

**SUMMARY OF REGULATORY AND VOLUNTARY PROGRAMS  
FOR PROTECTING BULL TROUT ON FOREST LANDS IN THE  
VICINITY OF PLUM CREEK OWNERSHIP IN MONTANA, IDAHO,  
AND WASHINGTON**

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**Plum Creek Bull Trout Conservation Project  
Technical Report No. 6**

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1997

# SUMMARY OF REGULATORY AND VOLUNTARY PROGRAMS FOR PROTECTING BULL TROUT ON FOREST LANDS IN THE VICINITY OF PLUM CREEK OWNERSHIP IN MONTANA, IDAHO, AND WASHINGTON

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## INTRODUCTION

Over the last 190 years of western European settlement in the northwestern United States, a myriad of impacts have occurred to water quality and native fish, including bull trout *Salvelinus confluentus*. Some of the earliest impacts to bull trout probably occurred in the early to mid 1800's when trapping reduced beaver populations by 60 million animals in the western United States. As Platts et al. (1995) describe:

“ Many streams controlled and stabilized by beaver (dams) were suddenly without this natural control. Great numbers of streams probably suffered severe erosion problems as they readjusted to free flowing conditions. The Hudson Bay trappers were under orders to eliminate the last beaver from any watershed where they trapped to delay the settlement of the west by persons of the United States. This may have been the first major habitat change since the late Pleistocene period that bull trout populations had to survive and adjust to.”

Anthropogenic impacts to water quality in the late 1800's primarily resulted from mining and livestock grazing. Placer mining often involved churning up entire valley bottoms in search of gold

and silver. Livestock grazing was also a dominant land use in this period (and continues today), with animal numbers reaching their highest levels around the turn of the century (Platts, 1990).

20th century impacts to water quality and native fish have come from a much broader list of activities. These include agriculture (farming), irrigation diversion, legal and illegal stocking of exotic species, illegal fish harvest, timber harvesting, hydroelectric dams and reservoirs, highway/railroad construction, and fish management policies that selected against bull trout.

Historic water quality impacts of agriculture included removal of riparian vegetation, stream channelization, and sedimentation. Diversion of water from streams and rivers for crop irrigation also impacted fish by de-watering streams and entrapment. Since bull trout spawn in the fall, they are particularly vulnerable to irrigation water diversion because they need sufficient late-season in-stream flows to access spawning areas. In addition, as juveniles out-migrate down rivers, they can be easily caught in un-screened diversions and become trapped in irrigation ditches.

Fish management policies and programs have historically been insensitive of the needs of native fish. To create more “desirable” sport fisheries, exotic fish such as eastern brook trout *Salvelinus fontinalis*, rainbow trout *Oncorhynchus mykiss*, German brown trout *Salmo trutta*, northern pike *Esox esox*, lake trout *Salvelinus namaycush*, and kokanee salmon *Oncorhynchus nerka* were planted in thousands of streams and lakes. Because streams and lakes have a finite “carrying capacity,” every pound of exotic fish biomass that occupies a stream means a pound less of native fish. In many streams and lakes today, fish biomass is almost entirely dominated by exotic fish. In addition to direct competition for food and habitat, exotic fish can also prey on native fish, and even cause genetic introgression through hybridization (Leary et al., 1991). Stocking of exotics in bull trout waters still occurs today throughout the Pacific Northwest. In addition, because bull trout are piscivorous and can prey upon desirable sport fish (both native and stocked), historic fish management strategies were implemented to select against bull trout (Platts et al., 1993). These strategies included liberal harvest limits on bull trout, bounties, and even eradication through poisoning. Liberal harvest limits began to be phased out by the 1960's in most western states. Today, legal harvest of bull trout is only allowed in two waters: Swan Lake (Montana) and Lake Billy Chinook (Oregon). Though early harmful fish management programs have been significantly curtailed, the legacy of these impacts still persist.

Illegal harvest of bull trout has also impacted population levels. Adfluvial bull trout (trout that mature in a lake) and fluvial bull trout (trout that mature in a river) can grow quite large (up to 20 pounds). Because they spawn during low water in the fall in relatively small streams, they are especially vulnerable to poaching. In western Montana, poaching is still considered a problem (Montana Bull Trout Restoration Team, 1994).

Timber harvest activities in the 20th century have also impacted water quality and fish habitat. Historic practices involved cleaning streams of obstructions (including large woody debris) so logs and railroad ties could be transported down rivers and streams. In many cases splash dams were used. Splash dams involved damming a stream with logs and water, then blowing key pieces of wood out of the dam with dynamite. The mass of logs and water would then flush downstream, transporting logs to streamside milling facilities. Though these practices have not been common for over 50 years, impacts persist to this day (Young et al., 1994). Other historic direct impacts from timber harvest activities included equipment operation in streams and intensive harvest of streamside timber. Other, more indirect stream impacts due to timber harvesting included sedimentation from roads and skid trails when erosion control practices were not used.

Only in the last 25 years have timber harvesting practices and other land uses begun to be regulated in the United States (Ice et al., 1997; Brown et al., 1993). The objective of this paper is to summarize present-day regulatory and voluntary programs for protecting bull trout habitat (and general water quality) on forest lands in the vicinity of Plum Creek's ownership.

## **DISTRIBUTION OF BULL TROUT RELATIVE TO PLUM CREEK OWNERSHIP**

Bull trout are widely distributed throughout Plum Creek's operating area in the Pacific Northwest (Figures 1 and 2). In Montana, Plum Creek has ownership in ten of the twelve bull trout basins (representing metapopulations<sup>1</sup>) as designated by the Montana Bull Trout Restoration Team (1997). In Idaho, Plum Creek has ownership in three of the 59 "key watersheds" as designated in Idaho's Bull Trout Conservation Plan (Batt, 1996). The three watersheds with Plum Creek ownership include the Lochsa River, Upper St. Joe River, and Little North Fork Clearwater River. Though "key" bull trout basins have not been designated in Washington, Plum Creek has ownership in four basins where distinct stocks may constitute metapopulations (Ahtanum Creek, Upper Yakima River, Naches River, and Lewis River; WDFW, in press).

Rarely does Plum Creek own large contiguous blocks of bull trout drainages. Owing to its origins, the checker-board pattern of Plum Creek's ownership suggests conservation of bull trout habitat will be a shared endeavor. In fact, an examination of land ownership within Plum Creek's 17 bull trout basins shows that the federal government is by far the single largest holder of bull trout habitat (Figure 3). In the 17 bull trout basins with Plum Creek ownership, federally-managed lands comprise 67% of the land area, whereas Plum Creek owns only 9.6% of the total acreage of the 17 bull trout basins (Table 1). Federal lands are distributed among national forests (55.7%, including wilderness areas), national parks (3.5%), wildlife refuges (0.1%), Tribal lands (7.1%), and lands administered by the Bureau of Land Management (1.0%). State-managed forest lands occupy a small percentage of the total (2.1%) (Table 1).

Of the approximately 4,164 miles of existing bull trout streams, Plum Creek lands directly affect 312 miles (7.5% of the total, Table 2, Figure 4). Because land management effects on life stages may differ, this mileage has been further stratified to highlight streams that likely serve as migration and foraging habitats for sub-adult and adult bull trout (Tier 2), and those streams that likely serve as spawning and rearing habitats (Tier 1). As a preliminary determination, migration/foraging streams were assumed to be fifth order streams and larger, while spawning/rearing streams were assumed

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<sup>1</sup> As described by Rieman and McIntyre (1993), a bull trout *metapopulation* can be considered as an aggregation of several sub-populations (e.g., individual streams) within a larger river basin where connectivity exists. The presence of several sub-populations increases the probability that at least one will survive periods of disturbance and can serve as a source area for repopulating the rest of the basin.

to be fourth order and smaller. This initial stratification was then modified using Plum Creek fish survey data. Where Plum Creek survey data indicated the presence of adult and sub-adult fish, but not juveniles, in third and fourth order streams, the "spawning/rearing" designation was changed to "migration/foraging." Results show that 175 miles (56%) of Plum Creek bull trout stream mileage is categorized as providing spawning and rearing habitat (Table 3, Figures 5-6). Because survey data were not available for all of Plum Creek's bull trout stream miles, or for non-Plum Creek streams, it is expected that the miles of "spawning/rearing" habitats are overestimated, particularly in areas dominated by Forest Service ownership.

Overall, Plum Creek Timber Company owns a relatively minor portion of bull trout basins and the stream miles within them. This is not to suggest that Plum Creek's role in bull trout recovery is insignificant. If not done properly, it is possible for forest management practices on this relatively small land base to have a disproportionately large effect on fish habitat and water quality. However, as will be seen in the next section, the existing resource protection measures that guide forest land management activities of Plum Creek Timber Company, the U.S. Forest Service, and other federal, state, and private land owners will collectively provide the bulk of the habitat needed to maintain or recover bull trout populations.

## **FOREST SERVICE PROGRAMS FOR PROTECTING WATER QUALITY AND BULL TROUT HABITAT**

As shown in the previous section, the U.S. Forest Service is the single largest landowner in bull trout basins that contain Plum Creek ownership. Eight National Forests are represented in Plum Creek's 17 bull trout basins. Accordingly, federal aquatic resource protection programs are paramount for determining the future status of bull trout populations in these areas. The Forest Service's program for protecting water quality and bull trout has three major elements: 1) implementation of conservative aquatic resource protection strategies to address the needs of bull trout and other at-risk stocks of native salmonids; 2) implementation of Best Management Practices (BMP's); and 3) project-level environmental review.

### **FEMAT's Aquatic Conservation Strategy**

The first of the Forest Service's aquatic conservation strategies was developed by the Forest Ecosystem Management Assessment Team (FEMAT) to govern federal land management within the range of the northern spotted owl (Figure 7) (USDA et al. 1993). From this, an Aquatic Conservation Strategy (ACS) was developed to restore and maintain the ecological health of watersheds (USDA 1994). The strategy was designed to provide a scientific basis for protecting aquatic ecosystems and enabling planning for sustainable resource management. Late-Successional Reserves are an important component of the Aquatic Conservation Strategy. The Standards and Guidelines, under which Late-Successional Reserves are managed, provide increased protection for all stream types (USDA 1994). Streams, rivers, lakes, ponds, and wetlands within these reserves may be particularly important for endemic or locally distributed fish stocks. The following describes two primary components of the Aquatic Conservation Strategy:

#### **Riparian Reserves**

These reserves are portions of watersheds, on Federal lands, where riparian-dependent resources receive emphasis. The reserves include those portions of a watershed directly coupled to streams and rivers, which are required for maintaining hydrologic, geomorphic, and ecological processes that directly affect standing and flowing water bodies. Riparian Reserves are intended to improve water quality by preventing sediments from reaching streams, maintaining stream temperatures by shading, and providing large woody debris to maintain invertebrate and vertebrate habitat within streams. The widths (in slope distance)

of Riparian Reserves on Federal lands vary according to the type of stream (USDA 1994; pages C-30 and C-31):

Fish-bearing streams - Riparian Reserves for fish-bearing streams consist of the stream and the area on each side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of the riparian vegetation, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance (600 feet total, including both sides of the stream channel), whichever is greatest.

