have trees, but that would return to a forested state over time. The following lifeform discussion summarizes the projected trends in wildlife forested riparian habitat in the Project Area for the No Action Alternative.

Lifeform 2—Frogs and salamanders. Primary forested riparian habitat for lifeform 2 species would increase 28 percent over the 30-year period from approximately 34 percent to 62 percent. Secondary riparian habitat would decrease approximately 6 percent over the same period. In general, frogs and salamanders are more closely linked to riparian habitats, especially for breeding, than most species. However, many species, such as the Pacific chorus frog, red-legged frog, and tiger salamander are highly terrestrial and found in upland habitats. The overall projected increase in riparian habitat is anticipated to provide a positive impact on these species by increasing the absolute amount of habitat for breeding and feeding, providing more stable conditions and decreasing habitat-related population fluctuations, lessening the potential for disjunct populations, and maintaining riparian corridors for biological connectivity.

Lifeform 3—Ducks and turtles. Primary forested riparian habitat for lifeform 3 wildlife would decrease approximately 6 percent over the 30-year period. Secondary habitat would increase approximately 6 percent over the same period. Therefore, changes in riparian habitat would remain relatively stable and habitat-related fluctuations in population size and structure for these species (ducks and turtles) should be insignificant. Highly mobile species, such as ducks, would typically adjust to unsuitable conditions by moving to more suitable habitat, while less mobile species such as western pond turtles would likely be adversely affected more.

Lifeform 5—Grouse and elk. Primary forested riparian habitat for lifeform 5 wildlife would essentially remain the same, or decrease very slightly from approximately 89 percent in Year 0 to approximately 88 percent in Year 30. Secondary habitat would essentially remain the same or increase very slightly from approximately 11 percent to approximately 12 percent over the 30-year period. Species of this lifeform are primarily mobile, upland species. Therefore, slight changes in the amount and availability of riparian habitats would not be anticipated to affect these species significantly.

Lifeform 6—Warblers and porcupines. Primary habitat for lifeform 6 would decrease from approximately 66 percent in Year 0 to 38 percent in Year 30. Secondary habitat would increase over the same period from approximately 34 percent to 62 percent. Therefore, in the riparian zones, the 28 percent loss in primary habitat for species of this lifeform would be replaced by a 28 percent gain in secondary habitat over the life of the Permit period. This 28 percent represents a decrease in breeding habitat quality, as primary breeding habitat is converted to secondary breeding habitat for species whose primary breeding is limited to riparian systems. However, warblers, porcupines, and other species of this lifeform are primarily mobile, upland species. Therefore, decreases in primary riparian habitat as well as overall changes in the amount and availability of riparian habitats, in general, would represent a small amount of the total primary breeding habitat including uplands. These changes should not significantly influence the population stability of these species.

Lifeform 7—Sparrows and thrushes. Primary forested riparian habitat for lifeform 7 species would decrease about 30 percent over the 30-year period. Secondary habitat would increase approximately 30 percent over the same period. Species of this lifeform are primarily mobile, upland species. Therefore, decreases in primary riparian habitat and the accompanying increases in secondary habitat, as well as overall changes in the amount and availability of riparian habitats, in general, should not significantly influence the population stability of these species.

Lifeform 9—Waxwings and grosbeaks. Primary forested riparian habitat would increase from 68 percent in Year 0 to 83 percent in Year 30. Although these species are known to use riparian areas, they tend to use hardwood-dominated stands near large streams and rivers. These conditions make up a relatively small portion of the overall analysis area. The increase in primary habitat should improve overall riparian conditions for these berry-eating bird species, but not to a significant degree.

Lifeform 12—Herons and eagles. Primary forested riparian habitat for lifeform 12 species would increase slightly, about 1 percent. Secondary habitat would increase about 32 percent during the 30-year period. The slight increase in primary habitat and the large increase in secondary habitat would create a more varied habitat base for foraging and feeding in riparian areas for herons, eagles, and other species of this lifeform, enhancing these species' persistence in the Project Area.

Lifeform 14—Bats and owls. Primary forested riparian habitat for lifeform 14 species would increase slightly from 11 percent in Year 0 to 12 percent in Year 30. Secondary habitat would increase from 35 percent to 67 percent during the same period. The overall increase in riparian habitat for feeding and roosting should reduce competition for tree nesting and roosting sites among bats, owls, and other species of this lifeform.

Lifeform 16—Kingfishers and beavers. Primary forested riparian habitat would decrease 8 percent from Year 0 to Year 30. Secondary habitat would increase 8 percent during the 30-year period. The overall effect on decreasing primary riparian habitat and increasing secondary habitat for kingfishers and beavers is anticipated to be about the same as current conditions. The riparian structure of

feeding habitats may be more diffuse, but kingfishers, beavers, and other members of this lifeform are mobile, adaptable, and have a wide range of tolerance to habitat modifications.

Special Emphasis Wildlife Species—Protected Species

Gray Wolf (*Canis lupis*)—Endangered. The gray wolf is a wide-ranging, highly mobile species not limited to the riparian systems that would be most affected by the EIS alternatives in the Project Area. The distribution and abundance of wolves is influenced by the availability and abundance of prey, such as elk, white-tailed deer, and upland mammals. In general, wolves are not directly dependent on specific habitat types, but are indirectly affected by habitat conditions that affect their prey. Wolves and their primary prey species, such as elk and deer, are characteristic of lifeform 5 species. For these species, the portion of the forested riparian habitat used by wolf prey species would remain relatively constant during the 30-year Permit period. Gray wolf populations, therefore, should remain relatively constant and essentially unaffected by habitat modifications, assuming the carrying capacity of these habitats and the prey species also remain relatively constant.

Direct impacts on wolves are not easily quantifiable but appear to be generally the direct result of interactions with humans through increased mortality and disruption of activities necessary for survival. The primary factor influencing the frequency of human-wolf interactions is the increased mobility of humans in wolf habitat areas, which can be facilitated by open road access. Under the No Action Alternative, the voluntary BMPs influencing road access that Plum Creek has already implemented on its ownership would continue, as would agency management practices on state and federal lands in the Planning Area. The Plum Creek BMPs for grizzly bear management have resulted in road closures and restriction of open roads to a density of approximately 1 mile per square mile or less. These current practices should also benefit the two wolf packs that frequent grizzly bear habitat in the Project Area. In these areas and throughout Plum Creek ownership, human interactions with wolves may be reduced by reducing the miles of roads open to the public. Under existing conditions, the potential for increased road access on Plum Creek ownership, which could increase the vulnerability of wolves especially to illegal hunting, is low.

Under the No Action Alternative and when planning projects in areas not covered by existing agreements, Plum Creek would continue its policy to avoid take of gray wolves on project-by-project basis. In general, the No Action Alternative would maintain existing management practices that do not negatively impact wolves.

Grizzly Bear (*Ursus arctos horribilis*)—Threatened. Grizzly bears are wide-ranging and their territory covers large areas of upland and riparian habitats. They use a variety of habitats daily and seasonally for foraging, cover, breeding, and rearing young. They are primarily upland species but may rely on low-elevation riparian habitats for spring forage and hiding cover. Because of the large area required to maintain grizzly populations, they are invariably influenced by land management practices on multiple ownerships that affect the quality of their habitat. Of particular importance are land management activities that interfere with

normal bear activities and increase the probability of interaction with humans. While not easily quantifiable, these disturbances appear to impact grizzly bears directly by increased mortality and indirectly by disrupting activities necessary for successful breeding and survival.

Under the No Action Alternative, the voluntary grizzly bear BMPs that Plum Creek already implements would continue on the approximately 200,000 acres of important grizzly bear habitat within Plum Creek ownership. These restrictions are within acceptable bear management guidelines and are in addition to the ongoing agency management practices on state and federal lands in the Planning Area. Human interactions with bears and disturbance of normal bear activity are reduced by reducing the miles of roads open to the public. The grizzly bear BMPs have resulted in road closures and restriction of open roads to a density of approximately 1 mile per square mile or less. Roads open to public access represent less than 15 percent of the total road density (that is, approximately 6 to 7 miles per square mile) on timberlands in the Project Area. Only a small amount of Plum Creek ownership in this area (less than one-half of 1 percent) contains roads that have not already been restricted or closed according to the BMPs. Under existing management conditions, levels of current road access and the potential for increased road access on Plum Creek ownership that could increase grizzly bear mortality, especially vulnerability to illegal hunting, are low.

In addition to maintaining the reduced open road density, the grizzly bear BMPs maintain riparian protective cover through selective timber harvesting (for bear security and to retain important bear foods) and protective cover adjacent to wetlands and wet meadows. Low-elevation riparian areas that are important preferred habitat during the spring would be retained or enhanced under each EIS alternative. Plum Creek's grizzly bear BMPs also prescribe the maintenance of upland cover in third-order watersheds, limit opening sizes of clearcuts, and restrict timing of operations.

Under the No Action Alternative, Plum Creek would continue to implement and maintain provisions of the cooperative Swan Valley Grizzly Bear Conservation Agreement (see Section 1.5). When planning projects in areas not covered by this Agreement, Plum Creek would continue its policy to avoid take of grizzly bears on a project-by-project basis.

Bald eagle (*Haliaeetus leucocephalus*)—Threatened. The trend in forested riparian habitat for lifeform 12, which includes bald eagles, would generally be positive over the analysis period. Primary and secondary riparian habitat would both increase. As long as this species is listed under the ESA, Plum Creek would avoid take of bald eagles by continuing to implement nest protection and other measures. In Montana, Plum Creek foresters are provided with maps of known nesting and roosting sites and with a state management plan designed to avoid take (Montana Bald Eagle Working Group 1994 and 1991). In Washington, state management recommendations address protection of nest sites and winter roost sites, as well as minimization or avoidance of disturbance during the nesting season. Adequate protection of eagle nest and winter roosting sites should ensure long-term survival of bald eagles within the Project Area.

Northern spotted owl (*Strix occidentalis caurina*)—Threatened. The primary late-successional breeding habitat for this cavity nesting species would essentially remain the same or decrease very slightly, approximately 1 percent, while secondary habitat would increase 32 percent over the 30-year period. Under the No Action Alternative, Plum Creek would avoid take of northern spotted owls on a project-by-project basis. Take avoidance measures include surveys for spotted owls, classifying and identifying spotted owl habitat types, protecting owl sites with buffers and set asides, and implementing seasonal protection measures, as required in Plum Creek's Cascades HCP by state rules outside Plum Creek's Cascades HCP project area.

Lynx (*Felis lynx canadensis)*—Threatened. The lynx is primarily an upland habitat species not restricted to the riparian systems that would be most affected by the EIS alternatives in the Project Area. Within the upland forested habitats, the lynx requires a range of early, intermediate, and late successional stages to satisfy its life requisites. Lynx, as well as most lynx prey species, such as snowshoe hares and grouse, are characteristic of lifeform 5 species. For the lynx and its prey species, the portion of riparian forested habitat within their ranges should remain relatively stable over the 30-year Permit period. Consequently, lynx populations should remain relatively constant and unaffected by overall habitat modifications, assuming other conditions, such as habitat carrying capacity, population structure, and prey abundance, also remain relatively stable.

Impacts on lynx other than habitat modifications are not easily quantifiable and are somewhat speculative. They may be the direct result of interactions with humans through increased mortality and disruption of activities necessary for survival. The frequency of human-lynx interactions and the increased mobility of humans in lynx habitat areas, specifically as it relates to illegal trapping vulnerability, may be affected by open road access. However, trapping is a regulated activity controlled through state and federal agencies. Under the No Action Alternative, the voluntary BMPs influencing road access that Plum Creek has already implemented on its ownership would continue, as would agency management practices on state and federal lands in the Planning Area. The distribution of lynx habitat includes essentially all of the grizzly bear habitat within the Planning Area. Consequently, BMPs implemented specifically for grizzly bear would also benefit upland predators like lynx. The Plum Creek BMPs for grizzly bear management have resulted in road closures and restriction of open roads to a density of approximately 1 mile per square mile or less. In these areas and throughout Plum Creek ownership, human interactions with lynx are reduced by reducing the miles of roads open to the public. Under existing conditions, the potential for increased road access on Plum Creek ownership, which could increase the vulnerability of lynx especially to illegal hunting and trapping, is low.

Lynx was listed as threatened under the ESA in March 24, 2000 (FR 2000a). Plum Creek will maintain its policy when planning projects in areas not covered by existing agreements and avoid take of lynx on project-by-project basis. In general, the No Action Alternative would maintain existing management practices that do not negatively impact lynx.

Sensitive Species

Myotis bats (*Myotis* spp.). The trend in forested riparian habitat for lifeform 14, which includes *Myotis* bats, would generally increase. Primary habitat would decrease 1 percent while secondary habitat would increase 32 percent over the 30-year period. *Myotis* apparently utilize mature and old-growth trees for roosting, and forage over water, along roads, and along forest edges. Changes in the riparian habitat structure would be unlikely to affect roosting or foraging for these species.

Pacific fisher (*Martes pennanti pacifica*). The trend in forested riparian habitat for lifeform 14, which includes fishers, would generally increase over the 30-year period. Fishers use dense riparian corridors for traveling and denning. Increased riparian habitat would benefit this species by improving connectivity to suitable foraging and breeding habitat.

Harlequin duck (*Histrionicus histrionicus*). Harlequin ducks are a lifeform 3 species that uses riparian habitats along fast-moving, mountain streams. Primary and secondary habitat for harlequin ducks would generally be stable over the 30-year period; therefore, this species is unlikely to be impacted positively or negatively.

Little willow flycatcher (*Empidonax trailii brewsteri*). Willow flycatchers occur in brushy, early-successional stand types. In forested riparian areas, this habitat would remain stable over the 30-year period. Therefore, foraging habitat in willow and alder thickets should remain the same and willow flycatcher populations should remain stable.

Tailed frog (*Ascaphus truei*). Primary habitat for lifeform 2, which includes tailed frogs, would increase approximately 28 percent from 34 to 62 percent over the 30-year period. Secondary habitat would decrease slightly over the 30-year period. Tailed frogs occur in cold, fast-moving streams, but depend on riparian areas for feeding, breeding, and cover. Increases in primary habitats should increase opportunities for breeding and feeding, thus enhancing the species' persistence within the Project Area.

Spotted frog (*Rana pretiosa*). Primary habitat for lifeform 2, which includes spotted frogs, would increase approximately 28 percent over the analysis period. Secondary habitat would decrease slightly over the same period. Spotted frogs occur in cold, fast-moving streams, but depend on riparian areas for feeding, breeding, and cover. Increases in primary habitats should increase opportunities for breeding and feeding, thus enhancing the species' persistence within the Project Area.

Cascades frog (*Rana cascadae*). Primary habitat for lifeform 2, which includes Cascades frogs, would increase approximately 28 percent over the 30-year period. Secondary habitat would decrease slightly over the same period. Cascades frogs occur in or near perennial water bodies and are often associated with non-woody plant communities. Increases in primary habitats may benefit Cascades frogs indirectly by maintaining stable hydrological conditions, thus enhancing the species' persistence within the Project Area.

Summary. Riparian stand structure and composition change over time because of natural succession and active management. These changes modify habitat conditions for the various faunal lifeform groups that depend on particular habitat characteristics

to meet life requisites. Modifications resulting from changes in stand characteristics are simultaneously beneficial for some species groups and adverse for other groups as primary and secondary habitats change. Under the No Action Alternative, the abundance of stands with saplings and small diameter trees would decrease during the period of analysis. Also, an estimated 4 percent decrease in high-density mature forest stands would occur. Faunal groups most adversely affected by these forest trends would be those that feed and breed in early-successional riparian habitats, such as thrushes, warblers, and sparrows. However, because these species also use adjacent forest uplands, impacts on these species should be insignificant. In general, the No Action Alternative would maintain existing management practices that do not negatively impact gray wolves, grizzly bears, or lynx.

Plum Creek's Proposed NFHCP

Wildlife Lifeform Types. Impacts on wildlife lifeforms are assessed as changes in the relative amounts of primary and secondary habitats for the majority of a lifeform's species. For the proposed NFHCP, these impacts essentially are the same as the impacts of the No Action Alternative, which were discussed for each lifeform and species. To compare the alternatives, the relative amounts of habitat that would be available to wildlife lifeform types are presented in Table 4.7-2. For each lifeform and each of the three action alternatives, the table lists the percent of primary and secondary habitat at 0, 10, 20, and 30 years. In general, the data show consistent increasing and decreasing trends over time for most of the lifeforms within all the alternatives. Accordingly, amounts of habitat for the intermediate intervals (10 and 20 years) tend to fall between the extremes of 0 and 30 years. Lifeform 5 (gray wolf, lynx, elk, grouse) is a notable exception to the general pattern with amounts of habitat slightly greater at 10 and 20 years than 0 and 30 years. Also, trends for the amount of primary habitat through time tend to be inversely proportional to trends in secondary habitat.

Over the proposed 30-year duration of the NFHCP, primary forested riparian habitat would increase overall (from X percent in Year 0 to Y percent in Year 30, shown in parentheses) for the following lifeforms:

- Lifeform 2—Frogs and salamanders (34 to 62 percent)
- Lifeform 9—Waxwings and grosbeaks (68 to 83 percent)
- Lifeform 12—Herons and eagles (11 to 14 percent)
- Lifeform 14—Bats and owls (11 to 14 percent)

The overall projected increase in riparian habitat is anticipated to provide a positive impact for these lifeforms by increasing the absolute amount of habitat for breeding and feeding, providing more stable conditions and decreasing habitat-related population fluctuations, lessening the potential for disjunct populations, and maintaining riparian corridors for biological connectivity.

For the following lifeforms, primary forested riparian habitat would decrease overall (from X percent in Year 0 to Y percent in Year 30, shown in parentheses) while secondary habitat would increase over the proposed 30-year duration of the NFHCP:

Insert Table 4.7-2
Wildlife Lifeform Habitats for EIS
Alternatives at 10-Year Permit Intervals

(8-1/2 x 11, landscape)

- Lifeform 3—Ducks and turtles (44 to 38 percent)
- Lifeform 5—Elk and grouse (89 to 86 percent)
- Lifeform 6—Warblers and porcupines (66 to 38 percent)
- Lifeform 7—Sparrows and thrushes (62 to 32 percent)
- Lifeform 16—Kingfishers and beavers (40 to 32 percent)

Although there would be an initial decrease in riparian habitat for these lifeforms, most of these species occur in the same or similar habitats in upland areas and are unlikely to be negatively impacted by decreases in primary riparian habitats.

