# SECTION 13 – Table of Contents

# 13 Pend Oreille Subbasin Overview

## 13.1 Regional Context for Pend Oreille Subbasin

The Pend Oreille Subbasin (Figure 13.1) is located in northern Idaho and northeastern Washington and represents the northeastern-most corner of the Intermountain Province (IMP). It is bordered by the Upper Columbia Subbasin to the west, the Coeur d' Alene and Spokane subbasins to the south, Montana to the east, and Canada to the north. The Pend Oreille River is the largest river in the Subbasin and flows west out of Lake Pend Oreille and north across the Idaho Panhandle and the northeastern corner of Washington before draining into the Columbia River in British Columbia.

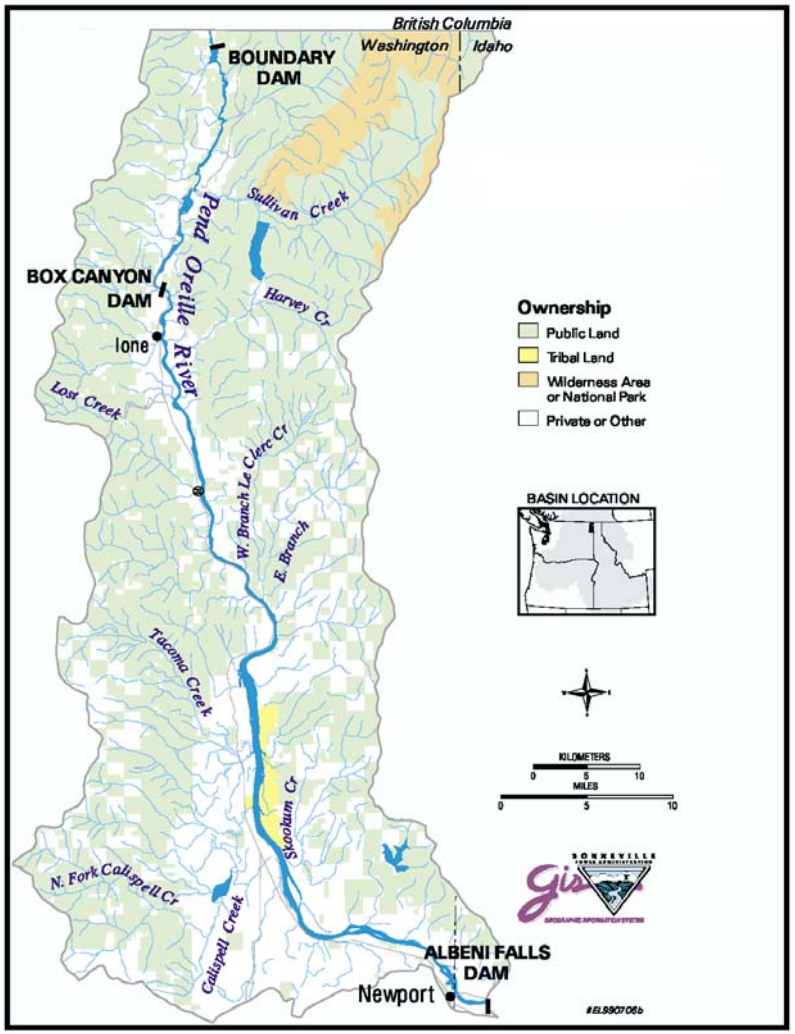
There are five dams on the Pend Oreille River including two in Canada, the Waneta and Seven Mile, plus Boundary, Box Canyon, and Albeni Falls in the United States. The dams have impacted both aquatic and terrestrial resources. None of the dams have fish passage facilities. Dams in the Pend Oreille tributaries further fragment the connectivity of native salmonid population, including Cedar Creek, Sullivan Lake, Mill Pond, Calispell Pumps, and West Branch LeClerc Creek Log Crib dams. Fish passage is blocked upstream of Lake Pend Oreille in the Clark Fork River at the Cabinet Gorge, Noxon Rapids, and Thompson Falls dams. These Clark Fork River dams are conducting experimental fish passage studies and are evaluating structure designs to pass bull trout and cutthroat trout, but the current numbers of fish passed are limited. The operational impacts of the dams have also impacted terrestrial resources by reducing the area of wetland habitats and associated primary productivity, reducing wildlife habitat and wildlife forage, and reducing nutrient input of extirpated salmon and other anadromous species to the ecosystem.

Hungry Horse Dam on the South Fork Flathead River near Kalispell, Montana regulates discharge into the Lower Clark Fork and Pend Oreille rivers. This dam provides nearly three million acre ft of flood control storage (http://www.usbr.gov/dataweb/html/hhorse.html).

## 13.2 Pend Oreille Subbasin Description[1]

The Pend Oreille Subbasin (Figure 13.1) extends from Cabinet Gorge Dam downstream to the Canadian border. The Subbasin is divided into three functional areas: 1) the Upper Pend Oreille Subbasin, encompassing Cabinet Gorge Dam, all of Lake Pend Oreille and its tributaries located on the Clark Fork River, down to Albeni Falls Dam which is located on the Pend Oreille River; 2) the Lower Pend Oreille Subbasin that includes the Lower Pend Oreille River and its tributaries from Albeni Falls Dam to the Canadian border; and 3) the Priest River Subbasin, which flows into Pend Oreille River just upstream of Albeni Falls Dam, including Upper Priest Lake, Priest Lake, and all tributaries up to the Canadian border. Each of the three geographical areas will be addressed separately in the overview, aquatic assessment, and aquatic inventory sections.

[1] Large portions of Section 13.2 were contributed to by the Pend Oreille Subbasin Summary Report (2001) pp. 3-10, 56-70, 124-129.



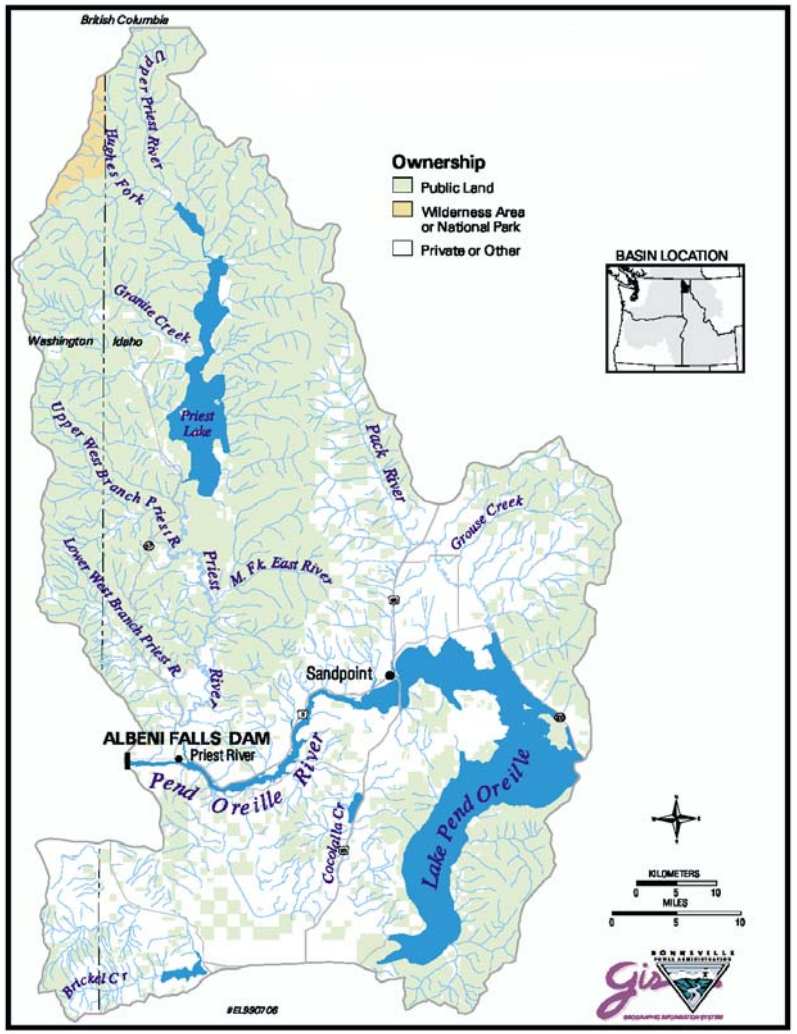




Figure 13.1. Pend Oreille Subbasin, map of Pend Oreille River to left, map of Lake Pend Oreille and Priest River to the right.

*Source*: (Bonneville Power Administration GIS)

### *Vegetation*

Historic and current vegetation communities are discussed separately for the Upper Pend Oreille, Lower Pend Oreille, and Priest River Subbasins. Figure 13.2 shows the current distribution of wildlife-habitat types in the Pend Oreille Subbasin based on IBIS (2003). A map of the historic vegetation of the IMP, including the Pend Oreille Subbasin, is provided in Section 4, Terrestrial Resources in the Intermountain Province (Figure 4.1).

### *Road Density*

Road density in the Pend Oreille Subbasin is depicted by density class, for each 6$^{th}$ order watershed (Figure 13.3). The majority of Pend Oreille Subbasin is ranked as high road density (1.7 to 4.7 miles of road per square mile). Several areas surrounding Lake Pend Oreille and Priest Lake, a reach of the Pend Oreille River west of Newport, and an area near Metaline Falls, are ranked moderate (0.7 to 1.7 miles of road per square mile). The far northern portion of the Subbasin is ranked as low road density (0.1 to 0.7 miles of road per square mile).

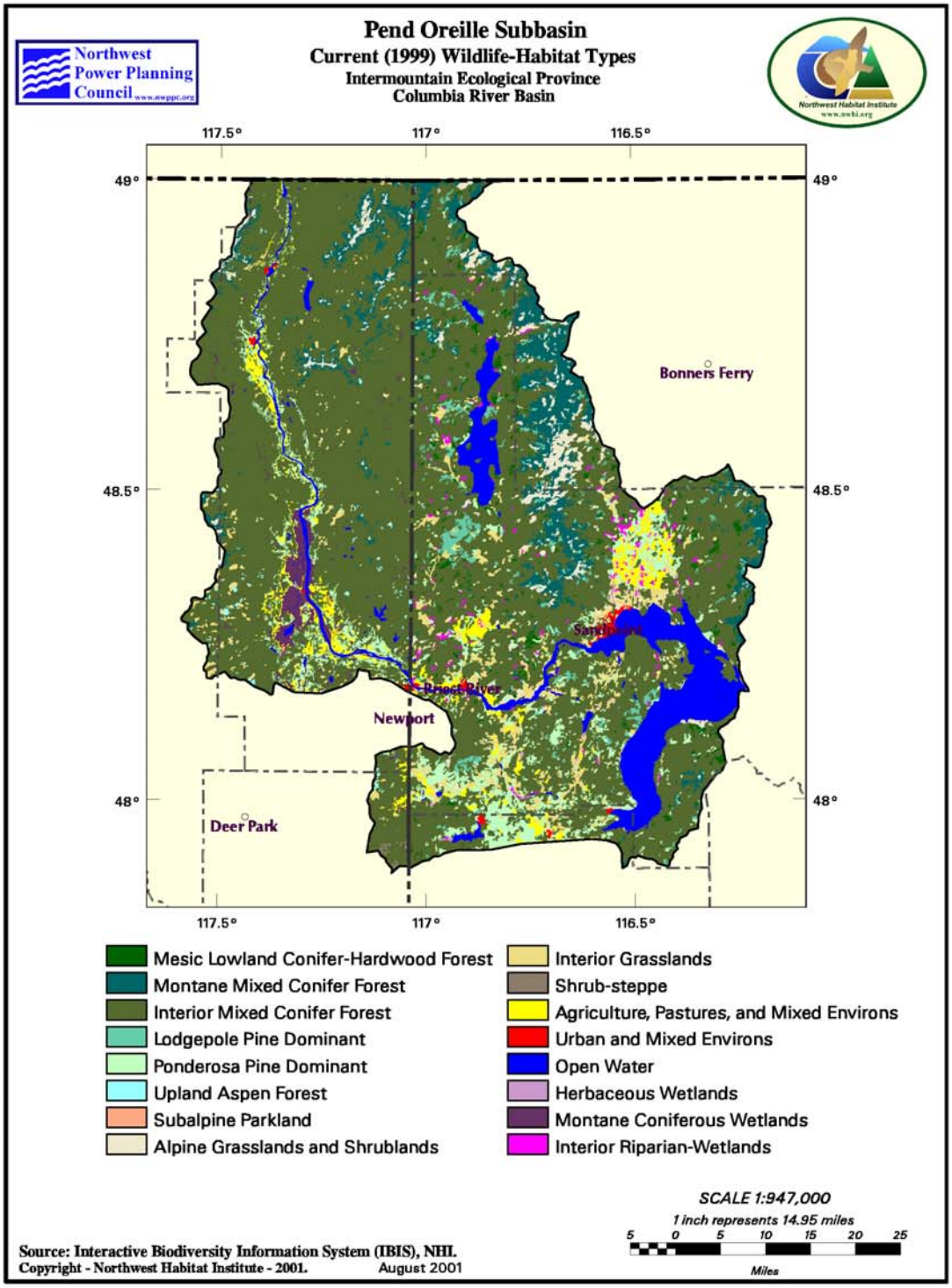



Figure 13.2. Current distribution of habitat-types within the Pend Oreille Subbasin

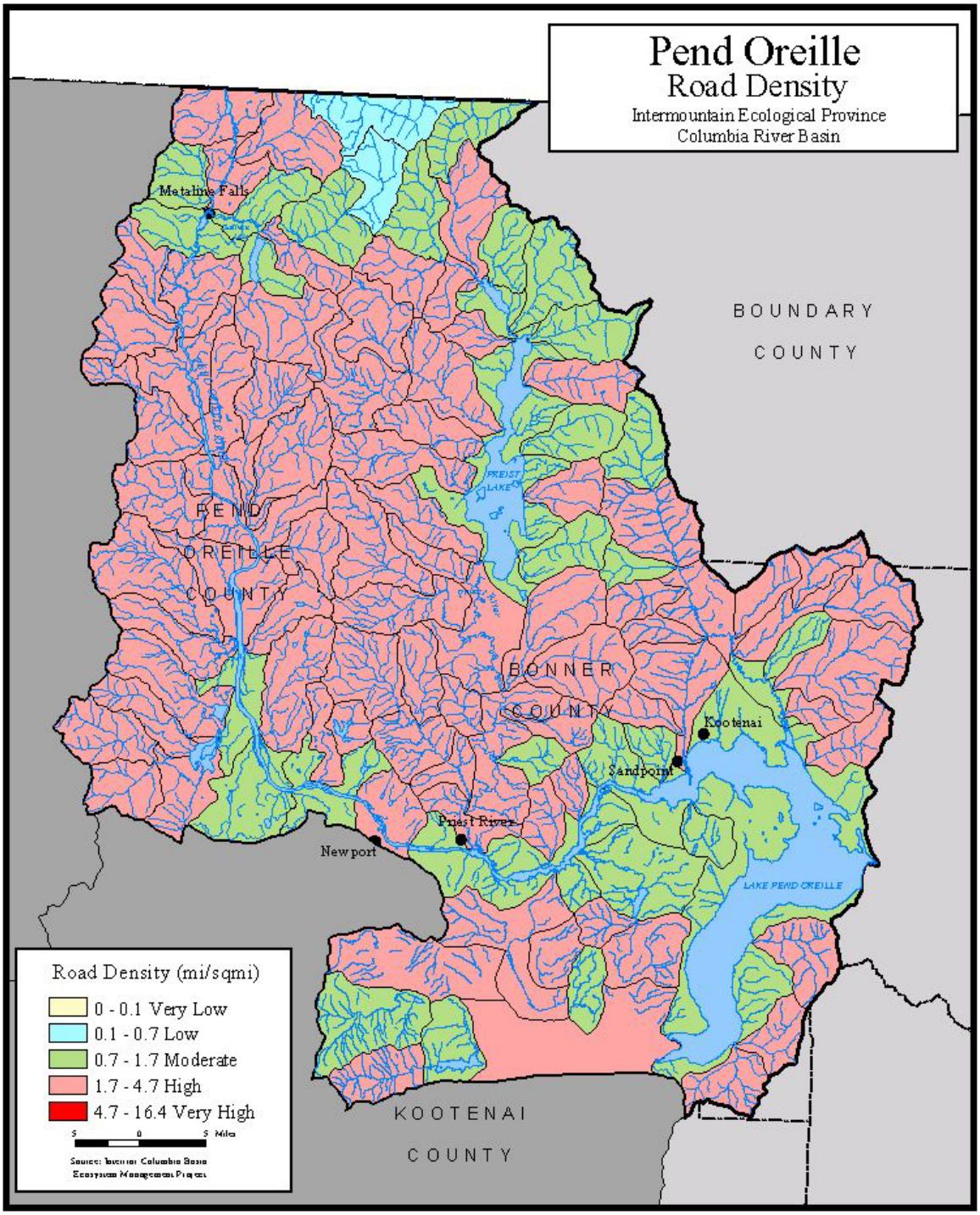



Figure 13.3. Road density within the Pend Oreille Subbasin ranked from very low (0-0.1 mi/square mile) to very high (4.7-16.4 mi/square mile)

## 13.2.1 Upper Pend Oreille Subbasin Description

### 13.2.1.1 General Location

The Upper Pend Oreille Subbasin drainage (3173 $km^2$) encompasses all of Lake Pend Oreille and its tributaries, including 15 km (9.3 mile) of the Clark Fork River upstream to Cabinet Gorge Dam, and the Pend Oreille River and its tributaries down to the lake's control point, Albeni Falls Dam (Figure 13.4). Lake Pend Oreille is located in the Panhandle region of northern Idaho and lies primarily within Bonner County. Lake Pend Oreille elevation is regulated by Albeni Falls Dam. However, elevations are restricted to 625.1 m (2051 ft) minimum in the winter and to 628.6 m (2062.5 ft) maximum in the summer by letter of agreement between U.S. Army Corps of Engineers (USACE) and Idaho Department of Fish and Game (IDFG). Congressional authorization of Albeni Falls Dam, by the 81st Congress, 1st Session, Senate Document No. 9, February 7, 1949, requires that Albeni Falls Dam not contribute to downstream flooding. Inflow comes through Cabinet Gorge (1952) and Noxon Rapids (1959) dams, which "power peaking" facilities owned and operated by Avista Corporation (Avista). During low flow (non-runoff) season, Avista operates them for hourly peaking, but these projects do not affect lake levels. The USACE operates Albeni Falls Dam, which is located on the Pend Oreille River near the Washington border.

### 13.2.1.2 Drainage Area

Three major tributaries enter Lake Pend Oreille: the Clark Fork River enters the lake approximately 15 km (9.3 miles) west of the Idaho-Montana border; the Pack River drains into the northeastern portion of the lake; and the Priest River drains into the Pend Oreille River about 8 km (5 miles) upstream of Albeni Falls Dam.

### 13.2.1.3 Topography/Geomorphology

The Selkirk Mountains to the west, the Cabinet Mountains to the north, and the Bitterroot Mountains to the east shape the Upper Pend Oreille Subbasin. During the ancient Precambrian period over 600 million years ago, shallow seas inundated northern Idaho. Sediments of clay, silt and sand settled out of brackish waters as seas retreated, subsequently metamorphosed, and began to fold and fault. In the last few million years, the Subbasin was substantially altered by major glacial events in the late Pleistocene period. Glacial advances resulted in highly dissected watersheds with high stream density, shallow soils, and subsoil compaction of glacial tills. Groundwater seeps and springs are prevalent in tributaries draining the Cabinet and Bitterroot mountains to the north and east of Lake Pend Oreille reflecting the more recent geology.


Figure 13.4. Location of the Upper Pend Oreille Subbasin in Idaho

The parent rocks of soils developed from the Precambrian Belt Supergroup weather to a preponderance of coarse fragments 60-70 percent, fine silts 20 percent plus, and a small amount of gravel and sand fraction. When these soils are eroded by natural or human caused agents into high gradient mountain streams (Rosgen B or steeper; Rosgen 1994), the fine silts are transported rapidly downstream out of the system while the coarse fragments remain as bedload. This bedload is transported locally within the channel during channel forming events (two-year discharge events). If erosion has been accelerated, the excess bedload fills pools and triggers additional bank cutting.

Generally, streams on the northern and eastern sides of Lake Pend Oreille tend to be more productive and have much less fine sediment than streams draining the granitic soils of the Selkirk Mountains. Streams flowing from the Cabinet and Bitterroot mountains are more likely to have bedload as a limiting habitat factor, whereas streams flowing from the granitic watersheds of the Selkirk Mountains may have fine sediment limiting habitat condition. Migratory fish are precluded from several tributaries, or portions of tributaries, due to natural waterfalls found throughout the basin.

#### 13.2.1.4 Climate

Continental and marine weather patterns influence climatic conditions in the Upper Pend Oreille Subbasin. Winter storms pass over the area from November through March causing a noticeably wet climate. Mid-winter storms periodically bring warm air masses resulting in rain-on-snow events at middle elevations of 762 meters (m) above mean sea level (msl) to 1,372 m above msl. Summer storms, however, generally pass farther north resulting in relatively dry seasonal conditions. Winds typically prevail from the southwest across Lake Pend Oreille.

Average monthly temperatures in the area range from -3° to 18°C. Annual precipitation averages 84 centimeters (cm) in Sandpoint and exceeds 125 cm in the surrounding mountains (Weisel 1982). Precipitation falls mainly as snow in the winter months, averaging 224 cm per year.

The main body of Lake Pend Oreille seldom freezes in winter; however, shallow areas in the northern end of the lake form an ice cover in some years.

#### 13.2.1.5 Hydrology

Lake Pend Oreille is the largest and deepest natural lake in Idaho, covering approximately 33,696 hectares (ha) prior to impoundment by Albeni Falls Dam in 1952. At full pool the lake now covers 38,362 ha (USFWS 1953; Hoelscher 1993). The lake has more than 282 km of shoreline and has a mean and maximum depth of 164 m and 351 m, respectively (Rieman and Falter 1976). An estimated 95 percent of the lake's volume is held in the large, southern-most basin, a glacially influenced portion of the Purcell Trench (Savage 1965) with a mean depth of 218 m.

The USACE regulates the lake's elevation via operations at Albeni Falls Dam about 3.5 m (11 ft) between a winter time low of 625.1m (2051 ft) msl and a summer time high of 628.6 m (2062 ft) above msl. Winter drawdown generally begins after Labor Day. Minimum pool is normally reached between 15 November and 1 December, with a target

date of 15 November to facilitate kokanee salmon spawning (Fredericks et al. 1995). The operation of Albeni Falls Dam is not to contribute to flooding downstream in the lowland Cusick Flats region downstream of the dam (U.S. Senate 1949).

The Clark Fork River is the largest tributary to Lake Pend Oreille. It drains the Clark Fork River watershed, an area of approximately 59,324 $km^2$ (Lee and Lunetta 1990). The river contributes approximately 92 percent of the annual inflow to the lake (Frenzel 1991) and most of the annual suspended sediment load. Tributaries to the Clark Fork below Cabinet Gorge Dam include Lightning Creek, Twin Creek, Mosquito Creek, and Johnson Creek. Pack River is the second largest tributary to the lake and is fed by a number of significant tributary watersheds, including Grouse Creek.

Melting snow produces annual runoff in the Clark Fork River with peak flows typically of 30-60 thousand cfs occurring in May or June. Tributaries to the lake and Pend Oreille River may experience one or more runoff events. Mid-winter rain-on-snow events can result in rapid snowmelt, and in some years the peak flow from tributary watersheds occurs during these events in winter, that is, the non-runoff season. Lightning Creek and other tributaries draining the Cabinet and Bitterroot Mountains are particularly susceptible to rain-on-snow events due to high precipitation, their location in relation to the lake, prevailing winds, and the tendency for warm winter storms to pick up moisture from the lake. The Pend Oreille River is the only surface outflow from Lake Pend Oreille. Reservoir narrows to what was once the natural river channel, but is now the forebay of Albeni Falls Dam. Velocities in the channel can be “river-like” during high flow conditions. The constricted sections of the lake “flows” for about 44 km from the lake’s northwest corner near Sandpoint into Washington. Lake Pend Oreille is hydrologically connected to the Spokane Valley-Rathdrum Prairie aquifer at the lake’s southern-most end, contributing about 44 million cubic meters ($m^3$) of water annually to the aquifer via subsurface flow (Hammond 1974; Drost and Seitz 1978).

#### 13.2.1.6 Water Quality

Lake Pend Oreille is an oligotrophic (nutrient poor) lake. The lake’s trophic status was determined in 1989 (Ryding and Rast 1989) using euphotic zone depth, annual mean total phosphorus concentrations, mean and maximum chlorophyll *a* concentrations, and mean and minimum secchi disc water transparency depths. Nutrient concentrations in shoreline areas and in the northern basin of the lake near Sandpoint are considerably higher due to urbanization and suspended sediments in Clark Fork River inflow. Most of the annual phosphorus, and suspended sediment load enters the lake via the Clark Fork River (Hoelscher 1993). Studies of the pelagic zone (open water area) of Lake Pend Oreille indicated no major temporal changes in water quality variables such as secchi-disc readings, pH, alkalinity, dissolved oxygen, percent saturation, nutrients, chlorophyll-a, and trophic state (Woods 1991). Reduction of nutrient loading is one of the priorities to improve water quality in the Clark Fork River according to the Tri-State Water Quality Commission in Sandpoint. Improvements have come primarily from improved treatments facilities in urban areas along the Clark Fork, but non-point runoff is also a concern for the future.

The 1998 303(d) list has been approved by the Environmental Protection Agency (EPA), thus was used rather than the proposed 2002 303(d) that has yet to be EPA approved. A number of stream segments within the Upper Pend Oreille Subbasin are listed as water quality limited (IDEQ 1998). Granite Creek, Pend Oreille River, Pend Oreille Lake, North Fork of Grouse Creek, Caribou Creek, Fish Creek, Schweitzer Creek, Cocolalla Creek, Hoodoo Creek, and the lower Clark Fork River are all listed for not complying with various water quality standards including sediment, flow alteration, metals, total dissolved gas (TDG), bacteria, dissolved oxygen, nutrients, habitat alteration, and thermal modification (IDEQ 1998).

As a result of plunge pool spillways at Cabinet Gorge and Noxon dams, TDGs in Lake Pend Oreille and Pend Oreille River exceed Idaho and Washington standards during runoff in high flow years. The Washington and Idaho state water quality standard for TDG is 110 percent. Regional efforts are being focused on this issue in an effort to more effectively manage TDG levels throughout the Columbia River Basin. Currently Avista is studying the problem at Cabinet Gorge Dam.

**13.2.1.7 Vegetation**

Historic vegetation patterns in the Upper Pend Oreille Subbasin were largely influenced by wildfire. Early accounts and photographs of the Subbasin indicate that old-growth stands of western red cedar, *Thuja plicates*, and other species were common in riparian zones and floodplains. Large cedar stumps can still be found in many riparian areas along Subbasin streams. Uplands were more typically dominated by seral species in various stages of succession, with age and composition dependent largely on fire cycles, elevation, slope, and aspect.

Low elevation riparian zones near tributary mouths include areas with and without tree canopy cover. Along stream corridors where tree overstory does not exist or is thin, vegetation includes shrubs and small trees such as thin-leaf alder, *Alnus sinuate;* willows, *Salix spp*.; snowberry, *Symphoricarpos albus;* mountain maple, *Acer glabrum;* red-osier dogwood, *Cornus stolonifera;* blue elderberry, *Sambucus cerulea;* and black hawthorn, *Crataegus douglasii.* Where tree canopy is present, tree species include black cottonwood, *Populus trichocarpa;* water birch, *Betula occidentalis;* quaking aspen, *Populus tremuloides;* and a mix of conifer species including western red cedar, *Thuja plicates;* western hemlock, *Tsuga heterophylla*; Douglas fir, *Psuedotsuga menziesi;* grand fir, *Abies grandis;* and western white pine, *Pinus monticola*.

Conifer forests in the Subbasin consist of mixed stands, typified by stands of western red cedar/western hemlock; stands of co-dominant Douglas fir and ponderosa pine, *Pinus ponderosa;* stands of Douglas fir; western larch, *Larix occidentalis;* lodgepole pine, *Pinus contorta;* and western white pine. Dense stands of Douglas fir, larch, and lodgepole are characteristic of slopes with north and east aspects. Relatively open stands of Douglas fir and ponderosa pine are typical on the warmer, dryer south and west aspects.

Representative species of upland shrubs include western serviceberry, *Amelachier alnifolia;* mountain maple; snowberry; mountain balm, *Ceanothus velutinus;* mallow ninebark, *Physocarpus malvaceus;* huckleberry, *Vaccinium spp.;* and others.

#### 13.2.1.8 Major Land Uses

Over half (55 percent) of the Upper Pend Oreille Subbasin is privately owned (Figure 13.5). The remaining land is managed by the U.S. Forest Service (USFS) (25 percent), the state (7 percent), and Bureau of Land Management (BLM) (1.6 percent). Major land uses in the Subbasin include agricultural and timber production and recreational development (Figure 13.6). Only 12 percent of the drainage is open water (Figure 13.5).

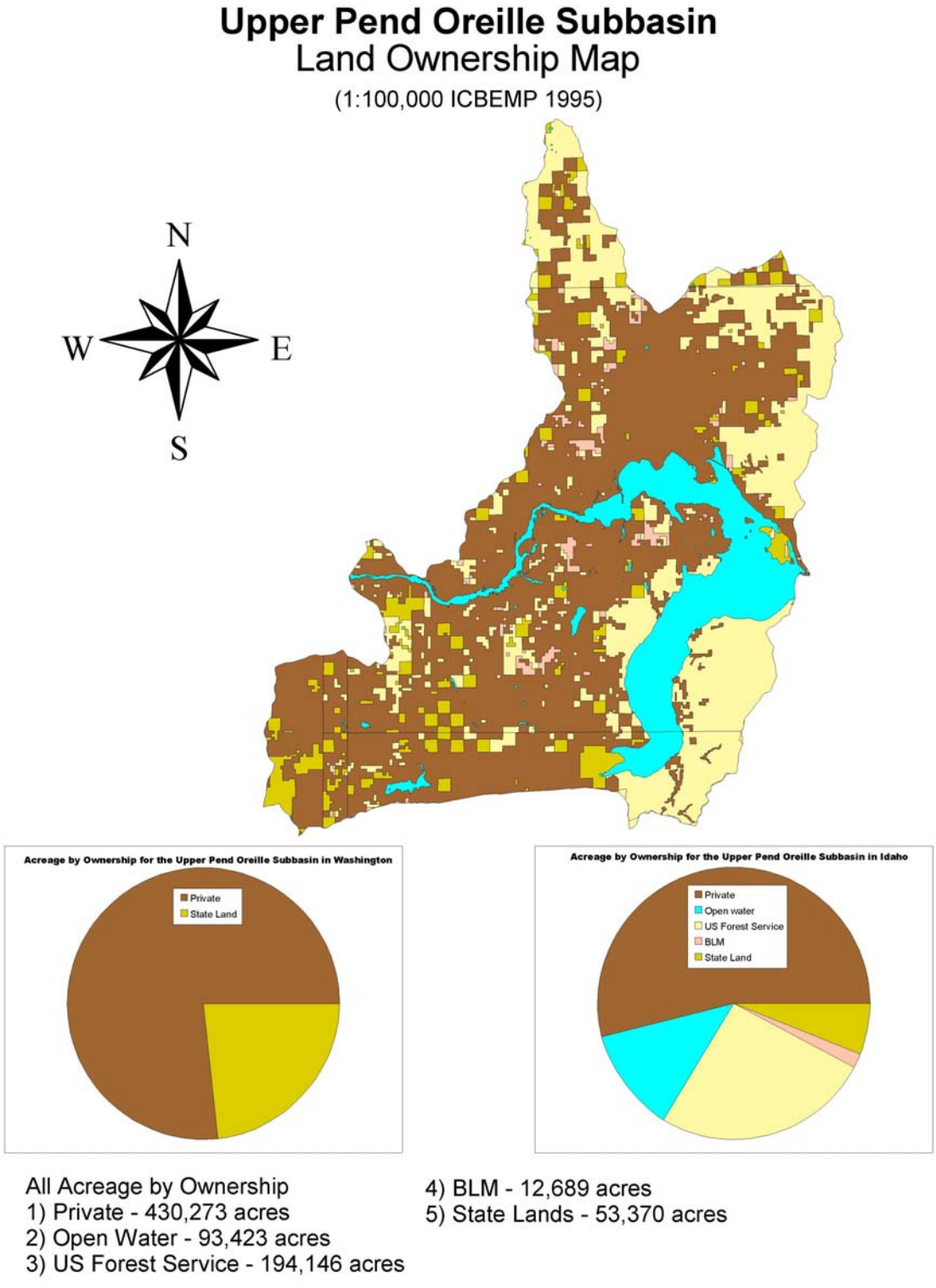



Figure 13.5. Land ownership categories in the Upper Pend Oreille Subbasin

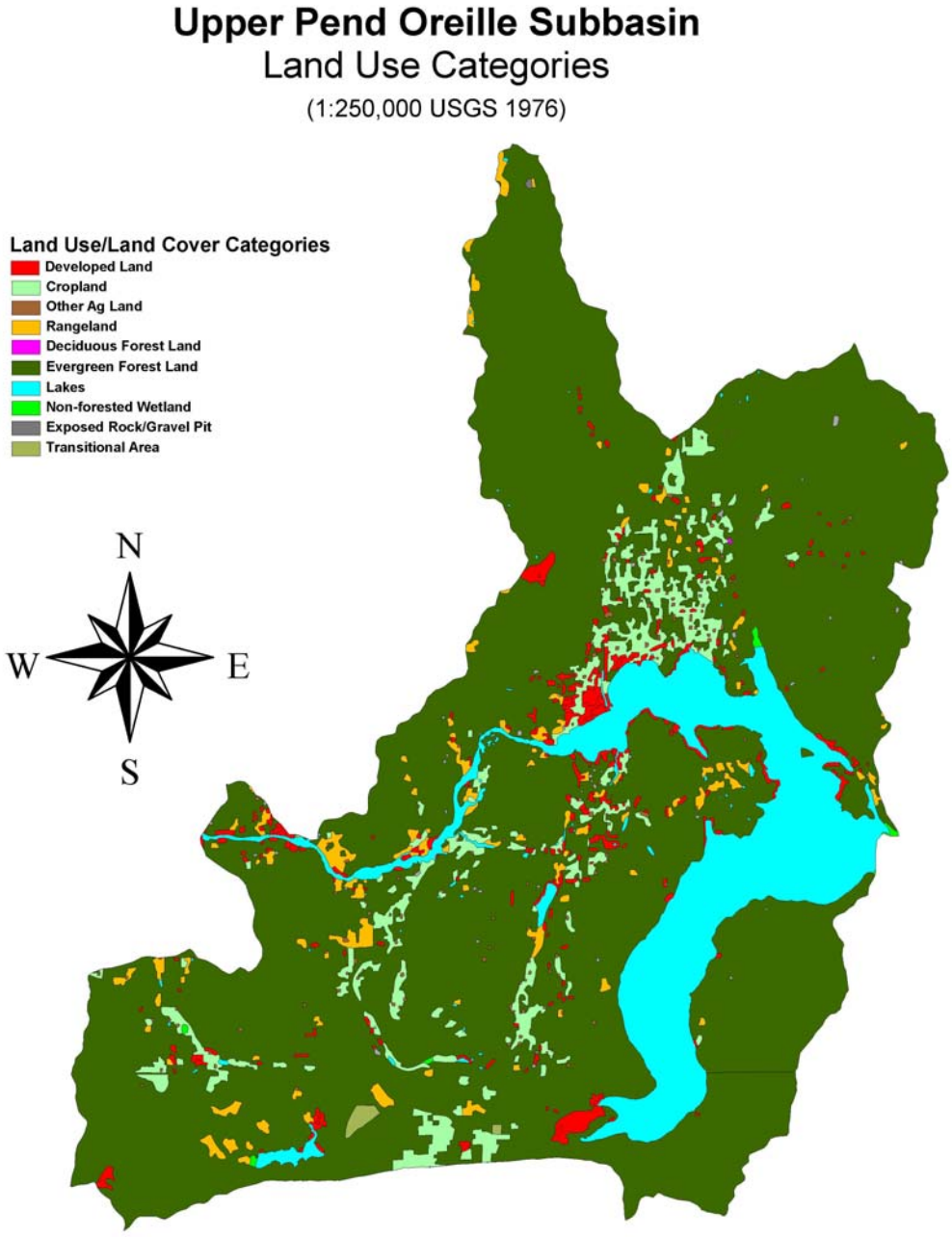



Figure 13.6. Land use categories for the Upper Pend Oreille Subbasin

## 13.2.2 Lower Pend Oreille Subbasin Description

### 13.2.2.1 General Location

The Lower Pend Oreille Subbasin (2737 $km^2$) is located in northeastern Washington approximately 80 km north of Spokane. The Subbasin lies primarily in Pend Oreille County and begins in Idaho at Albeni Falls Dam extending north along the Pend Oreille River corridor to the Canadian border (Figure 13.7). The Lower Pend Oreille Subbasin is bordered by the Selkirk Mountains to the west and the Chewelah Mountains or Calispell Mountains to the east in the upper part of the Colville Valley.