Permanently flowing non fish-bearing streams - Riparian Reserves for permanently flowing non fish-bearing streams consist of the stream and the area on each side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance (300 feet total, including both sides of the stream channel), whichever is greatest.

Constructed ponds and reservoirs, and wetlands greater than 1 acre - Riparian Reserves consist of the body of water or wetland and: the area to the outer edges of the riparian vegetation, or to the extent of seasonally saturated soil, or to the extent of unstable and potentially unstable areas, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance from the edge of the wetland greater than 1 acre or the maximum pool elevation of constructed ponds and reservoirs, whichever is greatest.

Lakes and natural ponds - Riparian Reserves consist of the body of water and the area to the outer edges of the riparian vegetation, or to the extent of seasonally saturated soil, or to the extent of unstable and potentially unstable areas, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance, whichever is greatest.

Seasonally flowing or intermittent streams, wetlands less than 1 acre, and unstable and potentially unstable areas - This category applies to features with high variability in size and site-specific characteristics.

At a minimum, the Riparian Reserves must include:

- The extent of unstable and potentially unstable areas (including earthflows),
- The stream channel and area extending to the top of the inner gorge,
- The stream channel or wetland and the area from the edges of the stream channel or wetland to the outer edges of the riparian vegetation, and
- Extension from the edges of the stream channel to a distance equal to the height of one site-potential tree, or 100 feet slope distance, whichever is greatest.

### **Key Watersheds**

The network of 164 Key Watersheds, located throughout the range of the spotted owl, either provide, or are expected to provide, high quality habitat. Under the Aquatic Conservation Strategy, there are Tier 1 and Tier 2 Key Watersheds. Tier 1 Key Watersheds contribute directly to conservation of at-risk anadromous salmonids, bull trout, and resident fish species. They also have a high potential of being restored as part of a watershed restoration program. Tier 1 Key Watersheds consist of watersheds identified previously by the Scientific Panel on Late-Successional Forest Ecosystems (1991), and the Scientific Analysis Team Report (1993). The network of 143 Tier 1 Key Watersheds provides refugia which may be crucial for maintaining and recovering habitat for at-risk stocks of anadromous salmonids and resident fish species. Although they may not contain at-risk fish stocks, the 21 widely distributed Tier 2 Key Watersheds are important sources of high water quality. Long-term management within Key Watersheds on Federal lands requires watershed analysis prior to resource management activity. For example, timber harvest, including salvage, cannot occur in Key Watersheds on Federal lands without a watershed analysis.

There are 8,119,400 acres, or about 33 percent of the total federal land within the range of the spotted owl, included among the Tier 1 Key Watersheds and 1,001,700 acres, or about four percent of the total federal land within the range of the spotted owl included among the Tier 2 Key Watersheds. Tier 1 watersheds inhabited by bull trout in the vicinity of Plum Creek lands are: (1) Box Canyon Creek, (2) upper Cle Elum River, (3) Naches River, and (4) upper Lewis River. No Tier 2 watersheds with bull trout occur in the vicinity of Plum Creek lands.

### ***PACFISH & Inland Native Fish Aquatic Protection Strategies***

Subsequent to the development of the Aquatic Conservation Strategy by FEMAT, the Forest Service and the Bureau of Land Management jointly developed a similar strategy for their lands within the range of anadromous pacific salmonids. This strategy, called "PACFISH (USDA Forest Service et al., 1995 and 1996)", includes the same general elements as the ACS (i.e., riparian habitat conservation areas (riparian reserves), key watersheds, watershed analysis, and watershed restoration) and covered the range of anadromous fish outside of the range of the spotted owl (Figure 7).

More recently, the Inland Native Fish Strategy (INFS) was created to cover the range of native, non-anadromous (resident) salmonids in the interior Columbia River basin on Forest Service lands (USDA Forest Service, 1995). INFS was implemented as an interim strategy until long-term management direction is developed through the Eastside Ecosystem Management Strategy EIS and the Interior Columbia River Basin EIS. Like FEMAT and PACFISH, INFS approaches aquatic protection by defining "Standards and Guidelines" for a variety of resource activities within Riparian Habitat Conservation Areas to achieve compliance with specified "Riparian Management Objectives." It also established 5.7 million acres of "Priority Bull Trout Watersheds" (USDA 1995).

The final management direction for National Forest and Bureau of Land Management administered lands in the interior Columbia River Basin is presently being developed. In May, the Draft Eastside EIS (USDA Forest Service et al., 1997) was released. The agencies preferred alternative in the Draft EIS includes aquatic conservation measures that exceed those described for the PACFISH and Inland Native Fish strategies. Though there is still uncertainty about what exact form the final decision will take, there is little doubt that it will be a highly conservative approach to aquatic protection.

### ***Best Management Practices***

The Forest Service's water quality protection strategy for areas outside of Riparian Reserves relies on implementation of Best Management Practices (BMP's) for the minimization of nonpoint source pollution. Though federal lands are not directly regulated by states, the Forest Service has typically entered into written agreements with states that they will meet or exceed state standards for protecting water quality. This includes meeting or exceeding requirements of various forest practices acts and streamside protection laws. As part of Montana's audit of BMP compliance, the Forest

Service was found to achieve compliance levels that are higher than the statewide average (Mathieus, 1996).

### ***Project-Level Environmental Review***

As required by the National Environmental Policy Act, the Forest Service must conduct an environmental review of their projects that might affect water quality and fish. As part of this review process, impacts of various alternatives must be evaluated before a decision is made to proceed. The public has an opportunity to review and comment on these analyses and decisions.

### ***Management of Federal Lands Outside the National Forest System***

In addition to multiple-use National Forest lands, there are many miles of bull trout streams on other categories of federal lands. These include lands in wilderness areas, national parks, etc., where management activities are even more restrictive than on National Forests, or are precluded altogether.

### ***Summary***

With the implementation of FEMAT, PACFISH, and INFS aquatic protection strategies, the Forest Service has embarked on a path of conservative, low-risk management of their lands, particularly riparian areas. These strategies, coupled with the fact that the Forest Service and other federal lands contain the vast majority of bull trout habitat, means that water quality and bull trout habitat in these areas are certain to be maintained and likely improve over time. Though federal land management programs provide the bulk of riparian function for bull trout streams, land management on private lands, including those owned by Plum Creek, can provide some incremental benefit to bull trout. The next section discusses Plum Creek's forest management system for protecting water quality and bull trout habitat.

## **PLUM CREEK'S FOREST MANAGEMENT SYSTEM FOR PROTECTING WATER QUALITY AND BULL TROUT HABITAT**

Plum Creek's existing aquatic resource protection efforts compliment those of the federal government. Though Plum Creek manages a minor amount of the total bull trout stream mileage relative to the Forest Service, it is more than any other single private landowner. Plum Creek's existing management system for protecting water quality and bull trout habitat has three major components: state rules and regulations, internal environmental policies and programs, and agreements with the federal government for habitat conservation. Before delving into the specifics of each component however, a brief description of Plum Creek's operational structure in the Pacific Northwest will help explain how the Company's timberlands are managed.

### ***Timberland Operational Structure***

In the Cascades Region of Washington, Plum Creek's 309,000 acres of timberlands are managed in three operating units. The Yakima Unit manages timberland in the Yakima River drainage, which includes three of the four major bull trout drainages in Washington (Upper Yakima River, portions of the Naches River, and Ahtanum Creek). The Columbia River Unit manages lands in southwestern Washington, including those in the Lewis River drainage. The Puget Sound Unit manages the remainder of the Cascades region timberlands in Puget Sound watersheds. Some land in the Naches river headwaters is also managed by the Puget Sound Unit. In each unit the forestry staff is organized into teams that collectively administer all aspects of forest management in their assigned areas.

In the Rockies Region of Idaho and Montana, Plum Creek's 1.6 million acres of timberlands are managed in two operating units. The Clearwater Unit manages timberlands in west-central Montana and northern Idaho. This includes land in eight of the twelve bull trout basins in the Region with Plum Creek ownership (Lochsa River, Little North Fork Clearwater River, and Upper St. Joe Rivers in Idaho; and the Bitterroot River, Upper Clark Fork River, Blackfoot River, Swan River, and Middle Clark Fork Rivers in western Montana). The Flathead Unit manages timberlands in northwestern Montana, including land in five bull trout basins (Flathead River, Upper Kootenai River, Middle Kootenai River, Lower Kootenai River, and Middle Clark Fork River). In each unit, foresters are assigned a management block of around 30,000 acres for which they are responsible for all aspects of timberlands management.

Though each region differs with respect to how it is organized and how decisions are made regarding resource management, implementation of aquatic resource protection measures is relatively uniform.

### ***State Rules and Regulations***

State-based rules and regulations provide the basic foundation for protection of water resources in Plum Creek's timberland management activities. These rules and regulations include the Washington Forest Practices Act, the Idaho Forest Practices Act, Montana's Best Management Practices for Forestry, and Montana's Streamside Management Zone Act. In addition to these core programs, activities along lakes and modification of streambeds and banks are regulated through review and permit processes administered by each state.

#### **Washington Forest Practices Act (RCW 76.09, WAC 222-08)**

The Washington Forest Practices Act and the implementing Forest Practices Rules and Regulations are the principal means of State regulation of activities on state and private forest lands in Washington. Administered and enforced by the Department of Natural Resources (DNR), the Forest Practices Rules and Regulations address most issues of concern on forested lands, including harvest practices, regeneration, pesticide application, road construction, and the protection of other public resources such as water quality, fisheries, and wildlife. All harvest activities on state and private forest lands require a Forest Practices Notification of Approval from the DNR, the issuance of which is contingent upon compliance with the Forest Practices Act and regulations. Most or all provisions within the forest practices rules and regulations ultimately influence fish and wildlife habitat by regulating how and when certain activities may take place on private forest lands. Washington's forest practice regulations are among the most stringent in the nation. Included in the Washington Forest Practices Act is a provision for voluntarily initiating Watershed Analysis. Watershed analysis is a systematic procedure to assess local processes within a watershed and provide information for developing management guidelines that protect and restore aquatic and riparian habitat. A key component of Watershed Analysis is monitoring to assess the effectiveness of prescriptions developed by the process. A detailed description of recommended methodologies for conducting watershed analysis can be found in the Washington Forest Practices Board Manual: *Standard Methodology for Conducting Watershed Analysis, Version 3.0* (WFPB 1995).

*The Timber, Fish, and Wildlife Agreement.* A distinguishing feature of the forest land management system in Washington State is the Timber, Fish, and Wildlife Agreement (TFW). This agreement was developed in 1987 by representatives from Native American Indian tribes, state agencies, the private timber industry, and environmental groups. The agreement created a process for cooperative management of public and private natural resources, based on adaptive management and a reliance on technical information. Since its inception, TFW participants have contributed to the continuous improvement of best management practices around the state. Many of these improvements have derived from information gathered through cooperative research and monitoring projects. Thus far, more than 15 million dollars of state, tribal, and private funds have been spent on these projects. The products of these efforts are a wide array of management tools, including a cumulative effects assessment and management system (called "Watershed Analysis"; this process will be described later)<sup>2</sup>. The results of completed watershed analyses are currently being used to comprehensively evaluate and revise forest practice rules and regulations. Overall, the TFW agreement has created a unique process that actively involves participants in natural resource management decisions at local, regional, and state-wide levels.