Optional 10- and 20-Year Permit Lengths. As riparian forest habitats undergo natural succession or are modified by actions taken under the NFHCP, the amount, distribution, and characteristics of habitat would vary for different wildlife lifeform types. Overall changes in the amount of habitat available to various life forms are projected to be less at 10 years than 20 years (Table 4.7-2). Primary habitat for lifeforms 2 and 9 would increase at 10 and again at 20 years. Primary habitat for lifeforms 3, 6, 7, and 16 would decrease at 10 and again at 20 years. The amount of habitat for lifeforms 5, 12, and 14 would be the same at 0 and 20 years, but would be greater for lifeform 5 and lesser for lifeforms 12 and 14 at 10 years. These intermediate variations at 10 and 20 years in amounts of primary and secondary riparian habitats are within the ranges of natural variability and are unlikely to impact species abundances permanently.

Special Emphasis Wildlife Species—Protected Species

Gray Wolf (*Canis lupis*)—Endangered. As described under the No Action Alternative, lifeform 5 species, such as the gray wolf, are not limited to riparian systems. Under the proposed NFHCP, the portion of the primary habitat in forested riparian areas used by wolf prey species would be greatest at 10 years with no net changes over existing conditions at 20 years of the 30-year Permit period. Gray wolf populations, therefore, should remain relatively constant or increase slightly as a result of riparian habitat modifications.

The primary factor influencing the frequency of human-wolf interactions, which is a direct threat to wolf populations, is the increased mobility of humans in wolf habitat areas, which can be facilitated by open road access. Under the proposed NFHCP, the voluntary BMPs influencing road access that Plum Creek has already implemented on its ownership would continue, as would agency management practices on state and federal lands in the Planning Area. The Plum Creek BMPs for grizzly bear management that have resulted in road closures and restriction of open road density should also benefit the two wolf packs that frequent grizzly bear habitat in the Project Area. While additional new roads would be constructed under the proposed NFHCP, similar to the No Action Alternative, some current roads would likely be abandoned and other roads would be closed to public access to protect fish. Under the proposed NFHCP, the potential for increased road access on Plum Creek ownership, which could increase the vulnerability of wolves especially to illegal hunting, would continue to be

relatively low, and would not likely be a significant impact on wolves in the Project Area.

Similar to the No Action Alternative and when planning projects in areas not covered by existing agreements, Plum Creek would continue its policy to avoid take of gray wolves on project-by-project basis under the proposed NFHCP. In general, the proposed NFHCP would maintain existing management practices that do not negatively impact wolves, and in some cases, road closures under the NFHCP may be beneficial to wolves. Although wolves are primarily upland species, the proposed NFHCP would slightly increase the quality of riparian forest habitats, which would benefit wolves and their big game prey.

Grizzly Bear (*Ursus arctos horribilis*)—Threatened. Like under the No Action Alternative, under the proposed NFHCP, the voluntary grizzly bear BMPs that Plum Creek already implements would continue on the approximately 200,000 acres of important grizzly bear habitat within Plum Creek ownership. These restrictions are within acceptable bear management guidelines and are in addition to the ongoing agency management practices on state and federal lands in the Planning Area. The effects of the BMPs, and the factors affecting grizzly bear populations, are described under the No Action Alternative. Any increases in road density under the proposed NFHCP, above the 1 mile per square mile open road limit in the BMPs, would be accompanied by overall decreases in human access by gating all new roads and through additional commitments to restrict access to roads for fish protection. Under the conditions of the NFHCP, the potential for increased road access on Plum Creek ownership that could increase grizzly bear mortality, especially the vulnerability to illegal hunting, is lower than with the other alternatives.

In addition to maintaining the reduced open road density, the grizzly bear BMPs maintain riparian protective cover through selective timber harvesting (for bear security and to retain important bear foods) and protective cover adjacent to wetlands and wet meadows. Under the proposed NFHCP, Plum Creek would also continue to implement and maintain provisions of the cooperative Swan Valley Grizzly Bear Conservation Agreement (see Section 1.5). When planning projects in areas not covered by this Agreement, Plum Creek would continue its policy to avoid take of grizzly bears on a project-by-project basis.

Bald eagle (*Haliaeetus leucocephalus*). The trend in forested riparian habitat for lifeform 12, which includes bald eagles, would be positive over the 30-year period. Both primary and secondary riparian forest habitat for eagles would increase over the 30-year Permit period with a slight decrease at 10 years for primary habitat and an increase in secondary habitat at 10 years. Bald eagles are opportunistic feeders, readily taking carrion such as fish or fish carcasses along streams and lake edges. Bald eagles will often search for food while perched in a tall tree with a good view. Increasing primary riparian habitats would ensure that perching trees adjacent to water bodies are available for bald eagles. Like the No Action Alternative, under the proposed NFHCP, Plum Creek would avoid take of bald eagles on a project-by-project basis as long as they are listed under the ESA. Effects on bald eagles under the proposed NFHCP would likely be very similar to those described under the No Action Alternative. To the extent that nesting or

wintering bald eagles use native salmonids as a prey source, the proposed NFHCP would benefit bald eagles by maintaining or increasing fish populations.

Northern spotted owl (*Strix occidentalis caurina*). Habitat changes for this species would be positive during the 30-year period. The primary late-successional breeding habitat for this cavity nesting species would increase approximately 3 percent while secondary habitat would increase 30 percent over the 30-year Permit period. At the 10-year interval, primary habitat would decrease slightly and secondary habitat would increase. While there may be a slight decrease in nesting sites as a result of the slight decrease in primary riparian habitat, the effects would likely be insignificant since spotted owls are widely distributed within upland forest habitats. Like the No Action Alternative, Plum Creek would avoid take of northern spotted owls on a project-by-project basis. Effects on northern spotted owls under the proposed NFHCP would likely be very similar to effects under the No Action Alternative.

Proposed for Listing

Lynx (*Felis lynx canadensis*)—Proposed Threatened. As described under the No Action Alternative, lifeform 5 species, such as lynx, are not restricted to riparian systems. The amount of primary riparian habitat available to lynx under the proposed NFHCP would be greatest at 10 years and show no net change over existing conditions at 20 years. The effect of these changes would be insignificant since this species is widely distributed within the upland forest landscape. Lynx populations should remain relatively constant and unaffected by overall habitat modifications, assuming other conditions, such as habitat carrying capacity, population structure, and prey abundance, also remain relatively stable.

Impacts on lynx other than habitat modifications are described under the No Action Alternative. Under the proposed NFHCP, the voluntary BMPs influencing road access that Plum Creek already implements on its ownership would continue, as would agency management practices on state and federal lands in the Planning Area. The distribution of lynx habitat includes essentially all of the grizzly bear habitat within the Project Area. Consequently, BMPs implemented specifically for grizzly bear would also benefit upland predators like lynx. Under the proposed NFHCP, the potential for increased road access on Plum Creek ownership, which could increase the potential vulnerability of lynx especially to illegal hunting and trapping, would be further reduced by commitments for road closures to conserve native salmonids.

Should lynx be listed as threatened under the ESA, Plum Creek would maintain its policy when planning projects in areas not covered by existing agreements and avoid take of lynx on project-by-project basis. In general, the proposed NFHCP would maintain existing management practices that do not negatively impact lynx.

Sensitive Species

Myotis bats (*Myotis* spp.). The trend in forested riparian habitat for lifeform 14, which includes *Myotis* bats, would be increases in both primary and secondary habitats over the analysis period. *Myotis* apparently use mature and old-growth trees for roosting, and forage over water, along roads, and along forest edges. Changes in the riparian habitat structure are unlikely to affect roosting or foraging for these species.

Pacific fisher (*Martes pennanti pacifica*). The trend in forested riparian habitat for lifeform 14, which includes fishers, would be increases in both primary and secondary habitats over the analysis period. Fishers use dense riparian corridors for traveling and denning. Increased riparian habitat would benefit this species.

Harlequin duck (*Histrionicus histrionicus*). Harlequin ducks are cavity-nesting members of the lifeform 3 group. There would be a slight decrease in primary habitat (6 percent) and a similar increase in secondary habitat. This species uses riparian habitats along fast-moving mountain streams. Changes in primary and secondary habitat for harlequin ducks would be unlikely to impact the species positively or negatively. A primary benefit of the NFHCP for harlequin ducks would be the enhanced retention of cover around CMZ areas and headwater streams where harlequin ducks nest and forage. Also, comprehensive measures developed to avoid impacts on stream temperatures and sedimentation (including road and upland management, range management, enhanced riparian buffers, and vegetation restoration efforts) would maintain or improve water quality and consequently the macroinvertebrate food resources that harlequin ducks consume. Disturbance during the nesting and brood-rearing periods (April to August) would be avoided around riparian areas where harlequin ducks are present. Maintenance of a timber and shrub mosaic, woody debris, and riparian vegetation in and adjacent to streams is important to retain breeding habitat.

Little willow flycatcher (*Empidonax trailii brewsteri*). Willow flycatchers occur in brushy, early-successional stand types. In forested riparian areas, this habitat would remain stable over the 30-year period. Therefore, foraging habitat in willow and alder thickets should remain the same and willow flycatchers populations should remain stable.

Tailed frog (*Ascaphus truei*). Primary habitat for lifeform 2, which includes tailed frogs, would increase approximately 28 percent over the analysis period. Secondary habitat would decrease slightly over the same period. Tailed frogs occur in cold, fast-moving streams, but depend on riparian areas for feeding, breeding, and cover. Increases in primary habitats should increase opportunities for breeding and feeding, thus enhancing the species' persistence within the Project Area.

Spotted frog (*Rana pretiosa*). Primary habitat for lifeform 2, which includes spotted frogs, would increase approximately 28 percent over the analysis period. Secondary habitat would decrease slightly over the same period. Spotted frogs occur in cold, fast-moving streams, but depend on riparian areas for feeding, breeding, and cover. Increases in primary habitats should increase opportunities for breeding and feeding, thus enhancing the species' persistence within the Project Area.

Cascades frog (*Rana cascadae*). Primary habitat for lifeform 2, which includes Cascades frogs, would increase approximately 28 percent over the analysis period. Secondary habitat would decrease slightly over the same period. Cascades frogs occur in or near perennial water bodies and are often associated with non-woody plant communities. Increases in primary habitats may benefit Cascades frogs indirectly by maintaining stable hydrological conditions, thus enhancing the species' persistence within the Project Area.

Mitigation. Mitigation measures for three special status species are discussed below.

Gray wolf (*Canis lupis*). Improving the habitat quality for wolf prey species would mitigate the slight decrease in primary riparian habitat. The NFHCP would improve habitat quality for the primary prey of wolves, white-tailed deer, by reducing disturbance and increasing cover in low-elevation riparian areas. Enhanced retention of cover on headwater streams would benefit white-tailed deer by increasing the amount of cover and improving connectivity of similar cover types across the landscape. Also, implementation of a riparian vegetation restoration program would result in beneficial changes to riparian vegetation in important winter and spring habitats for wolf prey. Reduced road access to wolf and wolf prey habitat may reduce risk of illegal mortality.

Grizzly bear (*Ursus arctos horribilis*). Measures implemented within the NFHCP would benefit grizzly bear habitat through the enhanced retention of vegetation in riparian areas. Forest management practices that provide a diversity of age classes and enhance production of forage, such as huckleberries, would positively affect the quality of grizzly bear habitat. Open and total road density standards have been developed for federal lands in each of the recovery zones, as well as within mixed federal and private landscapes in the Swan Valley Conservation Agreement area. Existing Conservation Agreement standards would continue to be adhered to in the Swan Valley area under the NFHCP. Reduced road access to grizzly bear habitat would likely reduce risk of illegal mortality. Coordination of timber harvesting activities by multiple landowners within and across grizzly bear management units would likely help reduce displacement and potential mortality within grizzly bear populations.

Lynx (*Felis lynx canadensis*). The lynx is a wide-ranging species influenced by upland and riparian forest management activities that optimize habitat conditions for lynx and lynx prey species. Increased cover retention around headwater streams would benefit lynx by retaining connected cover across the landscape in lynx habitat areas. The retention or creation of late-successional habitats in CMZs would provide potential denning stands. Reduced road access under the NFHCP would likely reduce disturbance of lynx (that is, to illegal trapping vulnerability) in the Planning Area. Increases in habitat connectivity and denning habitat combined with some level of reduced disturbance of lynx under the NFHCP are expected to enhance species' persistence within the Project Area.

A significant mitigation provision for potential wildlife habitat effects is the ICA commitment, which is unique to the proposed NFHCP. This conservation measure modifies forest management disturbances to wildlife habitat adjacent to but outside riparian management zones on fish-bearing and some non-fish-bearing streams. The ICAs generally would be treated with more sensitive forest management techniques, and would receive provisions for minimum tree retention or regeneration.

Unavoidable Adverse Impacts.

Riparian vegetation structure and composition change over time because of natural succession and active management. These changes result in unavoidable modifications in habitat conditions for the various faunal lifeform types that depend on particular habitat characteristics to meet life history requirements. The unavoidable

modifications resulting from changes in stand characteristics are simultaneously beneficial for some species groups and may be adverse for other groups as the amounts of primary and secondary habitats change. Under the NFHCP, stands with saplings and small diameter trees would decrease during the Permit period. Also, there would be an overall increase in riparian stands with large diameter, mature trees. Faunal groups most adversely and unavoidably affected by these stand trends would be those that feed and breed in the early-successional riparian habitats, such as thrushes, warblers, and sparrows, and that tend to be limited to just riparian habitats.

Cumulative Impacts. Impacts that are cumulative throughout the Project Area most influence wide-ranging upland species such as the gray wolf, grizzly bear, and lynx. Categories of cumulative impacts for this analysis include grazing and road construction and maintenance. Under all circumstances where they are applied, provisions for ICAs would reduce the potential for cumulative wildlife habitat effects.

It is generally believed that higher road density and road access may adversely affect wolves and grizzly bears. Approximately 78 miles of new roads would be constructed in grizzly bear habitat within the Project Area, which includes approximately 200,000 acres. Most of these new roads (approximately 68 miles) would be within land parcels that already have roads. Therefore, the impact on grizzly bears would be lower than in unroaded areas since slight increases in road density within existing roaded areas are anticipated to be less disruptive to the integrity of core habitat areas. In addition, new roads would be gated to restrict access by the public, and many miles of roads would be abandoned in accordance with grizzly bear BMPs.

Roads and human access also have an important influence on habitat quality and use by gray wolves within the Project Area. Restrictions in road access indirectly benefit wolves by generally benefiting big game populations through decreased vulnerability during hunting seasons or from poaching. Wolves can be directly vulnerable to human-caused mortality in areas with high levels of access. Road commitments within the NFHCP that would benefit wolf conservation and management include the abandonment of some surplus roads and the implementation of road restrictions that would involve vehicle access closures to eliminate easy access to certain bull trout/riparian areas.

Grazing within the Project Area is widespread and would continue to some extent. Grazing negatively impacts wildlife habitat directly by modifying and disturbing stand structures. For predators such as the gray wolf, grazing BMPs tend to benefit wolf prey species. When BMPs are augmented by efforts to reduce the impacts of cattle grazing on riparian vegetation through fencing and monitoring, prey species, such as white-tailed deer, benefit further by the improvement of the vegetative characteristics of targeted riparian areas.

Implementation of the proposed NFHCP would influence wildlife management activities in lands surrounding Plum Creek ownership. Generally, land management policies of state and federal ownership are designed to maintain and enhance natural resources. The proposed NFHCP with its environmental benefits, not only for fish, but also for wildlife, would augment state and federal programs at a landscape-level. The cumulative effects not only would

reflect the site-specific level of riparian habitat improvements but also would provide large-scale benefits to wildlife through enhancement across multiple ownerships. This is particularly significant for highly mobile species with large home ranges, such as the grizzly bear, gray wolf, lynx, and elk.

Internal Bull Trout Conservation Plan Alternative

Potential impacts on wildlife lifeform types and special emphasis wildlife species, mitigation, and unavoidable adverse and cumulative impacts under this alternative would be similar to those described for the NFHCP. The amount of primary and secondary riparian habitats available to wildlife lifeform types at 10, 20, and 30 years would be the same or nearly the same for this alternative as for the NFHCP (Table 4.7-2). Effects on protected and other sensitive wildlife species would be the same as under the proposed NFHCP.

Simplified Prescriptions Alternative

Potential impacts on wildlife lifeform types and special emphasis wildlife species, mitigation, and unavoidable adverse and cumulative impacts for the 30-year Permit interval would be similar to those described for the NFHCP, with three exceptions:

- Lynx primary habitat would decrease by 12 percent and secondary habitat would increase by 12 percent.
- Gray wolf primary habitat would decrease by 12 percent and secondary habitat would increase by 12 percent.
- For lifeforms 12 and 14, primary habitat would increase by 12 percent and secondary habitat would increase by 21 percent.

It is unlikely that the projected decreases in primary riparian habitats would influence lynx or gray wolf populations since both are widely distributed across the upland landscape. Projected increases in late-successional riparian habitats would benefit species, such as herons and eagles, that breed on thick branches and use tall trees. This habitat type also benefits species, such as owls and bats, that nest in cavities of large trees or roost in mature trees.

For the optional 10- and 20-year Permit intervals, potential impacts of this alternative would be generally the same as the NFHCP for all wildlife lifeforms and special status species, except those belonging to lifeforms 5, 12, and 14 (see Table 4.7-2). Primary habitat for these lifeforms would be similar at 0 and 10 years. Primary habitat for lifeform 5 would decrease at 20 and 30 years. Primary habitat for lifeforms 12 and 14 would follow the same pattern—habitat would remain the same at 10 years and increase at 20 and 30 years. Lynx and gray wolf primary habitat would show no change at 10 years, and decrease 7 percent at 20 years.

4.8 Land Use

4.8.1 Introduction

This analysis addresses the potential for impacting land use as a result of implementing management regimes associated with the proposed NFHCP, other action alternatives, and No Action Alternative. The analysis focuses on potential impacts on land uses in the Project and Planning Areas, with reference to potential related effects on native salmonids.