### 13.2.2.2 Drainage Area

The drainage area of the Pend Oreille River between Albeni Falls Dam and the Canadian border consists of Box Canyon and Boundary reservoirs and two hydroelectric facilities. The largest tributary to the Pend Oreille River in the U.S. is Sullivan Creek, which drains a basin approximately 227 $km^2$. Other large tributaries in the U.S. include Calispell Creek, Tacoma Creek, Ruby Creek, LeClerc Creek, Lost Creek, Slate Creek, and Skookum Creek. In Canada, the Salmo River is the largest tributary with a watershed draining about 1,300 $km^2$. The Salmo River flows southerly from its origin about 60 km to the confluence with the Pend Oreille River (Seven Mile Reservoir).

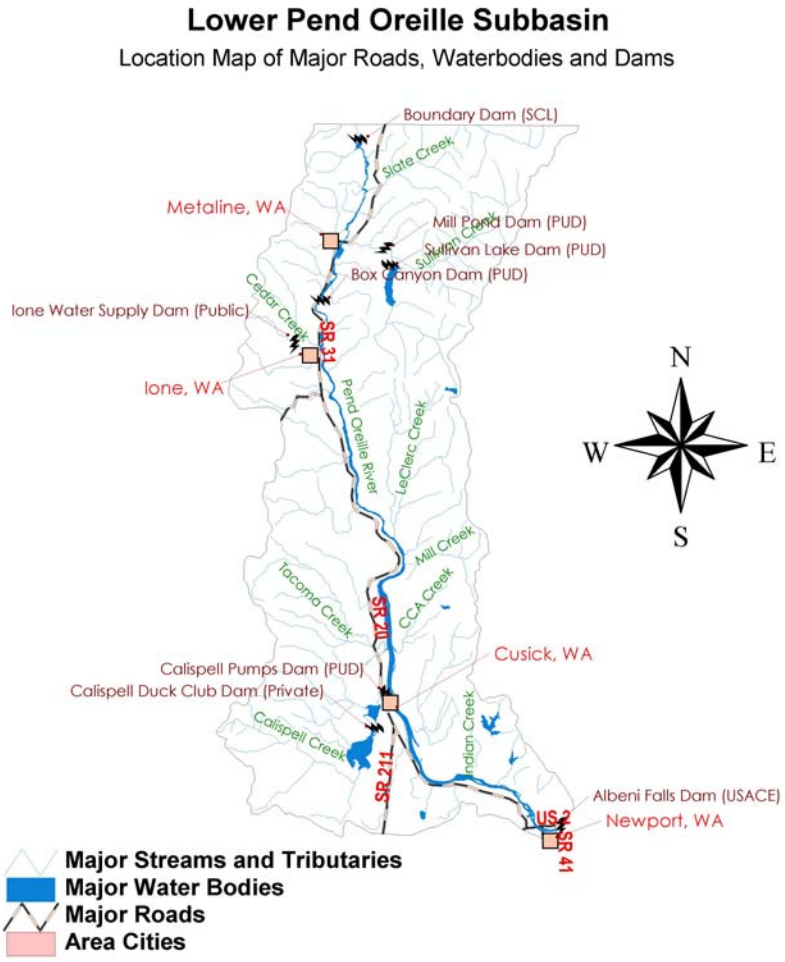



Figure 13.7. Location of Lower Pend Oreille Subbasin

### 13.2.2.3 Topography/Geomorphology

The Lower Pend Oreille Subbasin lies between the Selkirk Mountains to the east and the Calispell Mountains to the west. The highest peak within the lower Pend Oreille Subbasin is 2230 m (7316 ft) above msl. The southern portion of the Subbasin is mostly rural with large areas of forested mountains and valleys of open pasture. The surrounding topography of the northern portion of the Subbasin is relatively abrupt, and the mountains are steep and rugged.

Most of the Subbasin is underlain by metamorphic or igneous bedrock. The geologic basement rocks, or bedrock, found within the Lower Pend Oreille Subbasin are comprised of metamorphosed sedimentary rocks, quartzite, in the southern portion of the Subbasin. Highly metamorphosed volcanics and marine sediments including carbonates,

conglomerates and quartzite in the northern portion of the Subbasin, and intrusive igneous granite and granodiorites are in the central portion of the Subbasin. The bedrock outcrops at the surface in the high mountain ranges and is encountered at depths greater than 30 m in the valleys.

#### 13.2.2.4 Climate

The climate of the Lower Pend Oreille Subbasin combines characteristics of a typical mountain/continental climate, which predominates in the Rocky Mountains, and a maritime climate. Average annual precipitation at lower elevations near Newport, Washington is 63.5 cm. At higher elevations, the average annual precipitation ranges from 89 to 140 cm. Monthly precipitation patterns show that the majority of precipitation falls in the winter and spring, with the highest totals occurring from November through January. Peak rainfall also occurs in May and June, particularly in the northern portions of the Lower Pend Oreille Subbasin. Total annual snowfall averages 127 to 152 cm in the Pend Oreille River valley.

#### 13.2.2.5 Hydrology

The Pend Oreille River flows for 249 km in a northwesterly direction from its headwaters at Lake Pend Oreille to the Columbia River in British Columbia, Canada. The Pend Oreille River is impounded by several hydroelectric projects. Waneta and Seven Mile dams are located furthest downstream in Canada and are owned and operated by Tek Cominco and B.C. Hydro, respectively. Boundary Dam, owned and operated by Seattle City Light, is also located on the Pend Oreille River about 1.6 km upstream from the U.S.-Canadian border. The reservoir is 28.1 km long and has a surface area of about 664 ha at full pool. Boundary Dam is operated for load-following generation (Entz and Maroney 2001). Load-following generation means it does vary on a daily basis, but the variation changes based on load and on other resources in the system. Box Canyon Dam is a run-of-the river project, owned and operated by Pend Oreille County Public Utility District (PUD) Number 1, is located on the Pend Oreille River and forms a 2,983 ha reservoir. Box Canyon Reservoir extends upstream from Box Canyon Dam 89.8 km to the tailwaters of Albeni Falls Dam. Albeni Falls Dam is located in Idaho approximately 3.5 km upstream from Newport, Washington, with a storage capacity of 1.56 million-acre feet and is operated for hydropower generation, flood control, and recreation. Major lakes within the Subbasin include Sullivan Lake, Bead Lake, Marshall Lake, and Calispell Lake. The Sullivan Lake Project is also a FERC-licensed facility and currently operates only as a storage reservoir (no generation).

Peak flows in the Pend Oreille River below Albeni Falls occur in May and June and are the result of annual runoff above Albeni Falls Dam. Peak flows typically range from 50 to 90 thousand cubic feet per second (cfs). All gates at Albeni Falls Dam are removed during high flow periods exceeding 90 thousand cfs. Flooding along the Pend Oreille River begins at a flow of 100 thousand cfs.

The Calispell Creek is the main tributary to the Pend Oreille River between Albeni Falls Dam and Box Canyon Dam. The Calispell Creek empties into the Pend Oreille River in a diked section of the Pend Oreille River near the town of Cusick. Under normal operation, the Calispell Creek is pumped into the Pend Oreille River at a pumping station consisting

of six pumps. The peak flow in the Calispell Creek occurs in March to April and is the result of snow melts in the Calispell watershed. In years when the pumps are not capable of pumping the Calispell during the peak flow period, Box Canyon is required to lower the river by removing gates thus allowing the Calispell to free-flow into the Pend Oreille. This drawdown of the Pend Oreille River at Box Canyon Dam is only possible when the flow out of Albeni Falls Dam is less than 40 thousand cfs.

Pat McGrane (1999) reports,

> Problems can occur at Cusick if flows in excess of 43,000 cfs are passed through Lake Pend Oreille and into the Pend Oreille River during the spring when Lake Pend Oreille is held essentially level. Runoff (or dam releases) from upstream can at times coincide with normal spring runoff from Calispell and Trimble creeks, two lowland streams that border the Cusick Flats agricultural area. When the Pend Oreille River is high, gates in dikes across the mouths of the Calispell and Trimble creeks must be closed to keep the river from backing up into those smaller tributaries. The dikes hold back water from the Pend Oreille River, but can cause interior flooding on the tributary side of the dikes as the local creeks back up. Pumps designed to lift water from Calispell Creek and Trimble Creek through the dikes sometimes cannot handle the volume. When Lake Pend Oreille was held at an elevation of 2055 ft (626.4 m), Albeni Falls Dam has the hydraulic capacity to release more water than at elevation 2051 ft (625.1 m) due to an increase in head.

Between 1996 and 1999, winter elevations at Albeni Falls Dam were at 2055 ft (4 ft higher than previous winter lake elevations) to evaluate the benefits to kokanee in Lake Pend Oreille. During this same time frame, impacts to the watershed downstream were also investigated by the USACE (McGrane 1999). The study concluded there were "many factors that influenced the water levels in Cusick area over the past four years [1996-1999]. An uncommon series of wet winters [wettest period in over 20 years], the inadequacy of the Trimble Creek pumping facility, failure of Pend Oreille PUD to follow their agreement with the Calispell Creek drainage district (in 1997), the higher releases from Albeni Falls Dam as a result of the kokanee experiment, and the unusual evacuation of Hungry Horse Reservoir (in 1996) all played a role in producing high water levels during the early spring months in the Cusick area."

In Canada, the Salmo River, a fifth-order stream, is the main tributary to the Pend Oreille River. Between 1949 and 1976 the mean annual discharge in the Salmo River was 32.5 cubic meters per second (cms, 1148 cfs), with a mean monthly minimum and maximum discharge of 7.5 cms (265 cfs) and 128.5 cms (4538 cfs) (Baxter et al. 2004). Annual peak runoff occurs in May, with the highest flows between April and July (Baxter et al. 2004).

In the U.S., hydrologic records are maintained by the USGS with data published yearly. Gaging stations in Box Canyon Reservoir are located at the town of Newport (station no. 12395500) downstream of Box Canyon Dam (station no. 12396500), and the Pend

Oreille River at the international boundary (station no. 12398600). There are also USGS gages on Calispell Creek (station no. 12396000) and Sullivan Creek (stations no. 12396900, 12398000). The Sullivan Creek stations were discontinued as of 2004. Information sources on water rights, claims, and water use are available from the Washington Department of Ecology (WDOE) (WDOE 1994, 1995a, 1995b). Geiger et al. (1993) provides an annotated bibliography describing data and studies of surface and groundwater quantity on the Kalispel Indian Reservation.

#### 13.2.2.6 Water Quality

The lower Pend Oreille River is listed on Washington State's 1998 303(d) list for temperature, pH, and exotic aquatic plants (WDOE 1998). In addition to the Pend Oreille River, other streams are listed on the 303d list including: Skookum Creek for fecal coliform, and Lost and Cedar creeks for temperature exceedences.

Box Canyon Dam construction resulted in the river changing from a free-flowing system to a slow long and narrow flowing, run-of-river reservoir (Bennett and Liter 1991). Velocities in Box Canyon Reservoir range from 0.03 meters per second (mps, 0.1 feet per second, fps) during the summer up to .6 mps (2.0 fps) during the spring (Falter et al. 1991). A short flushing time and shallow depth do not allow vertical temperature stratification. Temperatures can reach 25 °C in the summer months and total dissolved gases exceed 110 percent during certain times of the year (Geist et al. 2004). Aquatic plants, particularly the proliferation and control of Eurasian watermilfoil, *Myriophyllum spicatum,* have been identified as water quality concerns (EPA 1993).

Sloughs along the Pend Oreille River have moderate to high nutrient levels (Falter et al. 1991) in the lower Pend Oreille River below Albeni Falls Dam (Box Canyon Reservoir). The sloughs and the river are homeothermous November through mid-April. The major sloughs weakly stratify in the spring; however, only Tiger Slough and Big Muddy Slough are known to remain strongly stratified throughout the summer. Water quality among the sloughs is similar with the exception of Calispell Slough and Trimble Slough, which have soft water (low conductivity and low total alkalinity). High fecal coliform levels have been identified as a concern in selected tributaries and sloughs (Pelletier and Coots 1990; Coots and Williams 1991).

#### 13.2.2.7 Vegetation

The majority of the Lower Pend Oreille Subbasin is located in the Okanogan Highlands Physiographic Province, which is characterized by conifer forest communities except on wet sites. The northern portion of the river corridor is within the western hemlock vegetation zone (Franklin and Dyrness 1973). Western red cedar is a major climax species in this zone, and grand fir is an important and persistent seral species. Sitka alder is characteristic at moist sites in this zone including riparian areas. Timbering has reduced the ecological function of the uplands by eliminating mature forests. This change is reflected in the number of plant and animal species present in the Subbasin that are listed as threatened or endangered under the Endangered Species Act (ESA).

The southern portion of the Lower Pend Oreille Subbasin near Albeni Falls Dam is within the ponderosa pine vegetation zone, broadly defined to include areas where

persistent, fire-maintained ponderosa pine forests predominate. Within this zone, groves of black cottonwood and quaking aspen typically occur on riparian or poorly drained sites. Other representative conifer tree species in this zone are Douglas fir, western larch, and grand fir. Lodgepole pine is a common seral species on burned sites. Representative shrub species in this zone include snowberry, shiny-leaf spiraea, and rose. On more mesic sites in the zone, ninebark, western serviceberry, and black hawthorn are typical.

Nearly all of the original forests between the major roads east and west of the Pend Oreille River were logged or burned at least once, or permanently cleared for agriculture or residential development (Entz and Maroney 2001). A large part of this area is in pasture, hayfields, and fallow land. Seasonally flooded wetlands are extensive. Wetland types include seasonally flooded fields, scrub-shrub, and forests; persistently flooded, emergent wetlands; persistently flooded, shallow riverine sloughs; old sloughs that are presently connected to the river only during flood conditions; and ponds not connected hydrologically to the river. Riparian cottonwood galleries are in decline as managed hydrology and land use practices have limited regeneration and replacement. The reduction in peak flooding has removed a critical process for the natural development of the floodplains.

Noxious weeds dominate disturbed areas of the Subbasin. The Pend Oreille County Weed Board has identified several noxious weed species, which receive most of the attention within the Subbasin.

Rare plants, whether listed under ESA or not, are a significant reflection of land disturbance in the Lower Pend Oreille Subbasin. The U.S. Forest Service (USFS) and U.S. Fish and Wildlife Service (USFWS) provide the majority of support for rare plant issues. Other entities such as the Kalispel Tribe and the Pend Oreille County PUD are active in identifying and managing botanical resources.

Known information about existing botanical resources in the Lower Pend Oreille Subbasin includes a plant species list of Pend Oreille County (Layser 1980) and a number of documented rare plant occurrences (Washington Natural Heritage Program [WNHP] 1996), a database for which is housed at the WNHP and the Idaho Conservation Data Center. The Pend Oreille PUD has conducted botanical fieldwork as part of its re-licensing efforts and has additional knowledge of rare plants and other plant species of special interest along Box Canyon Reservoir.

#### 13.2.2.8 Major Land Uses

Much of the land within the Lower Pend Oreille Subbasin lies within the Colville National Forest (refer to Figure 13.1). State, Tribal, and private land holdings make up the majority of the remaining ownership within the Subbasin. Rangeland and agricultural land are located adjacent to the Pend Oreille River corridor. Agricultural uses include cultivated crops, grazing, and animal husbandry. The city of Newport is located on the Washington-Idaho border and is the largest urban area in the Subbasin. Other developed areas include Cusick, Metaline, Metaline Falls, Ione, and Usk. Past and current land use practices have not changed significantly; timber production continues to be the predominant land use (Figure 13.8).

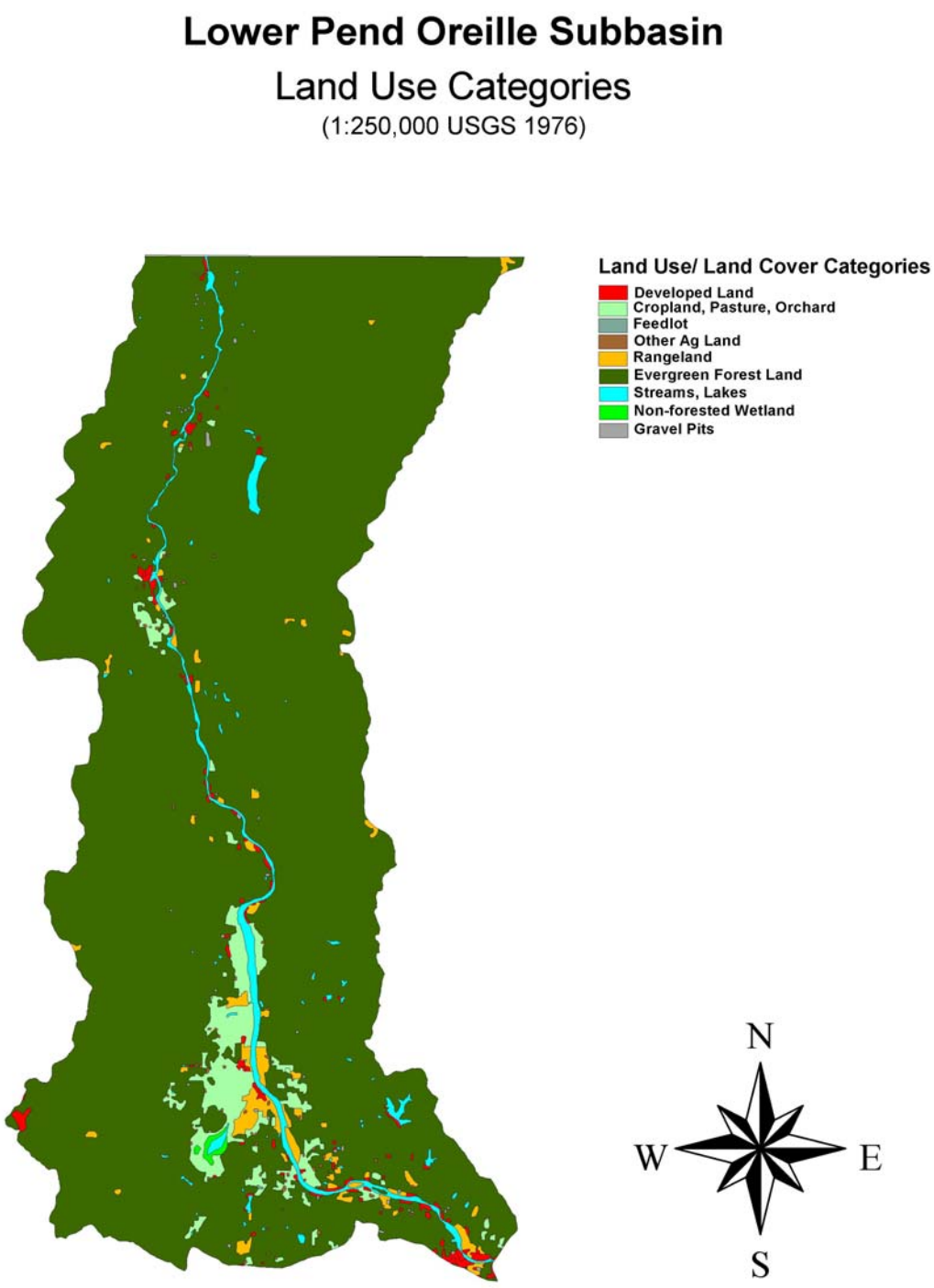



Figure 13.8. Land use categories for the Lower Pend Oreille Subbasin

## 13.2.3 Priest River Subbasin Description

### 13.2.3.1 General Location

The 2,538 $km^2$ Priest River Subbasin is located primarily within the northwest corner of the Idaho Panhandle within Bonner and Boundary counties (Figure 13.9). The Subbasin includes Upper Priest Lake, the Thorofare, Priest Lake, and the Priest River below Outlet Dam (also known as Priest Lake Dam) at Priest Lake. The Thorofare is a body of water connecting Upper Priest Lake with Priest Lake. The headwaters of Upper Priest River originate in the Selkirk mountain range in British Columbia, Canada. Headwaters of major tributaries on the western side of the Subbasin are located in northeast Washington. The Subbasin is bordered on the west by the mountain crest separating the Panhandle and Colville National Forests.

The Outlet Dam is owned by the state of Idaho and managed by Avista. The dam was first installed in 1950. Prior to 1950, the lake had annual log drives down the mainstem of the Priest River. Originally, the dam was installed because of concerns that the Lake would run dry. Prior to the impoundment, the water height was 1.5 to 1.8 m (5 or 6 feet) with the spring freshet. The lake height at this point in the summer was about 0.3 m (1 foot). Washington Water Power (WWP) built the original log-crib and they paid $15,000 for the water rights. In 1961, the Idaho Legislature passed H.B. 273 authorizing the state engineer to operate the dam. The law says that the water level at the dam would be maintained at 0.9 m (3 feet) until the end of each recreational season.

### 13.2.3.2 Drainage Area

Upper Priest Lake has two major tributaries: Upper Priest River and Trapper Creek. The Hughes Fork flows into the Upper Priest River above Upper Priest Lake. Caribou Creek and Beaver Creek flow into the Thorofare. The Thorofare contributes about 40 percent of the annual inflow to Priest Lake. Major streams draining the Selkirk range on the east side of Priest Lake are Lion Creek, Two Mouth Creek, Indian Creek, Hunt Creek, and Soldier Creek. Seven minor flow streams are interspersed between the major east side tributaries. The west side of the Priest Lake drainage extends from Beaver Creek, discharging into the lowest reach of the Thorofare just above Priest Lake, to the southern end of the lake. The west side of Priest Lake has one major stream, Granite Creek, and one moderate flow stream, Kalispell Creek and several smaller though significant streams, Lamb Creek and Reeder Creek. The remaining tributaries are of much lower volume. The Priest River originates at Outlet Dam on the southwest corner of Priest Lake 72.4 km to its confluence with the Pend Oreille River near the town of Priest River. Major tributaries include Binarch Creek, Upper West Branch, Lower West Branch, Quartz Creek and East River.

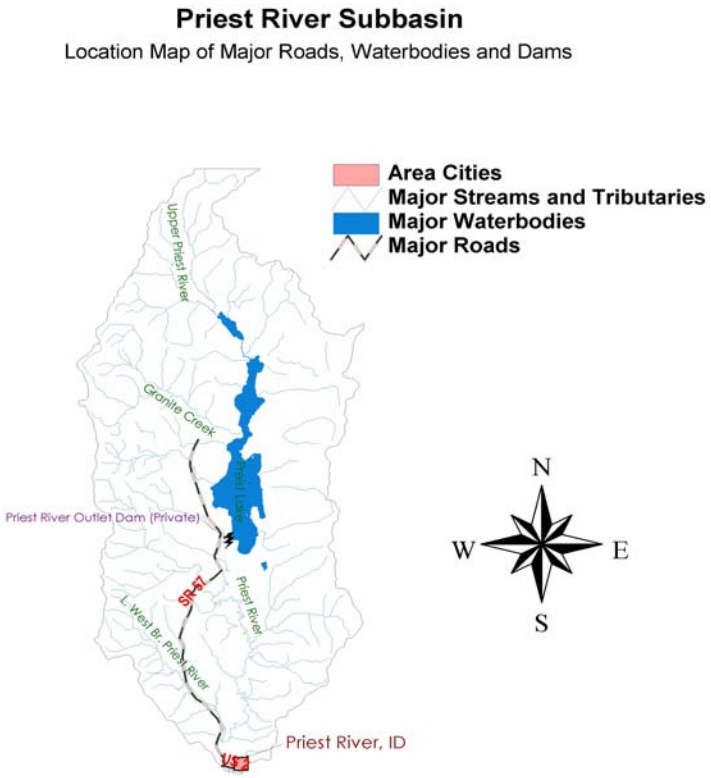



Figure 13.9. Location of Priest River Subbasin, Idaho, Washington and British Columbia, Canada

### 13.2.3.3 Topography/Geomorphology

Savage (1965, 1967) and Miller (1982) conducted geological investigations and mapping of the Priest River Subbasin. Summaries, maps, and updates of this work are provided by Bonner County (1989), Buck (1983), McHale (1995), Idaho Water Resource Board (1995), and Rothrock and Mosier (1997). Geology of the Priest River Subbasin is shown in Rothrock (2000). The entire Priest River Subbasin lies within the Northern Rocky Mountain Geomorphic Province (USFS 1997). Faulting is the major structural factor affecting the geology and drainage patterns. During the Pleistocene Era, a series of glaciers scoured the area after which time the glaciers receded and the river downcut in places through the glacial debris. Continental glaciation left extensive fluvial, lacustrine, and morainal deposits overlying bedrock in the Priest River Subbasin. The deposits include mixes of gravels, sands, silts, and clays. Elevation within the Subbasin ranges from 742 m, where Priest River enters the Pend Oreille River, to more than 2,134 m within the Selkirk Mountains.

### 13.2.3.4 Climate

The climate in the Priest River Subbasin is transitional between a northern Pacific coastal type and a continental type (Finklin 1983). July and August are the only distinct summer months and temperatures are relatively mild due to influence from Pacific maritime conditions. The average daily summer maximums are around 28 °C. Winter temperatures also are relatively mild compared to areas east of the Rocky Mountains. The annual precipitation averages 81 cm. At elevations above 1,463 m, snowfall accounts for more than 50 percent of total precipitation (Finklin 1983). The wettest months normally are November, December, and January. The elevation zone between 610 m and 1,067 m is subject to rapid snowmelt from winter storms. The lower half of the western side of the Subbasin is particularly vulnerable to high discharge rain-on-snow events.

### 13.2.3.5 Hydrology

Upper Priest Lake has a surface area of 541 ha, a maximum depth of 31.4 m, a mean depth of 18.3 m, and a volume of 0.1 $km^3$ (Fredenberg 2000). The lake has a short hydraulic residence time, about three months on average. The lake level on the larger main lake is controlled by the dam on Priest Lake. Priest Lake has a surface area of 9,430 ha, a maximum depth of 112 m, a mean depth of 39 m, and a volume of 3.7 $km^3$. Average hydraulic residence time is about three years.

### 13.2.3.6 Water Quality

In the Priest River Subbasin a study conducted by Idaho Department of Environmental Quality (IDEQ) in 1993 through 1995 examined several components of the lake system. These components included trophic status indicators of the open waters (limnetic zone), bathymetry, plant growth in near-shore (littoral) zones, quantity and quality of inflow waters, characteristics of selected groundwater aquifers, and watershed characterization utilizing a geographical information system (GIS). The study concluded: 1) open waters of Upper Priest Lake and Priest Lake can be classified as oligotrophic; 2) lake waters of shallow, near-shore sampling sites showed no indication of nutrient enrichment linked to onshore human development; 3) both lakes exhibit a marked decline in water clarity during tributary spring runoff; 4) phytoplankton growth in Priest Lake may be co-limited by phosphorus and nitrogen at least during summer months; 5) attached algae growth in the littoral zone of many Priest Lake shoreline areas appears excessive given the low nutrient content of ambient near-shore waters; 6) the primary nutrient fueling sources relating to attached algae biomass were not determined; 7) phosphorus, nitrogen, and sediment loading from various sources into Priest Lake was determined to be low to moderate, except that loading per area of runoff from some residential areas can be high; 8) some isolated areas of groundwater sampling indicate an altering of background water quality by sewage effluent plumes; and 9) project consultants consider human induced nutrients and sediments represent a potential threat to existing Priest Lake good water quality (Rothrock and Mosier 1997).

As of 1998, the State of Idaho had listed portions of the Priest River and the following tributaries as water quality impaired: Binarch Creek, Kalispell Creek, Lower West Branch of the Priest River, and Reeder Creek. These reaches did not meet clean water standards for dissolved oxygen, flow, sediment, and/or temperature. The beneficial uses

of Priest River include: domestic water supplies, agricultural water supply, coldwater biota, and recreation.

Studies by the State of Idaho and the University of Idaho suggest that the aquifer underlying the Kalispell Basin likely extends far beyond the Subbasin boundaries (USFS 1997). Preliminary data suggests that as much as 61 m of unconsolidated material underlies the basin and that the aquifer is one of the major water sources for Priest Lake.

#### 13.2.3.7 Vegetation

Vegetation within the Subbasin varies in association with soil moisture conditions, slope aspect, elevation, precipitation, temperature, wildfire history, and land use patterns. The area is predominately coniferous forest. In the higher elevations of the Selkirk range, subalpine fir and Engelmann spruce are the dominant species. A large area on both the east and west sides of the Subbasin is occupied by western red cedar and western hemlock in moist soils, and Douglas fir, grand fir, western larch, white pine, lodgepole pine, and ponderosa pine in semi-dry soils. There are some spectacular stands of western red cedar, for example, at the Roosevelt Grove of Ancient Cedars on Granite Creek and above Upper Priest Lake. The make-up of coniferous species has changed through time because of timber harvesting and replanting, fire, and plant diseases (Fredenberg 2000).

#### 13.2.3.8 Major Land Uses

The majority of land within the Priest River Subbasin is publicly owned and managed by the USFS or Idaho Department of Lands (IDL) (figures 13.10 and 13.11). The British Columbia Ministry of Forests manages the headwaters of the Upper Priest River. Private property comprises approximately 10 percent of the total land area on the west side of the Subbasin. There are some blocks of commercial timberlands owned by Burlington Northern Inc./Plum Creek Timber and a few large, private agricultural holdings in the Nordman, Lamb Creek, Reeder, Granite, Kalispell, Coolin, Cavanaugh and Huckleberry Bay areas (Fredenberg 2000). Most of the Priest Lake shoreline is managed by either the USFS or the IDL.

The majority of west side of the Subbasin is in the Idaho Panhandle National Forest (IPNF), Priest Lake Ranger District. The USFS manages the three large islands on Priest Lake, Kalispell, Bartoo, and Eightmile (Fredenberg 2000). There are also two state parks on the east shore of Priest Lake, Indian Creek and Lionshed State Parks.

More than 90 percent of the east side of the Subbasin is owned by the State of Idaho. Most of this land is administered by IDL under the State Endowment Trust. A substantial amount of private and commercial timberlands have been transferred to the state through various property exchange agreements, although some blocks of private forest land still exist (Fredenberg 2000). The Idaho Department of Parks and Recreation (IDPR) manages Priest Lake State Park.

Approximately 26 percent of the Priest Lake shoreline is privately owned (Bonner County 1989). The west shoreline is where the most concentrated residential and business development has occurred (Figure 13.10). Within the federal and state-owned lands, there is considerable waterfront development through lease lot programs (Fredenberg 2000).