#### **Idaho Forest Practices Act (Title 38, Chapter 13, Idaho Code, IDAPA 20.15)**

The Idaho Forest Practices Act ("IFPA") and the implementing forest practices rules and regulations govern forest practices on private lands in Idaho. Administered and enforced by the Idaho Department of Lands ("IDL"), the IFPA addresses forest practices such as road building, timber harvesting, reforestation, and streamside protection. Streamside protection zones (ISPZ) vary between 30-75 feet on each side of streams. Within this zone, no more than 25% of existing shade can be removed. With regard to large woody debris recruitment, Idaho rules require trees of specific sizes be retained in the ISPZ. In addition, requirements are often more stringent along streams designated as Stream Segments of Concern (SSOC) as part of Idaho's anti-degradation program. Many bull trout streams in Idaho are designated as SSOC and have these more stringent requirements. In 1991, the Idaho legislature amended the Act, directing IDL to evaluate alternatives for controlling the cumulative effects of forest practices on the aquatic environment. As a result, the Forest Practices Cumulative

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<sup>2</sup> A list of TFW research and monitoring project reports is available from Washington State Department of Natural Resources.

Watershed Effects Process for Idaho (Idaho Department of Lands, 1995) was developed and is being finalized by the Idaho Forest Practices Act Advisory Committee and the Idaho Land Board for inclusion in the IFPA. Similar to Washington's Watershed Analysis Program, the process is designed to identify areas of resource sensitivity, such as landslide-prone areas, and to design for such areas special management prescriptions that are more restrictive than the normal forest practices rules.

### **Montana Best Management Practices for Forestry**

In 1987, Montana adopted a set of voluntary Best Management Practices (BMP's) for forestry activities (DHES, 1987). These BMP's were subsequently approved by EPA as part of Montana's nonpoint source program for protecting water quality. Though Montana's BMP's are "voluntary," they must be implemented to avoid project level review under Montana's non-degradation law and rules. Montana BMP's for forestry include guidance for minimizing soil and water quality impacts associated with over 80 forest practices, such as providing energy dissipators at culvert outlets, and stabilizing erodible soils through seeding, mulching, etc. In order to ascertain statewide compliance with BMP's, and generate feedback on BMP effectiveness, the Montana Department of Environmental Quality (DEQ) has funded biannual audits since 1988. These audits are coordinated by the Montana Department of Natural Resources and Conservation. Three audit teams survey compliance with BMP's and their general effectiveness on about 40 recently harvested sites throughout the state. These include sites on federal, industrial private, state, and non-industrial private lands. Each audit team is composed of a hydrologist, logging engineer, forester, soil scientist, fish biologist, and a representative from the conservation community. In the most recent audit (Mathieus, 1996), audit teams found BMPs were fully applied 92% of the time, and were effective at protecting water quality 94% of the time. Since 1994, Plum Creek has averaged 96% compliance with BMP application, higher than any other landowner in Montana - private or public (Frank, 1994; Mathieus, 1996).

### **Montana Streamside Management Zone Act (MCA 77-5-301, ARM 26.6.601)**

In 1991, the Montana legislature passed the Montana Streamside Management Zone (SMZ) Act, which mandates a 50-100 foot zone around streams, lakes, and other bodies of water where timber harvest practices are regulated. This law and the rules are administered and enforced by the Montana Department of Natural Resources and Conservation. In March,

1993, rules were adopted to implement the SMZ law. Specific restrictions within SMZ's deal with timber harvesting, broadcast burning, equipment operation, road construction, side-casting of road material, slash deposition, and handling of hazardous or toxic materials.

#### **Hydraulic Code of Washington (WAC 220-110, RCW 75.20)**

The Washington State Department of Fish and Wildlife (WDFW) has authority to regulate forest management activities that use, divert, obstruct, or change the natural flow or bed of any waters of the state. This typically applies to water crossing structures and the felling or yarding of timber over fish-bearing streams, or streams that significantly influence fish-bearing streams. A Hydraulic Permit must be obtained from WDFW before these activities can be conducted. In most cases, this requires an on-site inspection by WDFW. These inspections give landowners an opportunity to discuss and better understand available techniques for improving fish passage.

#### **Washington State Shoreline Management Act (WAC 173-14, RCW 90.58)**

The Shoreline Management Act (SMA) designates as "shorelines of the state" all streams with average annual flows greater than 20 cfs, lakes over 20 acres, as well as all marshes, bogs, and swamps. Permits are required for development, including forest management, within 200 ft of these water bodies. The SMA requires local governments to enact master plans and local shoreline development regulations. Local governments must assign certain designations to shorelines and prescribe recommended uses and use restrictions for each designation. Any development or use within a shoreline area requires compliance with the SMA and the local master plan and regulations. The SMA also designates certain shorelines as "shorelines of state-wide significance ("SSWS"). Rivers west of the Cascade range, for example, with mean annual flow of 1000 feet per second and rivers east of the Cascade range with mean annual flow of 200 feet per second are designated SSWS. SSWS guidelines allow only selective commercial timber cutting within two hundred feet abutting landward of the ordinary high watermark within any SSWS, such that no more than 30% of the merchantable trees may be harvested in any ten year period. Depending upon the designation applied to a particular shoreline under the SMA, buffer requirements and other management restrictions may be more or less stringent than those dictated by the Washington State Forest Practices Act and regulations, with the more stringent regulations controlling.

### **Montana Lakeshore Protection Act (MCA 75-5-201)**

The Montana Lakeshore Protection Act applies to all private individuals and government entities proposing to do work in or near a body of water. A permit must be obtained for any work within 20 feet of the high water mark of a lake, including tree removal.

### **Idaho Stream Channel Protection Act (Title 42, Chapter 38, Idaho Code)**

The Idaho Stream Channel Protection Act requires that a permit be obtained for most stream channel alterations, including culvert and bridge installation. The Act is administered by the Idaho Department of Water Resources, but on forest lands administration has been delegated to the Idaho Department of Lands through a Memorandum of Understanding.

### **Montana Natural Streambed and Land Preservation Act (MCA 75-7-101)**

The Montana Natural Streambed and Land Preservation Act applies to any private, nongovernmental individual or entity that proposes any activity that physically alters or modifies the bed or banks of a perennial stream on public or private land. This law is administered by local Conservation Districts and its purpose is to minimize soil erosion and sedimentation, protect and preserve streams and rivers in their natural or existing state, and to prevent damage to the lands and property immediately adjacent to streams and rivers. A permit must be obtained for activities such as the installation or replacement of bridges and culverts. Local conservation district personnel or representatives review proposed projects to ensure that they minimize disturbance, allow for fish passage, and accommodate flood flows.

Together, the above state regulations govern a wide array of forest management activities with potential to affect fish habitat and water quality. Adherence to these standards provides a moderate to high level of resource protection during timber management activities throughout our ownership. Also, by their nature, these Best Management Practice systems are continually improving as new knowledge is gained during practice or through research and monitoring.

### ***Internal Environmental Policies and Programs***

The previous discussion focused on the multitude of state laws that regulate activities on all state-managed and privately-managed forest land. However, Plum Creek's management system goes

beyond standard rules and regulations. The second level in Plum Creek's forest management system for protecting water quality and bull trout habitat includes a number of internal Company policies and implementation programs. The following is a discussion of Plum Creek's Environmental Principles, Watershed Analysis, Pilot Landscape Management Projects, Grazing BMP's, Road Management, and Land Use Planning.

### **Environmental Principles**

In 1991, Plum Creek adopted a set of *Environmental Principles* for forest management activities. These principles guide how Plum Creek responds to public concern about water and air quality, wildlife, and ecological diversity. The *Environmental Principles* create an operating climate where good forest stewardship is individually rewarded and reinforced. This results in creative approaches to riparian management, enhanced local protection measures, and accelerated watershed restoration. Seven of the eleven *Environmental Principles* directly or indirectly relate to water quality and fish habitat protection. These are as follows:

- **Sustainable Forest Management** - Manage our forests in a sustainable, socially responsible, economical manner.
- **Ecological and Structural Diversity** - Enhance ecological and structural diversity where feasible and prudent by using a variety of silvicultural techniques, by retaining a diversity of vegetation and by leaving trees of various sizes and species, snags, culls and other organic debris.
- **Water Quality** - Meet and when appropriate exceed, state and federal standards to protect water quality and fisheries by using Best Management Practices for all forest management activities, including the retention of buffers along streams and wetlands.
- **Reforestation** - Ensure future forest productivity and sustained forest growth by using the most ecologically and economically appropriate reforestation methods. Ensure that reforestation has occurred in all harvest areas - within two years in the westside forests of our Cascade Region and within five years in the Rocky Mountain Region and the east slopes of the Cascade Region.

- **Soil Conservation** - Maintain soil and site productivity by minimizing soil disturbance during harvests, and by recycling harvest residue for nutrient preservation.
  
- **Adjacent Land Management** - Cooperate with neighboring landowners in addressing and minimizing potential cumulative effects of resource management activities.
  
- **Research and Development** - Learn, experiment, innovate and respond to changing scientific knowledge, public concerns and economic conditions to optimize both financial and environmental performance.

In 1996, working closely with the World Forestry Industry Group of Price Waterhouse, Plum Creek developed quantifiable performance standards for each of the *Environmental Principles*. An audit program was then designed, field-tested and finalized. Full-scale audits of the *Environmental Principles* were conducted on the Yakima and Flathead Units in 1996 and on the Puget Sound, Columbia River, and Clearwater Units in 1997. Results of these audits have been used to refine the auditing process and correct problems identified in the field.

### **Watershed Analysis**

As discussed above, the Washington Forest Practice Act includes a provision for landowners to voluntarily initiate Watershed Analysis for individual watersheds. The outcome of this scientific assessment is a set of new forest practice rules that are tailor-made for the unique hazards and vulnerabilities of a given watershed. Plum Creek holds significant ownership in 35 of Washington's Watersheds. Since 1993, three watershed analyses have been completed in the Cascade Region, and seven more are in various stages of completion. Plum Creek is also voluntarily conducting Washington-style watershed analyses in the Rockies Region, as discussed below in the Pilot Landscape Management Project section.

### **Plum Creek Grazing Best Management Practices**

In 1995, Plum Creek developed a set of Grazing Best Management Practices for 724,000

acres of Company lands that are leased for livestock grazing (Plum Creek, 1995). This set of Grazing BMPs includes a set of performance standards for grazing allotments. Standards include criteria for minimum acceptable streambank stability, riparian disturbance, and grass/shrub utilization. Each lessee is required to submit a range management plan for Plum Creek approval prior to turnout. This range management plan is developed in consultation with a Plum Creek range-management specialist or forester, and provides details about how the lessee will comply with Company performance standards. Then, twice each summer, the lessee monitors riparian condition at several locations throughout their allotment as agreed to by the lease administrator.