4.8.2 Issues Eliminated from Further Analysis

Most land use issues identified during public scoping were analyzed. Three were eliminated from further analysis by the Services (FWS and NMFS 1998) for the reasons given:

- Bull trout listing is a mechanism to control land use—Beyond the scope of this EIS
- Plum Creek should publicly disclose contracts they may hold with other landowners for deriving mitigation credits on their properties—Beyond the scope of this EIS

4.8.3 Issues Addressed in the Impact Analysis

Land use issues identified during public scoping and listed in the Scoping Report (FWS and NMFS 1998) are addressed in the impact analysis. Those issues deal primarily with three concerns:

- The NFHCP should not preclude traditional land uses and access
- The NFHCP should direct land uses changes and development so that impacts on native fish are minimized
- Conservation easements must be determined prior to the HCP and transferred upon sale to all lands involving fish habitat
- Another important land use issue raised during scoping is the concern that land use patterns at the landscape scale should not interfere with fish conservation measures

The land use analysis focuses on the likelihood of an impact occurring, rather than on specific impacts that may occur. This analytical approach is taken because the size of the Project Area makes the effects of land use decisions difficult to predict for smaller areas (ICBEMP 1997a).

How are Land Use Alternatives Compared?

The Planning Area for this EIS/NFHCP is 17 million acres, so it is not possible to say exactly what land uses will change and where. For this discussion, the overall trends in timber harvest, grazing, and land sales to conservation buyers are compared, as well as specific trends that result in land use changes. In general, sales to conservation buyers would be highest under the proposed NFHCP. Timber harvest and grazing would be restricted the most by the Simplified Prescriptions Alternative. The alternatives vary in the quality of the land use, the number of conservation commitments, and the overall approach to conservation-oriented land transactions intended to benefit native salmonids and their habitat. Those aspects are discussed and compared in this section. For the proposed NFHCP and the Internal Bull Trout Conservation Plan, land use would generally remain unchanged, but be better directed for native fish conservation during a 30-year Permit period than with the optional Permit lengths of 10 or 20 years. The Simplified Prescriptions Alternative lacks an overall plan for transfer of land to conservation buyers, so the Permit length is less of a factor.

4.8.4 Description of Area of Influence

Generally, only the Project Area would be most influenced by the proposed NFHCP and the alternatives (Map 1.3-1). However, changes in land uses within the Project Area could, in turn, cause changes in uses within the Planning Area. Also, the purchase, sale, or exchange of land within the Planning Area could influence fish conservation outcomes at those locations, as well as redefine the properties contained in the Project Area. Finally, it is feasible that some land exchanges could affect land uses outside of the Planning Area.

4.8.5 Affected Environment

Land uses in the Planning Area include the following (ICBEMP 1997a):

- Dispersed recreation, such as wildlife viewing, hunting, fishing, hiking, camping, and viewing scenery
- Developed recreation, such as golf courses, reservoirs, and ski areas
- Agriculture
- Livestock grazing
- Residential
- Commercial timber harvest and other forest products
- Manufacturing
- Minerals and energy development, including mining of metals and non-metallic minerals, and development of coal, oil, natural gas, and geothermal resources
- Utility corridors, including electric, pipeline, and communications
- Road systems for travel

Roads enable almost all of the land use activity described above, and they supply or enable the majority of recreation use.

At the Planning Area level, recreation is an important use of public and private lands (ICBEMP 1997a). Most recreation is tied to roads and accessible water bodies. Recreation as a land use includes dispersed recreation and developed recreation on public and private lands. Forest products and livestock grazing, while no longer solely dictating the economic prosperity of the region, remain economically and culturally important in rural areas distant from population centers that do not share in regional growth. Major population centers that have interests in the Planning Area include Boise, Lewiston, Moscow, Seattle, and Spokane.

Human communities near the Project Area have an even greater dependence on resources from those lands, particularly for forest products, livestock grazing, mining, and recreation. Also, they rely on the lands for less tangible amenities such as open space, rural lifestyle, and scenery. Regional centers with populations of at least 2,500 people include the following:

- Washington
  - Yakima
  - Packwood
  - Morton
  - Centralia
  - Chehalis
  - Castle Rock
  - Longview
  - Puyallup
  - Tacoma

- Idaho
  - Sandpoint
  - Coeur d'Alene
  - St. Maries
  - Kellogg
  - Orofino
  - Grangeville

- Montana
  - Whitefish
  - Columbia Falls
  - Kalispell
  - Libby
  - Missoula
  - Polson
  - Deer Lodge
  - Anaconda
  - Butte
  - Helena

People from many other smaller communities also have resource-based interests in the Project Area.

On Project Area lands, Plum Creek primarily is engaged in the following commercial forestry activities that would be covered under the Permit:

- Silviculture—tree planting, site preparation, stand maintenance, timber harvest, prescribed burning, forest nurseries and seed orchards

- Forest fire suppression

- Logging road construction and maintenance—gravel quarrying

- Open range cattle grazing

- Miscellaneous forest and land product sales—gravel, landscape stones, and other uses

- Conservation activities

- Other activities associated with commercial forestry

Plum Creek's non-forestry activities include the following:

- Special forest uses—commercial outfitting, recreation, electronic facility siting

- Manufacturing of forest products (Manufacturing sites are located at Columbia Falls, Kalispell, Pablo, and Fortine, Montana)

- Other activities common to the forest products business

These activities were described in Section 2.3.1, *Plum Creek's Land Management*.

A variety of land uses also occur on Plum Creek lands that are not being considered for Permit coverage. Predominant among them is dispersed public recreation. Other occasional land uses include research, education, water supply (municipal and residential), agriculture, irrigation, pesticide application for forest management, fertilization, and land development.

Although most lands in the Project Area are primarily intended for timber production, a number of properties have higher values for their non-timber amenities, such as recreational real estate and conservation. Because these lands may be defined by their higher market value, they were described as **Higher and Better Use** (HBU) properties in a 1995 land use study conducted by Plum Creek (Plum Creek 1998g). In that study, approximately 110,000 acres in Montana were identified as HBU land. Properties with access to waterbodies and at lower

elevations with less harsh climates are particularly sought after for recreational development, making them more likely candidates for the HBU designation (Heaton and Lichter 1986). This is evident in the Project Area, which contains about 7 percent HBU land, including about 8,650 acres within bull trout spawning and rearing watersheds, and about 74 miles bordering bull trout Key Migratory Rivers. No Project Area HBU land in Washington or Idaho has been identified to date.

Most roads in the Project Area serve only high-clearance vehicles. They are designed to a relatively low travel standard, and are suitable for most land and resource management and protection needs as well as dispersed roaded recreation. Relatively few roads are designed for passenger vehicles or to relatively high travel standards.

Exploration and use of mineral, oil, and gas rights occur in the Project Area. Plum Creek experience suggests that these activities rarely occur, perhaps only once in 20 years. In some cases, Plum Creek controls all or some of these rights on their lands; in other cases, the rights may be held by others. An inventory of mineral, oil, and gas ownerships and easements on Plum Creek land in the Project Area does not exist. The existence of rights held by others on Plum Creek lands varies with ownership history of the individual parcels.

Land use in the interior western United States is undergoing a transformation (Ringholz 1992). Communities historically were developed around land uses based upon natural resource use. Residents were employed by resource utilization industries operating nearby. Communities were typically small, resource industry dependent, homogenous, and close-knit. Some locations within the Planning Area have increased in population, and other related economic changes have occurred. The population of Flathead County, Montana increased approximately 25 percent over 15 years from 51,966 in 1980 to 69,512 in 1995 (Government Information Sharing Project 1999). Similarly, the number of housing units in Flathead County increased 20 percent between 1980 and 1990. The median value of owner-occupied housing increased approximately 25 percent from $47,900 in 1980 to $64,200 in 1990, and the median family income increased 35 percent from $18,587 in 1979 to $28,568 in 1989. These changes in population and economic conditions could have resulted in some changes in social conditions and subsequently affected land uses.

These demographic and economic shifts, combined with other shifts in the economy, have impacted small communities. New economic pressures on resource-based industries, including high-cost regulation and global competition, are augmented by the influx of a mobile society seeking recreation and residence, and freed from work location constraints by technology. Communities respond to this pressure by shifting from resource dependency to tourism, recreation, and extended suburbanization. Traditional residents, primarily participants in the resource-based economy, are being displaced by a new citizenry composed of retirees, urban escapees, and other newcomers. As a result, the value basis of communities may shift from resource utilization to abstract values such as open space and rural lifestyle. This process has been described as rural gentrification (Schuler 1996). Social migration such as this can be observed to varying degrees in the Project and Planning Areas. It

generally results in five related trends in land use and attendant impacts:

1. **Relative market values for different land uses are changing**. Market values for lands are based on the dominant land use. As new land uses emerge because of changing values, the market structure of lands changes. A newly valued amenity, such as open space, along with an expanded market of potential land buyers creates an "amenity increment" or "rent gap" (Nelson 1990). The shifting market ultimately results in shifting land uses. For example, commercial timberland may be valued at $800 per acre without competing land uses. Social migration may result in a demand for recreational development, a new land use for the locale, which may increase values to $2,000 per acre. Landowners are encouraged by the market to sell land, and commercial forestry as the predominant land use of a parcel may become displaced by recreational development.

2. **Land uses are shifting to those that are less regulated.** The rent gap described above may be widened by regulations. The value of commercial timberland near water where new regulations restrict or prohibit economic activity may cause the value of the timber to drop. These types of locations are in high demand for recreational real estate, which widens the gap. In the Planning and Project Areas, regulation of forestry during the past decade generally has outpaced regulation for residential development. For example, while residential development is regularly permitted along streamsides, forestry equipment is generally not allowed within 50 to 100 feet. The rent gap trend is expected to continue or increase (Healy and Short 1983). Therefore, residential development is expected to continue to displace forestry as a predominant land use. Uncertainty over future regulation is accelerating economic activity. That is, when there is a prospect of unknown future regulation that might impact the ability of a landowner to gain expected economic benefit from the existing land use, there is an economic incentive to take advantage of present economic conditions under known regulations to reduce the risk of losing that economic benefit in the future. Therefore, economic activity that may impact fish habitat may accelerate as a result of proposed and enacted ESA listings of native fishes.

3. **Cultural change is producing land use shifts.** As social migration occurs in small cities and rural communities in the Planning Area and the community value base changes, social pressure creates land use changes and the potential for community conflicts. A tree harvest on public land that is desirable to the traditional citizenry because it contributes to revenue generation is undesirable to the new citizenry because it may compromise aesthetic values. The potential outcome is that public sentiment shifts to favor fewer resource industry-based land uses.

4. **Dispersed recreation is being displaced by recreational development and commercial recreation.** As the more affluent newcomers intermingle with the increasingly economically distressed traditional populace, land speculation and development escalate (Ringholz 1992). As a result, traditional forms of

recreation, such as camping on larger private holdings, would be displaced by recreational developments purchased by the affluent newcomers. This results in a loss of lands available for dispersed camping as new owners of recreational properties close land that was formerly available to the public. Dispersed recreation availability also is impacted by increasing closures of private and public forest roads to address resource concerns. Some areas are experiencing a shift from open and free hunting and fishing on state and private lands to land sealed off by private clubs or outfitting businesses as a means of revenue generation.

5. **Land ownership is becoming fragmented**. Social migration causes a change in land ownership from large parcels to fragmented ownership of smaller parcels (Healy and Short 1981). Land uses change when portions of larger ownerships primarily managed for resource use, such as forestry or agriculture, are sold in a series of smaller transactions to buyers of property for residential or recreational development. Effective land use controls are much more difficult to establish when there are multiple owners with divergent interests as compared to large single landowners. Development for new residents is encroaching on previously undeveloped areas, especially those adjacent to public lands. New development can diminish habitat for fish and wildlife and is considered one of the threats to bull trout (ICBEMP 1997a; FWS 1998a).

4.8.6 Environmental Consequences

Potential impacts on land use include actions that contribute to a reduction or elimination of existing land uses in the Project and Planning Areas. The following discussion focuses on the likelihood of such impacts occurring under the proposed NFHCP and alternatives, and measures for mitigating or avoiding potential impacts. The impact analysis focuses on the 30-year Permit period, but concludes with brief assessments of the optional Permit periods of 10 and 20 years. Where appropriate, discussions of the proposed NFHCP and action alternatives refer to discussions under Existing Regulations—No Action Alternative. Land use provisions of alternatives that have potential for affecting native salmonids are discussed in Section 4.6 of this document.

Existing Regulations—No Action Alternative

Trends and Future Conditions. Land uses in the Project and Planning Areas under the No Action Alternative are expected to remain similar to existing conditions. Trends in changing land uses are observable and rates of change are expected to continue or increase. The trends, while not shifting the predominant land uses, probably would have negative and positive impacts on fisheries resources (see Section 4.6), as well as on the local customs and cultures of rural cities. Timber production would continue to be the predominant use in the Project Area, guided by state forest practice regulations and BMPs for forestland management. Under existing regulations, land uses would continue to be subject to review by the involved jurisdiction, and would be subject to change as the regulations

evolve. Differences in regulated land uses would continue to exist among the states and local jurisdictions in the Planning Area.

Expected land use trends associated with the No Action Alternative would result in specific land use changes that may impact the fisheries resource (see Section 4.6), the economy, and the local custom and culture within the Planning Area. Existing land use laws provide some level of protection, but offer little control of broad scale changes and effects.

Plum Creek's Proposed NFHCP

Impacts. The decision to issue a Permit to Plum Creek would begin the implementation and oversight of new management commitments and programs, as identified in the NFHCP. Management decisions during the proposed 30-year Permit term would determine when and where land uses would occur on Project Area lands, according to the provisions of the NFHCP. Therefore, specific land use activities, such as timber harvesting and road building, cannot be described except in a programmatic sense. However, none of the Permit provisions would preclude any current land uses. For example, riparian area management restrictions could limit the amount of available timber for harvest, but would not preclude this land use. In another example, road closures and road abandonment under the NFHCP, which would increase compared to the No Action Alternative, would impact access to Plum Creek lands for dispersed recreation, but not preclude it.

The land use trends described in the *Affected Environment* section would occur under the NFHCP. Flexibility in land use of specific parcels would be maintained. However, the NFHCP, especially its land use planning measures, provides ownership incentives that would affect the rate and nature of the changes. The land use planning measures are described in Section 5 of the NFHCP (see Chapter 3).

Shifts in land use toward less regulated uses would be moderated in the Planning and Project Areas because of incentives in the NFHCP to conduct land transactions that have a conservation outcome. The conservation outcome would be assured either because of the mission of the land buyer, such as the U.S. government, or because of restrictions placed on future land use by Plum Creek prior to sale or by private buyers after the sale. These measures may preclude the need for additional government regulation.

Acceleration of economic activity resulting from regulatory uncertainty would be moderated under the NFHCP because of the increased regulatory certainty provided to Plum Creek through the NFHCP and Permit. The habitat conservation planning provisions of the NFHCP remove the incentive to Plum Creek to sell lands for other uses because of uncertainty associated with the ESA.

While land use changes in the Planning and Project Areas would be similar to the No Action Alternative, NFHCP land use planning measures would influence the mix of conservation outcomes among ownerships. The primary mechanism is through NFHCP commitment L9, *Proportionality Balance*. This commitment ensures that the overall conservation benefits to covered species would persist throughout the Permit period, regardless of the disposition or acquisition of specific properties by Plum Creek within the Planning Area. The predictable conservation outcome would be accomplished by balancing the areas of land receiving

various levels of conservation-oriented constraints, within a specified range. This would be done through land sales to the public or conservation buyers, land exchanges, relinquishment of development rights, or an obligation of Plum Creek to place deed restrictions on certain lands if they are sold.

To the extent that positive conservation outcomes would be assured for a known proportion of the affected lands, cultural or societal conflicts could be reduced compared to the No Action Alternative. Since the NFHCP provides Plum Creek incentives to continue commercial forestry as the dominant land use, which precludes developed recreation, impacts to dispersed recreation would be less. Similarly, the NFHCP would influence the transfer of land ownership from private to public, so the impact on public recreational use would be less.

The trend of increasing fragmentation of ownership patterns would be moderated because the NFHCP provides an incentive for conservation-oriented exchanges with neighboring landowners rather than for unrestricted sales to a variety of new landowners. Also, an incentive is provided to Plum Creek to retain its ownership and maintain the predominant commercial forestry land use, rather than to sell land with unrestricted development rights to unspecified buyers.

Plum Creek developed Land Use Planning Principles in 1995 to guide land transaction activity and other land use planning. The principles were used by Plum Creek as the basis for the NFHCP land use commitments. Therefore, land transaction activity since 1995 is an indicator of how NFHCP commitments might influence current and future trends in land use in the Planning Area. Plum Creek has sold approximately 19,150 acres of HBU land in the Planning Area since 1996 (Plum Creek 1998g). Of this total, 73 percent has been transferred to public ownership, 13 percent to conservation buyers, 10 percent to developers, and 5 percent to adjacent landowners.

Optional 10- and 20-Year Permit Lengths. The proposed NFHCP would effectively minimize impacts on land uses on certain parcels beyond the Permit period. However, shorter Permit periods mean that the commitments would apply to fewer parcels and land transactions.

Mitigation. While the land use planning commitments of the NFHCP were specifically designed to minimize the impacts on fish habitat, they also serve to minimize and mitigate potential land use trends that may otherwise occur under the No Action Alternative. These commitments are described in Section 5 of the NFHCP. They are intended to provide an incentive system for propagating or preserving conservation on lands that are the subject of land transactions.

Unavoidable Adverse Impacts. The trends in land use discussed under the No Action Alternative represent unavoidable adverse impacts on fish habitat, local customs and cultures, and economics associated with changes in land use. The NFHCP would reduce the adverse impacts compared to the No Action Alternative.

Cumulative Impacts. There would be no adverse cumulative impacts on land uses in the Project or Planning Areas. Anticipated net conservation benefits in the Project Area from implementing land use planning commitments would benefit Planning Area conditions as well.

Internal Bull Trout Conservation Plan Alternative

Impacts. Overall effects on land uses under the Internal Bull Trout Conservation Plan would probably be intermediate to those described for the No Action Alternative and the proposed NFHCP. No existing land uses would be precluded under this alternative. For example, management restrictions aimed to avoid take of listed fish would restrict the levels of certain uses, such as timber harvest, but not preclude the land uses from occurring. The Internal Bull Trout Conservation Plan would contain existing regulations for land use planning as well as Plum Creek's Environmental and Land Use Principles. Conservation land sales and land exchanges with net conservation benefits for native salmonids probably would continue but would be fewer than under the NFHCP. This alternative would lack an incentive system for encouraging conservation sales.