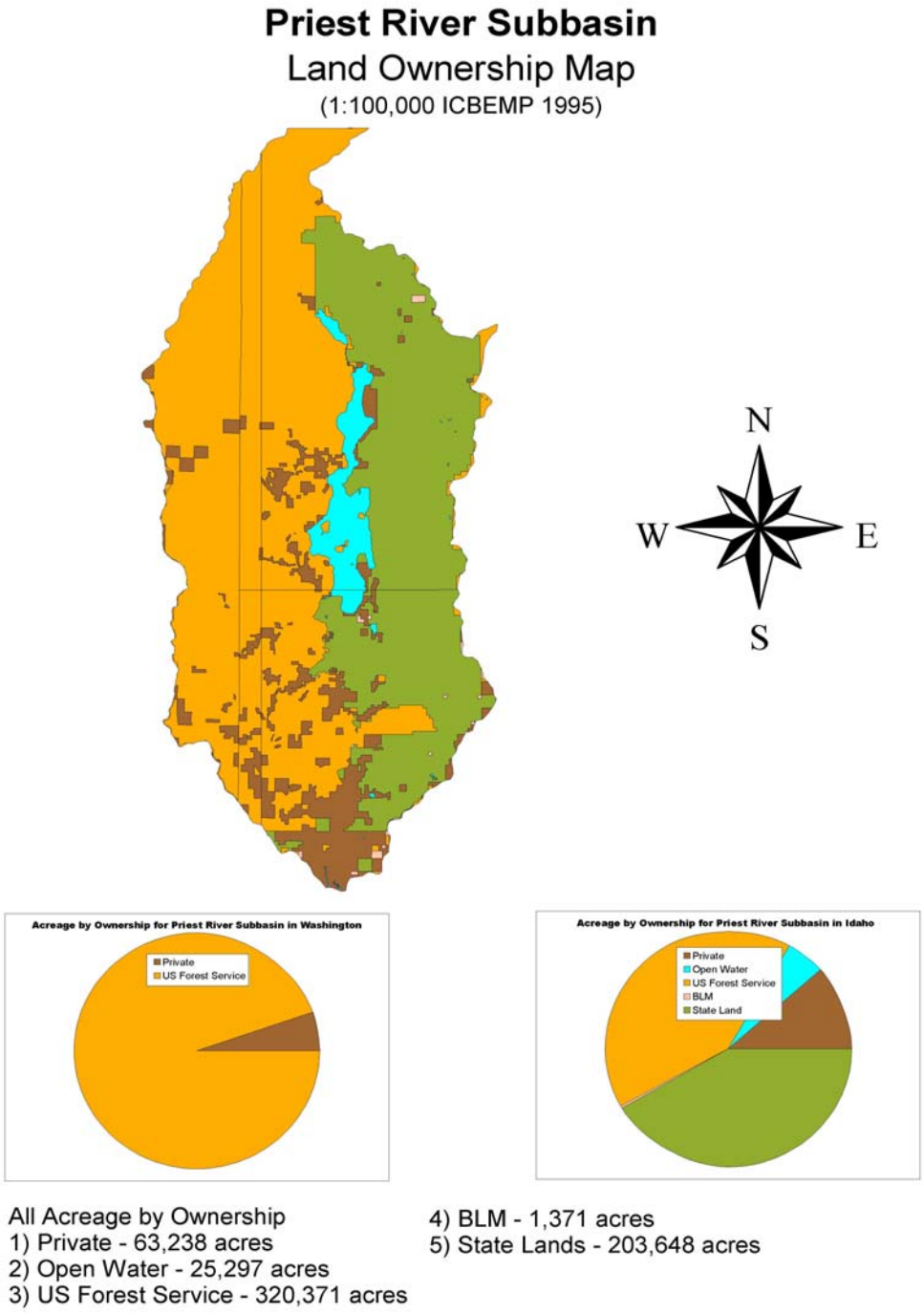



Figure 13.10. Land ownership characterization for the Priest River Subbasin

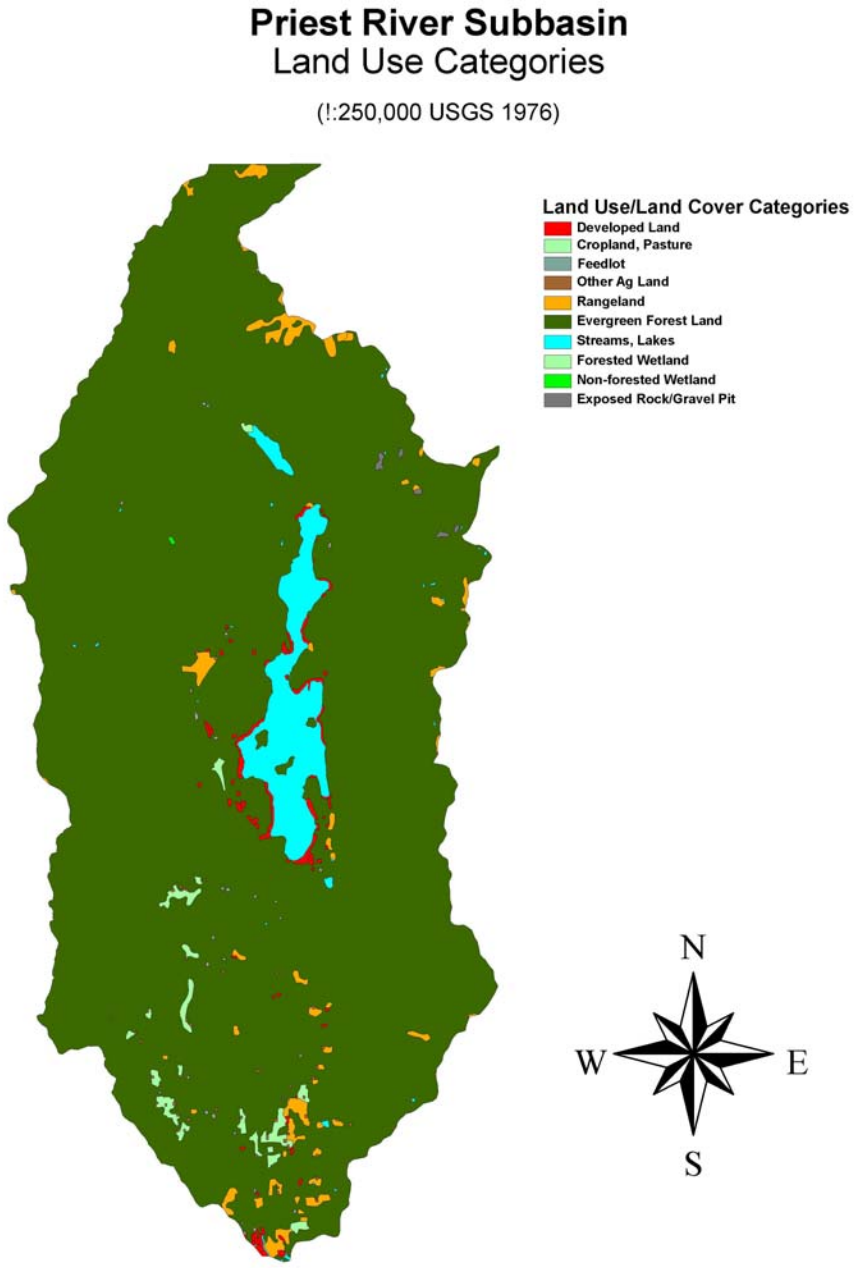



Figure 13.11. Land use categories for the Priest River Subbasin

## 13.3 Logic Path

The logic path starts with an overall physical description of the Subbasin, followed by an assessment of aquatic and terrestrial resources from which a management plan was created with specific strategies and objectives to address limiting factors and management goals. In the next section, Section 14 Pend Oreille Subbasin Assessment – Aquatic, aquatic resources regarding the historic and current status of selected focal species are described in detail. An analysis based on the QHA technique (described in Section 3) identifies specific habitat attributes that have been altered the most over time relative to the entire Subbasin and which areas in the Subbasin are categorized as having poor or good habitat for the respective focal species. Based on the current status of the focal species, limiting habitat attributes, and management goals recognized in the Subbasin, strategies and objectives were identified and are presented in Section 18 Pend Oreille Subbasin Management Plan. The terrestrial assessment, presented in Section 16, provides a description of the historic and current status of wildlife species and condition of terrestrial habitat types within the Subbasin. Based on the terrestrial assessment and key findings, strategies and objectives were developed and are defined in Section 18 Pend Oreille Subbasin Management Plan.

# SECTION 14 – Table of Contents

# 14 Pend Oreille Subbasin Assessment – Aquatic

## 14.1 Species Characterization and Status[1]

Over 30 species of fish, comprising 12 native and 20 nonnative species, are found in the Pend Oreille Subbasin today (Table 14.1). Many are important to the region for economic, aesthetic, cultural, recreational, and ecological values.

Table 14.1. Fish species currently present in the Pend Oreille Subbasin

| Species | Origin | Location | Status |
|---|---|---|---|
| Largescale sucker (*Catostomus catastomus*) | N | L,R,T | C/U |
| Longnose sucker (*C. macrocheilus*) | N | L,R,T | C/U |
| Slimy sculpin (*Cottus cognatus*) | N | L,R,T | C/U |
| Torrent sculpin (*C. rhotheus*) | N | L,R,T | C/U |
| Peamouth (*Mylocheilus caurinus*) | N | L,R | C/U |
| Westslope cutthroat trout (*Oncorhynchus clarki lewisi*) | N | L,R,T | C/S-D |
| Pygmy whitefish (*Prosopium coulteri*) | N | L | U/U |
| Mountain whitefish (*P. williamsoni*) | N | L,R,T | C/S-D |
| Northern pike minnow *(Ptychocheilus oregoninsis)* | N | L,R | A/S |
| Longnose dace (*Rhinichthys cataractae*) | N | L,R,T | C/U |
| Redside shiner (*Richardsonius balteatus*) | N | L,R,T | C/U |
| Bull trout (*Salvelinus confluentus*) | N | L,R,T | A/S-D |
| | | | |
| Black bullhead *(Ameiurus melas)* | E | L.R | U |
| Brown bullhead (*A. nebulosis*) | E | L,R | C/S |
| Lake whitefish (*Coregonus clupeaformus*) | E | L | A/S |
| Northern pike (*Esox lucius*) | E | L,R | C/I |
| Tiger muskie (*E. lucius x E. masquinogy*) | E | L,R | O/D |
| Channel catfish (*Ictalurus punctatus*) | E | L,R | O/D |
| Pumpkinseed (*Lepomis gibbosus*) | E | L | C/S |
| Bluegill (*L. macrochirus*) | E | L | O/I |
| Burbot (*Lota lota)* | E | L,R | O/D |
| Smallmouth bass (*Micropterus dolomieui*) | E | L,R | C/S-D |
| Largemouth bass (*M. salmoides*) | E | L,R | C/S-D |
| Rainbow trout (*Oncorhynchus mykiss*) | E | L,R,T | A/S |
| Kokanee salmon (*O. nerka*) | E | L,R,T | C/D |
| Yellow perch (*Perca flavescens*) | E | L,R | A/S |
| Crappie (*Pomoxis spp*.) | E | L,R | C/S |
| Lake trout (*Salvelinus namaycush*) | E | L | C/I |
| Brook trout (*S. fontinalis*) | E | T | C/I |
| Brown trout (*Salmo trutta*) | E | L,R,T | C/S |
| Walleye (*Sander vitreus*) | E | L,R | O/D |
| Tench (*Tinca tinca*) | E | L,R | C/I |

E=Exotic, N=Native, L=Lake, R=River, T=Tributary, A=Abundant, C=Common, O=Occasional, U=Unknown, S=Stable, I=Increasing, D=Declining

[1] Large portions of Section 14.1 were contributed to by the Pend Oreille Subbasin Summary Report (2001) pp. 10-14, 25-59, 70-74, 89-116, 129-134, 151-166.

### 14.1.1 Native Species

In addition to the species listed in Table 14.1, the historic native salmonid community also included Chinook salmon and steelhead trout prior to the construction of Grand Coulee Dam. These species were known to migrate upstream to the Salmo River (Canadian-U.S. border) (Baxter 2004), but were restricted mostly to the lower reaches of the Pend Oreille River by either one or combination of natural falls/rapids, Z Canyon at RM 19 (formerly known as Big Eddy Canyon) and/or Metaline Falls at RM 27 (Stone 1883; Rathbun 1895; J. Maroney, Fisheries Biologist, KNRD, personal communication, 2004).

Stone (1883) found no evidence of salmon or anadromous fish reaching Lake Pend Oreille. Stone (1883) further believed the first rapid (Z Canyon) prevented anadromous fish from entering the Pend Oreille system. However, historical observations and interpretations of potential natural barriers such as Z Canyon and Metaline Falls were not always consistent. Other observations by Gilbert and Evermann (1895, page 31) and Rathbun (1895) describe Metaline Falls to be "the most serious obstruction" on the Pend Oreille River and "that no [potential] obstructions were *below* Big Eddy Canyon [Z Canyon] … nearly as serious as Big Eddy Canyon or Metaline Falls" (Gilbert and Evermann 1895). Rathdun (1895) concluded the "possible effect of this obstruction [Metaline Falls] upon the movements of salmon was not determined satisfactorily, although Dr. Gorham inclined to the opinion that it would be insurmountable in its present state …" In contrast, Gilbert and Evermann (1895) concluded neither Z Canyon nor Metaline Falls was a barrier to anadromous upstream migration although they did not record or document any anadromous species above these natural falls/rapids. Gilbert and Evermann (1895) only documented the abundance of trout and char (bull trout) above Z Canyon and Metaline Falls.

### 14.1.2 Artificial Production

This section provides a chronological history of artificial production in the Upper Pend Oreille, Lower Pend Oreille, and Priest River subbasins illustrating the transformation of fish communities and dynamics through time. After the overview of artificial production, more information is provided on specific nonnative species including rainbow trout, lake trout, lake whitefish, brook trout, brown trout, and other warmwater species. Sections 14.6 and 14.7 discuss the historic and current status of the nonnative focal species, kokanee and largemouth bass.

#### 14.1.2.1 Upper Pend Oreille Subbasin

Fish stocking during the past 100 years has influenced fish populations in Lake Pend Oreille. Lake Superior whitefish were the first-known nonnative species stocked in Lake Pend Oreille during the late 1890s to feed a growing population of white settlers. Many of the warmwater species found in lowland lakes and some of the nonnative salmonids like brook trout were stocked in the early 1900s. In 1925, the U.S. Fish Commission stocked lake trout into Lake Pend Oreille (Entz and Maroney 2001).

Kokanee salmon dispersed downstream from Flathead Lake, Montana into Lake Pend Oreille during the winter flood of 1933. This species provided the largest fisheries in the

state of Idaho through the 1960s. The population started a long-term decline in 1966 concurrent with deeper drawdowns of the lake from dam operations at Albeni Falls (Maiolie and Elam 1993; Paragamian and Ellis 1994). In 1985, the Cabinet Gorge Kokanee Hatchery was built with funding from Bonneville Power Administration (BPA) and Washington Water Power (now Avista Corporation) to mitigate for dam related losses. Hatchery stocked kokanee have helped prevent a total kokanee collapse, but population recovery and meeting the harvest goal of 750,000 kokanee annually will depend on restoration of the wild portion of the kokanee population (Entz and Maroney 2001). Lake Pend Oreille kokanee are further discussed in Section 14.6.

After kokanee salmon were well established, the Idaho Department of Fish and Game (IDFG), in cooperation with the Bonner County Sportsmen Association, introduced Kamloops rainbow trout into Lake Pend Oreille in 1941 and 1942. These fish came from Kootenay Lake, British Columbia, and they soon created a world-class fishery with the existing world record 16.8 kg rainbow caught in 1947. The IDFG supplemented the rainbow trout population with a locally developed Kamloops rainbow broodstock during the 1960s through the 1970s. Fingerlings stocked during the 1980s until 1992 were derived from a local non-captive broodstock collected in the Clark Fork River and from fry received from Kootenay Lake (Table 14.2). All rainbow trout stocking was discontinued in 1992 due to the concern over piscivorous species population expansions.

Table 14.2. History of kokanee, cutthroat trout, rainbow trout, and bull trout stocking in Lake Pend Oreille, Idaho, 1986 through 1999

| Year Class (KL/KE only) | KL eggs collected | Kokanee adults trapped | Year kok re-lease | KL | KE | CT | Predators | |
|---|---|---|---|---|---|---|---|---|
| | | | | Fry released | Fry released | Fingerling released | Species released | Number released |
| 1985 | 10,661,104 | 76,245 | 1986 | 5,010,248 | None | 10,058 | KM | 3,864 |
| | | | | | | | | |
| 1986 | 9,102,142 | 59,181 | 1987 | 5,861,050 | None | 10,125 | KM | 6,930 |
| | | | | | | | | |
| 1987 | 17,255,051 | 88,064 | 1988 | 13,027,000 | None | None | KM | 11,638 |
| | | | | | | | K2 | 4,875 |
| 1988 | 14,155,998 | 69,163 | 1989 | 11,743,000 | None | None | KM | 13,351 |
| | | | | | | | K2 | 22,172 |
| | | | | | | | BU | 2,000 |
| 1989 | 9,579,772 | 81,991 | 1990 | 7,758,000 | None | None | K2 | 22,600 |
| | | | | | | | BU | 3,338 |
| 1990 | 6,038,108 | 61,913 | 1991 | 5,184,101 | None | 109,051 | None | |
| | | | | | | | | |
| 1991 | 6,591,608 | 91,426 | 1992 | 5,515,190 | None | 101,368 | K2 | 9,344 |
| | | | | | | | BU | 5,055 |
| 1992 | 7,498,513 | 106,876 | 1993 | 561,146 | None | 72,855 | None | |
| | | | | | | | | |
| 1993 | 11,097,143 | 179,419 | 1994 | 9,902,543 | None | 86,160 | None | |
| | | | | | | | | |
| 1994 | 16,613,806 | 160,321 | 1995 | 14,050,457 | None | 100,039 | None | |
| | | | | | | | | |
| 1995 | 12,893,131 | 136,586 | 1996 | 10,661,003 | 100,000 | 88,995 | None | |

| Year Class (KL/KE only) | KL eggs collected | Kokanee adults trapped | Year kok re-lease | KL | KE | CT | Predators | |
|---|---|---|---|---|---|---|---|---|
| | | | | Fry released | Fry released | Fingerling released | Species released | Number released |
| | | | | | | | | |
| 1996 | 4,496,439 | 56,113 | 1997 | 3,720,697 | None | 92,227 | None | |
| | | | | | | | | |
| 1997 | 601,661 | 16,204 | 1998 | 2,483,740 | None | 94,200 | None | |
| | | | | | | | | |
| 1998 | 8,955,972 | 91,996 | 1999 | 7,127,261 | 1,121,059 | 109,475 | None | |
| | | | | | | | | |
| 1999 | 22,383,530 | 225,540 | 2000 | 17,710,513 | None | | None | |
| **Total** | **157,923,978** | **1,501,038** | | **120,315,949** | **1,221,059** | **874,553** | **KM** | **35,783** |
| | | | | | | | **K2**<br>**BU** | **58,991**<br>**10,393** |

BU - LPO bull trout, KE - early spawning kokanee, KL - late spawning kokanee, KM - LPO stock rainbow fingerlings, K2 - Kootenay L. BC rainbow

Limited numbers of bull trout were stocked during 1989, 1990, and 1992 (Table 14.2). These fish came from Trestle Creek and Gold Creek, and the Clark Fork spawning channel adjacent to the Cabinet Gorge Hatchery.

The limited wild population of westslope cutthroat trout in Lake Pend Oreille was supplemented with hatchery stocking primarily during the 1990s. The presence of infectious pancreatic necrosis (IPN) and a viral disease affecting young westslope cutthroat trout at the Clark Fork Hatchery caused IDFG to terminate the cutthroat trout stocking program in Lake Pend Oreille. A new broodstock is being developed at the Hayspur Hatchery, but it will likely be several years before production fish are again available for stocking.

### 14.1.2.2 Lower Pend Oreille Subbasin

Native and nonnative populations of salmonids and other species have been supplemented or introduced by means of hatchery plantings in the Pend Oreille River and its tributaries since before the turn of the century. Some fish, such as brown trout, were introduced to the Pend Oreille River via plantings in the 1890s from an original Scottish strain (Hisata, as cited in Ashe and Scholz 1992). A table summarizing WDFW fish planting in the Pend Oreille River (between Box Canyon and Albeni Falls dams) and its tributaries from 1933-1994 is available in the Box Canyon Final License Application, Appendix E3.1-2 (2000). In Box Canyon Reservoir alone, approximately 226,328 rainbow trout were planted from 1935 to 1953. An additional 48,445 cutthroat trout were planted during this period (Bennett and Liter 1991). A total of 32,500 cutthroat trout were planted in the Pend Oreille River in 1939. Hatchery plantings into the Pend Oreille River were discontinued in the late 1950s due to poor angler harvest. Net pen stocking and release of rainbow trout has continued intermittently in the Pend Oreille River at Ione, Ruby, Metaline, and other locations. Intermittent tributary stocking of hatchery brook trout continued into the 1990s (Bennett and Garrett 1994).

The WDFW operates a native westslope cutthroat trout egg collection facility at Kings Lake. Trout eggs collected at this site are utilized for fry and yearling trout stocking efforts of lakes within the Lower Pend Oreille Subbasin and other areas within the IMP.

Historically, WDFW operated a hatchery facility located on Skookum Creek from the early 1950s through the mid-1960s. Fish propagated at this facility included cutthroat trout, rainbow trout, and eastern brook trout and were stocked in various area lakes, streams, and the Pend Oreille River. Hatchery operations were discontinued at this site due to poor fish growth and performance resulting from extremely cold hatchery source water temperatures (WDFW Region One archive files).

Currently, there are two ongoing hatchery operations in Box Canyon Reservoir: (1) the Pend Oreille net pen operations in the Blueslide area and (2) the Kalispel Tribe's largemouth bass hatchery, located on the Flying Goose Ranch. The Blueslide net pens have been operated continuously since 1991. The number of rainbow trout planted was 20,000 in 1991; 60,000 in 1993; 40,000 in 1992, 1994, 1995 and 1996; 45,000 in 1998-2000; 15,000 in 2001; 45,000 in 2002; and 30,000 in 2003. Fish stocked in 2002 and 2003 were sterile (triploid) fish (Curt Vail, Fish Biologist, WDFW, personal communication, 2003). The Kalispel Natural Resource Department (KNRD) developed a largemouth bass hatchery, funded by BPA, to supplement populations of largemouth bass in Box Canyon Reservoir. Annual production goal is 150,000 bass of which 100,000 are fry and 50,000 are fingerlings. The goal is to create/sustain a productive bass fishery in Box Canyon Reservoir that is available to Tribal members and the public.

In addition, the Newport High School production project was conducted in 1990, 1992, and 1993 where the numbers of rainbow trout planted were 10,000, 20,000 and 10,000, respectively (Gary Yann, Newport High School, personal communication). Net pen operations have also been operated in the Metaline and Boundary pool areas by local cooperators working with WDFW during the 1990s. Blueslide Resort in cooperation with Metaline Chambers, Pend Oreille Public Utilities District (PUD), and WDFW operates a rainbow (triploid) net pen facility releasing 25,000 to 30,000 fish annually. Local lakes are also stocked with westslope cutthroat trout and rainbow trout fry from the WDFW Colville Hatchery.

Walleye were planted by WDFW in 1983 and 1984 with 500,000 and 253,000 larvae, respectively (Bennett and Liter 1991). The WDFW also planted 148-tagged adult walleye in 1987 (WDFW, Spokane, as cited in Ashe and Scholz 1992). During the course of past fisheries studies, several anglers reported catching walleye, but there were no confirmed sightings of walleye, nor were there any walleye caught during the fisheries studies (Ashe and Scholz 1992; Bennett and Liter 1991).

#### 14.1.2.3 Priest River Subbasin

Fish stocking during the last 100 years has influenced fish populations in the Priest River Subbasin. Many of the warmwater species found in lowland lakes and some nonnative salmonids were hauled to Idaho in the early 1900s in milk cans on the Burlington Northern Railroad. The initial introduction and consequent spreading of brook trout

throughout the Priest River Subbasin probably had the biggest impact to native westslope cutthroat trout (Entz and Maroney 2001). In 1925, the U.S. Fish Commission stocked lake trout into Priest Lake.

The IDFG supplemented native westslope cutthroat trout in Upper Priest Lake and Priest Lake by stocking both fry and fingerling cutthroat trout directly into the lakes and into some tributaries from the 1940s through 1991. In 1989, 1990 and 1991, the IDFG attempted a net pen rearing program for cutthroat trout to provide a fishery for adipose-clipped cutthroat while requiring mandatory release of wild fish. This program was discontinued due to very poor returns of hatchery fish. Stocking records for the time period from 1976 to 1991 are summarized in Table 14.3. No cutthroat trout or kokanee have been stocked since 1991.

Table 14.3. Kokanee and cutthroat trout stocking history for Priest Lake, Idaho 1976-1991

| | Cutthroat Trout | | |
|---|---|---|---|
| **Year** | **Fingerlings** | **Fry** | **Kokanee** |
| 1991 | 86,072 | 0 | 0 |
| 1990 | 95,284 | 0 | 0 |
| 1989 | 54,500 | 129,045 | 2,628,504 |
| 1988 | 0 | 900,105 | 1,924,774 |
| 1987 | 49,125 | 600,434 | 0 |
| 1986 | 247,080 | 0 | 1,263,554 |
| 1985 | 338,650 | 68,137 | 2,294,591 |
| 1984 | 266,216 | 300,440 | 3,714,880 |
| 1983 | 151,700 | 0 | 2,779,420 |
| 1982 | 142,845 | 0 | 925,368 |
| 1981 | 38,802 | 0 | 0 |
| 1980 | 0 | 4,104 | 0 |
| 1979 | 0 | 0 | 1,780,525 |
| 1978 | 0 | 0 | 62,424 |
| 1977 | 0 | 0 | 1,072,560 |
| 1976 | 0 | 0 | 0 |
| **Total** | **1,470,274** | **2,002,265** | **18,446,600** |

Stocking records did not distinguish between the Henry's Lake cutthroat trout broodstock (Yellowstone cutthroat trout), and the King's Lake cutthroat trout broodstock (westslope cutthroat trout) until 1982. The King's Lake westslope cutthroat trout broodstock was formed using adfluvial westslope cutthroat trout from Priest Lake in the early 1940s, but it is unknown when fish from this native broodstock were used in place of the nonnative Henry's Lake stock. Limited genetic sampling has not shown any sign of introgression with nonnative cutthroat or rainbow trout.

Rainbow trout were also widely stocked as fry, fingerling, and catchable fish in the Priest River Subbasin. The catchable rainbow trout were stocked in Granite Creek, the main tributary to Priest Lake on the west side, and in the Priest River below the Outlet Dam. The catchable rainbow trout stocking program was discontinued by 1982 in Granite Creek and in the Priest River by 1992.

Kokanee were established in Priest Lake during the 1950s from eyed eggs taken from the population in Lake Pend Oreille and stocked in shoreline gravel beds. A naturally reproducing population was established and supplementation was no longer necessary. Kokanee eventually invaded Upper Priest Lake and provided a limited fishery. During and after the collapse of the kokanee fishery in the late 1970s, IDFG stocked kokanee fry in an attempt to re-establish a kokanee fishery. Between 1977 and 1989, a total of 18.4 million kokanee fry were stocked in Priest Lake (Table 14.3), but predation by lake trout continued to overwhelm the kokanee prey base. Since 2001, when first observed, kokanee have been seen spawning in large numbers along the Priest Lake shorelines. In 2003, over 3000 kokanee spawners were observed in a single weekly count. Priest Lake and Upper Priest Lake kokanee are further discussed in section 14.6.

Brown trout were likely stocked in the Priest River and East River drainage prior to 1967. However, due to the lack of detailed documentation prior to 1967, it is unknown exactly when brown trout were stocked in the lower Priest River and the East River. Currently, there is a remnant population of brown trout in the East River drainage.

#### 14.1.2.4 Rainbow Trout

Rainbow trout were first introduced into the Pend Oreille River system in 1919. Although there has been speculation that some rainbow trout may have originated from a native redband trout population, it is believed rainbow trout found in the Pend Oreille River and its tributaries are likely descendants of hatchery plantings in the early 1930s through the early 1950s (Entz and Maroney 2001). In what is now Box Canyon Reservoir, 226,328 rainbow trout were planted from 1935 to 1953. Today only triploid rainbow trout are stocked in the lower Pend Oreille drainage in the state of Washington. This management strategy was established to minimize the possible negative effects of rainbow trout hybridizing with native westslope cutthroat trout.

In Lake Pend Oreille, the Gerrard strain rainbow trout, which are predaceous and grow to large sizes, were first introduced in 1941. In Lake Pend Oreille, Vidergar (2000) found that 77 percent of the diet of rainbow trout larger than 275 mm is kokanee. Trophy rainbow trout exceeding 10 kg are caught every year and attract anglers from all over the country. Long-term management goals for the lake include continuing to provide a trophy rainbow trout fishery and utilizing kokanee salmon as a forage base. Bag limits, size restrictions, and season restrictions for rainbow trout were recently expanded to encourage angler harvest and reduce predation on the depressed kokanee population. These measures are intended to be short-term until the kokanee population shows signs of recovery as demonstrated by an increasing population trend. Resident rainbow trout contribute to the lower Clark Fork fishery, and rainbow trout are widely distributed in tributaries to Lake Pend Oreille and the lower Clark Fork River. Rainbow trout pose a threat of hybridization with westslope cutthroat trout, with hybrids being common in some portions of the Subbasin.

In the Priest River drainage, rainbow trout were widely stocked as fry, fingerling, and catchable fish. Catchable rainbow trout were stocked in Granite Creek, the main tributary to Priest Lake on the west side, and in the Priest River below the Outlet Dam. By 1982

and 1992, the catchable rainbow trout stocking program was discontinued in Granite Creek and in the Priest River, respectively (Entz and Maroney 2001). However, IDFG continues to stock isolated small ponds in the Subbasin with rainbow trout to provide harvest opportunities for unskilled anglers (N. Horner, Regional Fisheries Manager, IDFG, personal communication, 2003).

#### 14.1.2.5 Lake Trout

In 1925, the U.S. Fish Commission first introduced lake trout into Lake Pend Oreille. Lake trout dispersing from Flathead Lake, and possibly Upper Priest Lake and Priest Lake, likely contributed to the Lake Pend Oreille lake trout population. Lake trout are well established in Lake Pend Oreille and contribute to the sport fishery. They are considered to be a potentially significant threat to native fish and kokanee; therefore, the management emphasis is to reduce lake trout numbers through a year-round, no bag limit regulation.

Creel surveys in Lake Pend Oreille conducted by IDFG in 1985, 1991, and 2000 show estimated lake trout harvest increasing from zero in 1985, to fewer than 100 in 1991, to over 4,000 in 2000. The significant increase in lake trout harvest has occurred despite a nearly 20 percent drop in angler effort from 1991 to 2000. In 1991, catch rates for lake trout were estimated at over 10,000 hours per lake trout, compared with 78 hours per lake trout in 2000. In 2000, fishing regulations were liberalized to increase the harvest of lake and rainbow trout (the bag limit for lake trout has been removed, and for rainbow trout has been increased from two fish to six with no size limit and a year-round season).

Lake trout are thought to comprise 4 percent of the predator biomass and consume two percent of the kokanee production (Vidergar 2000). In 1999, a mark-and-recapture population estimate of lake trout (>405 mm fork length) estimated 1,792 fish with a 95 percent confidence interval of 1,054 to 5,982 (Vidergar 2000). By fall of 2001, researchers concluded that predation levels were still too high for kokanee forage base (Maiolie et al. 2002). In 2004, results from a mark-recapture study estimated 5,200 to 8,100 lake trout over 508 mm (>20 inches) in length present in Lake Pend Oreille (Peterson and Maiolie 2004).

Lake trout were also introduced into the Priest Lake system in 1925 (Bjornn 1957). Lake trout were largely forgotten until being “rediscovered” in 1952, when over 2,268 kg of lake trout were weighed in during a fishing derby sponsored by the Priest Lake Sportsmen Association. The lake trout population and fishery had relatively few, large fish until Mysis shrimp (*Mysis relicta*) were introduced from 1965 to 1968 (Bowles et al. 1991) (Figure 14.1).

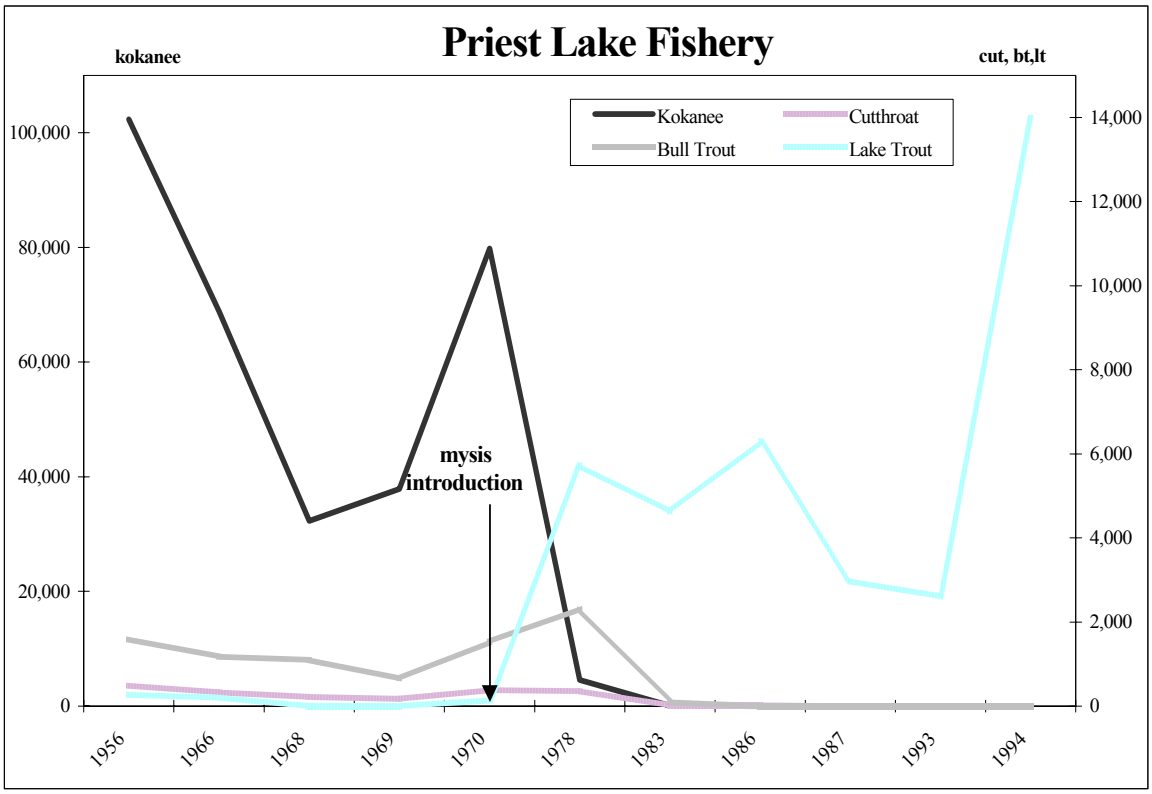



Figure 14.1. Estimated harvest of kokanee, cutthroat trout, bull trout, and lake trout in Priest Lake, Idaho from 1956 to1994

The presence of Mysis shrimp increased juvenile lake trout survival, increasing the population of lake trout, which then had adverse impacts on kokanee, bull trout, and cutthroat populations (Figure 14.1). Lake trout harvest increased to as much as 13,000 fish annually by 1994 (Davis et al. 2000) as interest shifted from the popular kokanee and cutthroat trout fisheries of the past to the only remaining harvest fishery. The average size of lake trout in the catch declined, primarily from the effects of increased exploitation (Figure 14.2). Young lake trout have now replaced kokanee as the primary forage fish for larger lake trout. The lake trout fishery is currently being managed as a yield fishery for fish in the 40 to 55 cm size range.