### **Pilot Landscape Management Projects**

In August, 1995, two Pilot Landscape Management Projects (PLMP's) were initiated in Plum Creek's Rocky Mountain Region. Plum Creek initiated these PLMP's in an effort to develop and assess the potential for application of an ecosystem-based approach to forest management in the Northern Rockies. The study areas are composed of multiple ownerships, with varying amounts of Plum Creek land within the areas. These landscape-scale assessments of current and potential future conditions of fish, wildlife and watershed resources are seen within Plum Creek as a logical next step forward from the innovative, stand-level experiments begun in 1991 with the implementation of the Environmental Forestry program. The PLMP's will provide a basis for evaluating the contribution of commercial forest lands to the conservation of public resources such as wildlife, water quality and fisheries. The pilot project areas include the Swan River Basin (408,630 acres total area; 82,718 acres Plum Creek), located southeast of Kalispell, Montana and the Thompson River Basin (410,276 acres total area; 170,642 acres Plum Creek), located west of Kalispell, Montana (Figure 8). These areas were selected to represent a range of ecological conditions within the Northern Rockies, while addressing a diversity of resource utilization issues and varying spatial relationships between Plum Creek and other lands. To date, ecological classification of each analysis area as been completed, watershed analyses and fish habitat inventories have been completed in the Swan, and watershed analyses and fish habitat inventories are underway in the Thompson.

### **Plum Creek Road Management Policy**

Plum Creek manages over 15,000 miles of road in the Cascades and Rockies Regions. These

roads are critical for management of our lands and also support significant recreational use by the public. Roads can also be a source of erosion, particularly if they are improperly used or maintained. Over the years, Plum Creek has found that unrestricted use of its roads, particularly by the public, can create severe erosion problems detrimental to water quality and aquatic species such as bull trout. Problems with erosion, along with concerns over wildlife security and maintenance costs, has prompted Plum Creek to close thousands of miles of roads to public motor vehicle use (via gates, barricades, earth berms, etc.) over the last 10 years. These road closures, in concert with implementation of BMP's benefit bull trout through reduced erosion and sediment delivery to streams, and possibly by reducing fishing pressure and illegal harvest in areas where closed roads make access more difficult.

Because roads often cross multiple ownerships, Plum Creek spearheaded the development of the Montana Road Management Cooperative (MRMC) in 1991. This cooperative includes the Forest Service, Bureau of Land Management, Montana Department of Fish, Wildlife, and Parks, Montana Department of State Lands, and Plum Creek. To date, the primary accomplishment of the MRMC has been the development of a consistent signage for displaying road use/closure status to the public for forest roads throughout western Montana. MRMC is also a forum for preparation of public education programs. These include distributing brochures, press releases, and public service announcements that promote the benefits of proper road use for the protection of water quality, fish habitat, and wildlife security. Similar programs exist for road management in Idaho and Washington.

### **Land Use Planning**

In 1994 Plum Creek established a comprehensive strategy to identify and evaluate lands that may have values significantly higher than timber values, with the objective to sell or exchange such lands over time. At that time, Plum Creek identified approximately 110,000 acres in Montana for study. To guide this process, a set of *Land Use Principles* were adopted in 1995 to complement the Company's *Environmental Principles*. Key Land Use Principles related to aquatic conservation are as follows:

- Support comprehensive land use planning as a means of establishing certainty and predictability in the land use process in order to protect community values while accommodating sensible development. Base planning decisions on an appropriate

level of physical, environmental and economic analysis.

- Work with other landowners and community members to understand and address land use related issues and potential impacts.
- Encourage consideration of creative and innovative land use concepts that lead to environmentally responsible development.
- Meet, and when appropriate exceed, local, state, and federal standards for protection of air and water quality, and fisheries and wildlife habitat.
- Encourage and support productive natural resource management and responsible development that is consistent with sound land use and environmental principles.

One method to implement these land use principles has been to seek conservation buyers. One such sale included the Blackfoot River corridor (20 miles river frontage, 11,730 acres) to The Nature Conservancy for eventual public ownership (BLM). Another included 120 acres on the shore of Lake Mary Ronan were sold to the Montana Department of Fish, Wildlife, and Parks (MDFWP) to expand an existing state park. Several other projects with conservation objectives are presently being worked on, including: 1) Signing of an Option to sell 2500 acres at Lindbergh Lake to Trust for Public Land (Tier 1 bull trout watershed); 2) Working to exchange 600 acres of high-value land at Chain of Lakes to MDFWP for timberland nearby; 3) Working with Flathead County to provide additional public access at Little Bitterroot Lake; and 4) Initiating discussions with MDFWP on possible conservation strategies along the Fisher and Thompson Rivers.

Land exchange has also been a tool Plum Creek has used to put special places into public ownership. Two examples of recent land exchanges that put bull trout habitat into public ownership are the Elk Creek exchange in the Swan River Valley and the Fly/Mosquito exchange in the Upper St. Joe River drainage. Elk Creek is one of the premier bull trout spawning streams in the Pacific Northwest. Over the last 15 years, Elk Creek has averaged 130 redds (spawning nests) per year. As part of this exchange, Plum Creek traded out of 1,600 undeveloped acres that were directly adjacent to the high density Elk Creek spawning

areas. The Fly/Mosquito exchange in the Upper St. Joe River basin placed 6,943 acres into public ownership. This included unroaded lands in three bull trout watersheds: Fly Creek, Mosquito Creek, and Beaver Creek. Plum Creek has a number of land exchanges that are currently in progress that include lands in bull trout-occupied watersheds. These include the 3,100 acres in the Rock Creek drainage in Western Montana as part of the Babcock Mountain Exchange, and approximately 61,000 acres of Plum Creek land as part of the Plum Creek-U.S. Forest Service Exchange in the central Cascades of Washington.

### ***Agreements with the Federal Government for Habitat Conservation***

Another vital component of Plum Creek's strategy for protecting natural resources involves conservation planning with the federal government. In the last three years, two comprehensive habitat protection agreements have been reached. These include the Cascades Habitat Conservation Plan and the Swan Valley Grizzly Bear Conservation Agreement.

#### **Cascades Habitat Conservation Plan**

Signed in 1996, Plum Creek's multi-species Habitat Conservation Plan (HCP) covers 170,000 Plum Creek acres, 23 watersheds, and includes 12,000 acres of riparian and wetland habitat. Under the HCP, Plum Creek has committed to a strict yet flexible 50-year ecosystem management strategy that will protect four listed vertebrate species and 281 others. For aquatic organisms (e.g., fish), riparian-dependent wildlife (e.g., amphibians), and other sensitive wildlife (e.g., spotted owls) emphasis is placed on managing riparian buffers and special habitats such as wetlands. This results in greater protection than would be afforded by Watershed Analysis prescriptions where the principal focus is fish and water quality. Specifics of the Riparian Management Strategy include:

- 200 ft. (horizontal distance) Riparian Habitat Areas (RHA) along perennial, fish-bearing streams<sup>3</sup>.
  - No commercial harvest allowed within 30 ft. (horizontal distance) of streams.
  - The remainder of the RHA will be managed to provide large woody debris, maintain late successional forest structure, accommodate channel migration, and provide slope stability. Forest conditions will also be maintained to provide, at a minimum, spotted owl feeding and dispersal habitat.
  
- 100 ft. (horizontal distance) RHA along perennial, non fish-bearing streams.
  - No ground-based equipment allowed within 30 ft. (horizontal

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<sup>3</sup>Salmonid fish are presumed to inhabit all streams with gradients less than 20% and drainage areas larger than 50 acres (western Washington), or 175 acres (eastern Washington), per revisions to the state's water typing system (WFPB 1996).

distance) of streams.

-The remainder of the RHA will be managed to protect downstream fish habitat, water quality, and habitat for other aquatic and riparian-dependent wildlife species, such as frogs and salamanders. Within Federal Late Successional Reserves, Adaptive Management Areas, and other areas suitable for owl dispersal, forest conditions will also be maintained to provide, at a minimum, spotted owl feeding and dispersal habitat.

### **Swan Valley Grizzly Bear Conservation Agreement**

In 1995, Plum Creek, Montana Department of State Lands, U.S. Forest Service, and the U.S. Fish and Wildlife Service signed an agreement for the conservation of grizzly bears in the Swan Valley in Montana. The agreement encompasses 369,299 acres, of which 82,718 acres are managed by Plum Creek. Beyond the benefits to grizzly bears, the agreement also benefits water quality and fish habitat in the Swan River basin. These benefits include: 1) Reducing the miles of roads that are open to public vehicle use. Within each "bear management unit," the density of open roads cannot exceed 1 mile of road per square mile of land. This benefits water quality in that less-trafficked roads have lower erosion rates and thus reduced sediment delivery to streams. To date in the Swan drainage, over 200 road closures have been implemented; 2) Maintaining "cover" in riparian areas for bear security. To accomplish this, selective harvesting of timber is required. In many cases, to maintain adequate cover levels, Streamside Management Zones (SMZ) cannot be harvested to the extent that standard SMZ rules allow. In addition, riparian areas occasionally extend beyond the regulatory SMZ boundary. The net effect of this is a wider stream buffer for sediment filtration, stream shading, large woody debris recruitment, and bank stability; 3) Maintaining "cover" around wetlands, potholes, and wet depressions. Though the SMZ law requires selective harvest in wetlands adjacent to streams, there are no regulatory requirements for tree retention in and around isolated wetlands and potholes. This provision of the grizzly bear agreement does not directly benefit bull trout, but it is a general benefit to aquatic resources in the Swan; and 4) Rotating activities in the Swan. The Agreement requires that only four of the eleven Bear Management Units (BMU's) have active timber harvesting over a three year period (except for winter when bears are hibernating). The effect of this is that each BMU experiences three years of activity followed by six years of inactivity. This

provision benefits water quality in that roads that would normally have sustained activity (and thus elevated sediment delivery potentials) are allowed to revegetate over extended periods. In addition to the Swan Valley, Plum Creek is implementing Grizzly Bear BMP's at the project level in all key occupied grizzly bear habitat in northwest Montana

## **RESTORATION PROGRAMS**

As was discussed in the introduction to this paper, little attention was paid to the environmental consequences of land use and fish management practices prior to the 1970's. With increasing scientific knowledge, public concern (regulation), and resource management awareness over the last three decades, the abusive early practices, particularly in the forest products industry, are largely non-existent today. No longer are splash dams used. No longer are logs skidded down streams by heavy equipment. No longer are roads built directly adjacent to streams, and no longer are riparian areas clearcut immediately adjacent to fish-bearing streams. Though these practices have been discontinued, lingering effects of their prior use continue to impact water quality and bull trout habitat. To address these legacy problems, private forest land managers and state and federal land management agencies throughout the northwest have funded hundreds of restoration efforts over the last two and a half decades.

Both the Forest Service and Plum Creek have engaged in restoration efforts that are directly targeted at ameliorating impacts of past practices on bull trout streams. In Plum Creek's Rocky Mountain Region, restoration efforts have largely been directed at bringing older roads up to modern BMP standards by adding road drainage features and reducing sediment delivery at stream crossings. Another restoration effort in the Rockies Region included adding large wood to Gold Creek, an important bull trout stream in the lower Blackfoot River basin. Riparian enhancement projects have been undertaken on other bull trout streams where willows were planted, and livestock excluded from heavily grazed reaches. Though road relocation and obliteration are not common restoration activities on Plum Creek lands, they have been done in specific cases. One example is the Little Thompson River basin, where in 1995, Plum Creek obliterated three miles of road that were no longer needed for timber hauling.