Land uses under the Internal Bull Trout Conservation Plan would undergo similar trends in land use as described for the No Action Alternative. The trends would be moderated by Plum Creek's Environmental and Land Use Principles. The lack of programs for persistence of conservation measures over a known proportion of the Planning Area (proportionality balance) and land use conservation areas with transferable standards could result in a reduction in overall land sales to conservation buyers compared to the proposed NFHCP. Therefore, impacts on land use would be intermediate between the No Action Alternative and the NFHCP.

Optional 10- and 20-Year Permit Lengths. Similar to, but less rigorous than, the proposed NFHCP, Plum Creek would conduct its land transaction program to minimize impacts on native fish habitat. Therefore, land uses that are more consistent with native fish conservation would be selected for a longer time and have greater potential environmental benefits under a 30-year conservation Permit. If a 10- or 20-year Permit option is selected, comparable conservation-based land transactions that provide a net benefit of conservation certainty beyond the shorter Permit terms could not be guaranteed.

Simplified Prescriptions Alternative

Impacts. The Simplified Prescriptions Alternative would result in a significant shift in land uses at the local level within the Project Area. Road abandonment, restrictions, and closures, combined with a reduction in new road construction, would limit most public opportunities for dispersed roaded recreation and viewing scenery, probably limiting public travel to about 10 percent of the road system. Riparian area management restrictions would result in greater restrictions on the amount of available timber harvest and operational flexibility, but would not preclude this land use from occurring. The Simplified Prescriptions Alternative would eliminate controlled grazing from most or all forested rangelands in the Project Area; however, some grazing would continue under the open range law. The change would affect over 100 individual leases and over 670,000 acres in Idaho and Montana, and a relatively small amount of land in Washington. This land use change would adversely affect ranchers and lessees who are locally dependent on Project Area rangeland.

The lack of Land Use Principles and specific land use planning commitments

designed to influence fish conservation could result in a reduction in overall land sales to conservation buyers or an imbalance in long-term conservation compared to the other action alternatives. As a result, uncertainty regarding future land uses and their potentially adverse effects on salmonids would be greater. Land uses under the Simplified Prescriptions Alternative would be subjected to similar trends of change as described under the No Action Alternative. Some of these trends would be moderated by the Simplified Prescriptions Alternative while others would be exacerbated. Land use impacts in the Project Area would be expected to increase under the Simplified Prescriptions Alternative because of the effects of conservation commitments on certain land uses, primarily recreation, grazing, and to a lesser extent timber harvest.

The Simplified Prescription Alternative contains a simple 5 percent cap on land sales that could be conducted without a Permit amendment. Similar to the NFHCP's land use planning commitments, the cap is intended to limit changes in ownership that increase conservation uncertainty for covered species. The cap would also serve to mitigate for land use changes that may occur outside of the scope of this proposed action.

Relative market values for various land uses would continue to change. The value of recreational development property would continue to increase relative to commercial forestland. Land sales and land use changes would be encouraged by these shifting market values. However, these land sales would be limited to some extent by the sales cap if Plum Creek avoids seeking a Permit amendment. Since the simple cap does not specify location restrictions or provide incentives for maintaining a balance in overall conservation, Plum Creek would tend to conduct land sales in areas with the highest real estate value, irrespective of their fish habitat values.

The Simplified Prescriptions Alternative impact the economic use of commercial timberland in the Project Area more than any of the other alternatives. Therefore, land uses based on resource extraction would continue to shift to areas that are least regulated. The amenity increment for shifting land uses, such as to developed recreation, would be the greatest under this alternative. As a result, the likelihood that amenity increments would determine the nature of land use changes is greater under this alternative than with any of the other alternatives.

Optional 10- and 20-Year Permit Lengths. Under this alternative, the simple cap on land sales would be in effect for the length of the Permit period. To the extent that this cap provides a net conservation benefit by moderating trends in land sales and land use uncertainty, this benefit would decrease under a shorter Permit period. Since the cap is a form of mitigation designed to simply limit land use changes rather than to influence them in a positive way, the benefit that may be gained by slowing changes in land use could be negated by an increased demand for more valuable real estate properties at the end of the Permit period. This potential negative effect is most likely under the shortest (10–year) Permit length, but may apply to longer Permit lengths as well.

4.9 Recreation Resources

4.9.1 Introduction

This section addresses the potential for impacting recreation resources by implementing management regimes associated with the proposed NFHCP, other action alternatives, and No Action Alternative. The analysis focuses on potential impacts on recreation resources in the Project and Planning Areas.

4.9.2 Issues Eliminated from Further Analysis

One recreation resource issue raised during public scoping was outside the scope of this EIS and was eliminated by FWS and NMFS (1998) in the Scoping Report from further analysis. The public suggested that Plum Creek either be released from the potential liability of sportsman damage or be given recreational revenues.

4.9.3 Issues Addressed in the Impact Analysis

Recreation resource issues identified during public scoping and listed in the Scoping Report (FWS and NMFS 1998) are addressed in the impact analysis. Principal themes in these issues include the following:

- Road closures on public and private lands should not block access to traditional recreation resource areas and uses.
- Saving bull trout will result in road closures and limit recreationist's access.

How is Recreation Affected by the Proposed NFHCP?

Many Plum Creek lands within the Planning Area border large tracts of federal land. In some cases, because of the checkerboard nature of property ownership, Plum Creek land is actually integrated with recreation areas in federal land. Plum Creek allows dispersed public recreation on their lands but limits that activity in a few ways, such as through road restrictions and camping limits. Under the proposed NFHCP, public access to Plum Creek lands would be somewhat more restricted because of selected road closures to protect bull trout from poaching. However, recreation conditions may improve because of some of the habitat protection measures contained in the proposed NFHCP. Recreation benefits in the Project Area would generally be greater over the proposed 30-year Permit period than the optional 10- or 20-year periods except under the Simplified Prescriptions Alternative, where opportunities would decline regardless of Permit length.

- Recreationists have little impact on logging roads.
- Access to huge areas without the use of roads is not possible without time and horses.

This analysis focuses briefly on the kinds of recreation presently occurring in the Project and Planning Areas and the potential for impacting recreation resources or opportunities by implementing the proposed NFHCP or any of the alternatives.

4.9.4 Description of Area of Influence

The area of influence, shown on Map 1.3-1 in Chapter 1, includes Project

Area and Planning Area lands in western Montana, northern Idaho, and Washington. At a broad scale, the area of influence reflects the degree of public access to Project and Planning Area lands, and thus the potential for continued recreation opportunities anticipated under various management regimes. At a finer scale, immediate areas of influence include types of locations and potential recreation sites within the Project Area where management regimes associated with the proposed NFHCP and alternatives would be implemented. Such areas include riparian habitat and roads on Plum Creek lands.

4.9.5 Affected Environment

This section summarizes recreation resources and opportunities in the Project and Planning Areas. The summary is based, in part, on presentations contained in the ICBEMP documents (Quigley and Arbelbide 1997; ICBEMP 1997a). The ICRB includes most of the Project and Planning Areas for this EIS/NFHCP.

Recreation is an important use of public and private lands in the ICRB, providing value at local, regional, national, and even international levels (ICBEMP 1997a). Recreation is often tied to roads and accessible water bodies. The presence of water, fish, and wildlife are the main attractions drawing visitors to recreation settings. Outdoor recreation opportunities in the ICRB are substantially greater than the national average because of the abundance of federally administered lands. The rate at which ICRB residents participate in outdoor recreation is also higher than the national average (Quigley and Arbelbide 1997).

Numerous recreation activities occur in the Planning Area. They include trail use (hiking and horseback riding), camping, hunting, fishing, wildlife viewing, day use (family outings, picnicking, rock climbing, and gathering berries and firewood), motor boating, non-motor boating, motor viewing (sightseeing), off-road vehicle use, winter sports (downhill and cross-country skiing, snowshoeing), and snowmobiling (Quigley and Arbelbide 1997). Day use and motor viewing comprise nearly half of the recreation activity days in the ICRB, followed by camping, fishing, trail use, and hunting. Roaded natural settings receive about 75 percent of all activity days in the ICRB, although trail use is expected to be one of the fastest growing recreation activities (ICBEMP 1997a). Predominant recreation activities in those portions of the ICRB that contain Project and Planning Area lands are day use, motor viewing, camping, hunting, and fishing. The relative popularity and ranking of these five activities varies within the Planning Area depending on specific geographic setting. Recreation and tourism are important to all local economies, especially to Montana's Flathead and Lewis and Clark Counties in the Planning Area (ICBEMP 1997a).

Plum Creek's Project Area lands represent an integral part of the recreation resource base and opportunities available to the public within the Planning Area. Many Plum Creek lands border large tracts of federal forest and rangeland or are blended with federal lands because of the checker-board nature of land ownership. As such, some federal recreation sites (for example, campgrounds) are located near lands managed by Plum Creek, and some of the roads and hiking trails used by recreationists on federal lands also cross Plum Creek lands. Plum Creek currently allows dispersed public recreation activities using trails and roads on their lands that may continue across their lands.

However, Plum Creek limits that public privilege by permanently or seasonally closing roads to motorized public access to protect wildlife, reduce risk of erosion from rutted roads, reduce fire risk during the fire season, and protect the company's investment in roads.

Access to private lands is important to hunters and anglers in the Planning Area. Under state laws, the public is entitled to use rivers and streams for recreational purposes up to the ordinary high-water mark, regardless of streambed ownership. However, the laws do not allow the public to enter posted lands bordering those streams or to cross posted private lands to gain access to streams. The MDFWP (1999) created the Private Land/Public Wildlife (PL/PW) Advisory Council in 1995 to work on issues related to landowner/sportsmen/outfitter relations and concerns. The PL/PW Council created the Enhanced Block Management Program to maintain public access to private lands by using funds from guaranteed variable priced licenses. This program has increased the amount of private land that is under block management and accessible to the public, but at the same time, additional acres of private land have been leased by outfitters and potentially lost to use by the general public.

Plum Creek allows the public to hunt and fish on their lands. They also issue special forest use permits to commercial outfitters for use of Plum Creek lands and special recreation permits for club activities on Plum Creek lands. There is unrestricted access to about 30 to 40 percent of Plum Creek's roads. The remainder have restricted access, are closed, or have been abandoned.

4.9.6 Environmental Consequences

Potential impacts on recreation resources include substantive changes in the types of recreation resources or activities available to the public and in the public's ability to gain access to those portions of public and private lands where recreation activities typically occur. The following discussion focuses on the likelihood of such impacts occurring under the proposed NFHCP and other action alternatives and on measures for mitigating or avoiding potential impacts. The impact analysis focuses on the 30-year Permit period, but concludes with brief assessments of the optional Permit periods of 10 and 20 years. Where appropriate, discussions of the proposed NFHCP and action alternatives refer to discussions under Existing Regulations—No Action Alternative, which examine projected trends and future conditions.

Existing Regulations—No Action Alternative

Future recreation resources, activities, and public access on Project Area (Plum Creek) lands would be similar to existing conditions, but not identical since the No Action Alternative is not a static condition. Under this alternative, new roads would be constructed, old roads would be maintained, and surplus roads would not be abandoned. There would continue to be some seasonal or permanent road closures that are used to protect wildlife, reduce risk of erosion from rutted roads, and reduce fire risk during the fire season. Road management practices would continue to provide the public access to many of Plum Creek's lands to pursue recreation activities they presently pursue. To some recreationists, the quality of the recreation experience on Plum Creek lands

may be lessened somewhat by the number of roads and the number and types of users potentially using these roads. Also, recreationists would have expectations that Plum Creek lands would continue to be managed as commercial timberlands characterized as naturally-appearing forestlands with moderately high to very high scenic integrity (Quigley and Arbelbide 1997) (see Section 4.10, *Visual and Aesthetic Resources*). To other recreationists, the value of the recreation experience lies more in the opportunity to access large areas of Plum Creek lands for day use, sightseeing, family outings, picnicking, wildlife viewing, hunting, camping, fishing, and a variety of other recreation activities. Continued access to private lands, like Plum Creek's, may become even more valuable if access to public lands declines because of road closures and abandonments.

Private lands, such as the Project Area, are generally not subject to specific plans and agreements, such as the Northwest Forest Plan, that prescribe the management of, and access to, recreation resources on public lands. However, private landowners such as Plum Creek allow the public to use their lands so long as this privilege is not abused. Plum Creek issues special forest use and recreation permits for activities on their lands, which is one of several of the covered activities described in Chapter 2 that Plum Creek would continue to implement. Private landowners also cooperate with the federal land management agencies in their application of resource management policies on adjacent federal lands. In addition, private landowners cooperate with state fish and wildlife agencies by supporting enforcement, poaching control, and the regulation of guides and outfitters stipulated by existing regulations.

Recreation resources, opportunities, and levels of use in the Planning Area would be expected to be the same under the No Action Alternative as under existing conditions (which is not to say they would be at constant levels). Covered activities associated with this alternative would only occur on Plum Creek land. They would not cause a change in the types of recreation activities available to the public in the Planning Area or the public's ability to access those portions of the Planning Area where recreation activities typically occur.

Plum Creek's Proposed NFHCP

There would be no adverse, unavoidable, or cumulative impacts on recreation resources in the Project or Planning Areas for many of the same reasons that were discussed under the No Action Alternative. Public access to Plum Creek lands would be somewhat restricted compared to existing regulations because of selected road abandonment intended to reduce aquatic impacts and closures intended to reduce bull trout mortality from illegal fishing. These road closures may reduce public access to portions of Plum Creek lands used for various recreation activities. In addition, public vehicle use would be restricted, where practical, on any new roads constructed during the Permit period.

A tradeoff of this reduced road use may be the implementation of NFHCP prescriptions described in Chapter 3 associated with Plum Creek's Environmental and Land Use Principles, riparian management, range management, land use planning, and legacy and restoration management. These prescriptions would contribute to the overall improvement and protection of Project Area conditions, particularly of riparian and streamside habitat.

This kind of habitat is enjoyed by many recreationists, is the site of numerous recreation activities (for example, picnicking, camping, fishing, wildlife viewing, and birdwatching), and would be more abundant and of higher quality than under the No Action Alternative. Prescriptions for road upgrades and maintenance may shift recreation use and activity within the Project Area over time.

Overall, Project Area recreation opportunities and use by the public may be slightly greater under the proposed NFHCP than existing regulations, even with selected road abandonment and closures. The proposed NFHCP would not directly or indirectly affect recreation resources, opportunities, or use levels on public or private lands elsewhere in the Planning Area.

Optional 10- and 20-Year Permit Lengths. Although the proposed NFHCP would implement road closures, the improved habitat expected to result from the prescriptions may provide increased recreational opportunities. As described in the *Environmental Consequences* sections of the major physical environment resources (such as Sections 4.2, *Geology and Soils*; 4.5, *Vegetation Resources*; and 4.6, *Fisheries and Aquatic Resources*), the management prescriptions generally produce greater long-term environmental benefits if the Permit is issued for a longer period. Therefore, it is expected that a 30-year Permit would also improve recreational opportunities better than a 10- or 20-year Permit.

Internal Bull Trout Conservation Plan Alternative

There would be no adverse, unavoidable, or cumulative impacts on recreation resources in the Project or Planning Areas under this action alternative. Effects on recreation resources would probably be intermediate to those described for the No Action Alternative and the proposed NFHCP. The Internal Bull Trout Conservation Plan would contain existing regulations and several of the prescriptions described for the proposed NFHCP, including Environmental Principles and generally similar road construction, upgrade, and abandonment policies; opportunistic road closures based on bull trout conservation; opportunistic riparian restoration; and beneficial range and riparian management strategies. The distribution of effects would vary since this alternative focuses on bull trout conditions with less emphasis on other Permit species and environmental concerns such as water quality. Compared to the No Action Alternative, recreation opportunities and use by the public under the Internal Bull Trout Conservation Plan may be slightly greater in the Project Area, but the same in the Planning Area.

Optional 10- and 20-Year Permit Lengths. Effects of this alternative would be intermediate to the No Action Alternative and the proposed NFHCP. For the same reasons as given for the proposed NFHCP, a 30-year Permit period is expected to result in better long-term recreational opportunities than a 10- or 20-year Permit.

Simplified Prescriptions Alternative

This alternative would reduce the amount of motorized forest recreation in the Project Area. In some parts of the Project Area, particularly in the Flathead National Forest, motorized access to FS lands has been significantly reduced, largely in response to grizzly bear management. In

much of the area, motorized forest recreation is considered one of the primary forms of outdoor recreation. Given the extensive amount of FS road closures, the additional closures under this alternative, while not large in the context of the whole Planning Area, represent a cumulative effect on a popular form of recreation. The public would be limited to primary roads in the Project Area, which comprise only about 10 percent of Plum Creek's road system, and only about half as many miles of new roads would be constructed. Roads would also be abandoned at a greater rate under this alternative. Because of these road management policies, the use of recreation resources on public lands adjacent to the Project Area may increase under the Simplified Prescriptions Alternative.

Optional 10- and 20-Year Permit Lengths. Fewer recreational opportunities would be available in the Project Area under this alternative than the proposed NFHCP or the Bull Trout Internal Conservation Plan. This trend of reduced use would be expected for the duration of the Permit period, regardless of whether it is a 10-, 20-, or 30-year Permit.

4.10 Visual and Aesthetic Resources

4.10.1 Introduction

This section addresses the potential for impacting visual and aesthetic resources (hereafter referred to as visual resources) as a result of implementing management regimes associated with the proposed NFHCP, other action alternatives, and No Action Alternative. The analysis focuses on potential impacts on visual resources in the Project and Planning Areas.

Which Alternative Improves Visual Resources the Most?

Each of the alternatives is expected to improve visual resources over time, largely because today's forestry techniques and regulations tend to reduce the visual impact of timber harvest. The proposed NFHCP includes commitments from Plum Creek to manage for aesthetic values near communities and travel corridors, as well as harvesting fewer trees in riparian areas. The Simplified Prescriptions Alternative preserves visual resources through wider riparian buffers, but does not contain the aesthetic commitments of the proposed NFHCP and may reduce access to scenery because it has more road closures. Visual resource benefits would generally be greater over a 30-year Permit period than over the optional Permit lengths of 10 or 20 years.