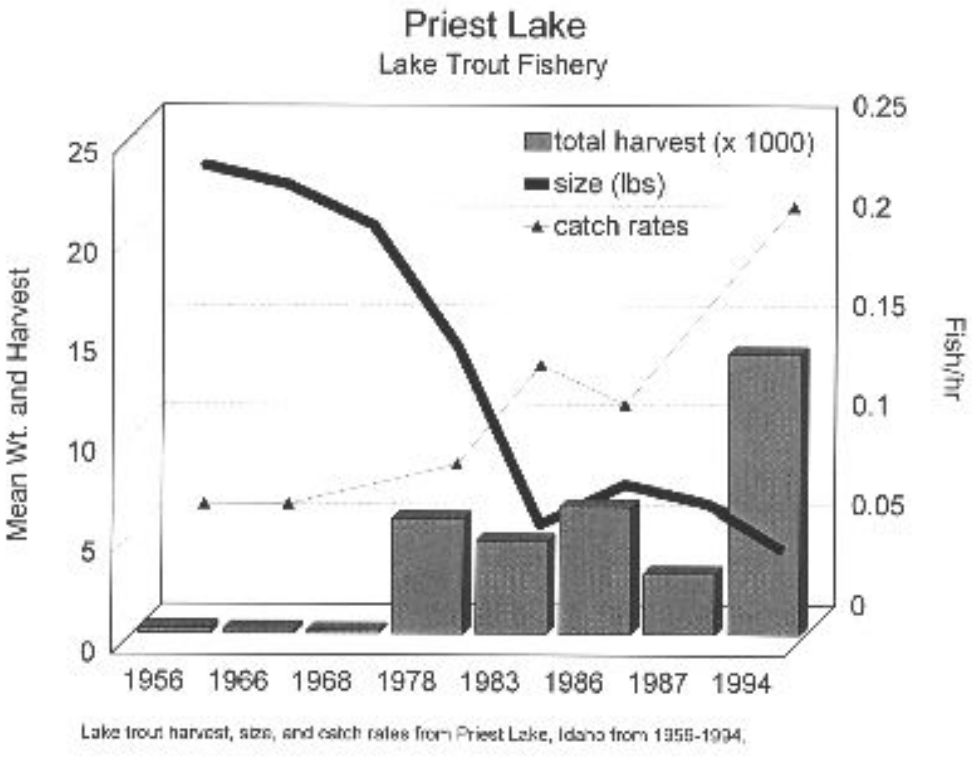



Figure 14.2. Lake trout size, harvest, and catch rates from Priest Lake, Idaho from 1956 to1994

Lake trout were absent from Upper Priest Lake during fishery surveys in 1956 (Bjornn 1957) and were still not present as late as 1979 (Rieman et al. 1979). Mauser (1986) reported lake trout were occasionally caught in Upper Priest Lake in 1985. Detailed angler diaries kept by two avid Upper Priest Lake anglers indicated lake trout were not uncommon in their catch by 1993, and their catch records show an increase in lake trout and decrease in bull trout the following years.

In 1997, IDFG conducted an intensive survey in Upper Priest Lake to assess lake trout population and bull trout abundance, and evaluate the feasibility of lake trout removal (Fredericks et al. 1997). Study results confirmed the presence of a well-established lake trout population. The size distribution of lake trout depicts a relatively young and expanding population. The collection of numerous juvenile lake trout suggests that they are reproducing successfully in Upper Priest Lake (Fredericks et al. 1997). Movement of sonic and spaghetti tagged lake trout demonstrated that migration between Upper Priest Lake and Priest Lake via the Thorofare is not uncommon (Fredericks 1999).

Lake trout suppression efforts have been partially successful in Upper Priest Lake through a program of intensive gill netting. In 1998, IDFG removed 912 lake trout from Upper Priest Lake by gill netting (Fredericks and Venard 2000). An additional 321 lake trout were removed in 1999. Ratios of bull trout to lake trout were similar in both years

(about 5:100). However, return rates of tagged fish provided a clear indication that interchange of lake trout between the two lakes is common and the upper lake cannot be treated as a closed system.

In 1999 and 2000, a study was conducted on the seasonal and diel movement patterns of lake trout, cutthroat trout, and bull trout in the Thorofare (Venard 2001). Venard (2001) found lake trout (n > 100) migrated through the Thorofare primarily during the night and in the spring and fall when waters were cooler than during the summer. Cutthroat trout (n > 100) were captured mostly from April to October during the day and night. Although few bull trout (n = 7) were detected using the Thorofare, their diel and seasonal movements were analogous to lake trout (Venard 2001).

Lake trout reduction in Upper Priest Lake is the most viable option for protecting and restoring the Upper Priest Lake bull trout population. The reduction of lake trout is unlikely unless a method can be established to control lake trout immigration through the Thorofare, a stream channel connecting Upper Priest Lake with Priest Lake. However, a fish barrier preventing migration between the lakes may prevent bull trout and cutthroat trout migration to their natal spawning streams (Venard 2001). Options to reduce lake trout movement are complicated by the strong public sentiment against obstructing free boat passage between the lakes.

In 2002, a strobe light test was conducted in the Thorofare. Results from this test concluded lake trout could be stopped from migrating through the waterway (Liter and Maiolie 2003). Gill netting by IDFG over the last three years has shown this method of removal is feasible at lake trout control. Funding for these two projects are now being investigated.

Future management decisions for native westslope cutthroat trout and bull trout enhancement will be dependent on the success of keeping lake trout out of Upper Priest Lake and/or the possibility of replacing the lake trout fishery with another sport fishery, such as kokanee, that has no impact on native fish restoration. The current management direction is to continue the existing lake trout fishery in Priest Lake and attempt to maintain Upper Priest Lake as a refuge for native species. The influx of lake trout and the increased brook trout populations in tributary streams has seriously compromised the abundance and survival of native species. If Upper Priest Lake can be protected, then options to eventually restore Priest Lake may remain viable. But, if bull trout are extirpated in Upper Priest Lake, it is doubtful they can ever be successfully restored to this watershed.

#### 14.1.2.6 Lake Whitefish

Ned Horner, Regional Fisheries Manager for IDFG, reported at a public meeting on February 28, 2004 that “lake whitefish were the most numerous fish caught during the deep water trap net assessment in Lake Pend Oreille conducted during the winter of 2003-2004. Lake whitefish were originally introduced into Lake Pend Oreille in the 1890s, but very few anglers target them. Although they appear to be quite abundant, little is known about their ecological role or relationship to other fish species in the lake.”

Potentially they could be managed as a sport fishery to help offset the declines in other fisheries. However, lack of knowledge prevents their effective management.

No studies, to our knowledge, document lake whitefish ecology in the Lake Pend Oreille system. It is unknown what limits their abundance. Lake whitefish food habits, age structure, and habitat usage have not been investigated. Research has discovered lake whitefish feed heavily on Mysis shrimp in Lake Pend Oreille, which may be causing a decline in Mysis shrimp abundance. Maiolie (2002) noted that the overall density of Mysis shrimp has been declining since 1980, and from 1998 to 2001 immature and adult Mysis shrimp densities declined from 426 Mysis shrimp/$m^2$ to 224 Mysis shrimp/$m^2$. The reason for the decline in Mysis shrimp is unknown, however, lake whitefish predation is a current leading theory (Maiolie, IDFG, personal communication, March 2003).

#### 14.1.2.7 Brook Trout

Brook trout are nonnative and abundant throughout the Pend Oreille Subbasin. In the Priest River Subbasin, the U.S. Fish Commission introduced brook trout in the early 1900s. However, current management (since the mid-1990s) in the Priest River Subbasin only stock brook trout in selected isolated lakes. In Washington, stocking programs were established as early as 1920 when the northeastern counties in Washington managed the fishery (C. Vail, Fisheries Biologist WDFW, personal communication, 2003). By the 1930s, WDFW managed the fishery and continued an extensive brook trout stocking program in northeastern Washington. In 2001, WDFW received a project grant from the State of Washington Salmon Recovery Funding Board, to pursue removal of brook trout in a portion of Middle Branch LeClerc Creek (a tributary to Box Canyon Reservoir - Pend Oreille River), utilizing antimycin, to facilitate restoration of bull trout (C. Vail, Fisheries Biologist, WDFW, personal communication). Beginning in 2002, the Kalispel Tribe implemented a brook trout removal program using a backpack electrofisher in Mineral Creek, a tributary in the LeClerc watershed. A total of 2,941 brook trout were captured and removed (J. Maroney, Fisheries Biologist, KNRD, personal communication, 2004). Westslope cutthroat trout were less abundant; 880 cutthroat trout were captured and returned to Mineral Creek.

Currently, brook trout are well distributed throughout the Subbasin including the rivers (Pend Oreille, Salmo with the exception of the South Fork Salmo, and Priest rivers), tributaries, and Box Canyon Reservoir (Andonaegui 2003). Brook trout have been identified as one of the primary limiting factors for bull trout recovery in the Pend Oreille Subbasin (Andonaegui 2003). Their distribution overlaps throughout much of the historic range of bull trout and westslope cutthroat trout in the Pend Oreille Subbasin, including portions of nearly all spawning and rearing streams. Brook trout inhabit areas where the habitat is disturbed from land use practices. Behnke (1979) described how clear-cutting along two streams in the Smith River drainage of Montana increased erosion, sediment loads, and water temperatures; the westslope cutthroat trout population was eliminated in the disturbed area, and brook trout was the principle species. Of all the factors threatening bull trout and westslope cutthroat trout, hybridization and interspecific competition with introduced salmonids are among the most detrimental (Liknes and Graham 1988; Leary et al. 1991; Markle 1992).

In the Priest River Subbasin, brook trout abundance appears to be highest in tributaries on the west side of Priest Lake and the Priest River, where sediment loads are highest, due partially to geology. Limited population data are available for some drainages based on timber sale assessments by the USFS and Idaho Department of Lands (IDL) and stream surveys by IDFG. A thorough evaluation of brook trout abundance and distribution in the subbasin is needed to determine the probability of re-establishing native trout and char fisheries.

Research during the 1980s indicated that brook trout were having a negative effect on adfluvial westslope cutthroat trout production in Priest Lake tributary streams (Irving 1987, Strach and Bjornn 1989). Limited surveys by the USFS in west side tributaries indicate that brook trout may have increased in abundance and distribution. Work by University of Idaho graduate students during the mid-1980s (Irving 1987; Cowley 1987; Strach and Bjornn 1989) indicated the presence of brook trout in Priest Lake tributaries reduced densities of westslope cutthroat trout and the removal of brook trout could result in increased production of westslope cutthroat trout. However, recent brook trout removal experiments in three Upper Priest Lake tributaries had limited effect based on the amount of in-stream and overhead cover present and the difficulty in removing all fish (Fredericks et al. 2000). Brook trout were maturing as early as age one for male and age two for females, so missing large numbers of fry resulted in little population impact. Comprehensive surveys are needed in all tributaries to Upper Priest Lake and Priest Lake to determine the distribution and abundance of brook trout to better define native fish restoration options.

#### 14.1.2.8 Brown Trout

The Scottish strain brown trout were first introduced to the Pend Oreille River via plantings conducted in the 1890s that continued into the 1990s (Hisata, as cited in Ashe and Scholz 1992). Brown trout are effective predators and can reduce a bull trout population through mortality. In the Washington portion of the lower Pend Oreille Subbasin, brown trout are currently only stocked in isolated lakes (with no stream outlets).

Brown trout populations appear to be the most common adfluvial salmonid species in the Pend Oreille River and tributaries. Although not as abundant, brown trout also occur in the lower Priest River and the East River. Their ability to tolerate warmer temperatures than other resident salmonids may be a partial explanation for this. Data collected during the two years of adfluvial trapping indicated that the streams likely to contain adfluvial populations included Indian Creek, Skookum Creek, Cee Cee Ah Creek (Entz and Maroney 2001), and Sullivan Creek (Andonaegui 2003).

Fisheries resources in Box Canyon Reservoir reach of the Pend Oreille River and its tributaries have been described by previous investigations conducted by researchers from the University of Idaho (Bennett and Liter 1991; Bennett and Garrett 1994) and Eastern Washington University (Ashe and Scholz 1992). Trout, although present in the reservoir, comprised less than one percent of the total fish captured using electroshocking, gill

netting, and seining methods. Brown trout were the most abundant, with 492 captured from 1988 to 1990.

#### 14.1.2.9 Warmwater Species

A variety of warmwater fish species have been introduced to the Pend Oreille Subbasin for the past century (Table 14.1). The majority of these warmwater species inhabit areas with warmer temperatures such as the mainstem Pend Oreille River reservoirs, low-velocity backwater sloughs, and inundated confluence zones of Pend Oreille River tributaries. Several warmwater fish species are also found in area lowland lakes within the subbasin. The data collected by Bennett and Liter (1991), Bennett and Garrett (1994), and Ashe and Scholz (1992) indicate that the most abundant game species in the Box Canyon Reservoir reach of the Pend Oreille River are yellow perch (37 percent of the total), pumpkinseed (21.1 percent), largemouth bass (7.7 percent), and black crappie (2.2 percent). The most abundant non-game species is tench (7.6 percent of the total) (Bennett and Liter 1991; Ashe and Scholz 1992). As a result of less suitable over-wintering habitat, warmwater fishes are lower in abundance above Albeni Falls Dam upstream to the outlet of Lake Pend Oreille compared to Box Canyon Reservoir (Karchesky 2002).

## 14.2 Focal Species Selection

The focal species selected in the Pend Oreille Subbasin include three native species (bull trout, westslope cutthroat trout, mountain whitefish) and two nonnative species (kokanee, largemouth bass). Each species was selected based on their ecological, cultural, and/or economic value. Focal species were selected based on criteria that were developed by the Council and the IMP Oversight Committee. The Subbasin Work Teams applied these criteria with input from the Ad-Hoc Technical Group to select the five species for the Pend Oreille Subbasin. For more information on the focal species selection process, refer to Section 3.

## 14.3 Focal Species – Bull Trout

Bull trout were selected as a focal species because of their historical and still potentially important value as a recreational fishery. In addition, bull trout were listed as a threatened species under the Endangered Species Act in June 1998. Bull trout are important ecologically because they are high up on the food chain feeding primarily on other fish. Bull trout are also an indicator species for habitat quality due to their sensitivity to habitat disturbance and specific habitat requirements.

### 14.3.1 Historic Status

Bull trout (adfluvial, fluvial, and resident life-history strategies) were once abundant in the Pend Oreille River and tributaries (Gilbert and Evermann 1895). The lack of man-made barriers allowed for fish movement and genetic interchange between stocks of bull trout in parts of the Clark Fork River, Pend Oreille River, Flathead River/Lake and Priest River/Lake (Gilbert and Evermann 1895). Historically, the Box Canyon Reach (upstream of Metaline Falls), extending from today's Box Canyon Reservoir upstream to the base of Albeni Falls Dam, was described as an excellent area for bull trout (Jordan and Evermann 1908, as cited in Geist et al. 2004). Individual Kalispel Tribal members reported bull trout as large as 660 mm (26 in) long and weighing 1.9 kg (5 pounds) or more (Gilbert

and Evermann 1895). Bull trout were also historically documented in the lower Pend Oreille River tributaries including LeClerc Creek (Gilbert and Evermann 1895), Calispell Creek (Smith 1931), and Ruby Creek (USFWS 2003).

According to Spruell et al. (2003), it is probable that bull trout populations in the Lake Pend Oreille and Clark Fork River system (upper Columbia) were historically within a continuous habitat isolated from other Columbia River populations by a natural barrier fall, Metaline Falls. However, the genetic data alone cannot determine whether bull trout were able to migrate down or up the falls (P. Spruell, Geneticist, University of Montana, personal communication, 2004). Investigations into the genetic characteristics of the entire Columbia River basin indicate bull trout populations in the Methow, Yakima, and Wenatchee (mid-Columbia) drainages are more similar to the upper Columbia than populations in the lower Columbia (Deschutes and drainages downstream) (P. Spruell, Geneticist, University Montana, personal communication, 2004). Spruell (personal communication, 2004) provides a couple of hypotheses for this genetic similarity:

(1) There has been genetic exchange traversing the falls in the recent past.
(2) The populations were founded by a common group of fish and subsequently retain some level of genetic similarity due to this common founding event despite the fact they are unable to navigate the falls.

Historical abundance estimates are not available for bull trout population within the entire Pend Oreille Subbasin. However, a literature review by Pratt and Huston (1993) suggest that Lake Pend Oreille could support 10,000 bull trout spawners per year, while 1978 harvest records show 2,300 bull trout were taken in Priest Lake (Mauser et al. 1988).

### 14.3.2 Current Status

Bull trout are present in varying abundance in the Pend Oreille Subbasin. All three life history strategies are assumed to be present in the Subbasin, although the migratory habits of all populations have not been evaluated. Bull trout populations in the Upper Pend Oreille Subbasin remain relatively stable while other populations in the Lower Pend Oreille and Priest River subbasins are depressed (Andoneagui 2003). The decline of many bull trout populations within the Lower Pend Oreille and Priest River subbasins is largely attributed to interspecies competition with nonnative species, man-made barriers in tributaries, hydroelectric facilities on the mainstem, and habitat fragmentation, degradation, and loss (Andoneagui 2003). In the 1998 Salmonid Stock Inventory for bull trout and Dolly Varden (WDFW 1998), the WDFW classified the Pend Oreille bull trout population status in Washington as “unknown” and expressed concern over few individual bull trout observations in the lower Pend Oreille Subbasin.

Currently the Pend Oreille Subbasin is delineated into three geographical sections including: 1) the Upper Pend Oreille (extends above Albeni Falls Dam upstream to the lower Clark Fork River below Cabinet Gorge dam), 2) the Lower Pend Oreille (extends downstream of Albeni Falls to the Canadian border), and 3) the Priest River drainage. However, the geological barriers are not recognized by bull trout sub-populations within the Subbasin. For example, bull trout have been documented to over-winter in the Upper

Pend Oreille Subbasin (Lake Pend Oreille) and then migrate downstream to spawn in the Priest River drainage (Middle Fork East River) (Geist et al. 2004). The principal reason Lower and Upper Pend Oreille River are differentiated is a result of Albeni Falls Dam, a current fish passage barrier located on the Pend Oreille River. The USFWS (2000) noted in their Biological Opinion that Albeni Falls Dam:

> … is a barrier isolating about 50 miles of the Pend Oreille River and its tributaries from Lake Pend Oreille. These migratory bull trout sub-populations are believed dependent upon Lake Pend Oreille for sub-adult and adult rearing … Bull trout were abundant in the Pend Oreille River through 1957, and then abruptly their numbers decreased to the point that individual fish are now noteworthy. This abrupt decline correlates with the commencement of operation of Albeni Falls Dam in 1952. No other abrupt or widespread threat can be identified for this portion of the Pend Oreille River basin during the 1950s. In the absence of passage, migratory bull trout remaining in the Pend Oreille River will continue to be harmed.

#### 14.3.2.1 Upper Pend Oreille Subbasin

Pratt and Huston (1993) documented life history traits of adfluvial bull trout in Lake Pend Oreille, its tributaries, and the lower Clark Fork River. Lower reaches of Lake Pend Oreille tributaries tend to be too warm to support bull trout and are resident of nonnative fish species (Pratt and Huston 1993). In contrast, the lower reaches of tributaries to the Clark Fork River (below Cabinet Gorge Dam) support bull trout concurrent with nonnative species (Pratt and Huston 1993). In addition, adfluvial bull trout that spawn in the Priest River drainage have been recently been documented over-wintering in Lake Pend Oreille and Pend Oreille River (Geist et al. 2004). This bull trout sub-population is further discussed under the Priest River Subbasin subheading.

Lake Pend Oreille bull trout utilize the lake and 40 percent of the lake tributaries (Pratt 1985, as cited in Pratt and Huston 1993). Populations of Lake Pend Oreille bull trout appear to be stable, however, this may change in the future due to the instability of bull trout populations from individual nursery streams (Pratt and Huston 1993). Despite the local population decline in some tributary spawning stocks, the Lake Pend Oreille bull trout are considered to be one of the strongest remaining populations in the U.S. with an estimated total adult population between 8,000 and 16,000 fish (Vidergar 2000). Lake Pend Oreille and its tributaries have historically provided a highly regarded sport fishery for bull trout, including trophy specimens. Estimated harvest peaked in the 1950s, as the last of the fish produced from adfluvial runs to Montana tributaries became available to anglers. Legal harvest of bull trout was discontinued beginning in 1996 due to the pending Endangered Species Act (ESA) listing and declining spawning runs in several tributaries. Kokanee were recently documented to be the principle food item of bull trout (n = 11) over 406 millimeters (mm), comprising 66 percent of the diet (Vidergar 2000).

Neraas and Spruell (2001, as cited in Spruell et al. 2003) have reported a substantial genetic divergence between bull trout populations in the lower Clark Fork River tributaries and Lake Pend Oreille tributaries. On a much smaller geographic scale, Spruell et al. (1999, as cited in Spruell et al. 2003) "found significant genetic divergence among bull trout populations from different tributaries within a single tributary to Lake Pend Oreille."

#### 14.3.2.2 Lower Pend Oreille Subbasin

As a result of factors such as degraded habitat, loss of connectivity, construction of dams, and nonnative fish introductions, bull trout numbers are now depressed in the Pend Oreille River and its tributaries between Boundary and Albeni Falls dams (Geist et al. 2004; Andonaegui 2003). Reservoir temperatures often exceed 20 °C and may reach 25 °C in the summer (Geist et al. 2004) and total dissolved gas can exceed 110 percent at certain times of the year (Entz and Maroney 2001, Box Canyon Final License Application, page E2-64).

Between 1974 and 2002, 33 individual bull trout (both juvenile and adult) were observed in the Pend Oreille River and its tributaries between Boundary and Albeni Falls dams (Andonaegui 2003). Since the late 1980s, fish surveys have found ≤ 10 bull trout in the mainstem of the Pend Oreille River (Ashe and Scholz 1992; Ashe et al. 1991; Bennett and Liter 1991; Kalispel Tribe fish surveys). Many of the tributaries have not yet been surveyed for the presence or absence of bull trout (Andonaegui 2003). Between 1988 and 1990, five bull trout (four adults and one juvenile) of 52,812 fish were identified in the 55 mile long Box Canyon Reservoir (Ashe and Scholz 1992). Bennett and Liter (1991) found only two bull trout of 29,213 fish captured during a concurrent study (1989-1990) from randomly selected sites in the Box Canyon Reservoir. From 1988 to 2001, Kalispel Tribe has only captured eight bull trout during routine fish surveys conducted throughout the Box Canyon Reservoir. In 2001, Kalispel Tribe captured one bull trout near Indian Creek, a tributary to the lower Pend Oreille River, during a routine fish survey that had a clipped adipose and originated from Trestle Creek, a tributary to Lake Pend Oreille (Andonaegui 2003). In July 2003, 10 bull trout were captured within the Box Canyon Reservoir between Indian Creek and Albeni Falls Dam (Geist et al. 2004). Nine of the 10 bull trout captured were found in or near a culvert, 1.5 km downstream of the dam on the left bank. The culvert provided a thermal refugia during the summer months with water temperatures ranging between 11.8-13.8 °C compared to temperatures in the adjacent Pend Oreille River ranging from 18-22 °C (Geist et al. 2004). By August, water levels declined enough to prevent fish access to the thermal refugia (Geist et al. 2004). Geist et al. (2004) suggest these bull trout originated upstream above Albeni Falls Dam. Geist et al. (2004) contend fluvial or adfluvial bull trout that spawn in the tributaries of Pend Oreille River below Albeni Falls dam would have moved to cooler waters in their natal spawning areas rather than remain in the thermal refugia near the culvert just below the dam.

Currently, only small remnant bull trout populations are found in the LeClerc Creek complex and the South Fork of the Salmo River (USFWS, 2002). It is noteworthy that brook trout have not been documented within the boundaries of Washington state in the

South Fork of the Salmo River (Andonaegui 2003, USFWS 2002). Individual fish sighting have been documented in Indian Creek, Fourth of July Creek, Cedar Creek, Sullivan Creek, mouth of Slate Creek, mouth of Skookum Creek, Sweet Creek, Marshall Creek, Mill Creek, and in the Pend Oreille River upstream of the town of Newport (Andonaegui 2003; A. Scholz, Eastern Washington University, personal communication, 2003; S. Lembcke, WDFW, personal communication, 2003; USFWS 2002). It has not yet been determined if these individuals are solely resident, adfluvial or a combination of the two life history strategies.

In the Salmo River drainage (Canada), bull trout surveys were conducted by BC Hydro in 2003 (Baxter 2004). The streams surveyed were Clearwater Creek, Sheep Creek, the upper mainstem of the Salmo River, Stagleap Creek, and the upper South Salmo River. In late September and early October, Baxter (2004) counted a total of 105 bull trout redds and 38 bull trout spawners. Bull trout spawning activity was highest in Sheep Creek and the upper Salmo River/Clearwater Creek and most limited in the South Salmo watershed in 2003 (Baxter 2004). The limited use of the South Salmo watershed in 2003 may have been a reflection of the low water levels making accessibility to the upper reaches of the river more difficult (Baxter 2004). Overall, bull trout numbers appear to be increasing based on estimates of annual escapement (1998-2003) in the Salmo River, five years after the regulation change for no harvest was implemented in 1999 (Baxter 2004).

#### 14.3.2.3 Priest River Subbasin

Bull trout populations appear to be severely depressed in the Priest River Subbasin (Fredericks et al. 2000, as cited in Andonaegui 2003). Bull trout have been documented and observed in the lakes (Upper Priest and Priest lakes) and some of their tributaries (Hughes Creek, Granite Creek), and Middle Fork East River, a tributary of the Priest River downstream of the Outlet Dam (PBTTAT 1998a). However, the extent and type of utilization by bull trout in these streams is not fully known.

In Upper Priest Lake and its tributaries, bull trout are nearly extirpated with the current population estimated at 116 adult fish (Venard 2001). Interspecies competition with and direct predation by lake trout are most likely the principal limiting factors. Refer back to the previous Section 14.1.2 under the subheading 14.1.2.5 Lake Trout for a more detailed discussion regarding the history of lake trout.

Fish surveys from 1982-1984 calculated an average density for bull trout in the west side Priest Lake drainage to be 3.4 fish/100$m^2$ in all habitat types (Andonaegui 2003). Bull trout harvest in Priest Lake and all tributaries was closed in 1984. Granite Creek, the main tributary to Priest Lake, still supports a few bull trout, but brook trout hybrids have also been observed in that drainage.

Currently bull trout can move between Upper Priest and Priest lakes via the Thorofare, small stream corridor between the lakes. During a study conducted in 1999 and 2000, 7 bull trout were observed in the Thorofare with total lengths ranging between 300 to 770 mm (Venard 2001). Although the number of individuals was few, this was a significant finding (~ 6 percent of the estimated population) considering the adult population of

Upper Priest Lake is estimated only to be slightly more than one hundred (IPNF 1998; Venard 2001).

Further downstream in the Middle Fork East River, the bull trout population is isolated from the upper portion of the Priest River drainage by the Outlet Dam at Priest Lake. The Middle Fork East River is the only tributary to the Priest River below the Outlet Dam known to support a bull trout population (DuPont and Horner, in press) (Figure 14.3). The spawning population is estimated to be less than 50 fish (Geist et al. 2004). The population uses about 10 km of the Middle Fork East River for spawning and rearing and no other bull trout population is known to be present within 50-stream km (Dupont and Horner, in press).

Juvenile bull trout are known to rear in about 8 km of stream in the Middle Fork East River drainage, with the majority of use occurring in about 3 km of stream (Figure 14.4) (Dupont and Horner, in press). Brook trout are in sympatry with bull trout in all of these stream reaches except for Uleda Creek (0.6 km reach) where the highest bull trout densities were found (Dupont and Horner, in press) (Figure 14.4). Prior to 2003, a man-made barrier about 0.6 km upstream from the mouth of Uleda Creek prevented bull trout upstream migration habitat that was considered high quality for bull trout spawning (Dupont and Horner, in press). In 2003, the barrier was removed (IDL in litt. 2003; S. Deeds, personal communication, 2004).

The bull trout population in Middle Fork East River displays a unique adfluvial life history (Geist et al. 2004; Dupont and Horner, in press). Sub-adult bull trout outmigrate from the East River downstream 34 km to the confluence of Priest River with Pend Oreille River, from the Pend Oreille River, the sub-adult bull trout swim upstream 37 km to Lake Pend Oreille (Figure 14.3) (Dupont and Horner, in press). Other bull trout populations are known to have an outlet spawning lifecycle similar to the Middle Fork East River bull trout (Thomas 1992; Herman 1997; Ringel and DeLaVergne 2000, as cited in DuPont and Horner, in press). However, none of these populations are believed to migrate more than 10 km downstream from the lake's outlet, and all spawn directly in the outlet stream or a short distance up a side tributary (Dupont and Horner, in press).

A radio telemetry study was attempted in spring of 2003 to monitor this downstream migration pattern and determine whether entrainment over Albeni Falls Dam is an issue (Geist et al. 2004). It has been suggested entrainment could occur if bull trout overshoot the outlet to Priest River when migrating downstream from Lake Pend Oreille or Pend Oreille. This study was unable to document or radio-tag sub-adult migration behavior in the Pend Oreille River. Questions still remain such as (taken from Geist et al. 2004):

1) When do bull trout move downstream?
2) What size does the migration occur?
3) Is bull trout migration timed so upstream movement in the Pend Oreille River is accomplished without being entrained?
4) Does entrainment occur?

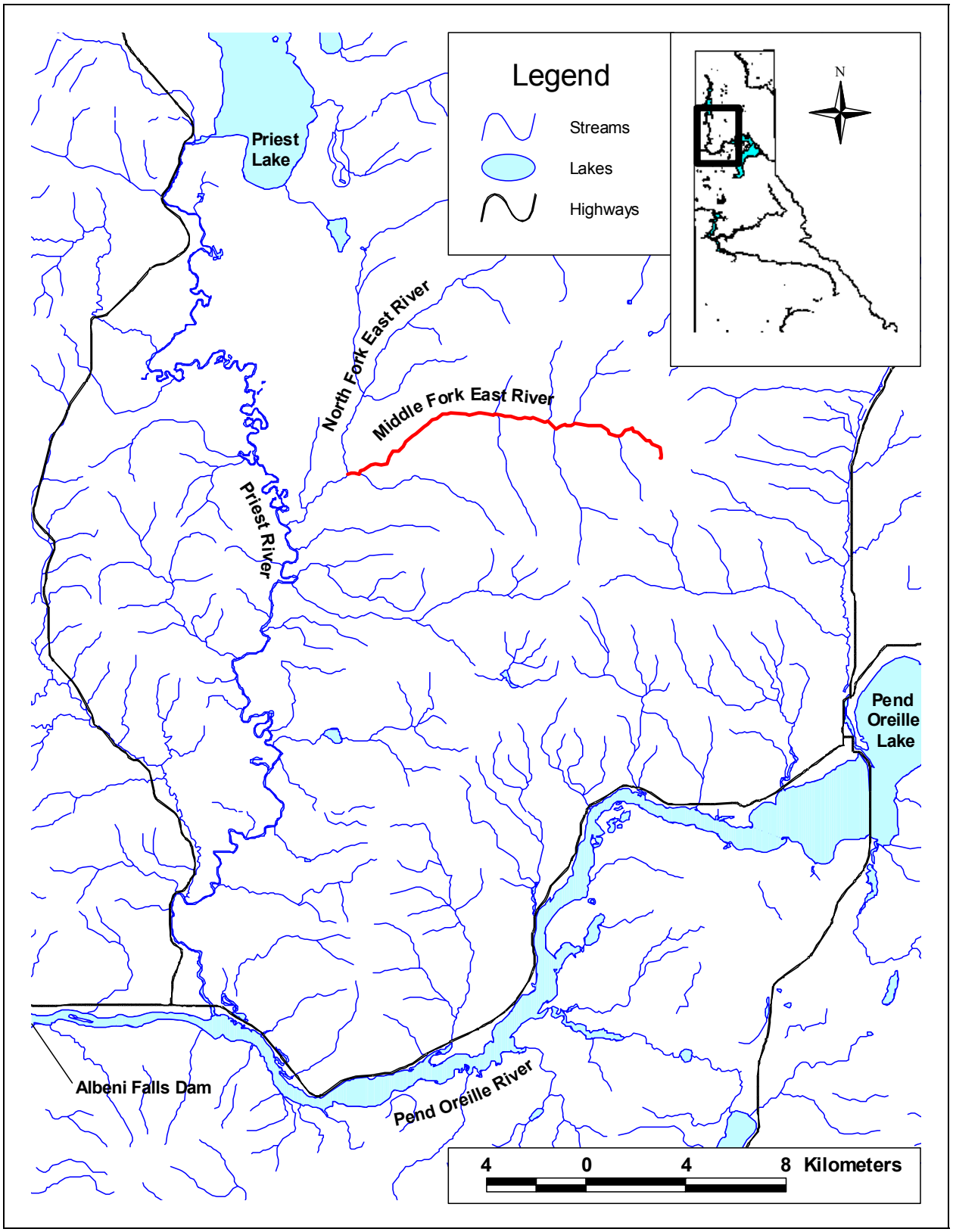



Figure 14.3. Location of Middle Fork East River, Idaho (*Source*: Dupont and Horner, in press)

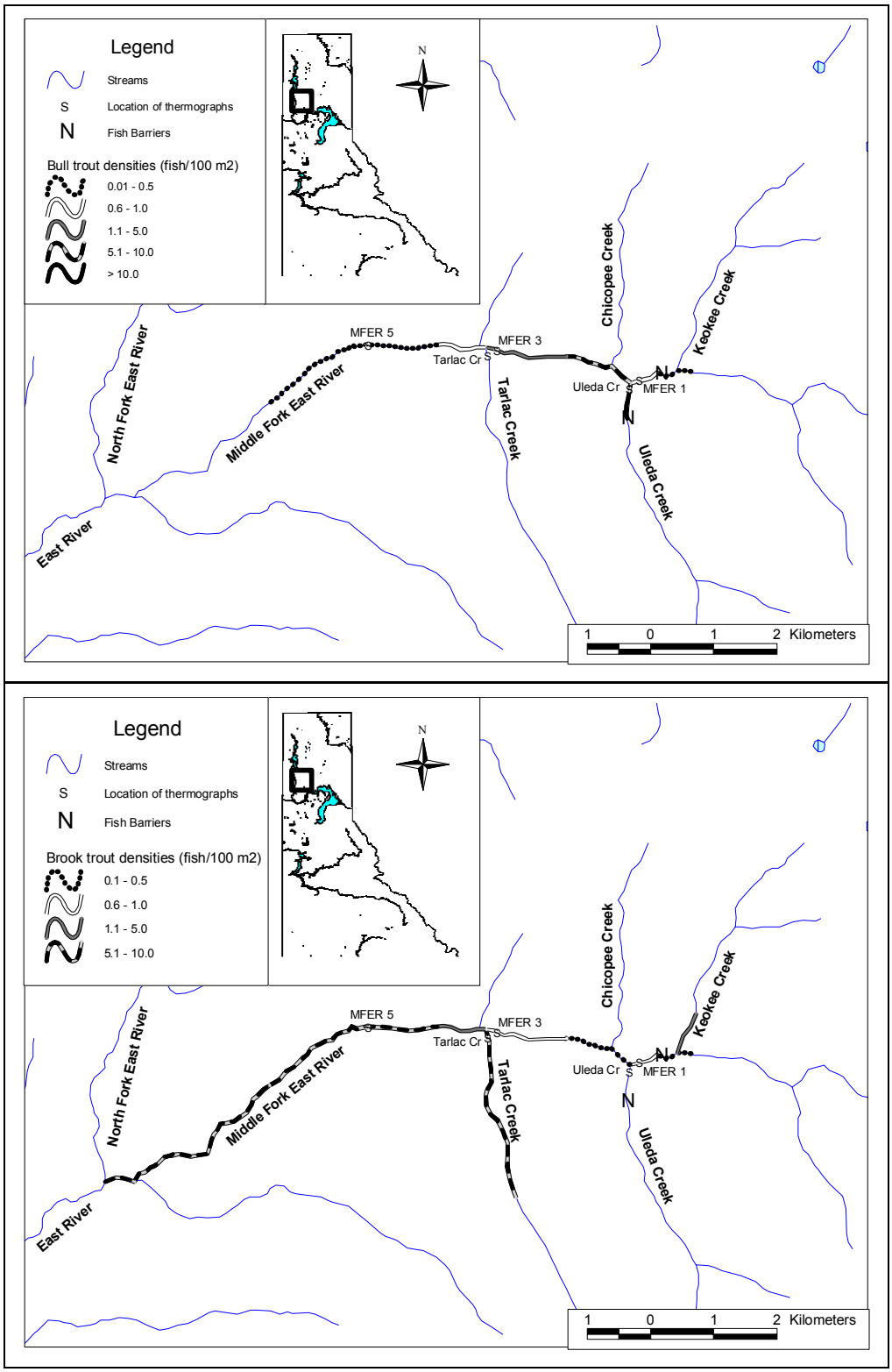



Figure 14.4. Estimated distribution and density of bull trout and brook trout in Middle Fork East River, Idaho based on sampling during 1986, 2001 and 2002. (*Source*: Dupont and Horner, in press)

#### 14.3.2.4 Stocking

Information regarding past stocking and captive breeding of bull trout is available in the previous section on artificial production in the Upper Pend Oreille Subbasin Section 14.1.2. Currently, there are no stocking or captive breeding programs in the Pend Oreille Subbasin.