In the Cascades Region, restoration has typically been directly linked to watershed analysis. Prescriptions developed during Watershed Analysis often include restorative measures such as sediment reduction and placement of large woody debris in streams. While the overall prescriptions for a given watershed can be seen collectively as contributing toward "cumulative restoration" of the processes within a watershed, site-specific actions can lead to significant near-term improvements. For example, road sediment abatement plans (including road relocation and abandonment) in the Ahtanum Creek watershed and elsewhere will significantly reduce the road-related inputs of fine sediment to bull trout streams within the next several years. A road system inventory to identify

potential fish passage problems is another example of cooperative restoration projects that follow Watershed Analysis. In some cases, restoration projects unrelated to forest management are identified. For example, irrigation diversions at the mouths of Big and Little creeks (tributaries to the upper Yakima River, Washington) were found to impede fish passage (Plum Creek, 1996). Local developers are presently investigating the option of removing these barriers as part of an agreement to obtain water rights. Opportunities such as these can often be funded with public dollars dedicated to this purpose.

## **DISCUSSION AND SUMMARY**

This report describes the array of existing aquatic resource protection measures that influence the current and future conditions of bull trout habitat across National Forest and Plum Creek ownership. When coupled with knowledge of bull trout environmental requirements, this information can be used to guide development of a practical and meaningful strategy for the conservation of bull trout habitat and water quality on Plum Creek's timberlands. Four major points emerged from the analysis. First, although Plum Creek owns substantial property in bull trout drainages throughout the Pacific Northwest (more than any other private landowner), these are but a fraction of the total lands within bull trout watersheds, and most of the remainder is managed by the Forest Service. Additionally, Forest Service lands are tightly interwoven with Plum Creek lands owing to the checkerboard pattern of Plum Creek's ownership. Therefore, the relative role of the federal government is large compared with Plum Creek, on a per acre basis. Second, about half of the total miles of bull trout streams that cross Plum Creek's serve as less sensitive foraging and migratory habitat. Third, all of the National Forests that are represented in Plum Creek's bull trout watersheds have recently adopted highly-conservative aquatic resource protection strategies. This provides an opportunity for Plum Creek to compliment the federal strategies to maximize benefits to bull trout while maintaining profitability and shareholder value. Fourth, there are numerous and varied aquatic resource protection measures already embodied in Plum Creek's environmental management system. These take the form of State forest practice rules, environmental principles, watershed analysis, and formal conservation agreements with the federal government. Collectively, these go a long way toward addressing bull trout habitat needs during forest management activities.

The legacy of past land-use and fish management impacts on bull trout have undoubtedly contributed to the current depressed state of many stocks. Included in these are past impacts from forest management activities (mostly legal at the time). Current Best Management Practices have evolved from these early practices and now provide considerable protection to aquatic resources. However, current science does not provide high certainty for all cause-effect pathways between forest practices and resource conditions. Continued experimentation with different land management approaches are still needed. Plum Creek has a demonstrated commitment to the use of "best available science" for developing innovative solutions to challenging resource management problems. This philosophy will be crucial for identifying remaining bull trout sensitivities not covered under current forest management systems, and for developing workable management approaches to address these sensitivities with appropriate implementation and monitoring.

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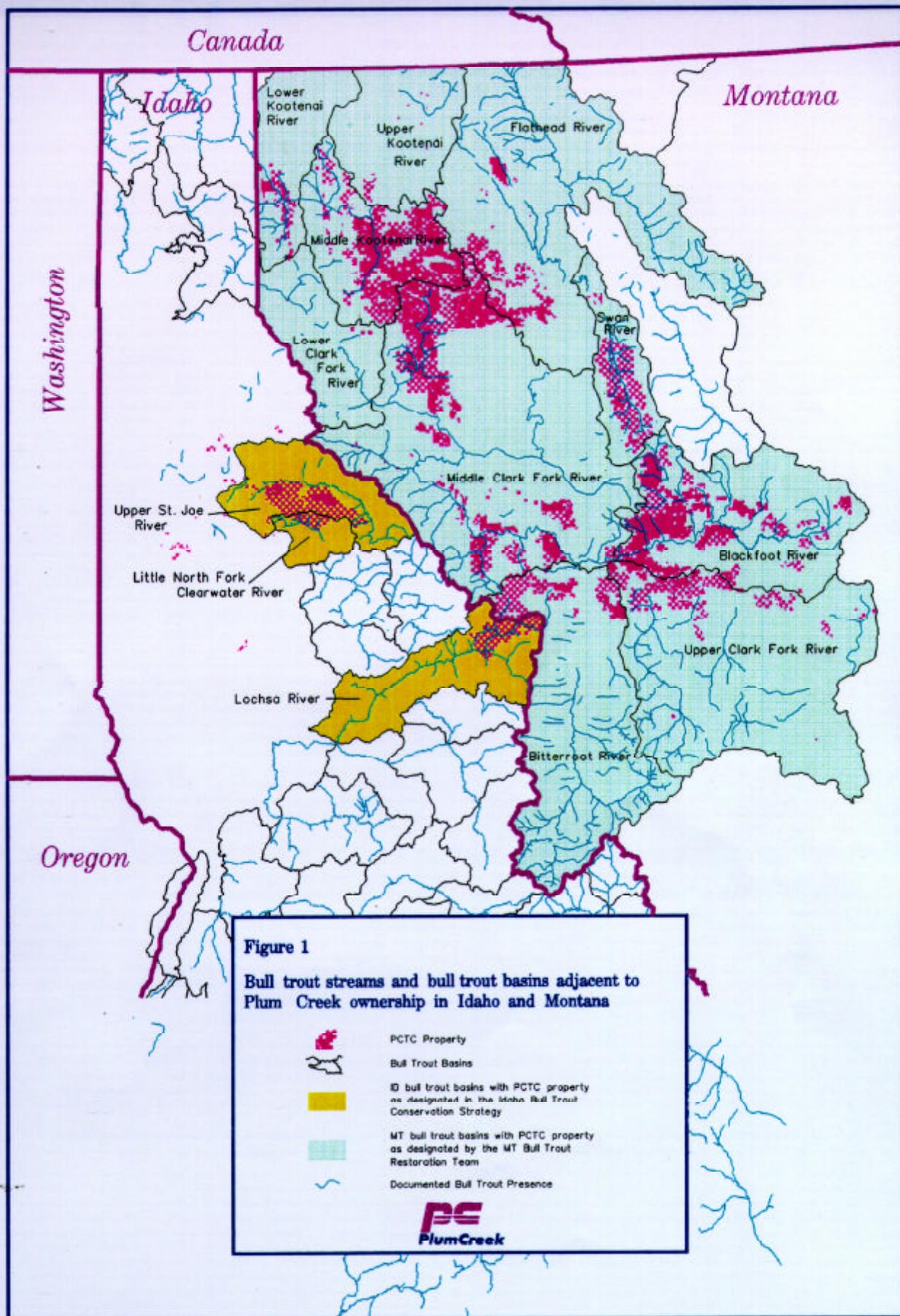
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- Figure 3. Land ownership distribution in selected bull trout basins in Montana, Idaho, and Washington.
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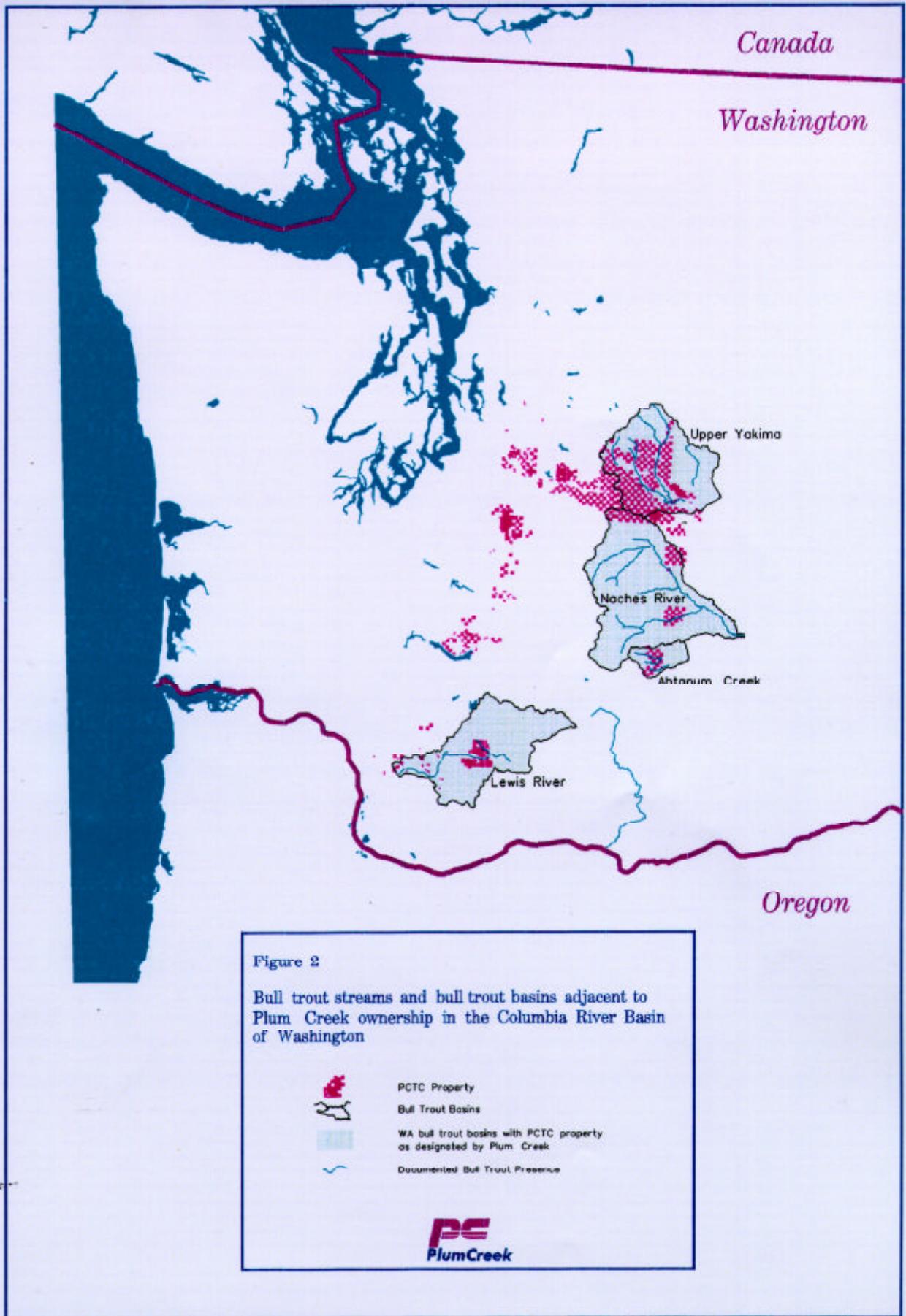
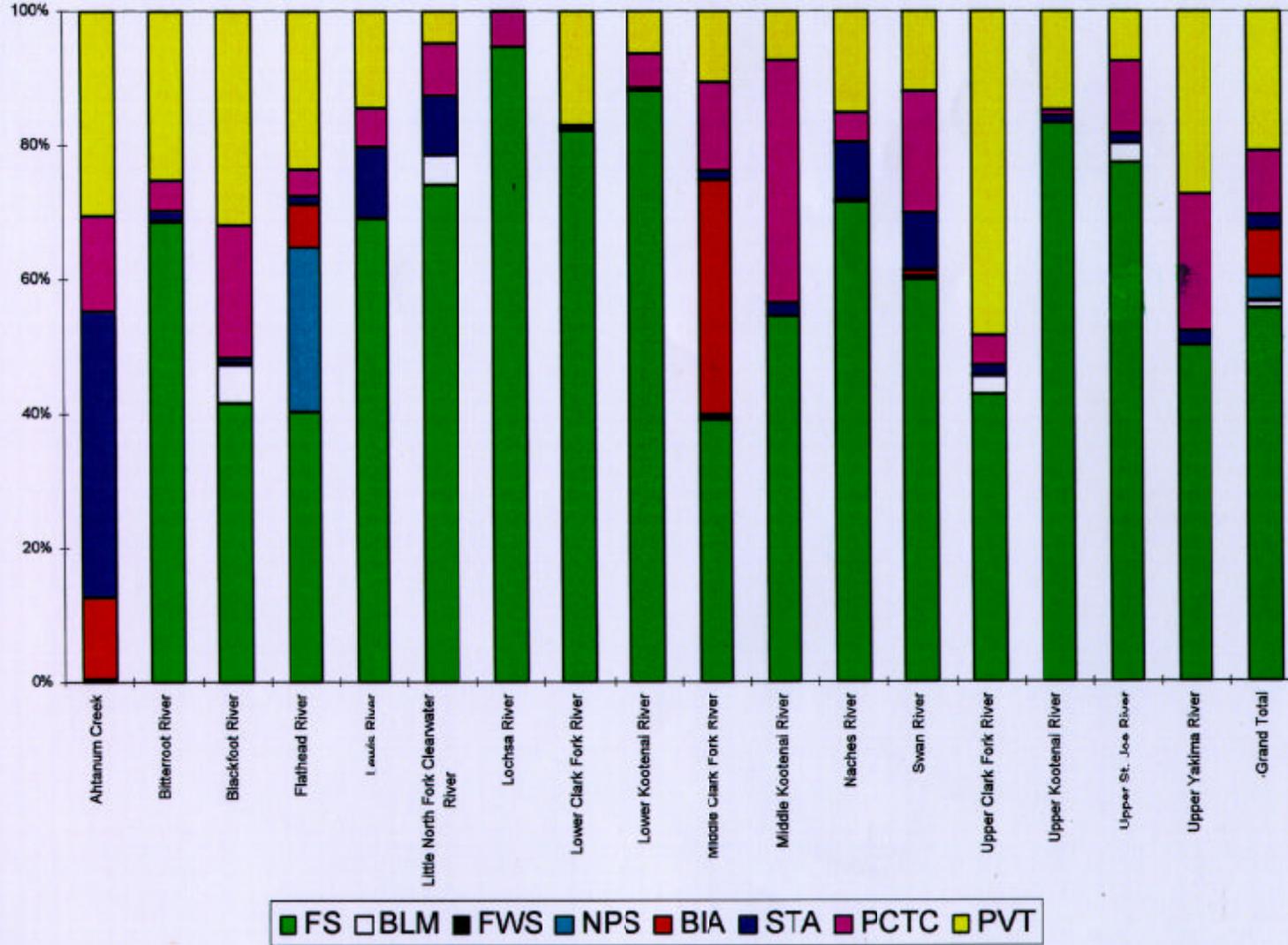
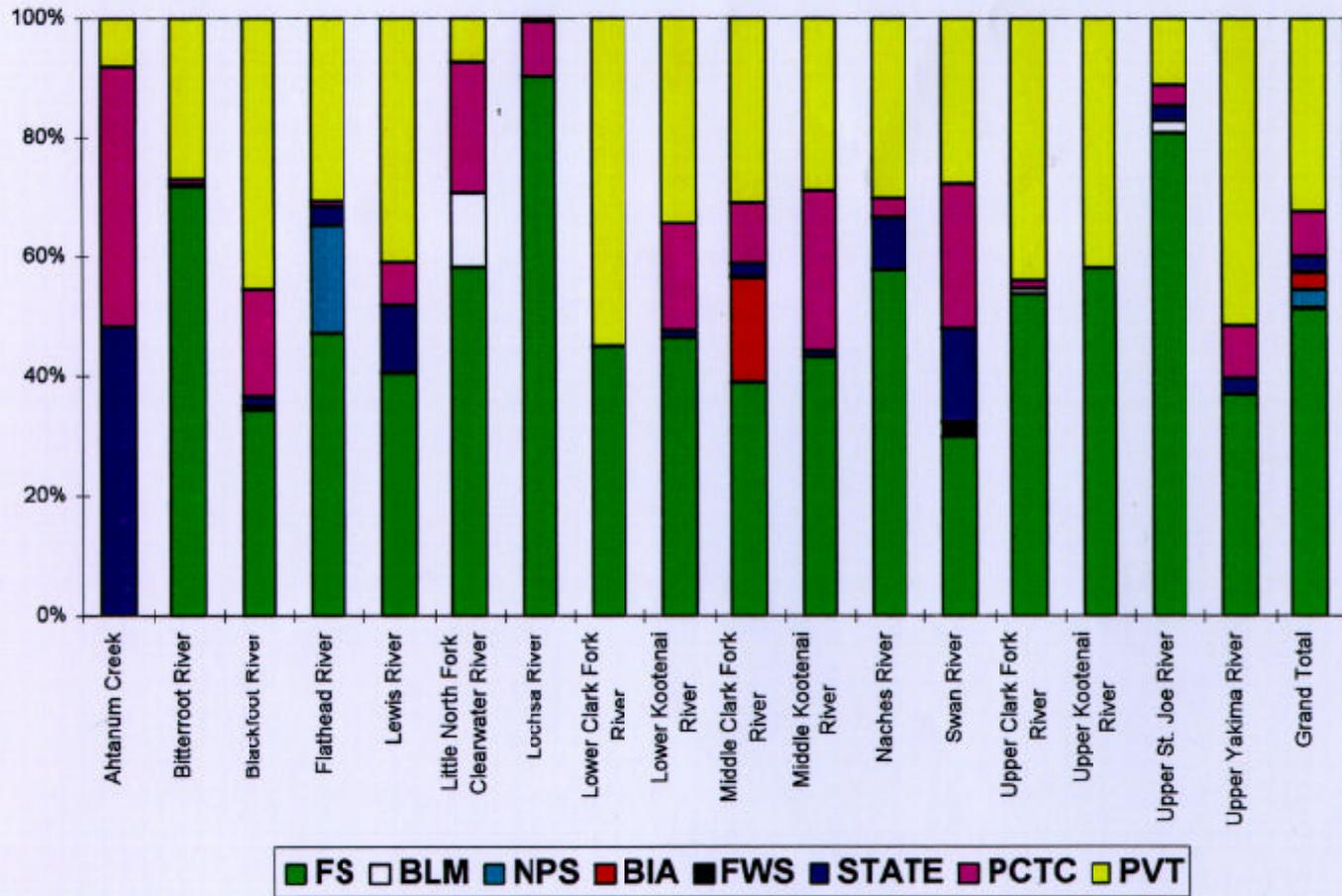