4.10.2 Issues Eliminated from Further Analysis

Visual resources issues identified during public scoping were analyzed. None were eliminated from analysis.

4.10.3 Issues Addressed in the Impact Analysis

Only two issues related to visual resources were identified during public scoping. They are listed in the Scoping Report (FWS and NMFS 1998) and are briefly noted here. They include acknowledging these issues:

1. The adverse effect wildfire can have on the visual quality of the landscape

2. Today's forestry techniques, economics, and streamside management regulations result in a

different-appearing landscape than when clearcutting occurred

Beyond these two comments from the public, the following analysis focuses specifically on whether prescriptions associated with the proposed NFHCP and alternatives would adversely affect or benefit visual resources in the Project and Planning Areas.

4.10.4 Description of Area of Influence

The area of influence covers viewsheds in western Montana, northern Idaho, and Washington. It includes the Project Area (Plum Creek lands) and Planning Area (Plum Creek and adjacent lands) (see Map 1.3-1 in Chapter 1). Immediate areas of influence within the Project Area include types of locations where prescriptions associated with the proposed NFHCP and alternatives would be implemented. These primarily consist of riparian habitat, lands adjacent to stream channels, and roads on Plum Creek lands.

4.10.5 Affected Environment

This section summarizes visual resources in the Project and Planning Areas. The summary is based on presentations contained in the ICBEMP documents (Quigley and Arbelbide 1997; ICBEMP 1997a), whose Project Area includes most of the Project and Planning Areas for this EIS/NFHCP.

Viewing scenery is important to an area's residents and visitors, and contributes to a region's quality of life and economics through recreation and tourism. Approximately 21 percent of the nation's population participates in viewing scenery, giving it the highest participatory rate of any recreational activity in the United States. People also choose where to conduct other recreational activities (for example, hiking, camping, hunting, and fishing) based, in part, on an area's scenic and aesthetic qualities. In the ICBEMP area, the demand for naturally-appearing, scenic landscapes is expected to exceed the demand for modified landscapes in the future (ICBEMP 1997a; Quigley and Arbelbide 1997).

Landscape themes and scenic integrity were used to characterize the type and general quality of scenery in the ICBEMP area (Quigley and Arbelbide 1997). Five landscape themes reflecting landscape character (natural attributes) and scenic condition (human or cultural attributes) were used to describe scenery type:

- Naturally-evolving forestlands and shrub/grasslands—Human intervention is minimal or nonexistent.
- Naturally-appearing forestlands—Human intervention may be evident or may have occurred but does not dominate the natural landscape.
- Naturally-appearing shrub/grasslands—Same as above for forestlands.
- Agricultural lands
- Developed areas

When all land ownerships are considered, naturally-appearing forestlands comprise 37 percent of the total ICBEMP area. Naturally-evolving forestlands and shrub/grasslands account for 5 percent of the total ICBEMP area (Quigley and Arbelbide 1997; ICBEMP 1997a).

Six levels of scenic integrity characterize the general quality of scenery in the

ICBEMP area (Quigley and Arbelbide 1997; ICBEMP 1997a):

- Very high—Landscape is visually intact with only minor deviations, if any.
- High—Landscape appears intact; scenic deviations caused by human activities may be present, but they repeat the form, line, color, texture, and pattern common to the landscape so as not to be evident.
- Moderately high—Landscape appears slightly fragmented but deviations remain subordinate to the valued landscape character, which includes those scenic components expected or preferred by viewers of a particular setting.
- Moderately low
- Low
- Not classified—Associated with the agricultural and developed landscape themes.

The scenic integrity levels of very high, high, and moderately high comprised 21, 21, and 31 percent, respectively, of the entire ICBEMP area when all land ownerships were considered. Galliano and Loeffler (1995, in ICBEMP 1997b) noted that landscapes with many roads and other types of development may not be considered to have high scenic integrity, but may be considered to have high scenic quality depending on the visual setting.

Study findings from 394 ecological subsections in the ICBEMP area were used to characterize visual resources in the Project and Planning Areas of this EIS/NFHCP. The predominant landscape themes in both areas are naturally-appearing forestlands followed by naturally-evolving forestlands. The predominant scenic integrity levels are very high, high, and moderately high, the same as for the entire ICBEMP area. ICBEMP study findings reflect the relatively high degree of scenic integrity on Project and Planning Area forestlands in Montana, Idaho, and Washington.

4.10.6 Environmental Consequences

Potential impacts on visual resources include an overall change in predominant landscape themes or scenic integrity levels in the Project and Planning Areas. The following discussion focuses on the likelihood of such impacts occurring under the proposed NFHCP and other alternatives and on measures for mitigating or avoiding potential impacts. The impact analysis focuses on the 30-year Permit period, but concludes with brief assessments of the optional Permit periods of 10 and 20 years. Because of similar assessment outcomes, discussions of the proposed NFHCP and action alternatives refer to discussions under the No Action Alternative.

Existing Regulations—No Action Alternative

Current predominant landscape themes and the degree of scenic integrity on forestlands in the Project and Planning Areas reflect decades of past land management practices. However, forest practices have changed rapidly over the past 25 years and any existing adverse visual effects would become less apparent over time. Under the No Action Alternative, evidence of past forest practices would diminish as forests mature, linear patterns of harvest units and

roads become less evident, and past disturbances begin to blend into a more naturally-appearing environment. Harvesting activities associated with the No Action Alternative would result in some visual degradation of immediately affected lands within the Project Area. However, future forest harvests would not include large rectilinear cuts, thereby improving scenic quality and integrity of forestlands. Also, many projects are aimed to improve forest health, reduce unnatural overcrowding resulting from fire suppression, and reduce wildfire hazards. Under the State of Washington's Forest Practices Act, for example, timber harvest must occur in smaller, geographically dispersed units than in the past (Raedeke Associates, Inc., 1995). In addition, state and local regulations limit development of HBU lands and promote the retention of naturally-occurring characteristics. As a result, visual resources in the Project Area would be expected to be of the same or slightly higher quality than at present. Naturally-appearing forestlands would continue to predominate the landscape, providing recreationists and those passing through the area views of high scenic quality. Scenic integrity would continue to range from high to moderately high.

Potential impacts on visual resources would be avoided or minimized by complying with those state regulations, BMPs, and local ordinances that guide management planning, restoration of disturbed areas, intensity of harvest, and silviculture for forest health, particularly in visually sensitive riparian areas within stream and river corridors.

Activities associated with the No Action Alternative would only occur on Plum Creek land and would not result in an overall change in landscape theme or a decline in scenic integrity on Project Area or Planning Area lands. Other landowners and land managers in the Planning Area must comply with the same or additional regulations as Plum Creek, which are designed to minimize or mitigate the potential for impacting visual resources. As a result, predominant landscape themes and levels of scenic integrity on forestlands in the Planning Area would be the same as under existing conditions.

Plum Creek's Proposed NFHCP

There would be no adverse, unavoidable, or cumulative impacts on visual resources in the Project or Planning Areas under the proposed NFHCP and associated covered activities for the same reasons that were discussed under the No Action Alternative. Existing state and local regulations and BMPs would apply to the proposed NFHCP. In addition, prescriptions associated with the NFHCP may contribute to a slight increase in scenic integrity within the Project Area while maintaining a predominant landscape theme of naturally-appearing forestlands. Plum Creek's commitment to visual quality under their internal Environmental Principles would be implemented under the proposed NFHCP. The visual quality Environmental Principle recognizes and manages for aesthetic values near communities and major travel corridors by using appropriate design standards, harvest methods, and tree retention. Other prescriptions associated with the proposed NFHCP would benefit visual resources in various ways. Fewer trees would be harvested in riparian corridors, which would protect and enhance the scenic quality of riparian areas to a greater degree than under the No Action Alternative. Examples of other NFHCP prescriptions described in Chapter 3 that would benefit visual resources in the Project Area include

systematically retiring a number of Project Area roads no longer in use, Land Use Conservation Area commitments that include restrictions on land development activities that may impact aquatic areas, and visual screens and enhancements.

Optional 10- and 20-Year Permit Lengths. Management prescriptions contained in the proposed NFHCP designed to improve habitat conditions for native salmonids may also improve visual resources. As described in the *Environmental Consequences* sections of the major physical environment resources (such as Sections 4.2, *Geology and Soils*; 4.5, *Vegetation Resources*; and 4.6, *Fisheries and Aquatic Resources*), the management prescriptions generally produce greater long-term environmental benefits if the Permit is issued for a longer period. Therefore, it is expected that a 30-year Permit would also benefit visual resources better than a 10- or 20-year Permit.

Internal Bull Trout Conservation Plan Alternative

There would be no adverse, unavoidable, or cumulative impacts on visual resources in the Project or Planning Areas under this alternative for the same reasons that were discussed under the No Action Alternative. Effects of this action alternative on visual resources would be generally similar to those effects described for the proposed NFHCP. Effects on visual resources would reflect implementation of existing regulations plus Plum Creek's Environmental Principles, but not the additional benefits from other prescriptions that would be implemented under the proposed NFHCP. Predominant landscape themes and levels of scenic integrity under this action alternative would be the same as under existing conditions.

Optional 10- and 20-Year Permit Lengths. For the same reasons as given for the proposed NFHCP, a 30-year Permit period is expected to result in better long-term visual resources than a 10- or 20-year Permit.

Simplified Prescriptions Alternative

There would be no adverse, unavoidable, or cumulative impacts on visual resources in the Project or Planning Areas under this alternative for the same reasons that were discussed under the No Action Alternative. Overall effects on visual resources would probably be similar to those described for the proposed NFHCP, but for slightly different reasons. There would be wider riparian buffers, less road construction and more road abandonment, and much less grazing under this alternative than the proposed NFHCP, but Plum Creek's internal Environmental Principles and other commitments associated with the NFHCP would not be implemented. There would also be less active management for forest health around riparian areas under the Simplified Prescriptions Alternative, resulting in higher fire hazards, fewer fire breaks, and less certainty for desirable scenic outcomes than under the NFHCP. In addition, there would be a reduced opportunity for viewing scenery because of reduced public access under this action alternative. Scenic integrity in the Project Area under the Simplified Prescriptions Alternative may be slightly greater than under the No Acton Alternative, with naturally-appearing forestlands continuing as the predominant landscape.

Optional 10- and 20-Year Permit Lengths. For the same reasons as given for the proposed NFHCP, a 30-year Permit period is expected to result in better long-term visual resources than a 10- or 20-year Permit.

4.11 Cultural Resources

4.11.1 Introduction

This analysis addresses the likelihood of potentially impacting cultural resources as a result of implementing management regimes associated with the proposed NFHCP, other action alternatives, and No Action Alternative. The analysis focuses on potential impacts on cultural resources in the Project and Planning Areas.

4.11.2 Issues Eliminated from Further Analysis

All cultural resources issues identified during public scoping were analyzed. None were eliminated from analysis.

4.11.3 Issues Addressed in the Impact Analysis

Cultural resources issues identified during public scoping and listed in the Scoping Report (FWS and NMFS 1998) are addressed in the impact analysis. The primary theme in the issues is that the NFHCP should not interfere with the protection and maintenance of Native American Treaty Rights, tribal resources, traditional fishing rights, and religious practices. The cultural resources analysis focuses on the likelihood of an impact occurring, rather than on what specific impacts may occur.

4.11.4 Description of Area of Influence

The area of influence covers western Montana, northern Idaho, and Washington. It includes the Project Area (Plum Creek lands) and Planning Area (Plum Creek and adjacent lands) (see Map 1.3-1 in Chapter 1). Immediate areas of influence within the Project Area include types of locations where prescriptions associated with the proposed NFHCP and alternatives would be implemented. Lands within the Planning Area, but outside the Project Area, that are of special interest include Native American reservation lands, ceded lands, traditional tribal areas of interest, and Traditional Cultural Properties.

What is the Likelihood of Impacting Cultural Resources?

The alternatives and the proposed NFHCP all help protect cultural resources through compliance with existing regulations. River and stream riparian corridors were among the most popular areas used by prehistoric and historic cultures, and are most likely to have cultural resource values. To the extent that these resources are located in areas that receive incremental protection under the alternatives, there would be different levels of effect. For example, the action alternatives and the proposed NFHCP offer better protection of cultural resources than the No Action Alternative because of slightly less activity and disturbance in riparian areas. The likelihood of encountering or impacting cultural resources would be lowest with the Simplified Prescriptions Alternative because of the wider riparian buffers and least amount of activity. The likelihood of encountering cultural resource sites would be the same regardless of whether a 10-, 20-, or 30-year Permit is selected.

4.11.5 Affected Environment

This section provides a broad overview of prehistoric and historic cultural resources of the Project Area and ethnographic information on Native American tribes in the Planning Area. The following discussion is based in part on cultural resources presentations contained in the ICBEMP documents (ICBEMP 1997a; Quigley and Arbelbide 1997), whose Project Area includes most of the Project and Planning Areas for this EIS/NFHCP. The ICBEMP documents note that to Native Americans, sacred cultural resources consist of their entire heritage of beliefs, traditions, customs, and spiritual relationships to the earth and natural resources. This section also includes a summary of cultural resource sites known to occur in the Project Area based on consultation with the State Historic Preservation Offices (SHPOs) in Montana, Idaho, and Washington.

The first human inhabitants of the area appeared more than 12,000 years ago. They were nomadic, following big game herds, and maintaining settlements in riverine, lake, and wetland environments (ICBEMP 1997a). Prehistoric resources associated with these early inhabitants include campsites, villages, graves, quarries, pictographs, trails, rock shelters, and religious sites (Raedeke Associates, Inc., 1995). Upland and mountain environments apparently received greater use over the past 4,000 years because of more moderate climatic conditions (Quigley and Arbelbide 1997). Culturally significant resources to these early inhabitants included hundreds of plant and animal species, minerals, landscapes, and natural processes that were used for subsistence and social values, in religious and traditional ceremonies, and in commerce. Access to major rivers that provided trout, salmon, steelhead, sturgeon, lampreys, and suckers was critical to many of these cultures. Subsequently, tribes kept large herds of horses that had been introduced by Euroamericans in the 1700s and early 1800s (ICBEMP 1997a).

The Lewis and Clark Expedition in 1804 and 1805 marked the earliest Euroamerican contact with native cultures in the area. This was soon followed by further Euroamerican exploration, fur trade, military posts, missionary work, and settlement (ICBEMP 1997a). The U.S. government encouraged settlement of the West by granting citizens, railroad companies, and mining and timber interests free land in exchange for meeting development requirements. Commercial development of the area was closely tied to the evolution of transportation from walking, to horses, to locomotives. Many of the pioneers remained in the area with the discovery of gold in the 1860s rather than migrate farther west (Quigley and Arbelbide 1997).

The effects of Euroamericans on Native Americans included disease, population shifts, cultural changes, new trade systems and goods, new religious practices, and competition for resources, lands, and traditional places (Quigley and Arbelbide 1997). This conflict and competition resulted in a treaty-making period between Indian tribes and the U.S. government that ended in 1871. The treaties provided tribes exclusive title to reservation lands and established federal government trust responsibilities to the tribes for traditional land uses such as hunting, fishing, gathering, and livestock grazing. Tribal ways of life and uses of the land began to change during the late 1800s and early 1900s with the creation of new federal

agencies and land management policies (ICBEMP 1997a).

A number of American Indian Tribes have reservations, ceded lands, ancestral ties, or areas of interest within the Planning Area. Areas of interest do not necessarily include reservation or ceded lands, but they do reflect a tribe's native territory, subsistence range, traditional and historical use area, usual and accustomed areas, or zone of influence (Quigley and Arbelbide 1997). The main tribes in the Planning Area include the Salish-Kootenai and Blackfeet Tribes in Montana; the Nez Perce, Lochsa, St. Joe, and Coeur d'Alene Tribes in Idaho; the Confederated Tribes and Bands of the Yakama Indian Nation in central Washington; and the Cowlitz and Chinook Tribes in western Washington. Other tribes whose areas of interest occur within the Planning Area boundaries include the Confederated Tribes of the Umatilla Indian Reservation (southern Washington), the Kalispel Tribe of Indians (northwestern Montana), and the Kootenai Tribe of Idaho (northwestern Montana) (ICBEMP 1997a).

Numbers and kinds of cultural resource sites known to occur on Project Area lands in Montana, Idaho, and Washington were identified by contacting the Montana SHPO in Helena, the Idaho SHPO in Boise, and the Washington State Office of Archaeology and Historic Preservation in Lacey, Washington. Information from Idaho and Washington identifies cultural resource sites specifically occurring on Plum Creek lands. Information from Montana identifies cultural resource sites known to occur on sections of land where Plum Creek has ownership. However, because many of these sections have multiple landowners, the cultural resource site may not occur specifically on Plum Creek land.

In Montana, Plum Creek owns land in 3,146 sections within the Project Area. A total of 953 known cultural resource sites occur on these 3,146 sections. However, because of multiple landowners in many sections, it is estimated that approximately one-half, or 475, of the 953 known cultural resource sites actually occur on Plum Creek land. Approximately 100 of the 475 cultural resource sites are represented primarily by lithic scatters, as well as firehearths, roasting pits, rock cairns, and surface stone quarries, and occasionally by a rock shelter/cave, pictograph, and scarred trees. The time period for many of these sites has been designated by researchers as "prehistoric." The remaining known cultural resource sites on Plum Creek land are predominantly historic in origin. About 150 of these sites are variously categorized as historic structures, and include pioneer log buildings, early residences, farmsteads, apartment buildings, schools, churches, and other architectural structures. The remaining 225 known historic properties on Plum Creek land in Montana include facilities or artifacts associated with historical travel, railroad, and stage routes; roads and trails; mining activity; industrial development, such as timber harvesting and sawmills; fire lookouts; and stock raising.

In Idaho, Plum Creek owns land in 265 sections within the Project Area. A total of 81 known cultural resource sites, consisting of 64 historic sites, 15 prehistoric sites, and 2 historic sites that may also be prehistoric sites, occur on Plum Creek land within these sections. Nearly 80 percent of the Idaho sites are historic, comprised primarily of historic cabins, out-of-use fire lookouts, mining sites (such as buildings and tailings), and logging sites (such as log flumes and decks). Two of the historic sites are camps made by the Lewis and

Clark expedition (10IH569 and 10IH574). Ten of the 15 prehistoric sites are pieces of the Lolo Trail, which was recorded multiple times because it crossed multiple sections of lands. Two of the prehistoric sites are "log peelings" of live ponderosa pine made by Native Americans (10IH1324 and 10IH2633).