### 14.3.3 Limiting Factors Bull Trout

Based on Qualitative Habitat Assessment (QHA) results, the number of reaches and watersheds that currently contain bull trout has decreased by 57 percent from historic numbers. Historically there were 98 of 167 delineated reaches and watersheds within the Pend Oreille Subbasin that supported bull trout. Currently, that number has dropped by 56 reaches (Table 14.4) to only 42 reaches and watersheds supporting bull trout.

Table 14.4. List of 56 reaches where bull trout are not currently present, but were historically present. Reach rank refers to the degree of habitat change from reference to present conditions. (Reach Rank of 1 = greatest habitat alteration)

| Reach Name | Reach Rank |
|---|---|
| Lower Calispell Creek | 1 |
| Lower Skookum Creek | 6 |
| Hoodoo Creek | 7 |
| Middle Branch LeClerc Creek | 9 |
| Rapid Lightning Creek | 10 |
| Davis/Kent Creeks | 14 |
| Lower Harvey Creek | 15 |
| Lower Tacoma Creek | 15 |
| Lower Cusick Creek | 15 |
| Brickel Creek | 20 |
| Lower Muddy Creeks | 23 |
| Indian Creek | 23 |
| South Fork Indian Creek | 23 |
| Lower Sand Creek | 26 |
| Middle West Branch LeClerc Creek | 26 |
| Lower Trimble Creek | 26 |
| North Fork East River | 26 |
| Maitlen Creek | 30 |
| Upper West Branch LeClerc Creek | 31 |
| McCloud Creek | 33 |
| Upper Cusick Creek | 34 |
| Pass Creek | 35 |
| Middle Creek | 35 |
| Middle Sullivan Creek | 39 |
| Soldier Creek | 39 |
| Upper East Branch LeClerc Creek | 44 |
| Kalispell Creek | 46 |
| Lower Lost Creek | 48 |
| South Skookum Creek | 50 |
| North Skookum Creek | 50 |
| Upper Tacoma Creek | 52 |
| Upper Ruby Creek | 52 |
| Renshaw Creek | 54 |

| Reach Name | Reach Rank |
|---|---|
| Lower Winchester Creek | 55 |
| Lower Cedar Creek | 55 |
| Upper Sullivan Creek | 57 |
| Upper Trimble Creek | 57 |
| Upper Lost Creek | 57 |
| Upper Big Muddy Creek | 57 |
| Caribou Creek | 64 |
| Upper Skookum Creek/Lakes | 66 |
| Lower Big Muddy Creek | 66 |
| Middle Harvey Creek | 68 |
| Sullivan Lake | 73 |
| North and Middle Fork Harvey Creek | 74 |
| Lower Ruby Creek | 75 |
| South Fork Tacoma Creek | 78 |
| Little Muddy Creek | 78 |
| South Fork Calispell Creek | 82 |
| Lower Small Creek | 84 |
| South Fork Lost Creek | 87 |
| Boulder Creek | 87 |
| East Fork Small Creek | 92 |
| Deemer/Leola Creek | 93 |
| Gypsy Creek | 93 |
| Jackson Creek | 96 |

Table 14.5 ranks the reaches and watersheds according to those least representative of reference habitat conditions. Reach scores are also shown in the table to acknowledge the tight distribution of scores for areas regarded as having highly altered habitat. The most altered habitat traits for the top ranked areas include riparian condition, channel stability, habitat diversity, and fine sediments (Tables 14.5, also see Table 14.26).

Reaches with habitat characteristics most similar to reference conditions are shown in Table 14.6. The least impacted area in the Pend Oreille Subbasin is Salmo River (limited to area with the United States) in the lower Pend Oreille Subbasin. Portions of the Priest River Subbasin (Upper Priest Lake, Upper Priest River, Gold Creek, Granite Creek) also ranked high for the least amount of habitat alteration. Other areas that were ranked within the top 20 for protection include tributaries to the lower Clark Fork River below Cabinet Gorge Dam and tributaries to Lake Pend Oreille.

Table 14.5. Ranking of reaches with the largest deviation from the reference habitat conditions for bull trout in the Pend Oreille Subbasin. A reach rank equal to 1 has the greatest deviation from reference condition in comparison to other reaches. Reach scores range from 0 to 1, with 1 having the greatest deviation from reference. Values associated with each habitat attribute range from 1 to 11, a value of 1 indicates a habitat attribute having the greatest deviation from reference compared to the other attributes within that reach. In some cases multiple habitat attributes have a value of 1 indicating all attributes equally deviate the most from the reference.

| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | Lower Calispell Creek | 1 | 0.6 | 1 | 7 | 1 | 1 | 7 | 1 | 7 | 11 | 6 | 7 | 5 |
| 1 | Main Pend Oreille River | 2 | 0.5 | 1 | 1 | 4 | 1 | 9 | 5 | 10 | 10 | 5 | 8 | 5 |
| 166 | Lightning Creek below Porcupine Creek | 3 | 0.5 | 1 | 1 | 4 | 7 | 7 | 1 | 11 | 7 | 5 | 7 | 6 |
| 35 | Lower Sullivan Creek | 4 | 0.5 | 2 | 2 | 5 | 9 | 5 | 5 | 10 | 10 | 1 | 5 | 4 |
| 167 | Clark Fork River (below Cabinet Gorge Dam) | 5 | 0.5 | 4 | 6 | 2 | 9 | 8 | 4 | 10 | 10 | 7 | 1 | 3 |
| 54 | Lower Skookum Creek | 6 | 0.4 | 1 | 3 | 4 | 1 | 7 | 7 | 9 | 10 | 5 | 6 | 10 |
| 138 | Middle Pack River | 7 | 0.4 | 1 | 1 | 1 | 1 | 6 | 6 | 10 | 6 | 1 | 6 | 10 |
| 108 | Hoodoo Creek | 7 | 0.4 | 2 | 5 | 1 | 2 | 5 | 2 | 5 | 11 | 5 | 5 | 5 |
| 44 | Middle Branch LeClerc Creek | 9 | 0.4 | 2 | 4 | 2 | 1 | 8 | 8 | 10 | 10 | 5 | 5 | 7 |
| 154 | Rapid Lightning Creek | 10 | 0.4 | 1 | 1 | 1 | 8 | 1 | 1 | 11 | 9 | 1 | 1 | 10 |
| 111 | Middle Fork East River | 11 | 0.4 | 2 | 2 | 1 | 7 | 2 | 2 | 10 | 7 | 2 | 7 | 10 |
| 150 | Grouse Creek | 12 | 0.3 | 1 | 3 | 3 | 2 | 6 | 6 | 10 | 6 | 5 | 6 | 10 |
| 148 | Lower Pack River | 13 | 0.3 | 1 | 1 | 4 | 5 | 8 | 5 | 9 | 9 | 1 | 5 | 9 |
| 5 | Davis/Kent Creeks | 14 | 0.3 | 1 | 1 | 1 | 1 | 8 | 8 | 8 | 5 | 5 | 8 | 7 |
| 38 | Lower Harvey Creek | 15 | 0.3 | 2 | 2 | 1 | 4 | 6 | 6 | 8 | 8 | 8 | 8 | 4 |
| 74 | Lower Tacoma Creek | 15 | 0.3 | 2 | 2 | 2 | 1 | 6 | 6 | 6 | 6 | 5 | 6 | 6 |

| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 76 | Lower Cusick Creek | 15 | 0.3 | 1 | 4 | 1 | 1 | 7 | 7 | 7 | 7 | 6 | 4 | 7 |
| 151 | North Fork Grouse Creek | 18 | 0.3 | 3 | 3 | 6 | 2 | 6 | 6 | 10 | 6 | 1 | 10 | 5 |
| 158 | Granite Creek (LPO) | 19 | 0.3 | 1 | 1 | 1 | 7 | 7 | 1 | 9 | 9 | 6 | 9 | 1 |
| 105 | Brickel Creek | 20 | 0.3 | 2 | 2 | 1 | 4 | 4 | 4 | 10 | 4 | 4 | 10 | 9 |
| 163 | Twin Creek | 21 | 0.3 | 1 | 2 | 2 | 2 | 5 | 5 | 9 | 8 | 5 | 9 | 9 |
| 165 | Lightning Creek between Porcupine and Rattle Creek | 22 | 0.3 | 1 | 1 | 1 | 9 | 6 | 1 | 9 | 6 | 6 | 9 | 5 |
| 83 | Lower Muddy Creeks | 23 | 0.3 | 3 | 5 | 1 | 1 | 7 | 7 | 7 | 7 | 3 | 5 | 7 |
| 120 | Indian Creek | 23 | 0.3 | 4 | 1 | 1 | 1 | 7 | 4 | 7 | 7 | 4 | 7 | 7 |
| 134 | South Fork Indian Creek | 23 | 0.3 | 4 | 1 | 1 | 1 | 7 | 4 | 7 | 7 | 4 | 7 | 7 |
| 36 | Lower Sand Creek | 26 | 0.3 | 2 | 4 | 2 | 1 | 4 | 4 | 9 | 9 | 4 | 9 | 8 |
| 42 | Middle West Branch LeClerc Creek | 26 | 0.3 | 1 | 3 | 3 | 1 | 6 | 3 | 10 | 10 | 6 | 9 | 8 |
| 71 | Lower Trimble Creek | 26 | 0.3 | 2 | 5 | 2 | 2 | 8 | 8 | 8 | 8 | 5 | 5 | 1 |
| 112 | North Fork East River | 26 | 0.3 | 2 | 4 | 1 | 2 | 4 | 4 | 10 | 4 | 4 | 10 | 9 |
| 10 | Maitlen Creek | 30 | 0.3 | 1 | 5 | 2 | 3 | 8 | 5 | 8 | 7 | 3 | 8 | 8 |
| 43 | Upper West Branch LeClerc Creek | 31 | 0.3 | 1 | 5 | 5 | 1 | 5 | 3 | 10 | 10 | 5 | 9 | 4 |
| 135 | Upper Pack River | 32 | 0.3 | 2 | 4 | 1 | 2 | 4 | 4 | 8 | 8 | 4 | 8 | 8 |
| 6 | McCloud Creek | 33 | 0.2 | 4 | 1 | 3 | 1 | 4 | 4 | 10 | 4 | 4 | 10 | 9 |
| 77 | Upper Cusick Creek | 34 | 0.2 | 1 | 1 | 1 | 1 | 8 | 8 | 8 | 8 | 5 | 5 | 7 |
| 45 | Lower East Branch LeClerc Creek | 35 | 0.2 | 1 | 2 | 2 | 2 | 6 | 6 | 9 | 9 | 2 | 8 | 9 |

| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 32 | Pass Creek | 35 | 0.2 | 1 | 1 | 4 | 1 | 5 | 5 | 8 | 8 | 5 | 8 | 8 |
| 47 | Middle Creek | 35 | 0.2 | 2 | 2 | 5 | 1 | 4 | 5 | 8 | 8 | 7 | 8 | 8 |
| 161 | (South) Gold Creek | 38 | 0.2 | 3 | 3 | 3 | 2 | 3 | 3 | 9 | 9 | 9 | 1 | 8 |
| 31 | Middle Sullivan Creek | 39 | 0.2 | 1 | 4 | 1 | 1 | 4 | 4 | 8 | 8 | 4 | 8 | 8 |
| 139 | Soldier Creek | 39 | 0.2 | 9 | 3 | 2 | 1 | 3 | 3 | 10 | 3 | 3 | 3 | 10 |
| 160 | North Gold Creek | 41 | 0.2 | 1 | 4 | 1 | 1 | 4 | 4 | 9 | 9 | 8 | 4 | 11 |
| 153 | South Fork Grouse Creek | 42 | 0.2 | 3 | 3 | 1 | 3 | 3 | 3 | 9 | 3 | 2 | 9 | 9 |
| 3 | Marshal Lake/Creek | 42 | 0.2 | 2 | 2 | 1 | 2 | 2 | 2 | 10 | 2 | 2 | 10 | 2 |
| 126 | Trapper Creek | 44 | 0.2 | 1 | 1 | 4 | 4 | 9 | 4 | 9 | 4 | 4 | 9 | 3 |
| 46 | Upper East Branch LeClerc Creek | 44 | 0.2 | 2 | 3 | 3 | 1 | 3 | 3 | 10 | 10 | 3 | 8 | 9 |
| 162 | Johnson Creek | 46 | 0.2 | 4 | 1 | 1 | 1 | 5 | 5 | 9 | 7 | 7 | 9 | 11 |
| 119 | Kalispell Creek | 46 | 0.2 | 1 | 3 | 1 | 8 | 8 | 4 | 8 | 8 | 4 | 4 | 7 |
| 156 | Strong Creek | 48 | 0.2 | 3 | 4 | 4 | 4 | 8 | 1 | 8 | 8 | 7 | 8 | 1 |
| 81 | Lower Lost Creek | 48 | 0.2 | 2 | 4 | 4 | 1 | 6 | 6 | 6 | 6 | 2 | 6 | 6 |
| 52 | South Skookum Creek | 50 | 0.2 | 2 | 3 | 3 | 1 | 7 | 7 | 10 | 10 | 3 | 3 | 9 |
| 53 | North Skookum Creek | 50 | 0.2 | 2 | 3 | 3 | 1 | 7 | 7 | 10 | 10 | 3 | 3 | 9 |
| 75 | Upper Tacoma Creek | 52 | 0.2 | 2 | 4 | 2 | 1 | 7 | 7 | 7 | 7 | 4 | 7 | 6 |
| 79 | Upper Ruby Creek | 52 | 0.2 | 2 | 4 | 2 | 1 | 6 | 6 | 6 | 6 | 6 | 6 | 5 |
| 21 | Renshaw Creek | 54 | 0.2 | 1 | 3 | 3 | 2 | 3 | 3 | 8 | 8 | 3 | 8 | 8 |
| 64 | Lower Winchester Creek | 55 | 0.2 | 1 | 5 | 1 | 1 | 6 | 6 | 6 | 6 | 6 | 6 | 4 |

| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 87 | Lower Cedar Creek | 55 | 0.2 | 1 | 4 | 1 | 1 | 7 | 7 | 7 | 7 | 4 | 7 | 6 |
| 131 | Lion/Lucky Creek | 57 | 0.2 | 1 | 4 | 2 | 2 | 7 | 4 | 7 | 7 | 4 | 7 | 7 |
| 50 | Lower CCA Creek | 57 | 0.2 | 2 | 7 | 3 | 1 | 3 | 3 | 8 | 8 | 3 | 8 | 8 |
| 29 | Upper Sullivan Creek | 57 | 0.2 | 2 | 4 | 1 | 2 | 4 | 4 | 7 | 7 | 7 | 7 | 7 |
| 72 | Upper Trimble Creek | 57 | 0.2 | 1 | 4 | 1 | 1 | 6 | 6 | 6 | 6 | 6 | 4 | 6 |
| 82 | Upper Lost Creek | 57 | 0.2 | 1 | 4 | 1 | 1 | 6 | 6 | 6 | 6 | 4 | 6 | 6 |
| 85 | Upper Big Muddy Creek | 57 | 0.2 | 1 | 4 | 1 | 1 | 6 | 6 | 6 | 6 | 4 | 6 | 6 |
| 56 | Lower Indian Creek | 63 | 0.2 | 3 | 4 | 1 | 1 | 6 | 6 | 6 | 6 | 4 | 6 | 6 |
| 155 | Trestle Creek | 64 | 0.2 | 1 | 1 | 1 | 1 | 9 | 1 | 9 | 9 | 8 | 1 | 7 |
| 127 | Caribou Creek | 64 | 0.2 | 2 | 8 | 1 | 2 | 8 | 2 | 8 | 2 | 2 | 8 | 7 |
| 55 | Upper Skookum Creek/Lakes | 66 | 0.2 | 2 | 4 | 2 | 1 | 6 | 6 | 6 | 6 | 4 | 6 | 6 |
| 84 | Lower Big Muddy Creek | 66 | 0.2 | 3 | 3 | 1 | 1 | 6 | 6 | 6 | 6 | 3 | 6 | 6 |
| 41 | Lower West Brach LeClerc Creek | 68 | 0.1 | 1 | 3 | 3 | 2 | 7 | 7 | 7 | 7 | 5 | 5 | 7 |
| 132 | Two Mouth Creek | 68 | 0.1 | 1 | 1 | 3 | 6 | 7 | 3 | 7 | 7 | 3 | 7 | 7 |
| 48 | Lower Mill Creek | 68 | 0.1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 | 8 | 7 | 8 | 8 |
| 19 | Sweet/Lunch Creek | 68 | 0.1 | 1 | 3 | 3 | 1 | 5 | 5 | 8 | 8 | 5 | 8 | 8 |
| 39 | Middle Harvey Creek | 68 | 0.1 | 1 | 2 | 2 | 2 | 2 | 2 | 7 | 7 | 7 | 7 | 7 |
| 18 | Sullivan Lake | 73 | 0.1 | 6 | 2 | 2 | 2 | 1 | 6 | 8 | 8 | 8 | 8 | 5 |
| 40 | North and Middle Fork Harvey Creek | 74 | 0.1 | 1 | 1 | 1 | 1 | 1 | 1 | 7 | 7 | 7 | 7 | 7 |
| 78 | Lower Ruby Creek | 75 | 0.1 | 2 | 2 | 2 | 1 | 6 | 6 | 6 | 6 | 6 | 6 | 5 |

| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 121 | South Fork Granite and Sema Creek | 76 | 0.1 | 1 | 1 | 6 | 1 | 7 | 1 | 7 | 7 | 1 | 7 | 7 |
| 88 | Upper Cedar Creek | 77 | 0.1 | 4 | 5 | 2 | 2 | 5 | 5 | 5 | 5 | 5 | 5 | 1 |
| 65 | Upper Winchester Creek | 78 | 0.1 | 2 | 2 | 2 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 164 | Lightning Creek above Rattle Creek | 78 | 0.1 | 1 | 1 | 1 | 7 | 1 | 7 | 7 | 5 | 5 | 7 | 7 |
| 73 | South Fork Tacoma Creek | 78 | 0.1 | 2 | 2 | 2 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 86 | Little Muddy Creek | 78 | 0.1 | 2 | 2 | 2 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 122 | North Fork Granite Creek | 82 | 0.1 | 1 | 1 | 4 | 4 | 7 | 1 | 7 | 7 | 4 | 7 | 7 |
| 58 | South Fork Calispell Creek | 82 | 0.1 | 2 | 2 | 1 | 2 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 67 | Lower Small Creek | 84 | 0.1 | 1 | 4 | 1 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 11 |
| 123 | Gold Creek | 85 | 0.1 | 5 | 4 | 1 | 5 | 5 | 2 | 5 | 5 | 2 | 5 | 5 |
| 57 | Upper Indian Creek | 85 | 0.1 | 1 | 1 | 1 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 27 | Slate Creek | 87 | 0.1 | 2 | 2 | 2 | 1 | 2 | 2 | 7 | 7 | 7 | 7 | 7 |
| 80 | South Fork Lost Creek | 87 | 0.1 | 4 | 1 | 1 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 128 | Boulder Creek | 87 | 0.1 | 6 | 3 | 3 | 3 | 1 | 1 | 6 | 6 | 6 | 6 | 6 |
| 91 | Big/Blue Creeks | 90 | 0.1 | 4 | 4 | 8 | 4 | 7 | 1 | 9 | 9 | 1 | 9 | 1 |
| 113 | Binarch Creek | 90 | 0.1 | 4 | 4 | 8 | 4 | 7 | 1 | 9 | 9 | 1 | 9 | 1 |
| 69 | East Fork Small Creek | 92 | 0.1 | 4 | 5 | 1 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 3 |
| 28 | Deemer/Leola Creek | 93 | 0.1 | 1 | 1 | 1 | 1 | 1 | 1 | 7 | 7 | 7 | 7 | 7 |
| 30 | Gypsy Creek | 93 | 0.1 | 1 | 1 | 1 | 1 | 1 | 1 | 7 | 7 | 7 | 7 | 7 |
| 125 | Upper Priest River | 95 | 0.0 | 1 | 1 | 1 | 5 | 5 | 1 | 5 | 5 | 5 | 5 | 5 |

| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 129 | Upper Priest Lake | 96 | 0.0 | 4 | 1 | 1 | 4 | 4 | 1 | 4 | 4 | 4 | 4 | 4 |
| 124 | Jackson Creek | 96 | 0.0 | 4 | 1 | 1 | 4 | 4 | 1 | 4 | 4 | 4 | 4 | 4 |
| 14 | Salmo River | 98 | 0.0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Table 14.6. Ranking of streams whose habitat is most similar to the reference condition for bull trout in the Pend Oreille Subbasin in comparison to other reaches. A reach rank equal to 1 reveals the reach with current conditions most similar to reference conditions in comparison to other reaches. Reach score ranges from 0 to -1, with -1 having the least deviation from reference. Values associated with each habitat attribute range from 1 to 11, a value of 1 indicates a habitat attribute being most similar to the reference compared to the other attributes within that reach. In some cases multiple habitat attributes have a value of 1 indicating all attributes are equally the most similar to the reference.

| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | Salmo River | 1 | -0.97 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 11 |
| 129 | Upper Priest Lake | 2 | -0.94 | 1 | 8 | 8 | 1 | 1 | 8 | 1 | 1 | 1 | 1 | 11 |
| 125 | Upper Priest River | 3 | -0.92 | 7 | 7 | 7 | 1 | 1 | 7 | 1 | 1 | 1 | 1 | 11 |
| 123 | Gold Creek | 4 | -0.88 | 1 | 7 | 11 | 1 | 1 | 8 | 1 | 1 | 8 | 1 | 10 |
| 122 | North Fork Granite Creek | 5 | -0.87 | 8 | 8 | 5 | 5 | 1 | 8 | 1 | 1 | 5 | 1 | 11 |
| 65 | Upper Winchester Creek | 6 | -0.86 | 7 | 7 | 7 | 11 | 1 | 1 | 1 | 1 | 1 | 1 | 10 |
| 88 | Upper Cedar Creek | 7 | -0.85 | 8 | 1 | 9 | 9 | 1 | 1 | 1 | 1 | 1 | 1 | 11 |
| 27 | Slate Creek | 8 | -0.84 | 5 | 5 | 5 | 10 | 5 | 5 | 1 | 1 | 1 | 1 | 11 |
| 121 | South Fork Granite and Sema Creek | 8 | -0.84 | 6 | 6 | 5 | 6 | 1 | 6 | 1 | 1 | 6 | 1 | 11 |
| 164 | Lightning Creek above Rattle Creek | 10 | -0.84 | 7 | 7 | 7 | 1 | 7 | 1 | 1 | 5 | 5 | 1 | 11 |
| 41 | Lower West Brach LeClerc Creek | 11 | -0.82 | 11 | 7 | 7 | 10 | 1 | 1 | 1 | 1 | 5 | 5 | 9 |
| 155 | Trestle Creek | 12 | -0.81 | 5 | 5 | 5 | 5 | 1 | 5 | 1 | 1 | 4 | 5 | 11 |
| 132 | Two Mouth Creek | 13 | -0.79 | 9 | 9 | 6 | 5 | 1 | 6 | 1 | 1 | 6 | 1 | 11 |

| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 156 | Strong Creek | **14** | -0.77 | 9 | 6 | 6 | 6 | 1 | 10 | 1 | 1 | 5 | 1 | 11 |
| 126 | Trapper Creek | **15** | -0.76 | 9 | 9 | 4 | 4 | 1 | 4 | 1 | 4 | 4 | 1 | 11 |
| 131 | Lion/Lucky Creek | **15** | -0.76 | 10 | 5 | 8 | 8 | 1 | 5 | 1 | 1 | 5 | 1 | 11 |
| 153 | South Fork Grouse Creek | **17** | -0.75 | 3 | 3 | 11 | 3 | 3 | 3 | 1 | 3 | 10 | 1 | 9 |
| 45 | Lower East Branch LeClerc Creek | **18** | -0.73 | 11 | 7 | 7 | 7 | 4 | 4 | 1 | 1 | 7 | 3 | 6 |
| 160 | North Gold Creek | **18** | -0.73 | 9 | 4 | 9 | 9 | 4 | 4 | 1 | 1 | 3 | 4 | 8 |
| 162 | Johnson Creek | **18** | -0.73 | 8 | 9 | 9 | 9 | 5 | 5 | 1 | 3 | 3 | 1 | 7 |
| 161 | (South) Gold Creek | **21** | -0.73 | 4 | 4 | 4 | 9 | 4 | 4 | 1 | 1 | 1 | 11 | 9 |
| 165 | Lightning Creek between Porcupine and Rattle Creek | **22** | -0.69 | 7 | 7 | 7 | 1 | 4 | 7 | 1 | 4 | 4 | 1 | 11 |
| 163 | Twin Creek | **23** | -0.69 | 11 | 8 | 8 | 8 | 4 | 4 | 1 | 3 | 4 | 1 | 7 |
| 135 | Upper Pack River | **24** | -0.67 | 8 | 4 | 10 | 8 | 4 | 4 | 1 | 1 | 4 | 1 | 11 |
| 158 | Granite Creek (LPO) | **25** | -0.66 | 7 | 7 | 7 | 4 | 4 | 7 | 1 | 1 | 6 | 1 | 11 |
| 150 | Grouse Creek | **26** | -0.62 | 10 | 8 | 8 | 10 | 2 | 2 | 1 | 2 | 7 | 2 | 6 |
| 111 | Middle Fork East River | **27** | -0.61 | 6 | 6 | 11 | 2 | 6 | 6 | 1 | 2 | 6 | 2 | 5 |
| 151 | North Fork Grouse Creek | **28** | -0.55 | 5 | 5 | 3 | 7 | 7 | 3 | 1 | 11 | 10 | 1 | 9 |
| 35 | Lower Sullivan Creek | **29** | -0.50 | 8 | 8 | 4 | 3 | 4 | 4 | 1 | 1 | 10 | 4 | 11 |
| 166 | Lightning Creek below Porcupine Creek | **30** | -0.47 | 9 | 9 | 8 | 2 | 2 | 9 | 1 | 2 | 6 | 2 | 7 |

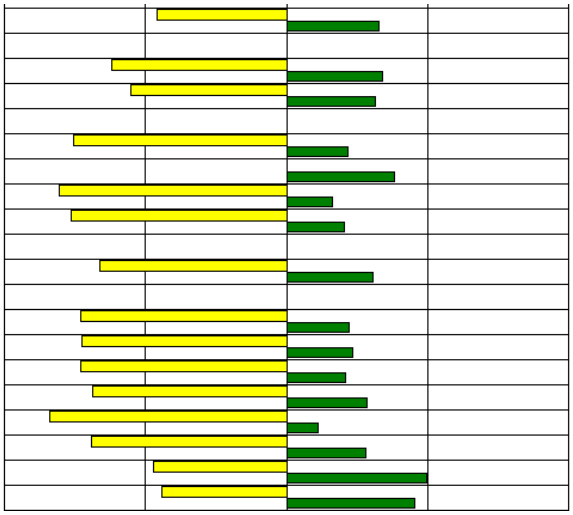
| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 148 | Lower Pack River | **31** | -0.46 | 7 | 7 | 5 | 7 | 6 | 2 | 1 | 11 | 7 | 2 | 4 |
| 167 | Clark Fork River (below Cabinet Gorge Dam) | **32** | -0.44 | 6 | 4 | 9 | 2 | 6 | 6 | 1 | 3 | 4 | 10 | 11 |
| 138 | Middle Pack River | **33** | -0.44 | 6 | 6 | 6 | 6 | 5 | 2 | 1 | 11 | 6 | 2 | 4 |
| 57 | Upper Indian Creek | **34** | -0.40 | 8 | 6 | 8 | 8 | 7 | 1 | 1 | 11 | 1 | 1 | 1 |
| 56 | Lower Indian Creek | **35** | -0.37 | 8 | 5 | 9 | 9 | 7 | 1 | 1 | 11 | 5 | 1 | 1 |
| 50 | Lower CCA Creek | **36** | -0.37 | 9 | 4 | 7 | 10 | 7 | 5 | 1 | 11 | 5 | 1 | 1 |
| 48 | Lower Mill Creek | **37** | -0.36 | 7 | 4 | 7 | 7 | 7 | 4 | 1 | 11 | 3 | 1 | 4 |
| 91 | Big/Blue Creeks | **38** | -0.35 | 9 | 3 | 7 | 9 | 8 | 4 | 1 | 11 | 4 | 1 | 4 |
| 113 | Binarch Creek | **38** | -0.35 | 9 | 3 | 7 | 9 | 8 | 4 | 1 | 11 | 4 | 1 | 4 |
| 3 | Marshal Lake/Creek | **40** | -0.34 | 7 | 3 | 10 | 7 | 7 | 3 | 1 | 11 | 3 | 1 | 6 |
| 19 | Sweet/Lunch Creek | **41** | -0.32 | 8 | 5 | 7 | 8 | 6 | 3 | 1 | 10 | 3 | 1 | 10 |
| 1 | Main Pend Oreille River | **42** | -0.29 | 7 | 7 | 5 | 7 | 4 | 3 | 1 | 7 | 5 | 2 | 7 |

Table 14.7. Tornado diagram for bull trout in the Pend Oreille Subbasin. Degree of confidence for protection and current habitat conditions range from 0.0 to 1.0 with the greatest confidence equal to 1.0. Protection reach scores are presented on the left side and current habitat reach scores are presented on the right. Negative scores are in parentheses.