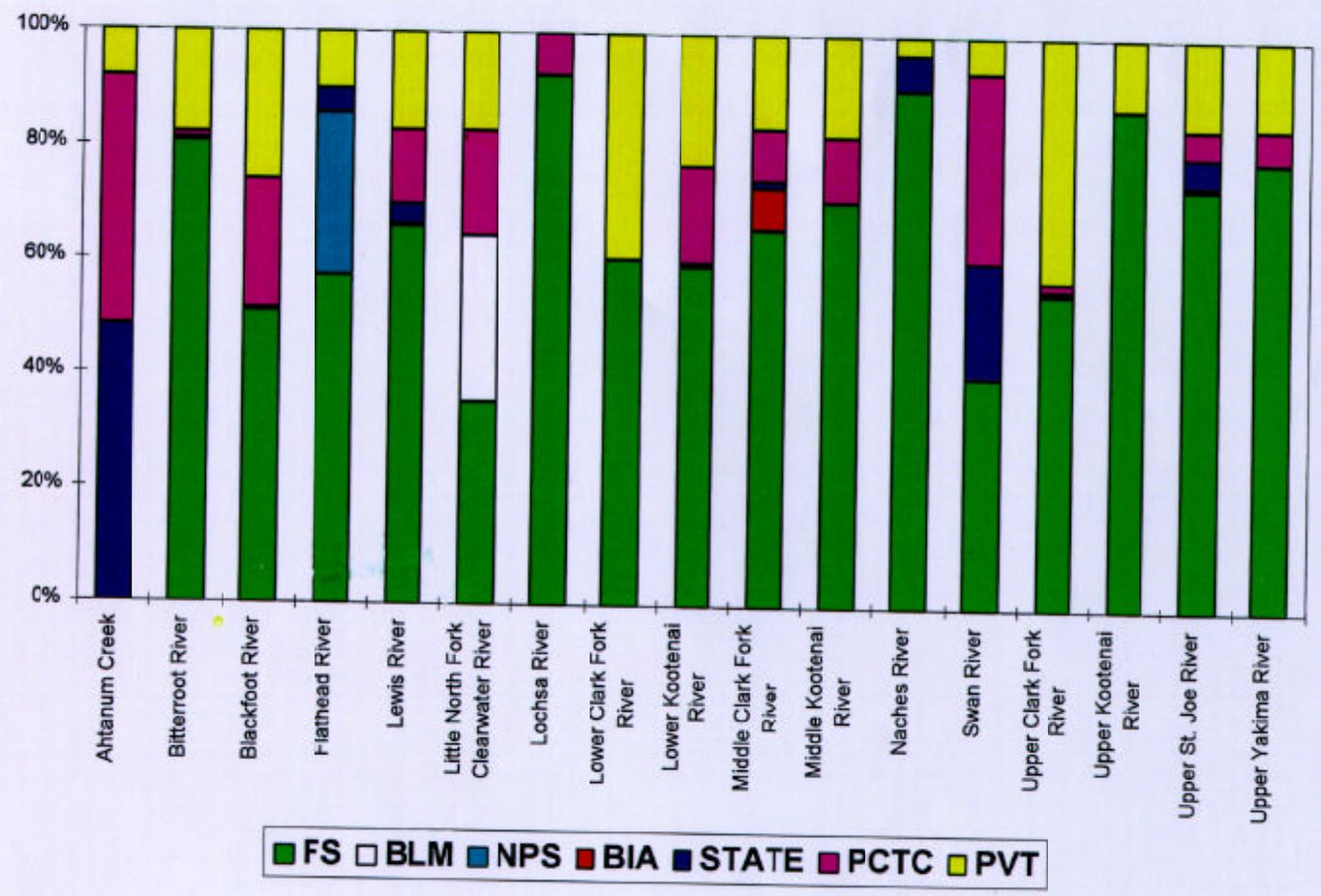
Figure 3. Land ownership distribution in selected bull trout basins in Montana, Idaho, and Washington.