In Washington, Plum Creek owns land in 141 sections within the Project Area. A total of five known cultural resource sites, consisting of four historic sites and one historic site that may also be a prehistoric site, occur on Plum Creek land within these sections. The four historic Washington sites include the Boundary Mine (45YA279), Rimrock Dam Power Station #3 (45YA445), Trail #123 (45SA510), and forest boundary trees (45SA457). The fifth site that may also be prehistoric is a rock shelter and lava tube.

4.11.6 Environmental Consequences

Potential impacts on cultural resources would include disturbance, destruction, or loss of part or all of the resource, and modification of the environmental setting around the site. Potential ethnographic impacts would include those activities resulting in the disturbance or loss of tribal heritages, which consist of beliefs, traditions, customs, and spiritual relationships. The following discussion focuses on the likelihood of such impacts occurring under the proposed NFHCP and alternatives. The impact analysis focuses on the 30-year Permit period, but concludes with brief assessments of the optional Permit periods of 10 and 20 years. Because cultural resources already receive some level of protection under existing regulations and because of similar assessment outcomes, discussions of the proposed NFHCP and other action alternatives refer to discussions under Existing Regulations—No Action Alternative.

Existing Regulations—No Action Alternative

Activities associated with the No Action Alternative would be subject to the same federal, state, and local regulations currently used to document and protect, and to preserve and conserve, cultural and ethnographic resources on private lands. The SHPO in each state is most often the point of contact for private landowners whose activities result in the inadvertent discovery of cultural resource sites. Coordination with SHPOs by private property owners is voluntary. The No Action Alternative would likely have some level of impact on known and unknown cultural resources, depending on site-specific factors. For example, areas where modification or avoidance of operations by Plum Creek are necessary to avoid take of listed salmonids for ESA compliance, may receive more protection for cultural resources than areas receiving state forest practice rule protections. There would be some likelihood of finding and potentially disturbing cultural resources, particularly along perennial stream and river channels since these areas often have a high probability of past human use. However, the specific impact on cultural resources is unknown at this time since future Plum Creek forest management activities in relation to the location of cultural resources is unknown. Impacts on cultural resources in Washington would be reduced since under Washington forest practice rules the state must conduct a cultural resources review prior to approval of timber harvest plans. Similar specific protections do not apply under Idaho or

Montana state law. Activities that would occur under the No Action Alternative would not interfere with the protection and maintenance of Native American Treaty Rights, tribal resources, traditional fishing rights, and religious practices in the Project Area or Planning Area under other laws. Numerous treaties, the American Indian Religious Freedom Act of 1978, and the Native American Graves Protection and Repatriation Act of 1990 provide for and protect the rights of American Indians, including their traditional and cultural uses of land.

Plum Creek's Proposed NFHCP

Impacts on known and unknown cultural resources may occur in some cases under the proposed NFHCP. The specific impact on individual cultural resources is unknown at this time since Plum Creek forest management activities and the associated conservation measures under the NFHCP in relation to the location of cultural resources are unknown. In general, impacts on cultural resources under the proposed NFHCP could be greater or less than those under the No Action Alternative depending on the site-specific activities under each alternative and the location of the particular cultural or ethnographic resource. Impacts would likely be less under the NFHCP than the No Action Alternative in areas where listed salmonids do not occur and the NFHCP would provide additional protections. For example, currently listed salmonids do not occur over approximately 80 percent of the Project Area; in these areas, the NFHCP would likely provide more protection for cultural resources than the No Action Alternative because of NFHCP conservation measures for Permit species. In areas where modification or avoidance of operations by Plum Creek are necessary to avoid take of listed salmonids under the No Action Alternative for ESA compliance, impacts on cultural resources may be greater under the NFHCP than under the No Action Alternative. The likelihood of harm to Native American cultural resources would likely be less under the proposed NFHCP than under the No Action Alternative because of the generally greater protections adjacent to stream and river channels where most past human activity was concentrated, particularly in Tier 1 watersheds and in riparian-upland Interface Caution Areas.

Similar to the No Action Alternative, impacts on cultural resources in Washington would be reduced since under Washington forest practice rules the state must conduct a cultural resources review prior to approval of timber harvest plans.

To comply with Section 106 of the National Historic Preservation Act (NHPA), Part 4.2.3 of the Implementing Agreement commits the Services to negotiate memoranda of agreement (MOAs). These MOAs would be negotiated with state historic preservation offices (SHPOs) and other interested parties to implement a phased approach to minimizing impacts to historic properties.

Optional 10- and 20-Year Permit Lengths. Those areas that would receive greater protection under the proposed NFHCP would likely receive more protection under the 30-year Permit than under Permits with terms of 10 or 20 years. Areas that would receive less protection under the NFHCP would likely receive less protection under a 30-year Permit than a 10- or 20-year Permit.

Internal Bull Trout Conservation Plan Alternative

Similar to the proposed NFHCP, the effects on cultural resources may be more or less than those under the No Action Alternative. The likelihood of affecting known and unknown cultural resources may be slightly less in some cases than under the No Action Alternative because of internal Plum Creek conservation measures, including their Environmental Principles, that would result in reduced activity and ground disturbance in riparian corridors adjacent to stream and river channels. However, like under the proposed NFHCP, the potential for impacting these resources could exist.

Optional 10- and 20-Year Permit Lengths. Effects of Permit lengths on cultural resources are expected to be the same as under the proposed NFHCP.

Simplified Prescriptions Alternative

Similar to the proposed NFHCP, effects on cultural resources may be more or less than those under the No Action Alternative. The potential to adversely impact known and unknown cultural and ethnographic resources in the Project and Planning Areas under this alternative would be slightly less, in some cases, than under the No Action Alternative. The likelihood of impacts on cultural resources could decline because of wider riparian buffers under this alternative than other alternatives, and the reduced activity and ground disturbance adjacent to perennial channels. However, similar to the proposed NFHCP, the potential for impacting cultural resources would still exist.

Optional 10- and 20-Year Permit Lengths. Effects of Permit lengths on cultural resources are expected to be the same as under the proposed NFHCP.

4.12 Social Resources

4.12.1 Introduction

This analysis addresses the potential for impacting social resources by

implementing management regimes associated with the proposed NFHCP, other action alternatives, and No Action Alternative. The analysis focuses on potential impacts on social resources in the Project and Planning Areas.

How are Social Impacts Compared?

The social resources section compares potential effects on surrounding communities. The primary issues are how an alternative may affect the local sense of place and lifestyle, and how an alternative is perceived as supporting local industry or protecting the environment. Society is collectively concerned about fish and ecological health, as well as the stability and empowerment of human communities. Although each of the alternatives addresses these concerns to varying levels, they are basically similar. The proposed NFHCP and Simplified Prescriptions Alternative would tend to offer slightly more environmental protection and long-term community stability than the Internal Bull Trout Conservation Plan or the No Action Alternative. A 30-year Permit length generally offers more stability for social resources than an optional Permit period of 10 or 20 years.

4.12.2 Issues Eliminated from Further Analysis

Most social resource issues identified during public scoping were analyzed. Two issues were eliminated from analysis by the Services (FWS and NMFS 1998) because they are beyond the scope of this EIS:

- Public trust versus private property—the contention that the right to property was never defined as land use entitlement
- Bull trout listing—the potential taking of individual rights and livelihood

4.12.3 Issues Addressed in the Impact Analysis

Social resource issues identified during public scoping and listed in the Scoping Report (FWS and NMFS 1998) are addressed in the impact analysis. The principal theme of these issues was that the NFHCP should not disrupt lifestyle patterns and opportunities or the quality of life.

Another important social issue raised during scoping—the protection of Tribal resources and reserved rights—is addressed in Section 4.11, *Cultural Resources*. The social resources analysis discusses the likelihood of an impact occurring, rather than specific impacts that may occur. This analytical approach was chosen because of the size and geographic range of the Project Area (1.6 million acres over 3 states) on which prescriptions (many of which are not site-specific) could potentially be implemented.

4.12.4 Description of Area of Influence

The area of influence for social resources is not necessarily defined by the physical boundaries of the Project and Planning Areas in western Montana, northern Idaho, and Washington (see Map 1.3-1 in Chapter 1). Instead, potentially influenced resources include individuals, groups of people, and possibly places whose social well being or value may be affected by implementing prescriptions associated with the proposed NFHCP and other alternatives. Examples include local resource-dependent communities, sites having local sense-of-place values, individual stakeholders and communities (including stockholders) with an interest in project outcome, and holders of rights and privileges (for example, outfitting permits, rights to use recreation resources, and access to private lands). Influences on the latter category were addressed in Section 4.9, *Recreation Resources*.

4.12.5 Affected Environment

Social resources are made up of social units of individuals, families, small groups, societies, and cultures. Although the Project Area is uninhabited, the Planning Area is sparsely populated and rural. Some rural areas are experiencing rapid population growth, especially those areas offering high quality recreation and scenery (ICBEMP 1997a). The population in the Planning Area has grown faster than the national average for all types of settings since 1990 (ICBEMP 1997a). However, 69 percent of the population lives in rural conditions (three times the national percentage), and average population density is about 11 persons per square mile (about one-sixth the national average) (ICBEMP 1997a).

Agriculturally-based lifestyles dominate the Planning Area; however, lifestyles in counties with rapid growth appear to be oriented more toward the natural environment, occupations related to natural resources, and recreation opportunities (ICBEMP 1997a). The desire for stability, predictability, and certainty are key community concerns (FEMAT 1993). Attempts by communities to cope with lifestyle change are constrained by high levels of regulatory and environmental uncertainty.

Factors that appear important in making communities resilient to economic and social change include population size and growth rate, economic diversity, social and cultural attributes, amenity setting, and quality of life (ICBEMP 1997a). Residents in the Planning Area indicate strong support for a variety of land uses, but public opinion is divided on some issues where a choice or trade-off is required. Support for environmental issues remains strong (FEMAT 1993). Public attitudes about resource management vary, especially between rural and urban dwellers, but commonalties are abundant and differences often are not great (FEMAT 1993). The concern for protecting people, too, is often at odds with environmental protection. There is increased public interest in having a greater role in natural resource decision making.

4.12.6 Environmental Consequences

Potential impacts on social resources or their well being can be expressed as substantive changes in group identity, autonomy, folkways, lifestyle, and relationship to the environment. The following discussion focuses on the likelihood of such impacts occurring under the proposed NFHCP and alternatives and on measures for mitigating or avoiding potential impacts, where appropriate. The reader is also referred to previous discussions of potential impacts on other resources that collectively contribute to and help define the social fabric and values for the Project and Planning Areas. The following impact analysis, conducted for each alternative, focuses on the 30-year Permit period, but concludes with brief assessments of the optional Permit periods of 10 and 20 years.

Existing Regulations—No Action Alternative

Timber-dependent communities would not likely benefit or be adversely affected by implementation of the No Action Alternative (that is, they would be impact neutral). Conditions and characteristics of social systems, which are complex, dynamic, and self-maintaining, would be expected to remain more or less the same as they are today. Regulatory and economic uncertainty associated with the ESA and its effects on people (landowners and stakeholders) and lifestyles would continue at more or less current levels. Communities of interest would rely on their own capacity and resiliency to absorb any change that may occur.

Plum Creek's Proposed NFHCP

Timber-dependent communities would not likely benefit or be adversely affected by implementation of the proposed NFHCP. However, decline in timber harvest can cause negative psychological consequences when harvest reductions exceed community expectations. This can lead to a sense of betrayal and loss of hope (FEMAT 1993). One community of

interest that could be most affected is Plum Creek's shareholders, to the extent that conservation commitments impact their business and investment expectations.

Plum Creek's proposed NFHCP offers hope of a solution for threats faced by bull trout and other native salmonids. Also, the regulatory and management stability and predictability that the proposed 30-year Permit would provide would reduce the potential effects of chronic instability of forest and land management.

Educational programs, such as proposed forester, contractor, and rancher training and certification programs, empower employees. Benefits include increased performance, personal rewards and recognition, and personal esteem. Increased clarity of acceptable management procedures would lead to greater job satisfaction among managers, particularly with field management tools such as the field implementation manual.

Continued participation by Plum Creek in cooperative watershed management forums would contribute to healthy dialogue among stakeholders at the local level. There are currently cooperative arrangements and agreements covering hundreds of acres in the Project Area with at least 40 organizations or initiatives in Idaho and Montana, and additional ones in Washington that are attributable to their Environmental Principles. This activity is an extension of Plum Creek's Environmental Principle for cooperation with adjacent land management. Examples include the Montana Bull Trout Restoration Plan, Montana watershed groups, Idaho Basin and Watershed Advisory Groups, and Washington watershed analysis partnerships.

There would be no adverse, unavoidable, or cumulative impacts on social resources in the Project or Planning Areas from implementing the NFHCP.

Optional 10- and 20-Year Permit Lengths. The proposed NFHCP offers several advantages for social resources, including cooperation with local groups, assurances for the survival of native salmonids, educational opportunities within and outside of Plum Creek, and a sense of regulatory stability and economic certainty. This sense of stability is the key factor in selecting a Permit length. A 30-year Permit offers environmental, social, and economic management assurances for a longer time than a 10- or 20-year Permit. The proposed Permit length of 30 years provides more stability.

Internal Bull Trout Conservation Plan Alternative

Potential effects on social resources associated with this action alternative would generally be similar to those described for the proposed NFHCP, with a few exceptions. Conservation actions under this alternative may be less satisfying to certain stakeholders because there would be less regulatory oversight, less regulatory accountability, less information shared about resource conditions and environmental performance, and fewer mechanisms to address the broader array of environmental management concerns other than the health of bull trout. There would be no adverse, unavoidable, or cumulative impacts on social resources in the Project or Planning Areas under the Internal Bull Trout Conservation Plan Alternative.

Optional 10- and 20-Year Permit Lengths. A 30-year Permit length offers

more stability for social resources than a 10- or 20-year Permit, for the same reasons as the proposed NFHCP.

Simplified Prescriptions Alternative

Timber-dependent communities would not be expected to benefit from the implementation of the Simplified Prescriptions Alternative, but they would probably not be substantively and adversely affected either. This action alternative would contain more restrictive regulations and provide less flexibility for timber harvest than the proposed NFHCP, with less local control by on-the-ground managers. As a result, there would be a slightly greater potential to impact peoples' expectations, lifestyles, and cultures. Also, sites valued by individuals and groups as having a defining sense of place may have restricted access given planned levels of road closures and abandonment under this alternative to benefit bull trout.

Somewhat conversely, environmental interests may find satisfaction in the somewhat greater conservation benefits that likely would accrue to fish under the Simplified Prescriptions Alternative than under the No Action Alternative. Conservation actions under this alternative may also be more satisfying to certain stakeholders because there would be more regulatory oversight and accountability than under the No Action Alternative.

There would be no adverse, unavoidable, or cumulative impacts on social resources in the Project or Planning Areas under the Simplified Prescriptions Alternative.

Optional 10- and 20-Year Permit Lengths. Under this alternative, some groups may have a greater sense of stability with the greater regulation and reduced harvest, while other groups may feel economically threatened. However, the cumulative effects are probably similar to the proposed NFHCP. It is likely, therefore, that a 30-year Permit length offers more stability for social resources than a 10- or 20-year Permit.

4.13 Economic Resources

4.13.1 Introduction

This analysis addresses the potential for impacting economic resources as a result of implementing management regimes associated with the proposed NFHCP, other action alternatives, and No Action Alternative. The analysis focuses on potential impacts on economic resources in the Project and Planning Areas.

4.13.2 Issues Eliminated from Further Analysis

Most economic resource issues identified during public scoping were analyzed. Four issues were eliminated from further analysis by the Services (FWS and NMFS 1998) because they are beyond the scope of this EIS. They include the following issues:

- Releasing Plum Creek from the liability of damage caused by sportsmen
- Sharing recreation revenues from hunting and fishing receipts with Plum Creek to partially compensate for the cost of providing public access to its lands
- The bull trout listing affecting people's ability to make a living
- Plum Creek selling HBU lands at prices conservation buyers can afford

What are the Economic Impacts of the Alternatives?

The Purpose and Need of this EIS (Chapter 1) has an economic component: the ability of Plum Creek to economically operate their business with regulatory certainty. The action alternatives, which could each potentially result in Permit issuance, all provide regulatory certainty with varying degrees of timber harvest. The No Action Alternative has the least implementation cost, but also provides the least amount of economic certainty for Plum Creek and resource-dependent communities. The proposed NFHCP has the highest implementation cost but the greatest amount of economic certainty for Plum Creek. The Internal Bull Trout Plan has the highest cost of take avoidance measures, but overall implementation costs less because less monitoring takes place. The Simplified Prescriptions alternative has the greatest cost in terms of reduced harvest opportunities. Economic stability, for Plum Creek and resource-dependent communities, would generally be greater over a 30-year Permit period than over the optional Permit lengths of 10 or 20 years.

An additional issue eliminated from further analysis is that adequate funding mechanisms should be available for implementing the NFHCP. Because funding assurance is a condition of Permit issuance and is explicitly addressed in the NFHCP and IA, this issue is not addressed further in the impact analysis.

4.13.3 Issues Addressed in the Impact Analysis

Economic resource issues identified during public scoping and listed in the Scoping Report (FWS and NMFS 1998) are addressed in the impact analysis. Those issues deal primarily with two concerns:

- The NFHCP should not disrupt local economic patterns.
- The NFHCP should not impose unacceptable costs on Plum Creek, public agencies, or the public.

The economic resources analysis discusses the likelihood of an impact occurring, rather than specific impacts that may occur. This analytical approach was chosen because of the size and geographic range of the Project Area (1.6 million acres over three states) on which prescriptions (many of which are not site-specific) could potentially be implemented.

4.13.4 Description of Area of Influence

The areas of influence address the various communities of interest, which are not spatially related as they are for other affected resources (except social resources). At a broad scale, the communities of interest primarily reflect the universe of U.S. taxpayers, Plum Creek shareholders, and environmental interests. At a finer scale, local communities of interest include the people living in resource-dependent communities and recreationists who benefit from land in the Project and Planning Areas where management regimes associated with the proposed NFHCP and other alternatives would be implemented.