NP = Not present


| Sequence | Reach Name | Protection Confidence | Current Habitat Condition Confidence |
|---|---|---|---|
| 1 | Main Pend Oreille River | 0.50 | 0.38 |
| 2 | Bead Lake | NP | |
| 3 | Marshal Lake/Creek | 0.42 | 0.21 |
| 4 | Shearer Lake | NP | |
| 5 | Davis/Kent Creeks | 0.42 | 0.21 |
| 6 | McCloud Creek | 0.50 | 0.25 |
| 7 | Lower Calispell Creek | 0.33 | 0.17 |
| 8 | Kalispel Reservation | NP | |
| 9 | Dry Canyon | NP | |
| 10 | Maitlen Creek | 0.30 | 0.15 |
| 11 | Three Mile Creek | NP | |
| 12 | Lime Creek | NP | |
| 13 | Peewee/Russian Creek | NP | |
| 14 | Salmo River | 0.50 | 0.25 |
| 15 | Ledbetter Lake | NP | |
| 16 | Flume Creek | NP | |
| 17 | Pocahontas Creek | NP | |
| 18 | Sullivan Lake | 0.50 | 0.25 |
| 19 | Sweet/Lunch Creek | 0.50 | 0.25 |
| 20 | Power Plant | NP | |
| 21 | Renshaw Creek | 0.50 | 0.25 |
| 27 | Slate Creek | 0.50 | 0.25 |
| 28 | Deemer/Leola Creek | 0.50 | 0.25 |
| 29 | Upper Sullivan Creek | 0.50 | 0.25 |
| 30 | Gypsy Creek | 0.50 | 0.25 |
| 31 | Middle Sullivan Creek | 0.50 | 0.25 |
| 32 | Pass Creek | 0.50 | 0.25 |
| 33 | Mill Pond | NP | |
| 34 | North Fork Sullivan Creek | NP | |
| 35 | Lower Sullivan Creek | 0.50 | 0.25 |
| 36 | Lower Sand Creek | 0.50 | 0.25 |
| 37 | Upper Sand Creek | NP | |
| 38 | Lower Harvey Creek | 0.50 | 0.25 |
| 39 | Middle Harvey Creek | 0.50 | 0.25 |
| 40 | North and Middle Fork Harvey Creek | 0.50 | 0.25 |
| 41 | Lower West Brach LeClerc Creek | 0.50 | 0.25 |
| 42 | Middle West Branch LeClerc Creek | 0.50 | 0.25 |
| 43 | Upper West Branch LeClerc Creek | 0.50 | 0.25 |
| 44 | Middle Branch LeClerc Creek | 0.50 | 0.25 |
| 45 | Lower East Branch LeClerc Creek | 0.50 | 0.25 |
| 46 | Upper East Branch Leclerc Creek | 0.50 | 0.25 |
| 47 | Middle Creek | 0.50 | 0.25 |
| 48 | Lower Mill Creek | 0.50 | 0.25 |
| 49 | Upper Mill Creek | NP | |
| 50 | Lower CCA Creek | 0.50 | 0.25 |
| 52 | South Skookum Creek | 0.50 | 0.25 |
| 53 | North Skookum Creek | 0.50 | 0.25 |
| 54 | Lower Skookum Creek | 0.50 | 0.25 |
| 55 | Upper Skookum Creek/Lakes | 0.33 | 0.17 |
| 56 | Lower Indian Creek | 0.33 | 0.17 |
| 57 | Upper Indian Creek | 0.50 | 0.25 |
| 58 | South Fork Calispel Creek | 0.50 | 0.25 |

| | | | | |
|---|---|---|---|---|
| 64 | Lower Winchester Creek | 0.33 | | 0.17 |
| 65 | Upper Winchester Creek | 0.50 | | 0.25 |
| 66 | Dorchester Creek | NP | | |
| 67 | Lower Small Creek | 0.33 | | 0.17 |
| 68 | Upper Small Creek | NP | | |
| 69 | East Fork Small Creek | 0.50 | | 0.25 |
| 70 | Cusick | NP | | |
| 71 | Lower Trimble Creek | 0.33 | | 0.17 |
| 72 | Upper Trimble Creek | 0.33 | | 0.17 |
| 73 | South Fork Tacoma Creek | 0.50 | | 0.25 |
| 74 | Lower Tacoma Creek | 0.33 | | 0.17 |
| 75 | Upper Tacoma Creek | 0.50 | | 0.25 |
| 76 | Lower Cusick Creek | 0.33 | | 0.17 |
| 77 | Upper Cusick Creek | 0.50 | | 0.25 |
| 78 | Lower Ruby Creek | 0.50 | | 0.25 |
| 79 | Upper Ruby Creek | 0.50 | | 0.25 |
| 80 | South Fork Lost Creek | 0.50 | | 0.25 |
| 81 | Lower Lost Creek | 0.50 | | 0.25 |
| 82 | Upper Lost Creek | 0.50 | | 0.25 |
| 83 | Lower Muddy Creeks | 0.33 | | 0.17 |
| 84 | Lower Big Muddy Creek | 0.50 | | 0.25 |
| 85 | Upper Big Muddy Creek | 0.50 | | 0.25 |
| 86 | Little Muddy Creek | 0.50 | | 0.25 |
| 87 | Lower Cedar Creek | 0.33 | | 0.17 |
| 88 | Upper Cedar Creek | 0.50 | | 0.25 |
| 91 | Big/Blue Creeks | 0.17 | | 0.21 |
| 105 | Brickel Creek | 0.50 | | 0.38 |
| 106 | Blanchard Lake | NP | | |
| 107 | Elmer Creek | NP | | |
| 108 | Hoodoo Creek | 0.50 | | 0.38 |
| 109 | Kelso | NP | | |
| 110 | Pend Oreille River above Albeni Falls Dam | NP | | |
| 111 | Middle Fork East River | 0.50 | | 0.38 |
| 112 | North Fork East River | 0.50 | | 0.38 |
| 113 | Binarch Creek | 0.50 | | 0.38 |
| 119 | Kalispell Creek | 0.50 | | 0.38 |
| 120 | Indian Creek | 0.50 | | 0.38 |
| 121 | South Fork Granite and Sema Creek | 0.50 | | 0.38 |
| 122 | North Fork Granite Creek | 0.50 | | 0.38 |
| 123 | Gold Creek | 0.50 | | 0.38 |
| 124 | Jackson Creek | 0.17 | | 0.21 |
| 125 | Upper Priest River | 0.50 | | 0.38 |
| 126 | Trapper Creek | 0.50 | | 0.38 |
| 127 | Caribou Creek | 0.50 | | 0.38 |
| 128 | Boulder Creek | 0.17 | | 0.21 |
| 129 | Upper Priest Lake | 0.17 | | 0.21 |
| 130 | Beaver Creek | NP | | |
| 131 | Lion/Lucky Creek | 0.50 | | 0.38 |
| 132 | Two Mouth Creek | 0.50 | | 0.38 |
| 133 | Bear Creek | NP | | |
| 134 | South Fork Indian Creek | 0.17 | | 0.21 |
| 135 | Upper Pack River | 0.33 | | 0.29 |
| 136 | Hunt Creek | NP | | |
| 137 | Horton Creek | NP | | |
| 138 | Middle Pack River | 0.50 | | 0.38 |
| 139 | Soldier Creek | 0.50 | | 0.38 |

| | | | | |
|---|---|---|---|---|
| 148 | Lower Pack River | 0.50 |  | 0.38 |
| 149 | Sand Creek | NP | | |
| 150 | Grouse Creek | 0.50 | | 0.38 |
| 151 | North Fork Grouse Creek | 0.50 | | 0.38 |
| 152 | Gold Creek (Pack River) | NP | | |
| 153 | South Fork Grouse Creek | 0.50 | | 0.38 |
| 154 | Rapid Lightning Creek | 0.50 | | 0.38 |
| 155 | Trestle Creek | 0.50 | | 0.38 |
| 156 | Strong Creek | 0.50 | | 0.38 |
| 157 | Trout Creek | NP | | |
| 158 | Granite Creek (LPO) | 0.42 | | 0.33 |
| 159 | Cedar Creek | NP | | |
| 160 | North Gold Creek | 0.42 | | 0.33 |
| 161 | (South) Gold Creek | 0.50 | | 0.38 |
| 162 | Johnson Creek | 0.50 | | 0.38 |
| 163 | Twin Creek | 0.33 | | 0.29 |
| 164 | Lightning Creek above Rattle Creek | 0.50 | | 0.38 |
| 165 | ning Creek between Porcupine and Rattle Creek | 0.50 | | 0.38 |
| 166 | Lightning Creek below Porcupine Creek | 0.50 | | 0.38 |
| 167 | Clark Fork River (below Cabinet Gorge Dam) | 0.50 | | 0.42 |

The tornado diagram (Table 14.7) and maps (Map PO-1, Map PO-2, located at the end of Section 14) present the reach scores for both current habitat condition (ranging from zero to positive one, Map PO-1) and protection (ranging from zero to negative one, Map PO-2). Scores closest to negative one depict reaches that are most representative of reference habitat conditions. Scores closest to positive one depict reaches with habitat conditions least similar to reference conditions. Confidence scores range from zero to one and are associated with the ratings assigned by local biologists based on documentation or their expert opinion regarding reference and current habitat attributes for each reach.

The QHA model can only assess the quality of habitat within the subbasin. The model does not recognize biological significance or such factors such as abundance, stability, or sustainability of bull trout populations.

Local biologists agree that the QHA model does identify areas that are highly degraded, however, they do not feel decisions for restoration should only look at the areas with the greatest degree of habitat alteration. For example, the mainstem of the Pend Oreille River was ranked second for habitat modifications (Table 14.5), but the feasibility of restoring that section of river for bull trout habitat is limited and unrealistic. Lower Calispell Creek is another highly impacted area where restoration efforts may be disproportionate to the biological benefits for bull trout populations.

Instead biologists feel areas such as Lightening Creek below Porcupine Creek, that currently have a reasonable population of bull trout and somewhat intact habitat, would benefit most biologically from restoration efforts. Additionally, local biologists agree Lower Sullivan Creek, lower Clark Fork River, and Middle Branch LeClerc Creek would greatly benefit from restoration efforts. Restoration efforts have already commenced on much of LeClerc Creek, however, nonnative species rather than habitat has become the main limiting factor in the Middle Branch LeClerc Creek. Although nonnative species are a significant impediment to bull trout recovery, habitat issues are equally important to address. Both of these limiting factors are critical and deserve equal attention and concurrent management.

Another important point is that protection should be extended to reaches that have relatively large numbers of bull trout and/or intact habitat, such as Trestle Creek (ranked 12th), regardless of the QHA ranking order. This approach should also be considered for other tributaries.

Current activities related to protection and restoration of creeks include a watershed assessment for restoration of Lightening Creek (funded by Avista), and a multi-agency effort to assess Middle Pack River drainage and develop a bull trout restoration plan. In Washington state, streams that are listed in the Bull Trout Recovery Plan Draft have been identified as priority for restoration. The Draft Bull Trout Recovery Plan (USFWS 2003) has identified local populations in the Northeast Washington Recovery Unit under a recovered condition as: Slate Creek, Indian Creek, Sullivan Creek (including Sullivan Lake and tributaries), Mill Creek, Cedar Creek (Pend Oreille County), Tacoma Creek, Ruby Creek, Calispell Creek, and the LeClerc Creek complex (including Fourth of July Creek, East Branch LeClerc Creek, and West Branch LeClerc Creek).

Biologists agree that the best chance for bull trout recovery is in restoring habitats that have cold waters and some intact habitats. The consensus is that restoration and protection of tributary habitats that provide critical spawning habitat is key for bull trout recovery.

### 14.3.4 Current Management

The USFWS is the primary federal agency responsible for endangered species listed under the ESA. The USFWS has drafted a recovery plan and proposed critical habitat for the Northeast Washington Recovery Unit (Chapter 23) that encompasses the lower Pend Oreille River and tributaries and the Clark Fork Recovery Unit (Chapter 3) that encompasses the upper Pend Oreille River (above Albeni Falls Dam), Lake Pend Oreille, Priest Lake and tributaries (USFWS 2002, 2002a). The recovery plan recommends strategies "to ensure the long-term persistence of self-sustaining, complex, interacting groups of bull trout distributed through the species' native range so that the species can be delisted" (USFWS 2002a).

Within Washington state, WDFW has developed a statewide bull trout management plan (WDFW 2000) with the overall goal to restore and/or maintain the health and diversity of bull trout stocks and their habitats to and/or at self-sustaining levels that would allow recreational utilization within resource protection guidelines. The intent of the goal is to address stock health beyond numerical abundance by ensuring the long-term productive capacity of self-sustaining bull trout stocks and their habitats. The highest priority for management of native char will be resource protection. The specific objectives and strategies in this plan are grouped into several elements including population maintenance, fisheries management, and habitat maintenance. In addition, it describes the enforcement, monitoring, evaluation, and research efforts needed to meet the bull trout management goal and objectives.

Local citizens and agency representatives developed the *Idaho Bull Trout Conservation Plan* (Lake Pend Oreille Bull Trout Watershed Advisory Group 1999). The plan calls for restoring bull trout such that healthy local populations are well distributed around the Lake Pend Oreille Subbasin and that a harvestable surplus of fish will be available. Bull trout restoration is also a primary emphasis of the Lower Clark Fork Settlement Agreement (Settlement Agreement) forged by Avista and local, state, and federal entities as part of the re-licensing of Cabinet Gorge and Noxon Rapids dams. The Settlement Agreement includes provisions for restoring fish

passage past Cabinet Gorge and Noxon Rapids dams to attempt to reconnect bull trout in Lake Pend Oreille with the Clark Fork River. This project includes trapping and radio tagging adult bull trout to assess their movements in the Clark Fork River below Cabinet Gorge Dam to identify the best potential locations for a permanent trap site or fish ladder entrance.

The Pend Oreille Lead Entity was created in 2000 under Washington's Salmon Recovery Act (RCW 77.85) to develop a strategy for restoration of native salmonid habitat within the lower Pend Oreille River and its tributaries and those tributaries, which drain into Priest River and Priest Lake, Idaho from Washington. In cooperation with local Technical and Citizens Advisory Groups, the Lead Entity submits protection, restoration, and assessment projects to the Salmon Recovery Funding Board annually for funding.

The Kalispel Tribe has a Fish and Wildlife Management Plan, which outlines the mission, goals, and objectives for sound resource management on and in the lands of the Kalispel Tribe. The goal for bull trout is to: protect, enhance, and restore native fish populations to maintain stable, viable levels, to ensure long-term, self-sustaining persistence, and to provide ecological, cultural, subsistence, and sociological benefits.

## 14.4 Focal Species – Westslope Cutthroat Trout

Westslope cutthroat trout were selected as a focal species because they are a native species that is threatened by exotic species and habitat degradation and its potential value in recreational fishing in the Pend Oreille Subbasin.

### 14.4.1 Historic Status

Shepard et al. (2003) estimate that 200 years ago westslope cutthroat trout occupied 56,600 miles of habitat within the five states of Washington (3,000 miles), Oregon (>1,000 miles), Idaho (19,000 miles), Montana (33,000 miles), and Wyoming (<100 miles). The Columbia River basin contained approximately 48 percent of this historical range that supported westslope cutthroat trout (Shepard et al. 2003). Historic range of westslope cutthroat in the Pend Oreille River, excluding Lake Pend Oreille, included 1,271 miles of stream habitat (Shepard et al. 2003).

There has been some debate as to the origin of westslope cutthroat trout populations documented in tributaries to the lower Pend Oreille River (McLellan and O'Connor 2000). Behnke (1992) concluded that the historic distribution of westslope cutthroat trout in the Clark Fork/Pend Oreille drainage extended downstream only as far as Albeni Falls Dam. Williams (1998) believed that the historic distribution actually extended as far downstream as Metaline Falls, suggesting that the westslope cutthroat trout populations in the tributaries of the lower Pend Oreille River above Metaline Falls were native. Gilbert and Evermann (1895) described a species that clearly resembles westslope cutthroat trout in Lake Pend Oreille at Sandpoint and the Pend Oreille River at various places between Newport and the mouth of the Salmon [Salmo] River.

Historically, westslope cutthroat trout comprised an important part of the sport fishery up until the 1960s. As a result of population declines, hatchery production was used through the 1990s to supplement wild stocks and provide a limited harvest fishery. Hybridization with rainbow trout, competition with kokanee for zooplankton, predation by brook trout and lake trout, loss of connectivity between populations due to hydropower dam construction, and loss of habitat from

logging, dam and road construction have contributed to declines of westslope cutthroat trout (Fickeisen and Geist 1993).

### 14.4.2 Current Status

Currently within the Columbia River basin, westslope cutthroat trout are present in approximately 33,500 miles of the historic range (59 percent) with over 70 percent of the current habitats within federally managed lands (Shepard et al. 2003). Westslope cutthroat trout remain present in 18,000 miles (95 percent) and 2,000 miles (66 percent) of their historic habitats within Idaho and Washington, respectively (Shepard et al. 2003). In the Lower Pend Oreille Subbasin, 258 miles of tributaries have been identified as conservation habitat containing 13 populations of westslope cutthroat (Shepard et al. 2003).

Genetic assessment has been conducted on 6,100 miles of habitat (18 percent of occupied habitats) and results indicate that genetically unaltered westslope cutthroat trout occupy between 13-35 percent of currently available habitat (8-20 percent historical habitat) (Shepard et al. 2003). In 1999, WDFW collected genetic information for westslope cutthroat trout in eight Pend Oreille tributaries into Boundary Reservoir. The tributaries included Cedar, East and West Branches of LeClerc, Middle, upper and lower Mill, north Fork Sullivan, upper and lower Sullivan, and Slate creeks. The results indicated that genetically distinct populations of westslope cutthroat trout occurred in these Pend Oreille tributaries. The results also failed to detect introgression by any of the hatchery strains (Kings Lake, Twin Lake, and Yellowstone) of cutthroat trout examined (with the exception in Slate Creek), which supports the conclusion by Williams (1998) that the populations were native (McLellan and O'Connor 2000). Little genetic testing has been conducted in other areas of the Pend Oreille Subbasin (for example, Priest River drainage and Lake Pend Oreille) to describe the degree of introgression.

The limited wild population of westslope cutthroat trout in Lake Pend Oreille was supplemented with hatchery stocking primarily during the 1990s. The presence of IPN, infectious pancreatic necrosis, and a viral disease affecting young westslope cutthroat trout at the Clark Fork Hatchery caused the IDFG to terminate the cutthroat trout stocking program in Lake Pend Oreille.

Nonnative Yellowstone cutthroat trout fry and fingerlings were stocked in Upper Priest Lake and Priest Lake during the 1950s and 1960s. Catchable rainbow trout were also stocked into Granite Creek to provide a stream fishery. There is no evidence this stocking provided any benefit to the lake fishery. Ongoing genetic analysis of westslope cutthroat trout from Upper Priest Lake has not shown hybridization with either Yellowstone cutthroat or rainbow trout (N. Horner, Regional Fisheries Manager, IDFG, personal communication). For more information on stocking history refer to Section 14.1.2 on artificial production.

Westslope cutthroat trout are still widely distributed throughout the Pend Oreille Subbasin. In the Lower Pend Oreille Subbasin, cutthroat trout are primarily the resident form residing in the tributaries. Some of the fish exhibit their migratory form as they are found in the reservoir and have been observed in adfluvial traps. Nonnative fish are a clear threat to the continued existence of westslope cutthroat trout. Competition with introduced salmonids is often listed as a major reason for the decline of cutthroat populations (Linkes and Graham 1988). Brook trout are present in most tributaries to the lower Pend Oreille River.

Westslope cutthroat trout populations in the Priest and Upper Priest lakes have declined since the 1950s. Historically, fishing for westslope cutthroat trout was the primary attraction at Priest and Upper Priest lakes. By the time the first creel census was conducted in 1956, however, annual harvest of westslope cutthroat trout in Priest Lake had already declined to 3,500 fish with catch rates of 0.5 fish per hour (Bjornn 1957). Westslope cutthroat trout harvest ranged from 1,300 to 2,700 fish during the 1960s and 1970s, but dropped abruptly after 1978 (Table 14.8, Davis et al. 2000). Various restrictive regulations, including reduced limits, minimum size limits, and tributary fisheries closures were applied in both the lake and tributary streams to address harvest issues.

Westslope cutthroat trout harvest has been closed in Upper Priest Lake and Priest Lake since 1992. Upper Priest Lake has been managed with catch-and-release regulations since 1994. The tributary streams producing adfluvial westslope cutthroat trout in Priest Lake were closed to fishing from 1982 through 1991. Streams were then reopened in 1992 under very restrictive regulations that allowed harvest of resident westslope cutthroat and brook trout. Despite harvest restrictions, the westslope cutthroat trout fishery did not respond.

Westslope cutthroat trout fingerlings were stocked in Priest Lake between 1981 and 1991, but the lack of any apparent benefit caused a shift in management to wild trout in 1992 (N. Horner, Regional Fisheries Manager, IDFG, personal communication). The primary cause for the loss in wild adfluvial westslope cutthroat trout production from tributary streams is believed to be from the combined effects of brook trout invasion and the loss of spawning and rearing habitat due to habitat degradation. Predation by lake trout on westslope cutthroat trout smolts entering Priest Lake may have been the primary reason westslope cutthroat trout did not respond to restrictive regulations or hatchery supplementation (shown in Figure 14.1).

Table 14.8. Estimated effort and harvest, by species, in Priest Lake, Idaho, 1956-1994. Numbers in parentheses are the 1994 equivalents for the survey period of previous years creel censuses.

| Census period | Year | Angler hours | Kokanee | Cutthroat | Bull trout | Lake trout | Total harvest | Overall success (fish/h) |
|---|---|---|---|---|---|---|---|---|
| April 30-October 15 | 1956 | 96,630 (48,984) | 102,360 | 3,580 | 1,590 | 270 (10,758) | 107,800 | 1.12 |
| April 30-November 30 | 1966 | 64,604 (49,386) | 68,884 | 2,387 | 1,173 | 199 (10,758) | 72,643 | 1.12 |
| May 18-September 6 | 1968 | 48,286 (36,652) | 32,314 | 1,611 | 1,096 | 0 (5,711) | 35,021 | 0.73 |
| June 2-September 6 | 1969 | 46,819 (27,000) | 37,880 | 1,256 | 650 | 0 (9,347) | 39,786 | 0.85 |
| May 16-October 2 | 1970 | 82,063 (46,216) | 79,840 | 2,776 | 1,526 | 138 (9,347) | 84,280 | 1.03 |
| April 15-December 15 | 1978 | 99,157 (56,599) | 4,593 | 2,585 | 2,320 | 5,724 (12,884) | 15,222 | 0.15 |
| April 16-December 15 | 1983 | 47,039 (56,599) | 66 | 105 | 92 | 4,620 (12,884) | 4,883 | 0.10 |
| April 12-November 7 | 1986 | 71,516 (56,343) | 0 | 134 | 0 | 6,295 (12,659) | 6,429 | 0.09 |
| May 9-July 17 | 1987 | 27,903 (25,001) | 0 | 11 | - | 2,969 (2,422) | 2,980 | 0.11 |
| January 23-March1 | 1993 | 12,918 (0) | 0 | 0 | 0 | 2,605 (0) | 2,605 | 0.20 |
| January 1-December 31 | 1994 | 62,602 | 0 | 0 | 00 | 13,987 | 13,987 | 0.22 |

### 14.4.3 Limiting Factors Westslope Cutthroat Trout

Historically, westslope cutthroat trout were present in 129 of 167 delineated reaches and watersheds in the Pend Oreille Subbasin. Currently, this number has dropped to 112 reaches and watersheds. Table 14.9 provides the names of the streams where westslope cutthroat trout are no longer present and corresponding rank for the relative deviation in habitat conditions from reference to current conditions.

Table 14.9. List of 17 reaches where westslope cutthroat trout are not currently present, but were historically present. Reach rank refers to the degree of habitat change from reference to present conditions, 1 = greatest habitat alteration.

| Reach Name | Reach Rank |
|---|---|
| Lower Calispell Creek | 2 |
| Lower Cusick Creek | 20 |
| Lower Muddy Creeks | 35 |
| Upper Cusick Creek | 47 |
| McCloud Creek | 52 |
| Lower Lost Creek | 64 |
| Renshaw Creek | 74 |
| Upper Lost Creek | 77 |
| Upper Small Creek | 84 |
| Lower Big Muddy Creek | 87 |
| Flume Creek* | 95 |
| Three Mile Creek | 103 |
| Middle Fork Calispell Creek | 103 |
| Little Muddy Creek | 103 |
| Lower Small Creek | 112 |
| Lower North Fork Calispell Creek | 118 |
| Lime Creek | 122 |

*R2 Consultants found a few westslope cutthroat trout in 1997 (Boundary Hydroelectric Project Bull Trout Field Investigations R2 Resource Consultants 1998).

Fine sediment, riparian condition, habitat diversity, and channel stability were the major habitat attributes that were most significantly altered from reference conditions (Table 14.10, also see Table 14.26). Habitat alterations are present throughout the subbasin to varying degrees. Sockwa Creek (highlighted in red in Map PO-3, located at the end of Section 14) appears to have experienced the greatest deviation from reference conditions in the subbasin.

Salmo River and watersheds in the Priest River drainage are ranked highest for protection indicating a lower level of habitat disturbance relative to the rest of the Subbasin (Table 14.11).

Table 14.10. Ranking of reaches with the largest deviation from the reference habitat conditions for westslope cutthroat in the Pend Oreille Subbasin. A reach rank equal to 1 has the greatest deviation from reference condition in comparison to other reaches. Reach scores range from 0 to 1, with 1 having the greatest deviation from reference. Values associated with each habitat attribute range from 1 to 11, a value of 1 indicates a habitat attribute having the greatest deviation from reference compared to the other attributes within that reach. In some cases multiple habitat attributes have a value of 1 indicating all attributes equally deviate the most from the reference.

| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 114 | Sockwa Creek | 1 | 0.9 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 11 | 1 | 1 | 10 |
| 7 | Lower Calispell Creek | 2 | 0.6 | 1 | 8 | 1 | 1 | 6 | 1 | 8 | 11 | 6 | 8 | 5 |
| 1 | Main Pend Oreille River | 3 | 0.5 | 1 | 1 | 4 | 1 | 9 | 5 | 11 | 10 | 5 | 8 | 5 |
| 146 | Syringa Creek | 4 | 0.5 | 4 | 4 | 1 | 4 | 1 | 1 | 11 | 9 | 4 | 9 | 4 |
| 35 | Lower Sullivan Creek | 5 | 0.5 | 2 | 2 | 5 | 9 | 5 | 5 | 10 | 10 | 1 | 5 | 4 |
| 54 | Lower Skookum Creek | 6 | 0.4 | 1 | 3 | 4 | 1 | 7 | 7 | 9 | 10 | 5 | 6 | 10 |
| 44 | Middle Branch LeClerc Creek | 7 | 0.4 | 2 | 4 | 2 | 1 | 8 | 8 | 10 | 10 | 5 | 5 | 7 |
| 138 | Middle Pack River | 8 | 0.4 | 1 | 1 | 1 | 1 | 6 | 6 | 10 | 9 | 1 | 6 | 10 |
| 110 | Pend Oreille River above Albeni Falls Dam | 9 | 0.4 | 1 | 1 | 1 | 1 | 1 | 1 | 11 | 10 | 1 | 9 | 1 |
| 154 | Rapid Lightning Creek | 10 | 0.4 | 1 | 1 | 1 | 8 | 1 | 1 | 11 | 9 | 1 | 1 | 10 |
| 149 | Sand Creek | 11 | 0.4 | 1 | 1 | 1 | 1 | 8 | 1 | 11 | 10 | 1 | 8 | 7 |
| 111 | Middle Fork East River | 12 | 0.4 | 2 | 2 | 1 | 7 | 2 | 2 | 10 | 9 | 2 | 7 | 10 |
| 140 | Hellroaring Creek | 12 | 0.4 | 1 | 1 | 1 | 1 | 7 | 7 | 11 | 10 | 1 | 7 | 1 |
| 141 | Caribou Creek | 12 | 0.4 | 1 | 1 | 1 | 1 | 7 | 7 | 11 | 10 | 1 | 7 | 1 |
| 148 | Lower Pack River | 12 | 0.4 | 1 | 1 | 4 | 5 | 5 | 5 | 10 | 9 | 1 | 5 | 10 |

| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100 | Upper Cocolalla Creek | 16 | 0.3 | 2 | 6 | 1 | 6 | 6 | 6 | 11 | 10 | 2 | 2 | 5 |
| 144 | Sand Creek | 17 | 0.3 | 1 | 5 | 1 | 1 | 5 | 5 | 11 | 10 | 1 | 8 | 9 |
| 150 | Grouse Creek | 18 | 0.3 | 1 | 3 | 3 | 2 | 6 | 6 | 10 | 9 | 5 | 6 | 10 |
| 95 | Algoma Area | 19 | 0.3 | 1 | 1 | 1 | 1 | 8 | 1 | 9 | 9 | 1 | 9 | 7 |
| 38 | Lower Harvey Creek | 20 | 0.3 | 2 | 2 | 1 | 4 | 6 | 6 | 8 | 8 | 8 | 8 | 4 |
| 74 | Lower Tacoma Creek | 20 | 0.3 | 2 | 2 | 2 | 1 | 6 | 6 | 6 | 6 | 5 | 6 | 6 |
| 76 | Lower Cusick Creek | 20 | 0.3 | 1 | 4 | 1 | 1 | 7 | 7 | 7 | 7 | 6 | 4 | 7 |
| 117 | Flat/Bear Paw Creeks | 20 | 0.3 | 1 | 5 | 1 | 1 | 6 | 6 | 11 | 10 | 6 | 6 | 1 |
| 145 | Little Sand Creek | 20 | 0.3 | 6 | 5 | 1 | 1 | 1 | 6 | 11 | 10 | 6 | 6 | 1 |
| 5 | Davis/Kent Creeks | 25 | 0.3 | 1 | 1 | 1 | 1 | 8 | 8 | 8 | 6 | 5 | 8 | 7 |
| 158 | Granite Creek (LPO) | 26 | 0.3 | 1 | 1 | 1 | 7 | 7 | 1 | 9 | 9 | 6 | 9 | 1 |
| 99 | Lower Cocolalla Creek | 27 | 0.3 | 1 | 6 | 1 | 6 | 6 | 6 | 10 | 10 | 1 | 1 | 5 |
| 151 | North Fork Grouse Creek | 27 | 0.3 | 3 | 3 | 6 | 2 | 6 | 6 | 10 | 9 | 1 | 10 | 5 |
| 157 | Trout Creek | 27 | 0.3 | 1 | 1 | 1 | 4 | 4 | 8 | 10 | 9 | 4 | 10 | 7 |
| 49 | Upper Mill Creek | 30 | 0.3 | 1 | 4 | 3 | 2 | 6 | 6 | 9 | 9 | 4 | 9 | 8 |
| 118 | Lamb Creek | 31 | 0.3 | 4 | 5 | 2 | 1 | 5 | 5 | 9 | 9 | 9 | 5 | 3 |
| 152 | Gold Creek (Pack River) | 32 | 0.3 | 3 | 3 | 3 | 1 | 6 | 6 | 11 | 10 | 1 | 6 | 9 |
| 105 | Brickel Creek | 33 | 0.3 | 2 | 2 | 1 | 4 | 4 | 4 | 10 | 9 | 4 | 10 | 8 |
| 137 | Horton Creek | 33 | 0.3 | 8 | 3 | 2 | 1 | 4 | 4 | 10 | 8 | 4 | 10 | 7 |
| 83 | Lower Muddy Creeks | 35 | 0.3 | 3 | 5 | 1 | 1 | 7 | 7 | 7 | 7 | 3 | 5 | 7 |

| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 120 | Indian Creek | 35 | 0.3 | 4 | 1 | 1 | 1 | 7 | 4 | 7 | 7 | 4 | 7 | 7 |
| 134 | South Fork Indian Creek | 35 | 0.3 | 4 | 1 | 1 | 1 | 7 | 4 | 7 | 7 | 4 | 7 | 7 |
| 103 | Wright Area | 38 | 0.3 | 6 | 6 | 6 | 1 | 1 | 1 | 11 | 10 | 1 | 6 | 5 |
| 36 | Lower Sand Creek | 39 | 0.3 | 2 | 4 | 2 | 1 | 4 | 4 | 9 | 9 | 4 | 9 | 8 |
| 42 | Middle West Branch LeClerc Creek | 39 | 0.3 | 1 | 3 | 3 | 1 | 6 | 3 | 10 | 10 | 6 | 9 | 8 |
| 71 | Lower Trimble Creek | 39 | 0.3 | 2 | 5 | 2 | 2 | 8 | 8 | 8 | 8 | 5 | 5 | 1 |
| 136 | Hunt Creek | 42 | 0.3 | 7 | 3 | 2 | 1 | 4 | 4 | 9 | 7 | 4 | 9 | 9 |
| 159 | Cedar Creek | 42 | 0.3 | 5 | 5 | 5 | 3 | 5 | 3 | 10 | 9 | 1 | 10 | 1 |
| 43 | Upper West Branch LeClerc Creek | 44 | 0.3 | 1 | 5 | 5 | 1 | 5 | 3 | 10 | 10 | 5 | 9 | 4 |
| 112 | North Fork East River | 45 | 0.3 | 2 | 4 | 1 | 2 | 4 | 4 | 10 | 9 | 4 | 10 | 8 |
| 135 | Upper Pack River | 46 | 0.3 | 2 | 4 | 1 | 2 | 4 | 4 | 8 | 8 | 4 | 8 | 8 |
| 77 | Upper Cusick Creek | 47 | 0.2 | 1 | 1 | 1 | 1 | 8 | 8 | 8 | 8 | 5 | 5 | 7 |
| 32 | Pass Creek | 48 | 0.2 | 1 | 1 | 4 | 1 | 5 | 5 | 8 | 8 | 5 | 8 | 8 |
| 37 | Upper Sand Creek | 48 | 0.2 | 3 | 4 | 2 | 1 | 4 | 4 | 8 | 8 | 4 | 8 | 8 |
| 45 | Lower East Branch LeClerc Creek | 48 | 0.2 | 1 | 2 | 2 | 2 | 6 | 6 | 9 | 9 | 2 | 8 | 9 |
| 47 | Middle Creek | 48 | 0.2 | 2 | 2 | 5 | 1 | 4 | 5 | 8 | 8 | 7 | 8 | 8 |
| 6 | McCloud Creek | 52 | 0.2 | 4 | 1 | 3 | 1 | 4 | 4 | 10 | 8 | 4 | 10 | 9 |
| 92 | Riley Creek | 52 | 0.2 | 2 | 7 | 5 | 1 | 7 | 5 | 7 | 7 | 2 | 7 | 4 |
| 93 | Johnson Creek (Pend Oreille River) | 52 | 0.2 | 1 | 5 | 5 | 1 | 8 | 5 | 8 | 8 | 1 | 8 | 4 |
| 161 | (South) Gold Creek | 52 | 0.2 | 3 | 3 | 3 | 2 | 3 | 3 | 9 | 9 | 9 | 1 | 8 |

| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 31 | Middle Sullivan Creek | 56 | 0.2 | 1 | 4 | 1 | 1 | 4 | 4 | 8 | 8 | 4 | 8 | 8 |
| 160 | North Gold Creek | 57 | 0.2 | 1 | 4 | 1 | 1 | 4 | 4 | 9 | 9 | 8 | 4 | 11 |
| 116 | Moores Creek | 58 | 0.2 | 1 | 3 | 4 | 1 | 9 | 4 | 9 | 8 | 4 | 9 | 7 |
| 46 | Upper East Branch LeClerc Creek | 59 | 0.2 | 2 | 3 | 3 | 1 | 3 | 3 | 10 | 10 | 3 | 8 | 9 |
| 90 | Pine/ Peewee Creeks | 60 | 0.2 | 1 | 7 | 7 | 1 | 3 | 3 | 10 | 7 | 3 | 10 | 6 |
| 91 | Big/Blue Creeks | 60 | 0.2 | 1 | 7 | 7 | 1 | 3 | 3 | 10 | 7 | 3 | 10 | 6 |
| 113 | Binarch Creek | 60 | 0.2 | 1 | 7 | 7 | 1 | 3 | 3 | 10 | 7 | 3 | 10 | 6 |
| 119 | Kalispell Creek | 60 | 0.2 | 1 | 3 | 1 | 8 | 8 | 4 | 8 | 8 | 4 | 4 | 7 |
| 3 | Marshal Lake/Creek | 64 | 0.2 | 2 | 2 | 1 | 2 | 2 | 2 | 10 | 9 | 2 | 10 | 2 |
| 81 | Lower Lost Creek | 64 | 0.2 | 2 | 4 | 4 | 1 | 6 | 6 | 6 | 6 | 2 | 6 | 6 |
| 153 | South Fork Grouse Creek | 64 | 0.2 | 3 | 3 | 1 | 3 | 3 | 3 | 9 | 8 | 2 | 9 | 9 |
| 156 | Strong Creek | 64 | 0.2 | 3 | 4 | 4 | 4 | 8 | 1 | 8 | 8 | 7 | 8 | 1 |
| 162 | Johnson Creek | 68 | 0.2 | 4 | 1 | 1 | 1 | 5 | 5 | 9 | 8 | 7 | 9 | 11 |
| 52 | South Skookum Creek | 69 | 0.2 | 2 | 3 | 3 | 1 | 7 | 7 | 10 | 10 | 3 | 3 | 9 |
| 53 | North Skookum Creek | 69 | 0.2 | 2 | 3 | 3 | 1 | 7 | 7 | 10 | 10 | 3 | 3 | 9 |
| 126 | Trapper Creek | 69 | 0.2 | 1 | 1 | 4 | 4 | 9 | 4 | 9 | 8 | 4 | 9 | 3 |
| 75 | Upper Tacoma Creek | 72 | 0.2 | 2 | 4 | 2 | 1 | 7 | 7 | 7 | 7 | 4 | 7 | 6 |
| 79 | Upper Ruby Creek | 72 | 0.2 | 2 | 4 | 2 | 1 | 6 | 6 | 6 | 6 | 6 | 6 | 5 |
| 21 | Renshaw Creek | 74 | 0.2 | 1 | 3 | 3 | 2 | 3 | 3 | 8 | 8 | 3 | 8 | 8 |
| 64 | Lower Winchester Creek | 75 | 0.2 | 1 | 5 | 1 | 1 | 6 | 6 | 6 | 6 | 6 | 6 | 4 |

| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 87 | Lower Cedar Creek | 75 | 0.2 | 1 | 4 | 1 | 1 | 7 | 7 | 7 | 7 | 4 | 7 | 6 |
| 29 | Upper Sullivan Creek | 77 | 0.2 | 2 | 4 | 1 | 2 | 4 | 4 | 7 | 7 | 7 | 7 | 7 |
| 50 | Lower CCA Creek | 77 | 0.2 | 2 | 7 | 3 | 1 | 3 | 3 | 8 | 8 | 3 | 8 | 8 |
| 72 | Upper Trimble Creek | 77 | 0.2 | 1 | 4 | 1 | 1 | 6 | 6 | 6 | 6 | 6 | 4 | 6 |
| 82 | Upper Lost Creek | 77 | 0.2 | 1 | 4 | 1 | 1 | 6 | 6 | 6 | 6 | 4 | 6 | 6 |
| 85 | Upper Big Muddy Creek | 77 | 0.2 | 1 | 4 | 1 | 1 | 6 | 6 | 6 | 6 | 4 | 6 | 6 |
| 89 | Lost Lake Creek | 77 | 0.2 | 1 | 1 | 1 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 131 | Lion/Lucky Creek | 77 | 0.2 | 1 | 4 | 2 | 2 | 7 | 4 | 7 | 7 | 4 | 7 | 7 |
| 68 | Upper Small Creek | 84 | 0.2 | 3 | 3 | 3 | 2 | 6 | 6 | 6 | 6 | 6 | 6 | 1 |
| 56 | Lower Indian Creek | 85 | 0.2 | 3 | 4 | 1 | 1 | 6 | 6 | 6 | 6 | 4 | 6 | 6 |
| 155 | Trestle Creek | 86 | 0.2 | 1 | 1 | 1 | 1 | 9 | 1 | 9 | 9 | 8 | 1 | 7 |
| 84 | Lower Big Muddy Creek | 87 | 0.2 | 3 | 3 | 1 | 1 | 6 | 6 | 6 | 6 | 3 | 6 | 6 |
| 127 | Caribou Creek | 88 | 0.2 | 2 | 8 | 1 | 2 | 8 | 2 | 8 | 7 | 2 | 8 | 6 |
| 19 | Sweet/Lunch Creek | 89 | 0.1 | 1 | 3 | 3 | 1 | 5 | 5 | 8 | 8 | 5 | 8 | 8 |
| 39 | Middle Harvey Creek | 89 | 0.1 | 1 | 2 | 2 | 2 | 2 | 2 | 7 | 7 | 7 | 7 | 7 |
| 41 | Lower West Brach LeClerc Creek | 89 | 0.1 | 1 | 3 | 3 | 2 | 7 | 7 | 7 | 7 | 5 | 5 | 7 |
| 48 | Lower Mill Creek | 89 | 0.1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 | 8 | 7 | 8 | 8 |
| 51 | Upper CCA Creek | 89 | 0.1 | 1 | 7 | 3 | 1 | 3 | 3 | 8 | 8 | 3 | 8 | 11 |
| 132 | Two Mouth Creek | 89 | 0.1 | 1 | 1 | 3 | 6 | 7 | 3 | 7 | 7 | 3 | 7 | 7 |
| 16 | Flume Creek | 95 | 0.1 | 1 | 3 | 3 | 1 | 5 | 5 | 8 | 8 | 5 | 8 | 11 |

| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | Sullivan Lake | 95 | 0.1 | 6 | 2 | 2 | 2 | 1 | 6 | 8 | 8 | 8 | 8 | 5 |
| 40 | North and Middle Fork Harvey Creek | 97 | 0.1 | 1 | 1 | 1 | 1 | 1 | 1 | 7 | 7 | 7 | 7 | 7 |
| 133 | Bear Creek | 97 | 0.1 | 1 | 1 | 1 | 1 | 7 | 1 | 7 | 7 | 1 | 7 | 7 |
| 17 | Pocahontas Creek | 99 | 0.1 | 2 | 2 | 2 | 1 | 5 | 5 | 8 | 8 | 5 | 8 | 11 |
| 78 | Lower Ruby Creek | 100 | 0.1 | 2 | 2 | 2 | 1 | 6 | 6 | 6 | 6 | 6 | 6 | 5 |
| 121 | South Fork Granite and Sema Creek | 101 | 0.1 | 1 | 1 | 6 | 1 | 7 | 1 | 7 | 7 | 1 | 7 | 7 |
| 88 | Upper Cedar Creek | 102 | 0.1 | 4 | 5 | 2 | 2 | 5 | 5 | 5 | 5 | 5 | 5 | 1 |
| 11 | Three Mile Creek | 103 | 0.1 | 1 | 1 | 1 | 1 | 6 | 6 | 6 | 6 | 1 | 6 | 6 |
| 13 | Peewee/Russian Creek | 103 | 0.1 | 1 | 1 | 1 | 1 | 5 | 5 | 7 | 7 | 7 | 7 | 7 |
| 60 | Middle Fork Calipsell Creek | 103 | 0.1 | 2 | 2 | 2 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 65 | Upper Winchester Creek | 103 | 0.1 | 2 | 2 | 2 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 73 | South Fork Tacoma Creek | 103 | 0.1 | 2 | 2 | 2 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 86 | Little Muddy Creek | 103 | 0.1 | 2 | 2 | 2 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 58 | South Fork Calispell Creek | 109 | 0.1 | 2 | 2 | 1 | 2 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 63 | Ten Mile Creek | 109 | 0.1 | 4 | 5 | 2 | 2 | 5 | 5 | 5 | 5 | 5 | 1 | 5 |
| 122 | North Fork Granite Creek | 109 | 0.1 | 1 | 1 | 4 | 4 | 7 | 1 | 7 | 7 | 4 | 7 | 7 |
| 67 | Lower Small Creek | 112 | 0.1 | 1 | 4 | 1 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 11 |
| 57 | Upper Indian Creek | 113 | 0.1 | 1 | 1 | 1 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 123 | Gold Creek | 113 | 0.1 | 5 | 4 | 1 | 5 | 5 | 2 | 5 | 5 | 2 | 5 | 5 |
| 27 | Slate Creek | 115 | 0.1 | 2 | 2 | 2 | 1 | 2 | 2 | 7 | 7 | 7 | 7 | 7 |

| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 80 | South Fork Lost Creek | 115 | 0.1 | 4 | 1 | 1 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 128 | Boulder Creek | 115 | 0.1 | 6 | 3 | 3 | 3 | 1 | 1 | 6 | 6 | 6 | 6 | 6 |
| 61 | Lower North Fork Calispell Creek | 118 | 0.1 | 2 | 2 | 2 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 11 |
| 69 | East Fork Small Creek | 119 | 0.1 | 4 | 5 | 1 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 3 |
| 28 | Deemer/Leola Creek | 120 | 0.1 | 1 | 1 | 1 | 1 | 1 | 1 | 7 | 7 | 7 | 7 | 7 |
| 30 | Gypsy Creek | 120 | 0.1 | 1 | 1 | 1 | 1 | 1 | 1 | 7 | 7 | 7 | 7 | 7 |
| 12 | Lime Creek | 122 | 0.1 | 1 | 1 | 1 | 1 | 5 | 5 | 8 | 8 | 5 | 8 | 11 |
| 34 | North Fork Sullivan Creek | 123 | 0.0 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 |
| 62 | Upper North Fork Calispell Creek | 123 | 0.0 | 2 | 4 | 2 | 1 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 125 | Upper Priest River | 123 | 0.0 | 1 | 1 | 1 | 5 | 5 | 1 | 5 | 5 | 5 | 5 | 5 |
| 124 | Jackson Creek | 126 | 0.0 | 4 | 1 | 1 | 4 | 4 | 1 | 4 | 4 | 4 | 4 | 4 |
| 129 | Upper Priest Lake | 126 | 0.0 | 4 | 1 | 1 | 4 | 4 | 1 | 4 | 4 | 4 | 4 | 4 |
| 130 | Beaver Creek | 126 | 0.0 | 4 | 1 | 1 | 4 | 4 | 1 | 4 | 4 | 4 | 4 | 4 |
| 14 | Salmo River | 129 | 0.0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Table 14.11. Ranking of streams whose habitat is most similar to the reference condition for westslope cutthroat trout in the Pend Oreille Subbasin in comparison to other reaches. A reach rank equal to 1 reveals the reach with current conditions most similar to reference conditions in comparison to other reaches. Reach score ranges from 0 to -1, with -1 having the least deviation from reference. Values associated with each habitat attribute range from 1 to 11, a value of 1 indicates a habitat attribute being most similar to the reference compared to the other attributes within that reach. In some cases multiple habitat attributes have a value of 1 indicating all attributes are equally the most similar to the reference.

| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | Salmo River | 1 | -0.92 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 11 | 1 | 1 | 10 |
| 124 | Jackson Creek | 2 | -0.89 | 1 | 7 | 7 | 1 | 1 | 7 | 1 | 11 | 1 | 1 | 10 |
| 129 | Upper Priest Lake | 2 | -0.89 | 1 | 7 | 7 | 1 | 1 | 7 | 1 | 11 | 1 | 1 | 10 |
| 130 | Beaver Creek | 2 | -0.89 | 1 | 7 | 7 | 1 | 1 | 7 | 1 | 11 | 1 | 1 | 10 |
| 62 | Upper North Fork Calispell Creek | 5 | -0.88 | 7 | 1 | 7 | 9 | 1 | 1 | 1 | 11 | 1 | 1 | 10 |
| 125 | Upper Priest River | 5 | -0.88 | 6 | 6 | 6 | 1 | 1 | 6 | 1 | 11 | 1 | 1 | 10 |
| 34 | North Fork Sullivan Creek | 7 | -0.86 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 10 | 1 | 1 | 11 |
| 28 | Deemer/Leola Creek | 8 | -0.86 | 4 | 4 | 4 | 4 | 4 | 4 | 1 | 11 | 1 | 1 | 10 |
| 30 | Gypsy Creek | 8 | -0.86 | 4 | 4 | 4 | 4 | 4 | 4 | 1 | 11 | 1 | 1 | 10 |
| 80 | South Fork Lost Creek | 10 | -0.84 | 6 | 7 | 7 | 7 | 1 | 1 | 1 | 11 | 1 | 1 | 10 |
| 128 | Boulder Creek | 10 | -0.84 | 1 | 5 | 5 | 5 | 8 | 8 | 1 | 11 | 1 | 1 | 10 |
| 69 | East Fork Small Creek | 12 | -0.84 | 7 | 1 | 8 | 8 | 1 | 1 | 1 | 10 | 1 | 1 | 11 |
| 57 | Upper Indian Creek | 13 | -0.83 | 6 | 6 | 6 | 6 | 1 | 1 | 1 | 11 | 1 | 1 | 10 |
| 123 | Gold Creek | 13 | -0.83 | 1 | 6 | 10 | 1 | 1 | 7 | 1 | 11 | 7 | 1 | 9 |
| 58 | South Fork Calispell Creek | 15 | -0.82 | 6 | 6 | 10 | 6 | 1 | 1 | 1 | 11 | 1 | 1 | 9 |

| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 63 | Ten Mile Creek | **15** | -0.82 | 6 | 1 | 7 | 7 | 1 | 1 | 1 | 10 | 1 | 10 | 9 |
| 122 | North Fork Granite Creek | **15** | -0.82 | 7 | 7 | 4 | 4 | 1 | 7 | 1 | 11 | 4 | 1 | 10 |
| 65 | Upper Winchester Creek | **18** | -0.81 | 6 | 6 | 6 | 10 | 1 | 1 | 1 | 10 | 1 | 1 | 9 |
| 73 | South Fork Tacoma Creek | **18** | -0.81 | 6 | 6 | 6 | 10 | 1 | 1 | 1 | 10 | 1 | 1 | 9 |
| 88 | Upper Cedar Creek | **20** | -0.81 | 7 | 1 | 8 | 8 | 1 | 1 | 1 | 10 | 1 | 1 | 11 |
| 121 | South Fork Granite and Sema Creek | **21** | -0.80 | 4 | 4 | 4 | 9 | 4 | 4 | 1 | 10 | 1 | 1 | 11 |
| 27 | Slate Creek | **21** | -0.80 | 5 | 5 | 4 | 5 | 1 | 5 | 1 | 11 | 5 | 1 | 10 |
| 78 | Lower Ruby Creek | **23** | -0.80 | 6 | 6 | 6 | 9 | 1 | 1 | 1 | 9 | 1 | 1 | 9 |
| 40 | North and Middle Fork Harvey Creek | **24** | -0.79 | 4 | 4 | 4 | 4 | 4 | 4 | 1 | 11 | 1 | 1 | 10 |
| 18 | Sullivan Lake | **25** | -0.78 | 4 | 6 | 6 | 6 | 9 | 4 | 1 | 10 | 1 | 1 | 10 |
| 39 | Middle Harvey Creek | **26** | -0.78 | 6 | 6 | 6 | 10 | 3 | 3 | 1 | 10 | 3 | 1 | 9 |
| 41 | Lower West Brach LeClerc Creek | **26** | -0.78 | 10 | 4 | 4 | 4 | 4 | 4 | 1 | 11 | 1 | 1 | 9 |
| 17 | Pocahontas Creek | **26** | -0.78 | 10 | 6 | 6 | 9 | 1 | 1 | 1 | 10 | 4 | 4 | 8 |
| 127 | Caribou Creek | **29** | -0.77 | 5 | 1 | 9 | 5 | 1 | 5 | 1 | 11 | 5 | 1 | 10 |
| 133 | Bear Creek | **29** | -0.77 | 4 | 4 | 4 | 4 | 1 | 4 | 1 | 10 | 4 | 1 | 10 |
| 155 | Trestle Creek | **31** | -0.76 | 4 | 4 | 4 | 4 | 4 | 4 | 1 | 10 | 3 | 1 | 10 |
| 48 | Lower Mill Creek | **31** | -0.76 | 4 | 4 | 4 | 4 | 1 | 4 | 1 | 10 | 3 | 4 | 10 |
| 56 | Lower Indian Creek | **33** | -0.75 | 8 | 5 | 9 | 9 | 1 | 1 | 1 | 9 | 5 | 1 | 7 |
| 13 | Peewee/Russian Creek | **34** | -0.75 | 6 | 6 | 6 | 6 | 4 | 4 | 1 | 10 | 1 | 1 | 11 |
| 132 | Two Mouth Creek | **35** | -0.75 | 8 | 8 | 5 | 4 | 1 | 5 | 1 | 10 | 5 | 1 | 11 |

| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | Upper Sullivan Creek | **36** | -0.74 | 8 | 4 | 10 | 8 | 4 | 4 | 1 | 10 | 1 | 1 | 7 |
| 50 | Lower CCA Creek | **36** | -0.74 | 9 | 3 | 4 | 10 | 4 | 4 | 1 | 10 | 4 | 1 | 8 |
| 72 | Upper Trimble Creek | **36** | -0.74 | 8 | 5 | 8 | 8 | 1 | 1 | 1 | 8 | 1 | 5 | 7 |
| 85 | Upper Big Muddy Creek | **36** | -0.74 | 8 | 5 | 8 | 8 | 1 | 1 | 1 | 8 | 5 | 1 | 7 |
| 89 | Lost Lake Creek | **36** | -0.74 | 7 | 7 | 7 | 7 | 1 | 1 | 1 | 7 | 1 | 1 | 6 |
| 64 | Lower Winchester Creek | **41** | -0.73 | 7 | 6 | 7 | 7 | 1 | 1 | 1 | 7 | 1 | 1 | 11 |
| 87 | Lower Cedar Creek | **41** | -0.73 | 8 | 5 | 8 | 8 | 1 | 1 | 1 | 8 | 5 | 1 | 7 |
| 75 | Upper Tacoma Creek | **43** | -0.73 | 7 | 5 | 7 | 11 | 1 | 1 | 1 | 9 | 5 | 1 | 9 |
| 79 | Upper Ruby Creek | **43** | -0.73 | 7 | 6 | 7 | 11 | 1 | 1 | 1 | 7 | 1 | 1 | 7 |
| 52 | South Skookum Creek | **45** | -0.72 | 8 | 4 | 4 | 10 | 2 | 2 | 1 | 10 | 4 | 4 | 9 |
| 53 | North Skookum Creek | **45** | -0.72 | 8 | 4 | 4 | 10 | 2 | 2 | 1 | 10 | 4 | 4 | 9 |
| 126 | Trapper Creek | **45** | -0.72 | 8 | 8 | 4 | 4 | 1 | 4 | 1 | 10 | 4 | 1 | 11 |
| 3 | Marshal Lake/Creek | **48** | -0.72 | 3 | 3 | 9 | 3 | 3 | 3 | 1 | 11 | 3 | 1 | 10 |
| 153 | South Fork Grouse Creek | **48** | -0.72 | 3 | 3 | 10 | 3 | 3 | 3 | 1 | 11 | 9 | 1 | 8 |
| 156 | Strong Creek | **48** | -0.72 | 8 | 5 | 5 | 5 | 1 | 9 | 1 | 9 | 4 | 1 | 11 |
| 90 | Pine/ Peewee Creeks | **51** | -0.72 | 8 | 6 | 6 | 8 | 3 | 3 | 1 | 10 | 3 | 1 | 11 |
| 91 | Big/Blue Creeks | **51** | -0.72 | 8 | 3 | 4 | 8 | 4 | 4 | 1 | 8 | 4 | 1 | 8 |
| 113 | Binarch Creek | **51** | -0.72 | 8 | 3 | 3 | 8 | 5 | 5 | 1 | 11 | 5 | 1 | 8 |
| 19 | Sweet/Lunch Creek | **51** | -0.72 | 8 | 3 | 3 | 8 | 5 | 5 | 1 | 11 | 5 | 1 | 8 |
| 51 | Upper CCA Creek | **51** | -0.72 | 8 | 3 | 3 | 8 | 5 | 5 | 1 | 11 | 5 | 1 | 8 |

| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 46 | Upper East Branch LeClerc Creek | 56 | -0.71 | 8 | 3 | 3 | 10 | 3 | 3 | 1 | 10 | 3 | 2 | 9 |
| 131 | Lion/Lucky Creek | 56 | -0.71 | 9 | 4 | 7 | 7 | 1 | 4 | 1 | 9 | 4 | 1 | 11 |
| 116 | Moores Creek | 58 | -0.70 | 8 | 7 | 4 | 8 | 1 | 4 | 1 | 11 | 4 | 1 | 8 |
| 31 | Middle Sullivan Creek | 59 | -0.70 | 8 | 3 | 8 | 8 | 3 | 3 | 1 | 8 | 3 | 1 | 7 |
| 162 | Johnson Creek | 60 | -0.69 | 7 | 8 | 8 | 8 | 4 | 4 | 1 | 11 | 3 | 1 | 6 |
| 92 | Riley Creek | 61 | -0.69 | 7 | 1 | 5 | 11 | 1 | 5 | 1 | 7 | 7 | 1 | 10 |
| 93 | Johnson Creek (Pend Oreille River) | 61 | -0.69 | 7 | 4 | 4 | 7 | 1 | 4 | 1 | 7 | 7 | 1 | 11 |
| 1 | Main Pend Oreille River | 63 | -0.37 | 8 | 8 | 6 | 8 | 2 | 4 | 1 | 5 | 6 | 3 | 8 |
| 32 | Pass Creek | 63 | -0.69 | 8 | 8 | 7 | 8 | 3 | 3 | 1 | 8 | 3 | 1 | 6 |
| 37 | Upper Sand Creek | 63 | -0.69 | 8 | 3 | 9 | 11 | 3 | 3 | 1 | 9 | 3 | 1 | 7 |
| 45 | Lower East Branch LeClerc Creek | 63 | -0.69 | 10 | 6 | 6 | 6 | 3 | 3 | 1 | 10 | 6 | 2 | 5 |
| 160 | North Gold Creek | 63 | -0.69 | 8 | 3 | 8 | 8 | 3 | 3 | 1 | 8 | 2 | 3 | 7 |
| 161 | (South) Gold Creek | 67 | -0.68 | 3 | 3 | 3 | 8 | 3 | 3 | 1 | 8 | 1 | 11 | 8 |
| 112 | North Fork East River | 68 | -0.67 | 7 | 7 | 4 | 11 | 6 | 4 | 1 | 7 | 3 | 1 | 7 |
| 47 | Middle Creek | 68 | -0.67 | 7 | 3 | 11 | 7 | 3 | 3 | 1 | 10 | 3 | 1 | 9 |
| 119 | Kalispell Creek | 68 | -0.67 | 7 | 6 | 7 | 7 | 1 | 3 | 1 | 7 | 3 | 3 | 7 |
| 43 | Upper West Branch LeClerc Creek | 71 | -0.67 | 8 | 3 | 3 | 8 | 3 | 7 | 1 | 8 | 3 | 2 | 11 |
| 159 | Cedar Creek | 72 | -0.66 | 3 | 3 | 3 | 7 | 3 | 7 | 1 | 10 | 9 | 1 | 11 |
| 36 | Lower Sand Creek | 73 | -0.66 | 7 | 3 | 7 | 11 | 3 | 3 | 1 | 7 | 3 | 1 | 7 |
| 42 | Middle West Branch LeClerc Creek | 73 | -0.66 | 8 | 5 | 5 | 8 | 3 | 5 | 1 | 8 | 3 | 2 | 8 |

| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 71 | Lower Trimble Creek | **73** | -0.66 | 7 | 4 | 7 | 7 | 1 | 1 | 1 | 7 | 4 | 4 | 11 |
| 103 | Wright Area | **76** | -0.66 | 2 | 2 | 2 | 6 | 6 | 6 | 1 | 10 | 6 | 2 | 11 |
| 120 | Indian Creek | **77** | -0.65 | 4 | 9 | 9 | 9 | 1 | 4 | 1 | 8 | 4 | 1 | 7 |
| 134 | South Fork Indian Creek | **77** | -0.65 | 4 | 9 | 9 | 9 | 1 | 4 | 1 | 8 | 4 | 1 | 7 |
| 105 | Brickel Creek | **79** | -0.65 | 7 | 7 | 11 | 3 | 3 | 3 | 1 | 10 | 3 | 1 | 7 |
| 137 | Horton Creek | **79** | -0.65 | 3 | 7 | 9 | 11 | 4 | 4 | 1 | 9 | 4 | 1 | 7 |
| 152 | Gold Creek (Pack River) | **81** | -0.64 | 5 | 5 | 5 | 8 | 2 | 2 | 1 | 11 | 8 | 2 | 8 |
| 118 | Lamb Creek | **82** | -0.63 | 7 | 3 | 9 | 10 | 3 | 3 | 1 | 8 | 1 | 3 | 11 |
| 135 | Upper Pack River | **82** | -0.63 | 7 | 3 | 10 | 7 | 3 | 3 | 1 | 7 | 3 | 1 | 11 |
| 49 | Upper Mill Creek | **84** | -0.63 | 11 | 5 | 7 | 10 | 3 | 3 | 1 | 7 | 5 | 1 | 7 |
| 99 | Lower Cocolalla Creek | **85** | -0.62 | 6 | 2 | 6 | 2 | 2 | 2 | 1 | 6 | 6 | 6 | 11 |
| 151 | North Fork Grouse Creek | **85** | -0.62 | 6 | 6 | 3 | 8 | 3 | 3 | 1 | 8 | 11 | 1 | 10 |
| 157 | Trout Creek | **85** | -0.62 | 7 | 7 | 7 | 4 | 4 | 3 | 1 | 10 | 4 | 1 | 11 |
| 158 | Granite Creek (LPO) | **88** | -0.62 | 6 | 6 | 6 | 3 | 3 | 6 | 1 | 6 | 5 | 1 | 11 |
| 5 | Davis/Kent Creeks | **89** | -0.61 | 8 | 8 | 8 | 8 | 1 | 1 | 1 | 7 | 5 | 1 | 6 |
| 38 | Lower Harvey Creek | **90** | -0.61 | 8 | 8 | 10 | 6 | 4 | 4 | 1 | 6 | 1 | 1 | 11 |
| 74 | Lower Tacoma Creek | **90** | -0.61 | 8 | 8 | 8 | 11 | 1 | 1 | 1 | 7 | 5 | 1 | 6 |
| 117 | Flat/Bear Paw Creeks | **90** | -0.61 | 7 | 6 | 7 | 7 | 2 | 2 | 1 | 10 | 2 | 2 | 11 |
| 145 | Little Sand Creek | **90** | -0.61 | 2 | 6 | 7 | 7 | 7 | 2 | 1 | 10 | 2 | 2 | 11 |
| 136 | Hunt Creek | **94** | -0.60 | 3 | 7 | 8 | 10 | 4 | 4 | 1 | 8 | 4 | 1 | 11 |

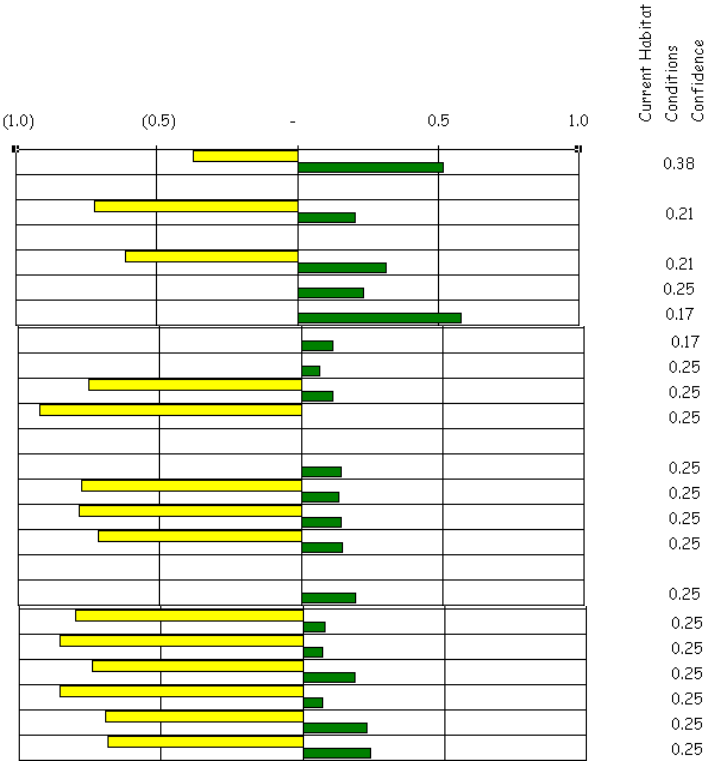
| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 95 | Algoma Area | **95** | -0.60 | 4 | 4 | 4 | 4 | 3 | 4 | 1 | 4 | 4 | 1 | 11 |
| 100 | Upper Cocolalla Creek | **96** | -0.59 | 6 | 2 | 11 | 2 | 2 | 2 | 1 | 9 | 6 | 6 | 10 |
| 150 | Grouse Creek | **97** | -0.58 | 10 | 7 | 7 | 10 | 2 | 2 | 1 | 9 | 6 | 2 | 5 |
| 111 | Middle Fork East River | **98** | -0.57 | 5 | 5 | 11 | 2 | 5 | 5 | 1 | 10 | 5 | 2 | 4 |
| 140 | Hellroaring Creek | **98** | -0.57 | 5 | 5 | 5 | 5 | 2 | 2 | 1 | 10 | 5 | 2 | 11 |
| 141 | Caribou Creek | **98** | -0.57 | 5 | 5 | 5 | 5 | 2 | 2 | 1 | 10 | 5 | 2 | 11 |
| 149 | Sand Creek | **101** | -0.56 | 4 | 4 | 4 | 4 | 2 | 4 | 1 | 10 | 4 | 2 | 11 |
| 144 | Sand Creek | **102** | -0.55 | 6 | 3 | 6 | 11 | 3 | 3 | 1 | 10 | 6 | 2 | 6 |
| 110 | Pend Oreille River above Albeni Falls Dam | **103** | -0.53 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 10 | 3 | 2 | 11 |
| 148 | Lower Pack River | **103** | -0.53 | 8 | 8 | 6 | 8 | 2 | 2 | 1 | 7 | 8 | 2 | 5 |
| 154 | Rapid Lightning Creek | **105** | -0.52 | 3 | 3 | 3 | 2 | 3 | 3 | 1 | 10 | 3 | 3 | 11 |
| 138 | Middle Pack River | **106** | -0.50 | 7 | 7 | 7 | 7 | 2 | 2 | 1 | 6 | 7 | 2 | 5 |
| 44 | Middle Branch LeClerc Creek | **107** | -0.50 | 9 | 7 | 9 | 11 | 2 | 2 | 1 | 6 | 4 | 4 | 8 |
| 54 | Lower Skookum Creek | **108** | -0.48 | 10 | 9 | 8 | 10 | 2 | 2 | 1 | 6 | 6 | 5 | 4 |
| 35 | Lower Sullivan Creek | **109** | -0.45 | 8 | 8 | 3 | 2 | 3 | 3 | 1 | 3 | 10 | 3 | 11 |
| 146 | Syringa Creek | **110** | -0.45 | 3 | 3 | 7 | 3 | 7 | 7 | 1 | 7 | 3 | 2 | 11 |
| 114 | Sockwa Creek | **112** | 0.00 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

The tornado diagram (Table 14.12) and maps (Map PO-3, Map PO-4, located at the end of Section 14) present the reach scores for both current habitat condition (ranging from zero to positive one, Map PO-3) and protection (ranging from zero to negative one, Map PO-4). Scores closest to negative one depict reaches that are most representative of reference habitat conditions. Scores closest to positive one depict reaches with habitat conditions least similar to reference conditions. Confidence scores range from zero to one and are associated with the ratings assigned by local biologists based on documentation or their expert opinion regarding reference and current habitat attributes for each reach.

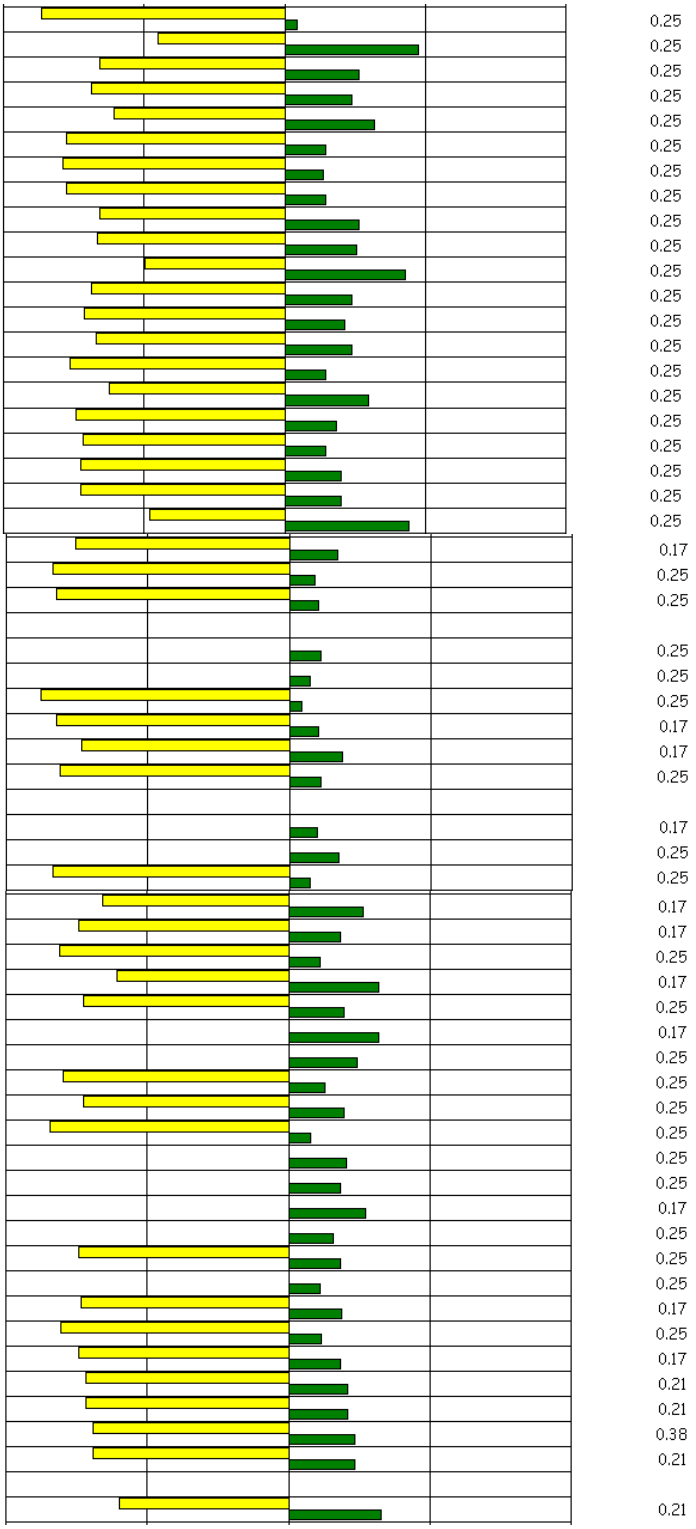
Table 14.12. Tornado diagram for westslope cutthroat trout in the Pend Oreille Subbasin. Degree of confidence for protection and current habitat conditions range from 0.0 to 1.0 with the greatest confidence equal to 1.0. Protection reach scores are presented on the left side and current habitat reach scores are presented on the right. Negative scores are in parentheses.