**Figure 4. Distribution of bull trout stream mileage by land ownership in selected bull trout basins in Montana, Idaho, and Washington.**



**Figure 5. Distribution of bull trout spawning and rearing habitat on various ownerships in selected bull trout basins in Montana, Idaho, and Washington (in miles).**



**Figure 6. Distribution of bull trout migration and foraging habitat by land ownership in selected bull trout basins in Montana, Idaho, and Washington.**

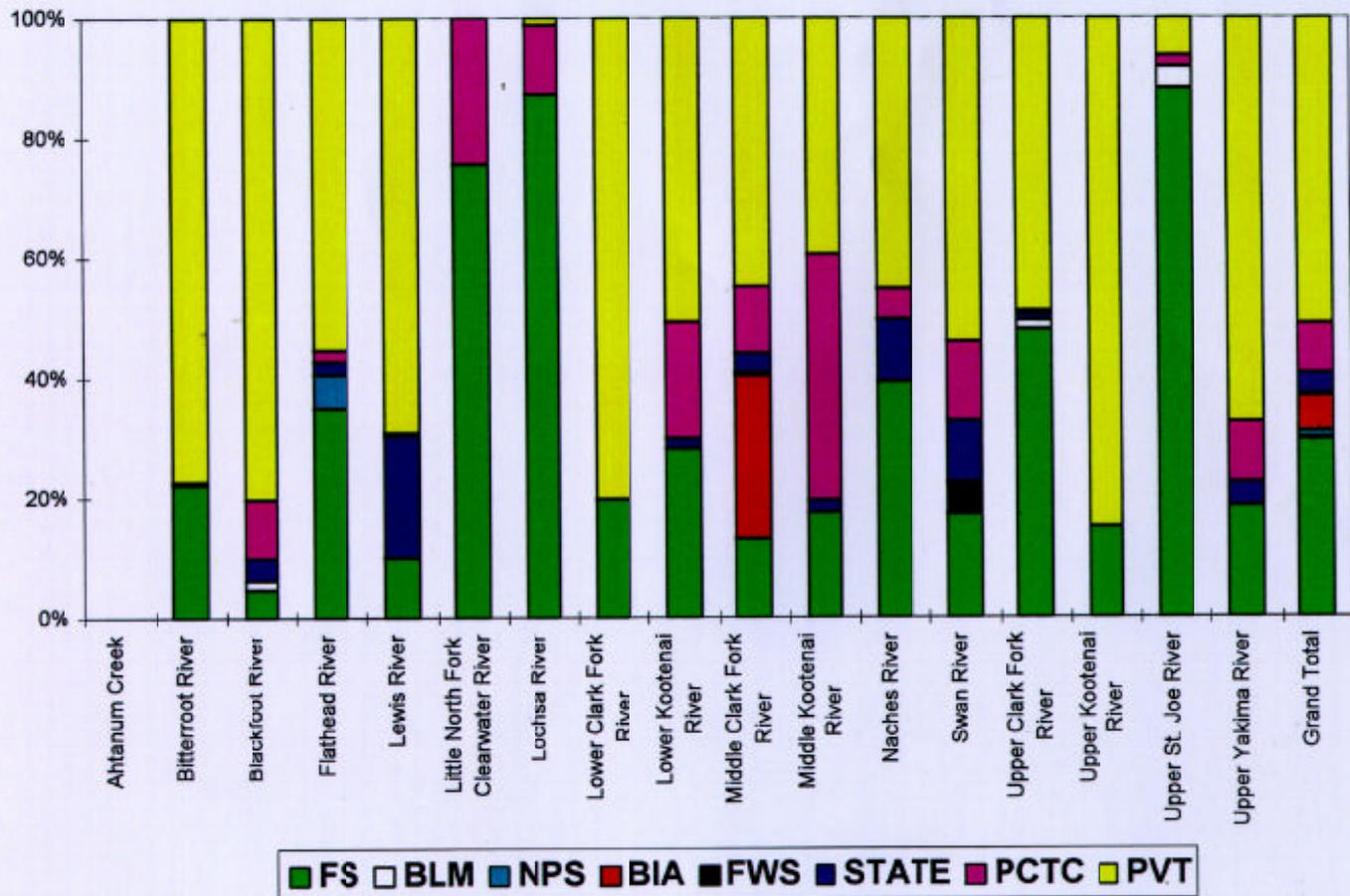
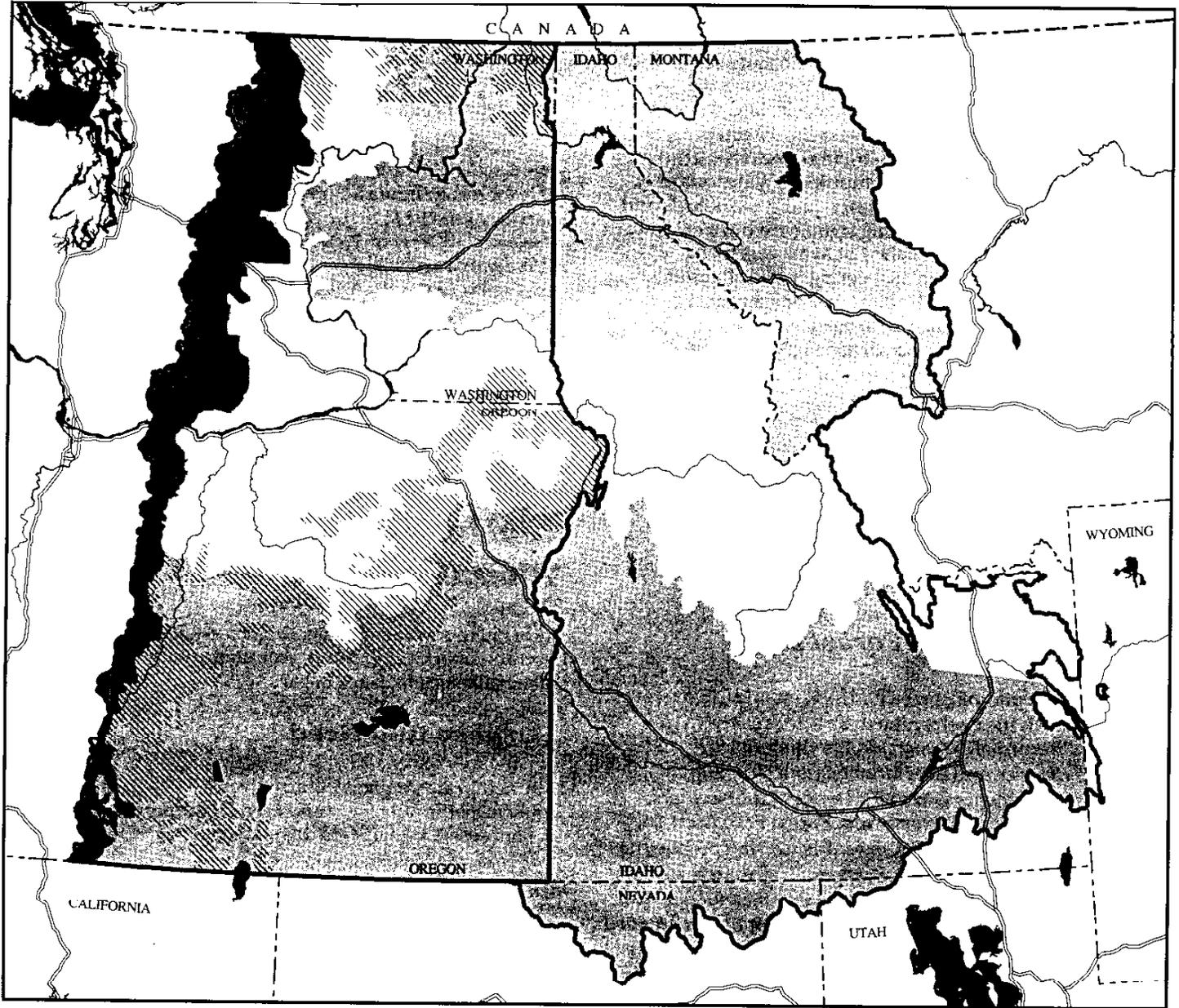
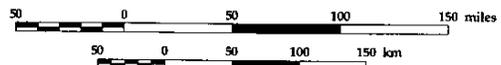


Figure 7. Boundaries of USDA Forest Service interim management strategies and the Northwest Forest Plan. Taken from the Interior Columbia Basin Ecosystem Management Draft EIS.