4.13.5 Affected Environment

The population in the Planning Area has grown faster than the national average since 1990 (ICBEMP 1997a). Population

growth can stimulate economic growth, provide new economic opportunities, and promote economic diversity in rural areas (ICBEMP 1997a). During the past 30 years, the Planning Area has exceeded the nation as a whole in terms of job formation (ICBEMP 1997a). Much of it occurred in metropolitan areas and counties experiencing rapid growth. Employment in service industries has increased significantly; that is, the number of households receiving non-labor income has grown. Increases include gains in recreation and tourism, plus gains in business, education, management, and engineering services. Most of the job growth has been in services, retail sales, finance, insurance, and real estate. Rapid employment growth also is found in advanced technology, retail trade, transportation services, and construction (ICBEMP 1997a).

Although employment is still available, the wage base in these new growth areas (for example, service industry jobs) is lower than the wage base for timber-industry jobs. In Montana, the statewide average labor income for all workers in 1994 was $20,500. The average for forest products labor income per worker was $33,300 (Keegan et al. 1995).

While the federal timber supply has dropped, overall timber industry employment in the Planning Area has remained stable or only decreased slightly during the last 20 years. In many cases, employment remained steady because there are more workers per unit volume of timber harvested (Keegan et al. 1995). This increased labor intensity occurred because of a shift to the manufactured wood products industry, which uses lower quality timber that requires more effort to harvest and process, and an expansion in the labor-intensive industries of log homes and secondary wood products manufacturing. Also, changes in logging practices to meet biological and aesthetic goals have resulted in labor-intensive harvest practices (Keegan et al. 1995).

However, wood products manufacturing employment still depends on a reliable source of timber and is of higher importance in the Planning Area than at national levels. For example, some regions, such as the Lower Columbia area of Washington, show 13 percent or higher employment in the timber industry (FEMAT 1993). Approximately 11 to 21 percent of the communities in the Planning Area rely on the timber industry (ICBEMP 1997a). The trend of reduced regional importance of wood products manufacturing results more from rapid growth in other sectors of the economy than from a decline in the wood products industry (ICBEMP 1997a).

Although wood products employment may be losing importance from the regional perspective of the Columbia Basin, smaller communities with less diverse economies could be more affected by the alternatives. More than 90 percent of the Project Area is located in the western nine counties of Montana. These counties account for over 80 percent of the labor income for Montana's timber industry (Keegan et al. 1995). Throughout the discussion of economic impacts, both the Columbia Basin economic data and the economic data for western Montana are presented to provide a large-scale and small-scale analysis.

A wide variety of land uses in the Project and Planning Areas contributes to the regional and local economies. Commercial forestry falls into this category. In the Planning Area, timber harvest on non-federal lands is projected to increase over

historical levels by 1 to 5 percent in Washington (FEMAT 1993), and by as much as 20 percent in Idaho and Montana (ICBEMP 1997a), based on present operating conditions and forest practice regulations for non-federal owners. The increase in demand is generated by a steadily declining trend in timber harvesting on federal lands with an unpredictable future. Timber harvest within the Project Area is cyclical, following the production flows of the land, the market demand for wood products, and the availability of alternative sources of raw materials. It is increasingly difficult to determine how the timber supply in a given area may be affected by changes in supply from one ownership (Phillips and Williams 1998). Increases in haul distances complicate this factor. Also, for those jurisdictions that benefit from tax receipts from commodity sales, changing levels of commodity outputs can affect administrative budgets.

Overall in Montana, the timber industry accounted for 14 percent of Montana's economic base from 1990 to 1994 as measured by income, and 10 percent of the state's economic base as measured by employment (Keegan et al. 1995). In the western nine counties of Montana, timber harvest has dropped by nearly 30 percent; from 725 million board feet in 1988 to 519 million board feet in 1993 (Keegan et al. 1995). Timber harvest in the two major timber-producing counties in Montana, Flathead and Lincoln, declined by 35 percent because of reduced timber availability on federal lands. As a result, the four northwestern Montana counties now supply 52 percent of the timber instead of the 60 percent supplied in previous years (Keegan et al. 1995).

Management costs are growing to respond to increasingly stringent environmental regulations. Cost increases are roughly proportional to the magnitude of new and augmented requirements for natural resource protection. For example, the cost of managing road systems to comply with new road management objectives is an issue of concern for timberland owners. In addition, fiscal resources of federal agencies to administer national programs vary from year to year as a result of Congressional funding and changing policies and priorities.

4.13.6 Environmental Consequences

Potential impacts on economic resources include substantive changes in the types and opportunities for employment, wage earning, revenue generation, program costs, and provisions for program funding. Economic consequences are discussed here in terms of different types of costs that would occur under the different management approaches. Costs can be grouped into two overall categories:

- **Direct costs** are out-of-pocket costs resulting from actions prescribed under the alternative. For example, extra conservation measures associated with road construction, riparian fencing, and increased timber harvest costs are all direct costs. Direct costs include increases in the cost of doing business because of measures specified in the alternatives.

- **Indirect costs** are the side effects of the actions under the alternatives, such as land set-asides and reduced access to timber harvest areas. Indirect costs include **opportunity costs**, which describe the lost revenue from reduced timber harvest or grazing opportunities.

Either direct costs or indirect costs that occur because of the implementation of conservation can also be termed **conservation costs**. Costs for conservation may be **known costs**, which are predictable and measurable. These are described for each of the alternatives. **Unknown costs** are not predictable or measurable, and are associated with an uncertain regulatory future. For example, conservation measures described in the action alternatives have a known cost, while the take avoidance strategy in the No Action Alternative is an unknown cost. Unknown costs contribute to economic uncertainty for Plum Creek and for timber-dependent communities.

Direct cause-and-effect economic relationships are difficult to demonstrate, especially at the broad Project and Planning Area scales. Broad-scale economic assessments require non-traditional programmatic approaches. Because of this, the following discussion focuses on the likelihood that economic impacts would occur under the proposed NFHCP and alternatives, and on measures for mitigating or avoiding potential impacts. The impact analysis is for the 30-year Permit period, but concludes with brief assessments of the optional Permit periods of 10 and 20 years.

Existing Regulations—No Action Alternative

Generally, trends and future conditions of economic resources and systems would continue more or less as they are today under the No Action Alternative. Underlying factors such as population growth, employment, wages, tax revenues, and resource production would remain more or less the same. Plum Creek's current trend of increasing business costs to address environmental concerns, including fish conservation, is expected to continue. While providing for the conservation of listed and unlisted native salmonids and their habitat, Plum Creek would continue to face economic uncertainty in the use of their lands in the long term.

All action alternatives involve conservation measures in addition to mandatory measures under the No Action Alternative. Therefore, the known cost of implementing most of the conservation measures is expected to be least for the No Action Alternative. An exception is the potentially higher cost of site-specific take avoidance measures, including surveys for presence or occurrence of listed endangered and threatened species, and of site-specific lost economic opportunities as a result of more conservative management practices for ESA compliance. However, the No Action Alternative represents the least certain regulatory future, and may or may not have the greatest amount of unknown costs associated with future mandated conservation measures. Uncertainty in estimating future costs is likely to foster shorter-term business planning, strategies, and investments. In forestry, a shorter-term business strategy may be less likely to accommodate fish conservation. For example, investment in long-lasting, low-maintenance erosion control measures for roads may not be feasible if only shorter-term business benefits of the erosion control measures are tallied.

Cumulative effects of sustained instability and cycles of socio-economic transition may occur under the No Action Alternative. This instability would limit the capability of communities within the Planning Area to react to problems associated with the timber industry or Plum Creek. However, if such effects occurred, they probably would affect

certain resource-dependent businesses to a greater extent than whole communities given the geographical range of the Project and Planning Areas. Larger communities with more diverse economies probably have a greater tolerance for the instability of a single company than smaller communities that depend on a single company for their economic base. Some communities in the Project Area depend on Plum Creek and its contractors for their economic health.

Plum Creek's Proposed NFHCP

At a broad national scale, as defined in Section 4.13.4, *Description of Area of Influence*, economic effects of this alternative would be fairly negligible. At the finer, but still broad, Planning Area scale, the region has a growing economy that is poised for more growth. There may be only an imperceptible potential for change at this scale. However, the maintenance of a high-quality environment may be a factor in future regional economic growth. At the Project Area scale, local community job loss becomes more of an issue, if losses occur at all, with rural resource-dependent communities at greatest risk of decline. To the extent that local production of goods and services declines, the economic effects at the local level would become most tangible. For example, there is some risk of declines in economic multiplier effects and local funding from a decline in taxable revenue.

NFHCP implementation would add known costs associated with conservation to Plum Creek's timber management activities compared to the No Action Alternative. These costs would reduce the unknown costs of the No Action Alternative and result in greater long-term economic certainty. For example, if road construction and upgrading under the No Action Alternative normally costs $X, the NFHCP adds conservation cost, $Y, for the extra measures. Therefore, costs for the same road-building functions would be $X+$Y, since all of the existing regulations must be met as well as the additional standards required under the NFHCP. In addition to the increased costs per mile, direct costs of the NFHCP would also be higher because a greater number of miles would be treated with extra conservation measures.

Increased road construction costs of the NFHCP may be partially offset over time if new conservation standards reduce maintenance costs and road washouts. For example, reconstruction of culverts can often be several times the cost of culvert installation at the initial time of construction.

Indirect costs for riparian protection under the NFHCP include opportunity costs of riparian protection—the loss of harvestable timber and land. The opportunity cost of wider riparian buffers is the value of the trees in those wider buffers that become unavailable for harvest. It is also the value of the land within the buffer that becomes unavailable for growing future trees for harvest. These indirect costs are expected to be higher under the NFHCP than under the No Action and Internal Bull Trout Conservation Plan Alternatives because fewer trees would be harvested in riparian areas. Indirect costs of the Simplified Prescriptions Alternative would be greater than the NFHCP because even fewer trees would be harvested in riparian areas.

Costs of conservation measures to address grazing in riparian areas, including loss of income through leases, are expected to be intermediate in magnitude under the

NFHCP. Land use planning costs are expected to be highest under the NFHCP because land transactions are most restricted in terms of potential buyer limitations and conservation encumbrances, which reduce potential market prices for land sales. The proposed NFHCP is expected to incur the highest cost and most rapid cost accumulation for legacy and restoration management. The costs of restoring and repairing riparian areas, fencing, engineered fish habitat structures, hot spot treatments, and other planned activities vary widely depending on size of area, type of structure, and remoteness and accessibility of the site.

Costs for the NFHCP's adaptive management and monitoring are expected to be the highest among the alternatives. Higher costs are expected because the Services perceive a higher level of conservation uncertainty from this approach, which focuses conservation measures on road and riparian management, rather than the less focused approach of the Simplified Prescriptions Alternative.

In general, the NFHCP contains the highest direct costs among the action alternatives because it is an active conservation strategy; however, it has lower indirect costs than the passive measures of the Simplified Prescriptions Alternative. However, the combination of direct and indirect costs makes the NFHCP much more costly than the No Action or the Internal Bull Trout Conservation Plan Alternatives.

Plum Creek is making the investment in the NFHCP because they seek the benefit of reducing the potential for unknown costs in the future (Jostrom 1999). By embracing an active conservation strategy and defining known conservation costs, Plum Creek seeks to avoid greater take avoidance costs that could be possible in the future under the No Action Alternative. Recent emergency forest practice regulations in the state of Washington demonstrate that the regulatory cost to a landowner of not having incidental take protection can be quite tangible, at least for the affected species and areas. For example, emergency measures on behalf of the northern spotted owl resulted in landowner holdings being withdrawn from management opportunity.

Ideally, Plum Creek would assess the NFHCP's cost-to-benefit ratio, in part, by estimating the unknown regulatory costs that would be saved. The amount of benefit would be used to determine the point at which proposed conservation is "the maximum extent practicable," a requirement for HCP issuance. In the case of the NFHCP, Plum Creek has indicated to the Services that estimating regulatory costs associated with ESA compliance for fish is difficult because those costs are unknown. Emergency state rules associated with ESA fish listings do not impact most of the Project Area, and Plum Creek has a great deal of the access to its holdings secured. Therefore, the benefit of a more certain regulatory future is much less tangible. Also in the NFHCP, it is much less certain as to what constitutes a "take" for fish compared with, for example, the northern spotted owl. Since a more explicit estimate of unknown regulatory costs would be speculative, Plum Creek developed NFHCP business goals to help determine what conservation costs are reasonable and could be used to define "the maximum extent practicable." Section 1 of the NFHCP, at the back of Chapter 3, discusses how Plum Creek used the business goals to guide NFHCP development. Since Plum Creek has

proposed to implement the NFHCP, the Services assume that, overall, it is an economically practicable alternative for Plum Creek. In addition, the services evaluated practicability from a biological perspective.

There would be no substantive, unavoidable adverse impacts on economic resources in the Project Area from implementing the proposed NFHCP. Economic communities of interest may experience slightly adverse outcomes compared to the No Action Alternative, but with some improved economic certainty as affected by the "No Surprises" rule of the ESA. To the extent that certain communities rely on Plum Creek for a portion of their economic security, additional stability for Plum Creek would translate to additional stability for those communities. As noted in Section 4.12, *Social Resources*, social systems (including their economic and financial components), are complex, dynamic, and self-maintaining. Economic communities of interest would rely on their internal capacity and resiliency to absorb any changes that may result from implementing the proposed NFHCP.

Compared to the No Action Alternative, the proposed NFHCP would provide a greater amount of public resource benefits financed by private sector investment. Also compared to No Action, the proposed NFHCP would mean that fewer public scientific resources would be required to determine how much additional regulation of private sector activities is needed for species recovery. Under the NFHCP, the incentive provided by greater regulatory certainty mobilizes private sector investment in science and conservation with a relatively small investment of public resources.

Cumulative Effects. Cumulative effects of the proposed NFHCP may include cycles of socio-economic transition that limit the economic flexibility of communities within the Planning Area to react to problems. During the last 15 years, the amount of timber harvested from national forests in the Planning Area has declined significantly. For example, the estimated annual timber harvest from federal lands in the Upper Columbia River Basin declined from about 1,130 million board-feet in 1985 to about 700 million board-feet in 1994, after reaching a high of 1,260 million board-feet in 1987 (ICBEMP 1997a). During this same period, the amount of timber sold has declined more dramatically than the amount of timber harvested. At some point, harvest is also expected to drop significantly because harvest will be finished on the old sales and less timber is available for new sales. Under proposed future federal land management, commodity production on non-federal lands may increase as much as 20 percent to compensate for the reduction in federal supply (ICBEMP 1997a). Solid wood prices are expected to increase 0.7 percent per year as a result of reduced federal supply.

These regional trends reflect significant local impacts. In 1989, Montana's 10 national forests harvested about 520 million board feet, which comprised 41 percent of Montana's timber harvest. In 1994, the harvest dropped to 280 million board feet, or 28 percent of the timber harvest (Keegan et al. 1995). At the same time, harvest from Montana's private lands has increased. The 1993 harvest from private landowners was 658 million board feet, or 28 percent of Montana's timber harvest. The 1994 private timber harvest was the second highest on record,

accounting for 74 percent of the timber harvested in the state (Keegan et al. 1995).

Employment among the wood products manufacturers has shifted in rough proportion to the volume of wood consumed (FS and BLM 1997a), generally from those relying more heavily on federal timber to those relying less heavily. As the federal timber supply has decreased, Plum Creek has increased their reliance on their own forestland to supply timber to their mills. With the shift toward private timber supply, Plum Creek has reduced its solid wood supply to other wood products manufacturers, compounding impacts of reduced federal supply in the Planning Area.

The nine western Montana counties, which contain more than 90 percent of the Project Area, process more than 82 percent of the timber delivered to Montana mills. Of the 869 million board feet processed in those counties in 1993, about 85 percent was harvested from that same region (Keegan et al. 1995). Significant changes in the amount of timber harvested in this nine-county area could have an affect on the sawmill and log processing industries, if these mills are unable to acquire logs from other areas. Also, the timber industry represents 41 percent of the economic base in these nine counties (Keegan et al. 1995).

Implementation of the NFHCP would further reduce regional timber supply. Although the reduction caused by the NFHCP would be relatively small compared to the total supply in the Planning Area, there would be a potential cumulative effect on timber-based employment and resource-dependent economies when combined with the impact of reduced federal timber supply. As federal timber availability became less predictable, however, the Permit could provide increased long-term economic stability for communities that are now more dependent on private timber harvest.

Optional 10- and 20-Year Permit Lengths. The proposed NFHCP would have the highest direct implementation and management costs of all the alternatives because the pay-as-you-go conservation strategy loads most of the high direct costs associated with mitigation measures up front.

The optional shorter Permit lengths would provide greater annualized conservation value than that provided by the 30-year proposal, but overall conservation value would be less because of the shorter implementation periods. The shorter periods are less likely to provide opportunities for measuring gains in conservation outcomes or for adapting management according to monitoring results and scientific findings. Also, a longer Permit period may offer more economic stability for resource-dependent communities.

The 30-year Permit would be more economically favorable to Plum Creek than a 10- or 20-year Permit. Permit length is the benefit Plum Creek receives as a result of their increased conservation costs. If the benefit is reduced, then the practicability of high-cost conservation is reduced. It may not be reasonable to assume that Plum Creek would remain a willing HCP applicant under a 10- or 20-year Permit with the same conservation commitments.

Internal Bull Trout Conservation Plan Alternative

Economic resources and systems would continue about the same as at present under this alternative. As with the No Action Alternative, the current trend of increasing regulatory costs to address environmental concerns is expected to continue. It is expected that the more limited coverage provided by this alternative's Permit would create greater economic uncertainty for Plum Creek in the use of their land than would be expected under the NFHCP's Permit.

This alternative is expected to incur intermediate levels of costs for implementing most of the conservation measures it considers. However, compared with other action alternatives, it has the following features:

- The lowest opportunity costs for riparian area protection.
- The lowest costs for adaptive management and monitoring. (If the Services issue a Permit for this alternative, then these adaptive management costs would increase.)
- The highest cost of take avoidance measures, which are direct costs and include surveys for presence or occurrence of listed endangered and threatened species. The indirect costs of take avoidance are also high because of the economic opportunities lost as a result of more conservative management practices for ESA compliance.

Voluntary internal audits of Plum Creek's Environmental Principles would be similar to the mandatory external audits of the proposed NFHCP. Where take avoidance measures are not warranted, this alternative would provide relatively high flexibility for cost-effective management.

There would be no unavoidable adverse impacts on economic resources under this alternative. Effects would generally be intermediate to those described for the No Action Alternative and the proposed NFHCP. Also, there would be no significant adverse cumulative impacts on economic resources associated with the Planning Area from implementing this alternative. Some economic uncertainty associated with the ESA may extend to communities of interest aligned with the Planning Area.

Optional 10- and 20-Year Permit Lengths. Under this alternative, economic resources and systems would be similar to the No Action Alternative. Plum Creek would have lower management and implementation costs because not as many direct mitigation costs would be incurred up front. Overall conservation value would be less under the shorter implementation periods of the 10- and 20-year Permits. The shorter Permit lengths would provide greater annualized conservation value than the 30-year proposal, but the difference would not be as great as under the NFHCP. Although this alternative could result in Permit issuance for any of the Permit lengths considered, the economic uncertainty in land use would be greater under the shorter Permit periods. The 30-year Permit length may offer more overall economic stability than a 10- or 20-year Permit, and would be more economically favorable to Plum Creek.

Simplified Prescriptions Alternative

Economic resources and systems in the Planning Area would continue more or

less the same under this alternative as at present. Economic impacts in the Project Area are perceived to be greatest under this alternative. The current trend of increasing costs to address environmental concerns, including fish conservation, is expected to continue. As with the proposed NFHCP, the overall costs of program implementation to the Services would be relatively high.

Costs to Plum Creek would be highest among all alternatives, primarily because of the indirect costs associated with land set asides and reduced access to certain lands for forest management. Long-term regulatory certainty for Plum Creek would be similar to the proposed NFHCP, though fewer opportunities would be provided for science-based adaptive management.

Management costs associated with reduced road density and access constraints in unroaded areas would be highest among all the alternatives. While the reduced road construction allowed would result in a savings because only half of the road miles would be constructed, the savings would be more than offset by increased management costs. For example, 500 acres of unroaded land that might require 4 miles of road under the NFHCP would be constrained to only 2 miles under the Simplified Prescriptions Alternative. To provide an example of the magnitude of costs involved, standard industry assumptions were used, as follows:

- Foresters need about 4 miles of road to harvest 500 acres by traditional ground methods
- Foresters can expect to harvest 7 thousand board feet per acre
- Roads cost approximately $20,000 per mile to build
- Helicopter logging costs $150 more per each thousand board feet harvested

Therefore, harvesting the 500 acres in the example under the proposed NFHCP would require a road construction cost of $80,000 (4 miles of roads at $20,000 per mile). Under the Simplified Prescriptions Alternative, however, Plum Creek would only be allowed 2 miles of roads, and the remainder must be harvested by helicopter. Therefore, the increased cost in this example would be $222,500. The road construction savings would be $40,000 because 2 miles fewer roads are constructed, but the savings would be offset by $262,500 in increased logging costs for helicopter logging half of the 500 acres (7 thousand board feet, multiplied by 250 acres, multiplied by $150 per thousand board feet for increased helicopter logging costs). In the long term, reduced access and more expensive logging would promote a shorter-term economic view for forest management decision making, possibly influencing harvest prescriptions.

Riparian forest management prescriptions would be similar in direct costs to the NFHCP, but indirect costs would be much greater. Higher indirect costs would result from the reduction in timberland value, as well as the loss of long-term forest productivity for those set-aside areas. In one reasonably likely example, the total net value of timber along a 1-mile-long segment of a fish-bearing stream for a distance of 200 feet from the stream on one side would be about $170,000 (based on industry standards). When this example is applied to the alternatives, the costs are as follows:

- Simplified Prescriptions Alternative—The value would be reduced by about $105,000 because only 36 percent of the area could be harvested.

- No Action Alternative—The value would only be reduced by about $20,000 because 88 percent is available for harvest.

- Proposed NFHCP—The value reduction is intermediate to the other two alternatives at a potential loss of about $50,000 because 71 percent of the land is available for harvest.

Direct costs to Plum Creek under the Simplified Prescriptions Alternative would be lower than under the proposed NFHCP and possibly the No Action Alternative because major reductions in the grazing program would be implemented. The alternative would generate modest revenue losses for Plum Creek. The greatest economic impact would be curtailment of leases to 106 ranchers who graze cattle on Plum Creek land. Many of these ranchers could be put out of business, and the livestock industry in western Montana would be impacted.

Land use planning costs of the alternative would be similar to those of the No Action Alternative because land transactions would be among the least constrained. Costs of legacy and restoration management would be intermediate, as would costs of plan administration and implementation. The Simplified Prescriptions Alternative would have lower adaptive management costs than the NFHCP because the scientific uncertainties would be handled up front through more risk-averse conservation measures.

No mitigation measures have been identified for the Simplified Prescriptions Alternative. Economic communities of interest would rely on their own capacity and resiliency to absorb any changes. Compared to existing conditions, changes from implementing this alternative would be somewhat adverse for timber-based economies and very adverse for the livestock industry. An unavoidable adverse impact would be felt by the livestock industry in western Montana. The cumulative impact of reduced timber availability from Plum Creek land, combined with reductions in federal timber availability, would be similar to that discussed for the NFHCP. The magnitude of the cumulative impact would be greater, commensurate with the greater reduction in timber supply.

Optional 10- and 20-Year Permit Lengths. Permit length considerations would be similar to the NFHCP. Lower direct costs at the beginning of the Permit period would reduce changes in the cost-to-benefit ratio as the Permit term is reduced. The applicant would prefer a shorter Permit length under this alternative if required conservative measures are perceived to be overly restrictive in addressing scientific uncertainty.

4.14 Air Quality

4.14.1 Introduction

This section addresses the potential for impacting air quality by implementing management regimes associated with the proposed NFHCP, other action alternatives, and No Action Alternative. The analysis focuses on potential impacts on air quality in the Project and Planning Areas.

4.14.2 Issues Eliminated from Further Analysis

No air quality issues or concerns were identified during public scoping (FWS and NMFS 1998).

How is Air Quality Affected by the Alternatives?

Several requirements of the federal Clean Air Act regulate forest practices, such as prescribed burning and controlling dust from unsurfaced roads. The proposed NFHCP and all of the alternatives require Plum Creek to meet Clean Air Act standards and existing state regulations. Air quality under the No Action Alternative would likely be about the same as it is today. The proposed NFHCP and the Internal Bull Trout Conservation Plan Alternative are supported by Environmental Principles that address air quality, which could improve slightly. Air quality may also improve slightly under the Simplified Prescriptions Alternative. Air quality benefits would be greater over a 30-year Permit period than over the optional Permit lengths of 10 or 20 years.

4.14.3 Issues Addressed in the Impact Analysis

This analysis briefly describes existing air quality in the Project and Planning Areas and the likelihood of impacting air quality as a result of implementing the proposed NFHCP or any of the alternatives. The analysis focuses on two principle ways land management activities on forest lands can adversely affect air quality:

1. Release of airborne particles during prescribed burns
2. Generation of fugitive dust from unsurfaced roads

4.14.4 Description of Area of Influence

Airsheds have physical boundaries that differ from watersheds. Airshed quality is influenced by land features such as mountains, valleys, watersheds, vegetation, and large water bodies. For this analysis, the area of influence is the entire Project and Planning Areas, which are depicted in Map 1.3-1 in Chapter 1.

4.14.5 Affected Environment

The Federal Clean Air Act is designed to reduce air pollution, protect human health, and preserve the Nation's air resources. Several air quality programs under the Clean Air Act regulate prescribed burning and other forest manufacturing practices. National Ambient Air Quality Standards (NAAQS) to protect human health and welfare have been established for the criteria air pollutants of particulate matter (PM_{10}), sulfur dioxide, nitrogen dioxide, carbon monoxide, and lead. The Clean Air Act requires states to implement a State Implementation Plan (SIP) to ensure the NAAQS are attained for these criteria pollutants. Conformity provisions of the Clean Air Act prohibit actions that cause or contribute to a new violation of the NAAQS, increase the frequency or severity of an existing violation, or delay the timely attainment of a standard. Actions must conform to the applicable SIP.

Air quality conditions and trends in the ICRB, which includes most of the Project and Planning Areas of this EIS/NFHCP, are summarized by Quigley and Arbelbide (1997). Current air quality conditions in

the Basin are good compared to other parts of the country. Forest fires significantly affect the air resource, especially locally. Presently, forest fires produce more smoke emissions than occurred historically because fire hazards are greater and there is more fuel available for fire consumption. When combined with natural fires, controlled burns and prescribed wildfire use within the ICRB are expected to increase smoke emissions. However, prescribed burns are less polluting than natural wildfires.

Particulate matter in the ICRB comes primarily from wildfire, prescribed burns, road and wind-blown dust, volcanic eruptions, and vehicle exhaust. Most particulate matter of concern to human health comes from fire, and most of this is less than 10 microns (one millionth of a meter) in diameter and referred to as PM_{10}. Fugitive dust can also contribute measurably to PM_{10} levels, depending on road length, quality, and maintenance, and the level of use for forest management and by the public.

Areas where one or more of the NAAQS, including PM_{10}, have been violated are called **non-attainment areas**. Shoshone County in northeastern Idaho was identified as a PM_{10} non-attainment area (Quigley and Arbelbide 1997). The Whitefish/Columbia Falls, Montana, region may sometimes also be a PM_{10} non-attainment area. The southern half of Shoshone County, Idaho, includes Project Area and Planning Area lands. Idaho Division of Environmental Quality (IDEQ) staff stated that Shoshone County, specifically the Pinehurst area, has had air quality problems in the past that included ash from forest fires and wood stoves, and fugitive dust caused by excessive traffic within forest areas. The Pinehurst area in Shoshone County has been in compliance with NAAQS and the SIP for several years and has requested reclassification to reflect that compliance (Gersten 1999). SIPs for forestlands ensure that fugitive dust from roads and smoke from prescribed burning do not violate state standards.

Slash burning was routinely used on Plum Creek lands prior to 1990 to dispose of harvest residue and prepare sites for forest regeneration. Today, harvest residue is often left unburned to enhance habitat and eventually decay. Controlled burning is used to reduce moisture stress and competition from other vegetation for space. When controlled burning is prescribed, fires are ignited during fall or winter when state regulations and weather conditions permit. Slash burning is done on Plum Creek lands in the Rockies because of the state slash hazard laws.

Air emissions from forest products manufacturing facilities, which were described along with other covered activities in Section 2.3.1, *Plum Creek's Land Management*, are controlled by the federal Clean Air Act, Environmental Protection Agency air operating programs, and state regulations, such as the Montana Air Quality Act. Air operating and permit programs are designed to limit potential impacts to receptors within acceptable levels.

4.14.6 Environmental Consequences

Potential impacts on air quality include actions that contribute to a new violation of NAAQS, increase the frequency or severity of an existing violation, or delay attaining a standard. The following discussion focuses on the likelihood of such impacts occurring under the proposed NFHCP and alternatives and on measures

for mitigating or avoiding potential impacts. The impact analysis focuses on the 30-year Permit period, but concludes with brief assessments of the optional Permit periods of 10 and 20 years. Where appropriate, discussions of the proposed NFHCP and action alternatives refer to discussions under Existing Regulations—No Action Alternative.

Existing Regulations—No Action Alternative

All covered activities associated with the No Action Alternative would be subject to the same federal and state regulations that currently result in compliance with NAAQS and the SIPs in the Project and Planning Areas. Because of these existing regulations, the No Action Alternative would not adversely affect air quality on Plum Creek lands, including PM_{10} levels associated with the generation of smoke particles and fugitive dust. Prescribed burns on Plum Creek lands are largely limited to slash piles during appropriate times of year, and large, broadcast burns are no longer used as a standard management tool. In addition, generation of fugitive dust by forest management and public traffic would be generally similar to existing conditions. As a result, effects of activities under the No Action Alternative would be expected to conform with the applicable SIP. New roads would be constructed to higher standards, which would reduce fugitive dust impacts on aquatic areas. Legacy roads would be maintained but not improved. Existing regulations are expected to limit air emissions from forest products manufacturing facilities to acceptable levels.

Potential air quality impacts would be avoided or minimized by complying with federal and state existing regulations listed in Chapter 3 under the No Action Alternative. Prescribed burns are regulated by programs such as the State of Washington's Smoke Management Plan, and by the North Idaho and Montana Airshed Groups Memorandum of Agreement to minimize or prevent the accumulation of smoke in Idaho and Montana as necessary to meet state and federal air quality standards when prescribed burning is necessary (North Idaho and Montana State Airshed Groups 1990). Existing regulations would be followed during road construction, voluntary upgrade, and maintenance to control fugitive dust.

There would be no adverse cumulative impacts on air quality caused by implementing the No Action Alternative. Activities associated with the No Action Alternative would only occur on Plum Creek land and would not result in an overall change in air quality or non-conformance with NAAQS or applicable SIPs in the Project Area or adjacent Planning Area lands. Other landowners and land managers in the Planning Area must comply with the same or additional regulations as Plum Creek, which are designed to avoid or minimize the potential for impacting air quality. As a result, air quality in the Planning Area would be expected to generally be the same as under existing conditions.

Plum Creek's Proposed NFHCP

There would be no adverse, unavoidable, or cumulative impacts on air quality in the Project or Planning Areas under the proposed NFHCP for the same reasons that were discussed under the No Action Alternative. Prescriptions associated with the proposed NFHCP would contribute to good air quality in the Project Area and perhaps slightly better conditions than at

present. For example, Plum Creek's commitment to air quality under their Environmental Principles would be implemented under the proposed NFHCP. This Environmental Principle would protect air quality by burning only when required by law for hazard abatement, or when burning is an appropriate silvicultural technique to improve forest conditions or improve aesthetics in visually sensitive areas.

Also important, some of the forest road and upland management prescriptions that would be implemented under the NFHCP would reduce the generation of fugitive dust, thereby contributing to good air quality. Examples of these prescriptions include complying with Montana's voluntary road BMPs, applying enhanced BMP standards to new roads, upgrading roads to enhanced BMP standards, locating roads away from aquatic areas, improving road surfaces at stream crossings, treating road hot spots, abandoning surplus roads while upgrading adjacent roads, and closing some roads. Air emissions from forest products manufacturing facilities would be the same as under existing regulations. Mitigation measures would consist of existing federal and state regulations and BMPs.

Optional 10- and 20-Year Permit Lengths. The proposed NFHCP offers measures beyond state requirements for controlling fugitive dust from roads and for reducing emissions from prescribed burning. Long-term benefits to the environment would likely be greater if these measures are implemented for a 30-year period rather than a 10- or 20-year Permit period.

Internal Bull Trout Conservation Plan Alternative

There would be no adverse, unavoidable, or cumulative impacts on air quality in the Project or Planning Areas under this alternative for the same reasons that were discussed under the No Action Alternative. Mitigation measures would be the same as for the proposed NFHCP. Effects of this action alternative on air quality would be very similar to those effects described for the proposed NFHCP. Effects would reflect implementation of existing regulations, Plum Creek's Environmental Principles, and many of the forest road and upland management prescriptions described previously for the NFHCP.

Optional 10- and 20-Year Permit Lengths. Effects of this alternative would be similar to the NFHCP. Therefore, long-term benefits to the environment would likely be greater if these measures are implemented for a longer Permit period.

Simplified Prescriptions Alternative

There would be no adverse, unavoidable, or cumulative impacts on air quality in the Project or Planning Areas under this alternative for the same reasons that were discussed under the No Action Alternative. Mitigation measures would also be the same as for the proposed NFHCP. Air quality under this alternative would probably be generally similar to air quality under the proposed NFHCP, but for different reasons. Plum Creek's Environmental Principles would not be implemented under this action alternative, which may result in the generation of slightly more smoke from prescribed burns. However, new road construction would be reduced and road abandonment

would be increased, probably resulting in somewhat lower levels of fugitive dust than under the proposed NFHCP. Reduction or elimination of grazing would greatly reduce fugitive dust effects from foot traffic on aquatic habitats. Air emissions from forest products manufacturing facilities would be about the same as under existing regulations. Resulting air quality conditions under the Simplified Prescriptions Alternative would probably be slightly better than under the No Action Alternative.

Optional 10- and 20-Year Permit Lengths. Although this alternative uses a different set of management prescriptions that the NFHCP, the total effects on air quality would be similar. Therefore, long-term benefits to the environment would likely be greater if these measures are implemented for a longer Permit period.

4.15 Irreversible and Irretrievable Commitments of Resources

No irreversible and irretrievable commitments of any of the resources analyzed in this chapter would occur from implementing the management prescriptions and covered activities associated with the proposed NFHCP, Internal Bull Trout Conservation Plan Alternative, Simplified Prescriptions Alternative, or No Action Alternative. Where appropriate, mitigation measures were identified to prevent the potential for resource impacts or losses. Those resources were discussed under the headings in Sections 4.2 through 4.14, as follows:

- Geology and Soils
- Water Resources and Hydrology
- Water Quality and Contaminants
- Vegetation Resources
- Fisheries and Aquatic Resources
- Wildlife Resources
- Land Use
- Recreation Resources
- Visual and Aesthetic Resources
- Cultural Resources
- Social Resources
- Economic Resources
- Air Quality

The proposed NFHCP, two other action alternatives, and No Action Alternative would each provide the potential to conserve and improve aquatic and riparian habitat in the Project Area compared to existing conditions. The proposed NFHCP contains reversible programs aimed at making ongoing land management activities compatible with the environment. Through deliberate conservation measures, environmental effects are expected to be constrained and within the capacity of the dynamically changing environment to absorb them or recover from them.

Conservation of aquatic and riparian habitat would benefit and contribute to the perpetuation of native salmonids and other aquatic resources present in Project Area waters and, to a lesser degree, in Planning Area waters. The expected degree of conservation benefit would be greatest under the proposed NFHCP, followed by the Simplified Prescriptions Alternative, the Internal Bull Trout Conservation Plan Alternative, and the No Action Alternative. A detailed comparison among the alternatives is presented in Chapter 5 of this EIS.