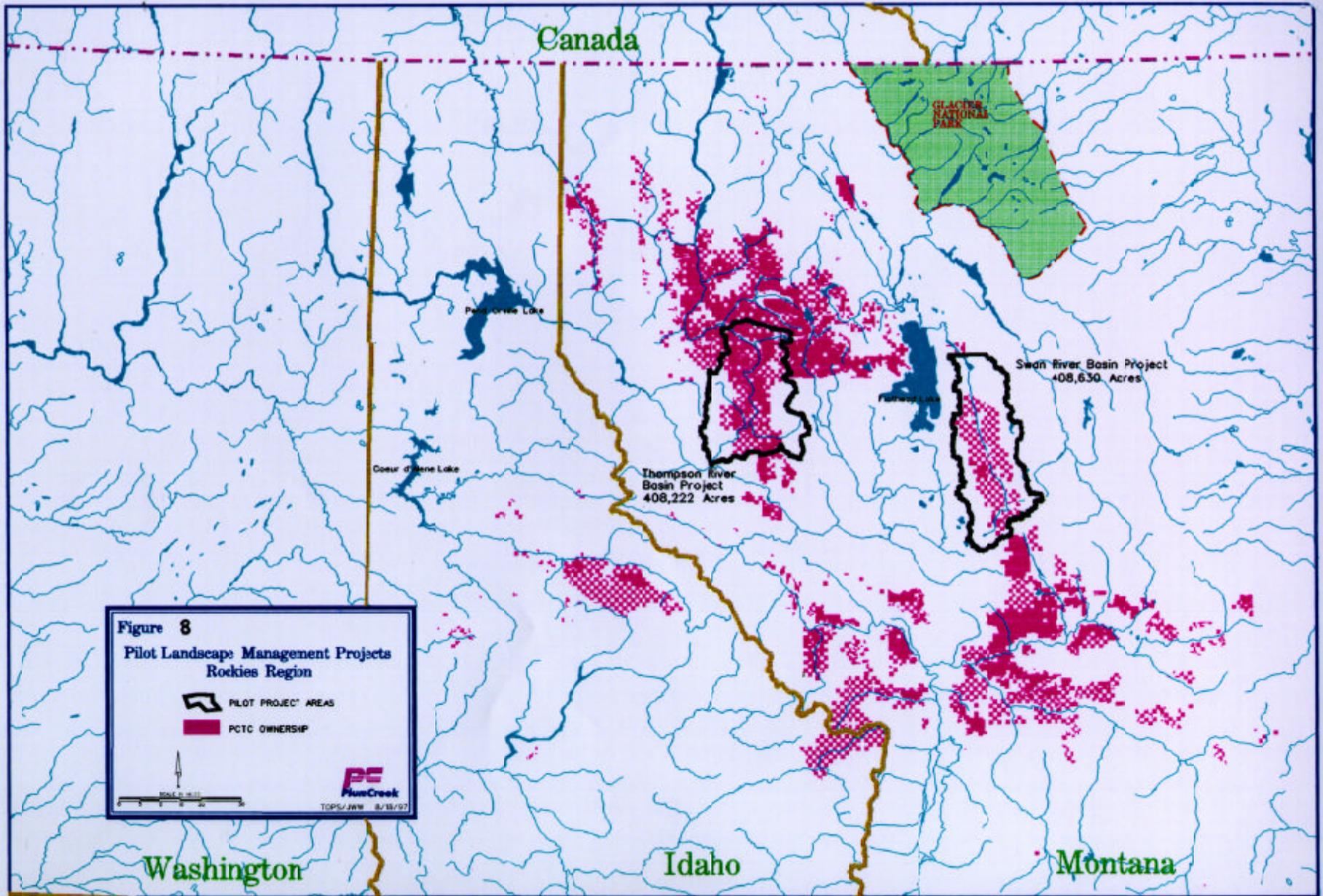


**Map 1-3.**  
**Interim Management**  
**Strategies and Northwest**  
**Forest Plan**

INTERIOR COLUMBIA  
 BASIN ECOSYSTEM  
 MANAGEMENT PROJECT



- |  |   |
|--|---|
|  Northwest Forest Plan        |  Water           |
|  Inland Native Fish Strategy* |  Major Rivers    |
|  PACFISH                      |  Major Roads     |
|  Fastside Screens             |  EIS Area Border |



**Figure 8**  
**Pilot Landscape Management Projects**  
**Rockies Region**

 PILOT PROJECT AREAS  
 PCTC OWNERSHIP

  
 SCALE 0 - 100  
  
 TOPIC/JWW 8/18/97

**Table 1. Land ownership within selected bull trout basins in Montana, Idaho, and Washington (in acres).**

Bull Trout Basin	BIA	BLM	FS	FWS	NPS	PCTC	PVT	STA	Grand Total
Ahtanum Creek	8703	37	254	0	0	10092	21726	30192	71004
Bitterroot River	0	0	1250618	2762	0	81244	462953	28286	1825863
Blackfoot River	4810	84400	616603	0	0	292989	473927	9342	1482072
Flathead River	167443	0	1041831	0	631167	103517	611627	29450	2585035
Lewis River	0	66	323429	0	0	27134	67797	49977	468404
Little North Fork Clearwater River	0	7497	125809	0	0	13153	8300	15128	169887
Lochsa River	0	0	716421	0	0	40399	653	6	757479
Lower Clark Fork River	0	0	588902	0	0	2651	122697	2493	716743
Lower Kootenai River	0	0	571938	0	0	33429	41440	2936	649743
Middle Clark Fork River	1113963	0	1249926	23172	0	421534	340879	42367	3191841
Middle Kootenai Rver	0	0	496106	0	0	327970	67408	17651	909135
Naches River	662	1141	507776	0	160	30925	108008	61307	709978
Swan River	3897	0	281777	2253	0	85207	56422	40062	469618
Upper Clark Fork River	0	63920	1016363	0	1546	105530	1145432	36193	2368984
Upper Kootenai River	0	0	665954	0	0	6709	118527	8168	799358
Upper St. Joe River	0	18901	502772	0	0	70205	48867	9380	650124
Upper Yakima River	0	38	239283	0	0	97442	130787	10246	477795
<b>Grand Total</b>	<b>1299477</b>	<b>176001</b>	<b>10195763</b>	<b>28186</b>	<b>632873</b>	<b>1750130</b>	<b>3827451</b>	<b>393183</b>	<b>18303064</b>

Source: (1) Interior Columbia River Basin Ecosystem Management Project, USDA Forest Service; (2) Plum Creek Timber Company data.

**Table 2. Miles of bull trout streams on various ownerships in selected bull trout basins in Montana, Idaho, and Washington.**

Basin	BIA	BLM	FS	FWS	NPS	PCTC	PVT	STATE	Grand Total
Ahtanum Creek	0.0	0.0	0.0	0.0	0.0	3.0	0.6	3.3	6.9
Bitterroot River	0.0	0.0	435.3	0.0	0.0	5.2	163.1	2.5	606.1
Blackfoot River	0.4	3.0	148.0	0.0	0.0	77.5	196.3	5.9	431.2
Flathead River	0.0	0.0	311.8	0.0	120.2	5.7	203.0	21.5	662.3
Lewis River	0.0	0.2	34.2	0.0	0.0	6.1	34.5	9.5	84.4
Little North Fork Clearwater River	0.0	5.2	24.3	0.0	0.0	9.1	3.1	0.0	41.7
Lochsa River	0.0	0.0	178.8	0.0	0.0	18.3	1.1	0.0	198.3
Lower Clark Fork River	0.0	0.0	48.2	0.0	0.0	0.0	58.8	0.0	107.1
Lower Kootenai River	0.0	0.0	43.0	0.0	0.0	16.6	31.8	1.0	92.4
Middle Clark Fork River	120.6	0.0	267.2	1.8	0.0	69.9	212.7	15.2	687.4
Middle Kootenai River	0.0	0.0	56.6	0.0	0.0	35.1	38.0	1.3	131.0
Naches River	0.0	0.0	99.5	0.0	0.0	5.5	52.0	15.3	172.3
Swan River	0.0	0.0	48.4	4.0	0.0	39.2	45.1	25.3	162.0
Upper Clark Fork River	0.0	4.2	258.1	0.0	0.0	5.8	211.4	1.3	480.8
Upper Kootenai River	0.0	0.0	28.6	0.0	0.0	0.0	20.6	0.0	49.2
Upper St. Joe River	0.0	2.7	107.2	0.0	0.0	4.5	14.9	3.4	132.7
Upper Yakima River	0.0	0.0	43.7	0.0	0.0	10.3	60.9	3.2	118.1
<b>Grand Total</b>	<b>121.0</b>	<b>15.3</b>	<b>2132.9</b>	<b>5.8</b>	<b>120.2</b>	<b>311.3</b>	<b>1347.9</b>	<b>108.8</b>	<b>4163.8</b>

Data Sources: (1) Montana Department of Fish, Wildlife and Parks; (2) Idaho Department of Fish and Game; (3) Washington Department of Fish and Wildlife; (4) Plum Creek Timber Company.

**Table 3. Miles of bull trout spawning and rearing habitat on various ownerships in selected bull trout basins in Montana, Idaho, and Washington.**

Basin	BIA	BLM	FS	NPS	PCTC	PVT	STATE	Grand Total
Ahtanum Creek	0.0	0.0	0.0	0.0	3.0	0.6	3.3	6.9
Bitterroot River	0.0	0.0	415.0	0.0	4.8	92.2	2.5	514.4
Blackfoot River	0.4	0.7	140.7	0.0	62.4	71.7	0.2	276.0
Flathead River	0.0	0.0	207.2	103.0	0.0	36.6	15.1	361.9
Lewis River	0.0	0.2	30.3	0.0	5.9	7.9	1.6	45.9
Little North Fork Clearwater River	0.0	5.2	6.3	0.0	3.3	3.1	0.0	17.9
Lochsa River	0.0	0.0	99.6	0.0	7.9	0.0	0.0	107.5
Lower Clark Fork River	0.0	0.0	40.2	0.0	0.0	26.3	0.0	66.6
Lower Kootenai River	0.0	0.0	32.2	0.0	9.2	12.5	0.4	54.3
Middle Clark Fork River	24.6	0.0	221.3	0.0	30.7	55.1	4.0	335.7
Middle Kootenai Rver	0.0	0.0	44.8	0.0	7.2	11.2	0.0	63.1
Naches River	0.0	0.0	56.0	0.0	0.0	2.0	3.8	61.8
Swan River	0.0	0.0	35.8	0.0	29.5	5.6	17.9	88.8
Upper Clark Fork River	0.0	2.8	215.3	0.0	5.3	167.6	0.4	391.4
Upper Kootenai River	0.0	0.0	25.6	0.0	0.0	3.6	0.0	29.3
Upper St. Joe River	0.0	0.4	50.2	0.0	3.3	10.7	3.4	68.1
Upper Yakima River	0.0	0.0	28.5	0.0	2.1	5.6	0.0	36.2
Grand Total	25.0	9.2	1648.9	103.0	174.6	512.3	52.8	2525.8

Data Sources: (1) Montana Department of Fish, Wildlife and Parks; (2) Idaho Department of Fish and Game; (3) Washington Department of Fish and Wildlife; (4) Plum Creek Timber Company.

**Table 4. Miles of bull trout migration and foraging habitat on various ownerships in selected bull trout basins in Montana, Idaho, and Washington.**

Basin	BIA	BLM	FS	FWS	NPS	PCTC	PVT	STATE	Grand Total
Ahtanum Creek	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bitterroot River	0.0	0.0	20.4	0.0	0.0	0.4	71.0	0.0	91.8
Blackfoot River	0.0	2.3	7.3	0.0	0.0	15.1	24.6	5.7	155.1
Flathead River	0.0	0.0	104.7	0.0	17.2	5.7	66.4	6.4	300.4
Lewis River	0.0	0.0	3.9	0.0	0.0	0.2	26.6	7.8	38.5
Little North Fork Clearwater River	0.0	0.0	17.9	0.0	0.0	5.8	0.0	0.0	23.7
Lochsa River	0.0	0.0	79.2	0.0	0.0	10.4	1.1	0.0	90.7
Lower Clark Fork River	0.0	0.0	8.0	0.0	0.0	0.0	32.5	0.0	40.5
Lower Kootenai River	0.0	0.0	10.7	0.0	0.0	7.4	19.3	0.6	38.1
Middle Clark Fork River	96.0	0.0	45.9	1.8	0.0	39.2	57.6	11.1	351.7
Middle Kootenai River	0.0	0.0	11.9	0.0	0.0	27.9	26.8	1.3	67.9
Naches River	0.0	0.0	43.5	0.0	0.0	5.5	50.0	11.5	110.5
Swan River	0.0	0.0	12.6	4.0	0.0	9.7	39.5	7.4	73.2
Upper Clark Fork River	0.0	1.4	42.9	0.0	0.0	0.5	43.8	0.8	89.4
Upper Kootenai River	0.0	0.0	3.0	0.0	0.0	0.0	17.0	0.0	20.0
Upper St. Joe River	0.0	2.4	57.0	0.0	0.0	1.2	4.1	0.0	64.6
Upper Yakima River	0.0	0.0	15.2	0.0	0.0	8.2	55.2	3.2	81.8
Grand Total	96.0	6.1	484.0	5.8	17.2	137.2	835.6	56.1	1637.9

Data Sources: (1) Montana Department of Fish, Wildlife and Parks; (2) Idaho Department of Fish and Game; (3) Washington Department of Fish and Wildlife; (4) Plum Creek Timber Company.