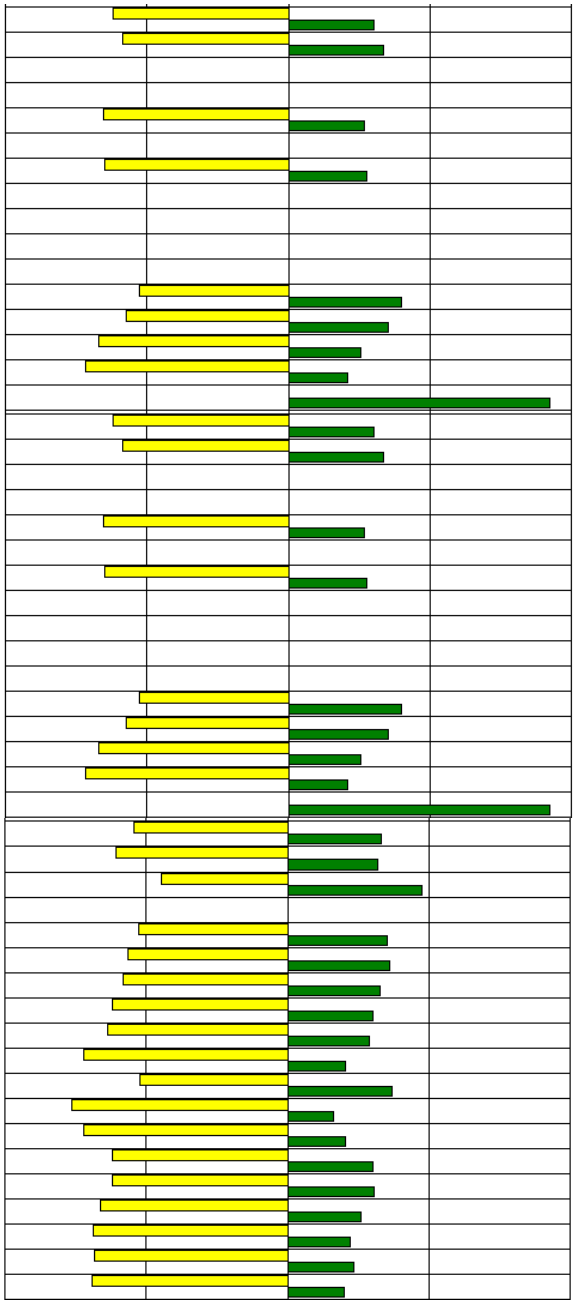
NP = Not present

| Sequence | Reach Name | Protection Confidence | Current Habitat Conditions Confidence |
|---|---|---|---|
| 1 | Main Pend Oreille River | 0.50 | 0.38 |
| 2 | Bead Lake | NP | |
| 3 | Marshal Lake/Creek | 0.42 | 0.21 |
| 4 | Shearer Lake | NP | |
| 5 | Davis/Kent Creeks | 0.42 | 0.21 |
| 6 | McCloud Creek | 0.50 | 0.25 |
| 7 | Lower Calispell Creek | 0.33 | 0.17 |
| 11 | Three Mile Creek | 0.33 | 0.17 |
| 12 | Lime Creek | 0.50 | 0.25 |
| 13 | Peewee/Russian Creek | 0.50 | 0.25 |
| 14 | Salmo River | 0.50 | 0.25 |
| 15 | Ledbetter Lake | NP | |
| 16 | Flume Creek | 0.50 | 0.25 |
| 17 | Pocahontas Creek | 0.50 | 0.25 |
| 18 | Sullivan Lake | 0.50 | 0.25 |
| 19 | Sweet/Lunch Creek | 0.50 | 0.25 |
| 20 | Power Plant | NP | |
| 21 | Renshaw Creek | 0.50 | 0.25 |
| 27 | Slate Creek | 0.50 | 0.25 |
| 28 | Deemer/Leola Creek | 0.50 | 0.25 |
| 29 | Upper Sullivan Creek | 0.50 | 0.25 |
| 30 | Gypsy Creek | 0.50 | 0.25 |
| 31 | Middle Sullivan Creek | 0.50 | 0.25 |
| 32 | Pass Creek | 0.50 | 0.25 |



| | | | |
|---|---|---|---|
| 34 | North Fork Sullivan Creek | 0.50 | 0.25 |
| 35 | Lower Sullivan Creek | 0.50 | 0.25 |
| 36 | Lower Sand Creek | 0.50 | 0.25 |
| 37 | Upper Sand Creek | 0.50 | 0.25 |
| 38 | Lower Harvey Creek | 0.50 | 0.25 |
| 39 | Middle Harvey Creek | 0.50 | 0.25 |
| 40 | North and Middle Fork Harvey Creek | 0.50 | 0.25 |
| 41 | Lower West Brach LeClerc Creek | 0.50 | 0.25 |
| 42 | Middle West Branch LeClerc Creek | 0.50 | 0.25 |
| 43 | Upper West Branch LeClerc Creek | 0.50 | 0.25 |
| 44 | Middle Branch LeClerc Creek | 0.50 | 0.25 |
| 45 | Lower East Branch LeClerc Creek | 0.50 | 0.25 |
| 46 | Upper East Branch Leclerc Creek | 0.50 | 0.25 |
| 47 | Middle Creek | 0.50 | 0.25 |
| 48 | Lower Mill Creek | 0.50 | 0.25 |
| 49 | Upper Mill Creek | 0.50 | 0.25 |
| 50 | Lower CCA Creek | 0.50 | 0.25 |
| 51 | Upper CCA Creek | 0.50 | 0.25 |
| 52 | South Skookum Creek | 0.50 | 0.25 |
| 53 | North Skookum Creek | 0.50 | 0.25 |
| 54 | Lower Skookum Creek | 0.50 | 0.25 |
| 56 | Lower Indian Creek | 0.33 | 0.17 |
| 57 | Upper Indian Creek | 0.50 | 0.25 |
| 58 | South Fork Calispel Creek | 0.50 | 0.25 |
| 59 | Power Lake | NP | |
| 60 | Middle Fork Calipsel Creek | 0.50 | 0.25 |
| 61 | Lower North Fork Calispell Creek | 0.50 | 0.25 |
| 62 | Upper North Fork Calispell Creek | 0.50 | 0.25 |
| 63 | Ten Mile Creek | 0.33 | 0.17 |
| 64 | Lower Winchester Creek | 0.33 | 0.17 |
| 65 | Upper Winchester Creek | 0.50 | 0.25 |
| 66 | Dorchester Creek | NP | |
| 67 | Lower Small Creek | 0.33 | 0.17 |
| 68 | Upper Small Creek | 0.50 | 0.25 |
| 69 | East Fork Small Creek | 0.50 | 0.25 |
| 71 | Lower Trimble Creek | 0.33 | 0.17 |
| 72 | Upper Trimble Creek | 0.33 | 0.17 |
| 73 | South Fork Tacoma Creek | 0.50 | 0.25 |
| 74 | Lower Tacoma Creek | 0.33 | 0.17 |
| 75 | Upper Tacoma Creek | 0.50 | 0.25 |
| 76 | Lower Cusick Creek | 0.33 | 0.17 |
| 77 | Upper Cusick Creek | 0.50 | 0.25 |
| 78 | Lower Ruby Creek | 0.50 | 0.25 |
| 79 | Upper Ruby Creek | 0.50 | 0.25 |
| 80 | South Fork Lost Creek | 0.50 | 0.25 |
| 81 | Lower Lost Creek | 0.50 | 0.25 |
| 82 | Upper Lost Creek | 0.50 | 0.25 |
| 83 | Lower Muddy Creeks | 0.33 | 0.17 |
| 84 | Lower Big Muddy Creek | 0.50 | 0.25 |
| 85 | Upper Big Muddy Creek | 0.50 | 0.25 |
| 86 | Little Muddy Creek | 0.50 | 0.25 |
| 87 | Lower Cedar Creek | 0.33 | 0.17 |
| 88 | Upper Cedar Creek | 0.50 | 0.25 |
| 89 | Lost Lake Creek | 0.33 | 0.17 |
| 90 | Pine/ Peewee Creeks | 0.17 | 0.21 |
| 91 | Big/Blue Creeks | 0.17 | 0.21 |
| 92 | Riley Creek | 0.50 | 0.38 |
| 93 | Johnson Creek (Pend Orielle River) | 0.17 | 0.21 |
| 94 | Smith/Carr Creeks | NP | |
| 95 | Algoma Area | 0.17 | 0.21 |



| | | | | |
|---|---|---|---|---|
| 99 | Lower Cocolalla Creek | 0.50 |  | 0.38 |
| 100 | Upper Cocolalla Creek | 0.50 | | 0.38 |
| 101 | Fish Creek | NP | | |
| 102 | East of Edgemere | NP | | |
| 103 | Wright Area | 0.17 | | 0.21 |
| 104 | Spirit Lake | NP | | |
| 105 | Brickel Creek | 0.50 | | 0.38 |
| 106 | Blanchard Lake | NP | | |
| 107 | Elmer Creek | NP | | |
| 108 | Hoodoo Creek | NP | | |
| 109 | Kelso | NP | | |
| 110 | Pend Oreille River above Albeni Falls Dam | 0.17 | | 0.21 |
| 111 | Middle Fork East River | 0.50 | | 0.38 |
| 112 | North Fork East River | 0.50 | | 0.38 |
| 113 | Binarch Creek | 0.50 | | 0.38 |
| 114 | Sockwa Creek | - | | 0.13 |
| 99 | Lower Cocolalla Creek | 0.50 | | 0.38 |
| 100 | Upper Cocolalla Creek | 0.50 | | 0.38 |
| 101 | Fish Creek | NP | | |
| 102 | East of Edgemere | NP | | |
| 103 | Wright Area | 0.17 | | 0.21 |
| 104 | Spirit Lake | NP | | |
| 105 | Brickel Creek | 0.50 | | 0.38 |
| 106 | Blanchard Lake | NP | | |
| 107 | Elmer Creek | NP | | |
| 108 | Hoodoo Creek | NP | | |
| 109 | Kelso | NP | | |
| 110 | Pend Oreille River above Albeni Falls Dam | 0.17 | | 0.21 |
| 111 | Middle Fork East River | 0.50 | | 0.38 |
| 112 | North Fork East River | 0.50 | | 0.38 |
| 113 | Binarch Creek | 0.50 | | 0.38 |
| 114 | Sockwa Creek | - | | 0.13 |
| 144 | Sand Creek | 0.50 | | 0.38 |
| 145 | Little Sand Creek | 0.50 | | 0.38 |
| 146 | Syringa Creek | 0.17 | | 0.21 |
| 147 | Boyer Slough | NP | | |
| 148 | Lower Pack River | 0.50 | | 0.38 |
| 149 | Sand Creek | 0.50 | | 0.38 |
| 150 | Grouse Creek | 0.50 | | 0.38 |
| 151 | North Fork Grouse Creek | 0.50 | | 0.38 |
| 152 | Gold Creek (Pack River) | 0.50 | | 0.38 |
| 153 | South Fork Grouse Creek | 0.50 | | 0.38 |
| 154 | Rapid Lightning Creek | 0.50 | | 0.38 |
| 155 | Trestle Creek | 0.50 | | 0.38 |
| 156 | Strong Creek | 0.50 | | 0.38 |
| 157 | Trout Creek | 0.42 | | 0.33 |
| 158 | Granite Creek (LPO) | 0.42 | | 0.33 |
| 159 | Cedar Creek | 0.42 | | 0.33 |
| 160 | North Gold Creek | 0.42 | | 0.33 |
| 161 | (South) Gold Creek | 0.50 | | 0.38 |
| 162 | Johnson Creek | 0.50 | | 0.38 |

### 14.4.4 Current Management

The USFWS (2002) has recently decided not to list westslope cutthroat trout as a threatened species under the ESA (Federal Register 65:20120). Management and conservation strategies are the responsibility of each state under their respective state law. Protection of westslope cutthroat trout habitat and restoration of historic habitat is imperative to the health and expansion of westslope cutthroat trout in the Lower Pend Oreille Subbasin (C. Vail, Fisheries Biologist WDFW, personal communication, 2004). Westslope cutthroat trout restoration projects, including fish passage, are a key component of the Native Salmonid Restoration Plan (NSRP) in the Settlement

Agreement with Avista Corporation. In the Pend Oreille Subbasin, westslope cutthroat trout in streams and rivers will be managed primarily as a wild trout fishery with restrictive regulations.

Within the Washington portion of the Pend Oreille Subbasin, WDFW manages trout fisheries in several isolated lowland lakes utilizing a native westslope cutthroat trout stock, which originated from Granite Creek and Kalispell Creek, which are tributaries to Priest Lake. The broodstock for management efforts utilizing this stock of fish are maintained at Kings Lake in Pend Oreille County (Crawford 1979; J. Whalen, WDFW, personal communication, 2003).

## 14.5 Focal Species – Mountain Whitefish

Mountain whitefish are a native salmonid distributed throughout the Pend Oreille Subbasin. Although there is very little data regarding the historical distribution, population sizes, seasonal distribution, or migratory patterns of this species in the Subbasin, biologists feel that this species is very important from an ecological standpoint and has potential for greater recreational value. Mountain whitefish often comprises a large proportion of fish biomass in streams (Pettit and Wallace 1975) and contributes to the prey base for other salmonids (for example, bull trout) that occupy the same habitats.

### 14.5.1 Historic Status

Mountain whitefish occupy both lotic and lentic environments. McPhail and Troffe (2001) describe the historic geographical distribution of mountain whitefish to be extensive in the Columbia River basin. However, mountain whitefish appear to be absent from coastal drainages with the exception of the Puget Sound and the westside river drainages of the Olympic Mountains (McPhail and Troffe 2001).

Mountain whitefish are native to the Pend Oreille Subbasin, however little is known about the specifics of their historical distribution or population sizes. According to McPhail and Troffe (2001) mountain whitefish populations may complete their life cycle exclusively in lakes, rivers, or migrate between lakes and rivers within a drainage system. Mountain whitefish are a forage item for bull trout. As a consequence bull trout may influence the population dynamics, foraging behavior, and growth rates of mountain whitefish (McPhail and Troffe 2001).

### 14.5.2 Current Status

Few studies exist that describe abundance, distribution, and life history strategies of mountain whitefish in the Pend Oreille Subbasin. Previous investigations by the University of Idaho (Bennett and Liter 1991; Bennett and Garrett 1994) and Eastern Washington University (Ashe and Scholz 1992) found that mountain whitefish were the most numerous salmonid in Box Canyon Reservoir, with 4,385 captured (5.4 percent of the total). A study conducted by Downs et al. (2003) between 1999-2001 estimated mountain whitefish populations (>200 mm) to range between 1,963-26,613 fish. This population estimate was based on a mark-recapture study conducted on the lower Clark Fork River below Cabinet Gorge Dam to the inlet of Foster side-channel (Downs et al. 2003).

In the Lower Pend Oreille Subbasin, mountain whitefish inhabit predominantly lotic environments including the mainstem and tributaries of the Pend Oreille River. They are found primarily in riffle areas in summer and large pools in winter. Tributaries of the Pend Oreille River in Washington are used for spawning and early rearing. These include but are not limited to LeClerc Creek, including East Branch and West Branch, Sand Creek, Sweet Creek, North Fork Skookum Creek, Cee Cee Ah Creek, Cedar Creek, Ruby Creek (Kalispel Tribe 2000). Since mountain whitefish are fall/winter spawners they could likely use any tributary available to them since water temperatures are favorable at that time of year (Whalen, WDFW, personal communication, 2003).

### 14.5.3 Limiting Factors Mountain Whitefish

Based on QHA results, mountain whitefish identified to be historically present in 62 of 167 delineated reaches and watersheds in the Subbasin. The current distribution has decreased to 23 reaches (63 percent decline). Table 14.13 shows the reaches where mountain whitefish are no longer present and corresponding rank for the degree of habitat deviation from reference conditions. It should be noted in 2003 (after information had been collected for the QHA), WDFW captured mountain whitefish in an adfluvial trap in lower Harvey Creek (WDFW, unpublished data 2003).

Table 14.13. List of 39 reaches where mountain whitefish are not currently present, but were historically present. Reach rank refers to the degree of habitat change from reference to present conditions, 1 = greatest habitat alteration.

| Reach Name | Reach Rank |
|---|---|
| Lower Calispell Creek | 1 |
| Middle Branch LeClerc Creek | 4 |
| Lower Harvey Creek* | 6 |
| Lower Cusick Creek | 7 |
| Lower Tacoma Creek | 8 |
| Lower Trimble Creek | 10 |
| Lower Sand Creek | 11 |
| Upper West Branch LeClerc Creek | 11 |
| Lower Muddy Creeks | 14 |
| Middle Creek | 16 |
| Upper Cusick Creek | 17 |
| Pass Creek | 18 |
| Marshal Lake/Creek | 23 |
| Upper Tacoma Creek | 27 |
| Upper Ruby Creek | 28 |
| Lower Lost Creek | 29 |
| Lower Winchester Creek | 30 |
| Renshaw Creek | 31 |
| Upper Trimble Creek | 33 |
| Lost Lake Creek | 35 |
| Upper Lost Creek | 37 |
| Upper Big Muddy Creek | 37 |
| Lower Big Muddy Creek | 40 |
| Lower Mill Creek | 41 |
| Middle Harvey Creek | 42 |
| Upper Cedar Creek | 43 |
| North and Middle Fork Harvey Creek | 45 |
| Pocahontas Creek | 48 |

| Reach Name | Reach Rank |
|---|---|
| Upper Winchester Creek | 49 |
| South Fork Tacoma Creek | 49 |
| Little Muddy Creek | 49 |
| Three Mile Creek | 52 |
| South Fork Calispell Creek | 53 |
| Slate Creek | 54 |
| South Fork Lost Creek | 56 |
| East Fork Small Creek | 57 |
| Lower Small Creek | 58 |
| Lime Creek | 61 |
| Salmo River | 62 |

*Mountain whitefish were captured during WDFW's adfluvial trapping in Harvey Creek (WDFW, unpublished data 2003).

The most disturbed areas appear to be geographically located in the lower Pend Oreille Subbasin (Table 14.14). Fine sediment was the principle change in habitat from reference conditions (see Table 14.26).

Stream habitats that are most similar to reference conditions are primarily concentrated in the Priest River Subbasin and lower Pend Oreille Subbasin (Table 14.15).

The tornado diagram (Table 14.16) and maps (Map PO-5, Map PO-6, located at the end of Section 14) present the reach scores for both current habitat condition (ranging from zero to positive one, Map PO-5) and protection (ranging from zero to negative one, Map PO-6). Scores closest to negative one depict reaches that are most representative of reference habitat conditions. Scores closest to positive one depict reaches with habitat conditions least similar to reference conditions. Confidence scores range from zero to one and are associated with the ratings assigned by local biologists based on documentation or their expert opinion regarding reference and current habitat attributes for each reach.

Table 14.14. Ranking of reaches with the largest deviation from the reference habitat conditions for mountain whitefish in the Pend Oreille Subbasin. A reach rank equal to 1 has the greatest deviation from reference condition in comparison to other reaches. Reach scores range from 0 to 1, with 1 having the greatest deviation from reference. Values associated with each habitat attribute range from 1 to 11, a value of 1 indicates a habitat attribute having the greatest deviation from reference compared to the other attributes within that reach. In some cases multiple habitat attributes have a value of 1 indicating all attributes equally deviate the most from the reference.

| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | Lower Calispell Creek | 1 | 0.4 | 6 | 10 | 4 | 1 | 4 | 2 | 6 | 11 | 6 | 6 | 2 |
| 1 | Main Pend Oreille River | 2 | 0.4 | 6 | 2 | 4 | 1 | 9 | 5 | 11 | 10 | 6 | 6 | 3 |
| 35 | Lower Sullivan Creek | 3 | 0.3 | 9 | 2 | 7 | 7 | 3 | 6 | 10 | 10 | 5 | 3 | 1 |
| 44 | Middle Branch LeClerc Creek | 4 | 0.3 | 7 | 2 | 3 | 1 | 6 | 9 | 10 | 10 | 7 | 3 | 5 |
| 54 | Lower Skookum Creek | 5 | 0.3 | 5 | 2 | 4 | 1 | 5 | 8 | 9 | 10 | 5 | 3 | 10 |
| 38 | Lower Harvey Creek | 6 | 0.2 | 7 | 3 | 4 | 1 | 5 | 6 | 8 | 8 | 8 | 8 | 1 |
| 76 | Lower Cusick Creek | 7 | 0.2 | 5 | 3 | 3 | 1 | 7 | 7 | 7 | 7 | 6 | 2 | 7 |
| 74 | Lower Tacoma Creek | 8 | 0.2 | 4 | 2 | 3 | 1 | 6 | 6 | 6 | 6 | 5 | 6 | 6 |
| 5 | Davis/Kent Creeks | 9 | 0.2 | 4 | 2 | 3 | 1 | 8 | 8 | 8 | 5 | 5 | 8 | 7 |
| 71 | Lower Trimble Creek | 10 | 0.2 | 6 | 5 | 3 | 2 | 8 | 8 | 8 | 8 | 6 | 3 | 1 |
| 36 | Lower Sand Creek | 11 | 0.2 | 7 | 4 | 2 | 1 | 2 | 5 | 9 | 9 | 7 | 9 | 5 |
| 43 | Upper West Branch LeClerc Creek | 11 | 0.2 | 6 | 5 | 6 | 1 | 3 | 3 | 10 | 10 | 6 | 6 | 2 |
| 42 | Middle West Branch LeClerc Creek | 13 | 0.2 | 7 | 2 | 5 | 1 | 3 | 3 | 10 | 10 | 7 | 7 | 6 |
| 83 | Lower Muddy Creeks | 14 | 0.2 | 6 | 5 | 2 | 1 | 7 | 7 | 7 | 7 | 3 | 3 | 7 |
| 6 | McCloud Creek | 15 | 0.2 | 9 | 2 | 4 | 1 | 3 | 5 | 10 | 6 | 6 | 10 | 8 |

| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 47 | Middle Creek | 16 | 0.2 | 5 | 2 | 5 | 1 | 2 | 4 | 8 | 8 | 7 | 8 | 8 |
| 77 | Upper Cusick Creek | 17 | 0.2 | 6 | 2 | 3 | 1 | 8 | 8 | 8 | 8 | 6 | 3 | 5 |
| 32 | Pass Creek | 18 | 0.2 | 6 | 2 | 4 | 1 | 3 | 5 | 8 | 8 | 6 | 8 | 8 |
| 45 | Lower East Branch LeClerc Creek | 19 | 0.2 | 7 | 2 | 4 | 1 | 3 | 6 | 9 | 9 | 4 | 7 | 9 |
| 46 | Upper East Branch LeClerc Creek | 20 | 0.2 | 8 | 3 | 5 | 1 | 2 | 4 | 10 | 10 | 5 | 5 | 9 |
| 91 | Big/Blue Creeks | 21 | 0.1 | 5 | 8 | 9 | 1 | 2 | 3 | 10 | 5 | 5 | 10 | 3 |
| 113 | Binarch Creek | 21 | 0.1 | 5 | 8 | 9 | 1 | 2 | 3 | 10 | 5 | 5 | 10 | 3 |
| 3 | Marshal Lake/Creek | 23 | 0.1 | 6 | 4 | 2 | 1 | 2 | 5 | 8 | 8 | 6 | 8 | 8 |
| 31 | Middle Sullivan Creek | 23 | 0.1 | 9 | 4 | 4 | 1 | 1 | 6 | 10 | 7 | 7 | 10 | 1 |
| 52 | South Skookum Creek | 25 | 0.1 | 7 | 3 | 4 | 1 | 4 | 8 | 10 | 10 | 4 | 2 | 8 |
| 53 | North Skookum Creek | 25 | 0.1 | 7 | 3 | 4 | 1 | 4 | 8 | 10 | 10 | 4 | 2 | 8 |
| 75 | Upper Tacoma Creek | 27 | 0.1 | 6 | 2 | 2 | 1 | 7 | 7 | 7 | 7 | 5 | 7 | 4 |
| 79 | Upper Ruby Creek | 28 | 0.1 | 5 | 3 | 2 | 1 | 6 | 6 | 6 | 6 | 6 | 6 | 4 |
| 81 | Lower Lost Creek | 29 | 0.1 | 4 | 3 | 4 | 1 | 6 | 6 | 6 | 6 | 2 | 6 | 6 |
| 64 | Lower Winchester Creek | 30 | 0.1 | 5 | 4 | 3 | 1 | 6 | 6 | 6 | 6 | 6 | 6 | 2 |
| 21 | Renshaw Creek | 31 | 0.1 | 6 | 6 | 4 | 1 | 2 | 3 | 8 | 8 | 4 | 8 | 8 |
| 50 | Lower CCA Creek | 31 | 0.1 | 5 | 3 | 5 | 1 | 2 | 4 | 8 | 8 | 5 | 8 | 8 |
| 72 | Upper Trimble Creek | 33 | 0.1 | 5 | 4 | 2 | 1 | 6 | 6 | 6 | 6 | 6 | 2 | 6 |
| 87 | Lower Cedar Creek | 34 | 0.1 | 4 | 3 | 2 | 1 | 7 | 7 | 7 | 7 | 4 | 7 | 6 |
| 89 | Lost Lake Creek | 35 | 0.1 | 4 | 2 | 3 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |

| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | Sullivan Lake | 36 | 0.1 | 7 | 3 | 5 | 2 | 1 | 6 | 8 | 8 | 8 | 8 | 4 |
| 82 | Upper Lost Creek | 37 | 0.1 | 4 | 3 | 2 | 1 | 6 | 6 | 6 | 6 | 4 | 6 | 6 |
| 85 | Upper Big Muddy Creek | 37 | 0.1 | 4 | 3 | 2 | 1 | 6 | 6 | 6 | 6 | 4 | 6 | 6 |
| 56 | Lower Indian Creek | 39 | 0.1 | 5 | 3 | 2 | 1 | 6 | 6 | 6 | 6 | 4 | 6 | 6 |
| 84 | Lower Big Muddy Creek | 40 | 0.1 | 5 | 3 | 2 | 1 | 6 | 6 | 6 | 6 | 4 | 6 | 6 |
| 48 | Lower Mill Creek | 41 | 0.1 | 6 | 3 | 5 | 1 | 1 | 4 | 8 | 8 | 6 | 8 | 8 |
| 39 | Middle Harvey Creek | 42 | 0.1 | 6 | 3 | 5 | 1 | 1 | 4 | 7 | 7 | 7 | 7 | 7 |
| 88 | Upper Cedar Creek | 43 | 0.1 | 4 | 5 | 3 | 2 | 5 | 5 | 5 | 5 | 5 | 5 | 1 |
| 19 | Sweet/Lunch Creek | 44 | 0.1 | 5 | 2 | 3 | 1 | 3 | 6 | 8 | 8 | 7 | 8 | 8 |
| 40 | North and Middle Fork Harvey Creek | 45 | 0.1 | 5 | 2 | 4 | 1 | 6 | 6 | 6 | 6 | 6 | 6 | 3 |
| 78 | Lower Ruby Creek | 45 | 0.1 | 6 | 3 | 5 | 1 | 1 | 4 | 7 | 7 | 7 | 7 | 7 |
| 41 | Lower West Brach LeClerc Creek | 47 | 0.1 | 3 | 2 | 3 | 1 | 7 | 7 | 7 | 7 | 6 | 3 | 7 |
| 17 | Pocahontas Creek | 48 | 0.1 | 6 | 2 | 3 | 1 | 3 | 5 | 8 | 8 | 6 | 8 | 11 |
| 65 | Upper Winchester Creek | 49 | 0.1 | 4 | 2 | 3 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 73 | South Fork Tacoma Creek | 49 | 0.1 | 4 | 2 | 3 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 86 | Little Muddy Creek | 49 | 0.1 | 4 | 2 | 3 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 11 | Three Mile Creek | 52 | 0.1 | 5 | 2 | 3 | 1 | 6 | 6 | 6 | 6 | 3 | 6 | 6 |
| 58 | South Fork Calispell Creek | 53 | 0.1 | 4 | 2 | 2 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 27 | Slate Creek | 54 | 0.1 | 6 | 3 | 5 | 1 | 2 | 4 | 7 | 7 | 7 | 7 | 7 |
| 57 | Upper Indian Creek | 55 | 0.1 | 4 | 2 | 3 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |

| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 80 | South Fork Lost Creek | 56 | 0.1 | 4 | 2 | 3 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 69 | East Fork Small Creek | 57 | 0.1 | 4 | 5 | 3 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 2 |
| 67 | Lower Small Creek | 58 | 0.0 | 4 | 3 | 2 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 11 |
| 125 | Upper Priest River | 59 | 0.0 | 4 | 1 | 3 | 5 | 5 | 2 | 5 | 5 | 5 | 5 | 5 |
| 129 | Upper Priest Lake | 60 | 0.0 | 4 | 1 | 3 | 4 | 4 | 2 | 4 | 4 | 4 | 4 | 4 |
| 12 | Lime Creek | 61 | 0.0 | 6 | 2 | 3 | 1 | 3 | 5 | 8 | 8 | 6 | 8 | 11 |
| 14 | Salmo River | 62 | 0.0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Table 14.15. Ranking of streams whose habitat is most similar to the reference condition for mountain whitefish in the Pend Oreille Subbasin in comparison to other reaches. A reach rank equal to 1 reveals the reach with current conditions most similar to reference conditions in comparison to other reaches. Reach score ranges from 0 to -1, with -1 having the least deviation from reference. Values associated with each habitat attribute range from 1 to 11, a value of 1 indicates a habitat attribute being most similar to the reference compared to the other attributes within that reach. In some cases multiple habitat attributes have a value of 1 indicating all attributes are equally the most similar to the reference.

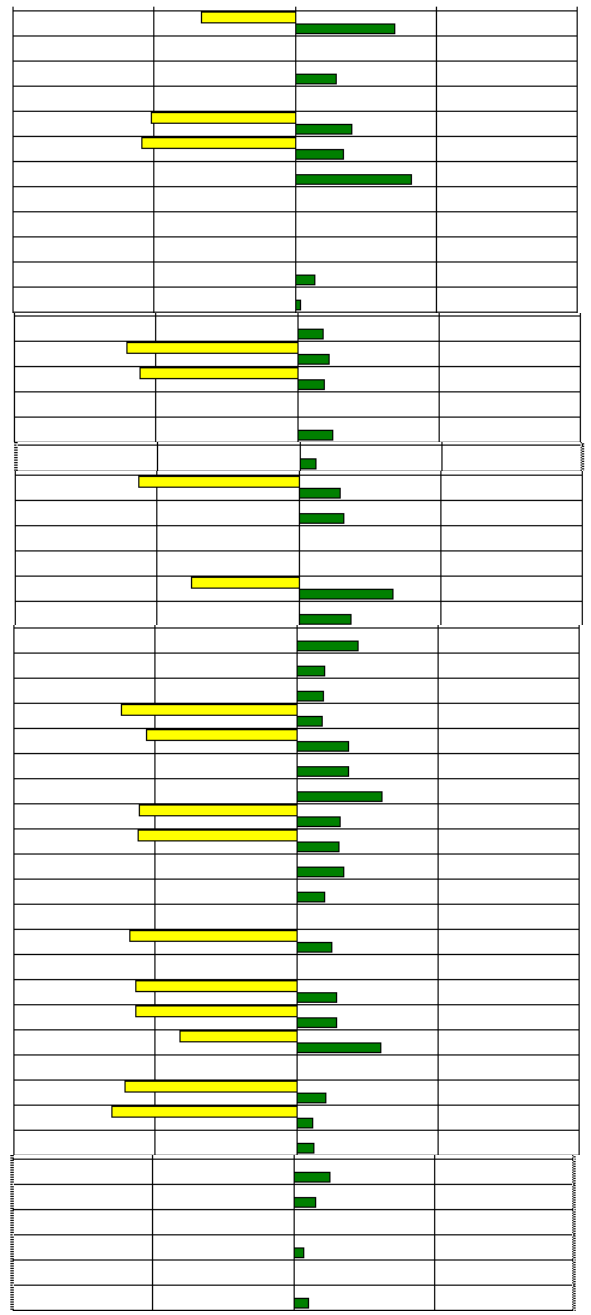
| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 129 | Upper Priest Lake | 1 | -0.69 | 11 | 6 | 10 | 1 | 1 | 7 | 1 | 8 | 8 | 1 | 5 |
| 125 | Upper Priest River | 2 | -0.69 | 11 | 6 | 10 | 1 | 1 | 7 | 1 | 8 | 8 | 1 | 5 |
| 57 | Upper Indian Creek | 3 | -0.66 | 11 | 7 | 10 | 4 | 1 | 5 | 1 | 8 | 8 | 1 | 5 |
| 41 | Lower West Brach LeClerc Creek | 4 | -0.62 | 11 | 7 | 10 | 6 | 1 | 4 | 1 | 8 | 9 | 3 | 4 |
| 78 | Lower Ruby Creek | 5 | -0.62 | 11 | 5 | 10 | 6 | 1 | 4 | 1 | 6 | 6 | 1 | 6 |
| 56 | Lower Indian Creek | 6 | -0.61 | 11 | 6 | 10 | 7 | 1 | 4 | 1 | 7 | 9 | 1 | 4 |
| 18 | Sullivan Lake | 7 | -0.60 | 11 | 6 | 10 | 3 | 4 | 5 | 1 | 7 | 7 | 1 | 7 |
| 87 | Lower Cedar Creek | 8 | -0.60 | 11 | 6 | 10 | 7 | 1 | 4 | 1 | 7 | 9 | 1 | 5 |
| 50 | Lower CCA Creek | 9 | -0.59 | 11 | 5 | 9 | 6 | 3 | 6 | 1 | 6 | 9 | 1 | 4 |
| 52 | South Skookum Creek | 10 | -0.57 | 11 | 6 | 9 | 7 | 2 | 4 | 1 | 7 | 9 | 3 | 4 |
| 53 | North Skookum Creek | 10 | -0.57 | 11 | 6 | 9 | 7 | 2 | 4 | 1 | 7 | 9 | 3 | 4 |
| 31 | Middle Sullivan Creek | 12 | -0.57 | 11 | 5 | 10 | 6 | 3 | 6 | 1 | 6 | 9 | 1 | 4 |
| 91 | Big/Blue Creeks | 13 | -0.57 | 11 | 4 | 8 | 5 | 3 | 5 | 1 | 9 | 9 | 1 | 5 |
| 113 | Binarch Creek | 13 | -0.57 | 11 | 4 | 8 | 5 | 3 | 5 | 1 | 9 | 9 | 1 | 5 |
| 46 | Upper East Branch LeClerc Creek | 15 | -0.56 | 11 | 5 | 9 | 6 | 3 | 6 | 1 | 6 | 9 | 2 | 4 |
| 45 | Lower East Branch LeClerc Creek | 16 | -0.56 | 11 | 8 | 9 | 5 | 3 | 6 | 1 | 6 | 9 | 2 | 4 |
| 19 | Sweet/Lunch Creek | 17 | -0.56 | 10 | 6 | 9 | 4 | 3 | 5 | 1 | 7 | 8 | 1 | 11 |
| 6 | McCloud Creek | 18 | -0.54 | 11 | 7 | 10 | 5 | 3 | 5 | 1 | 7 | 7 | 1 | 4 |
| 42 | Middle West Branch LeClerc Creek | 19 | -0.53 | 11 | 7 | 10 | 4 | 3 | 8 | 1 | 4 | 9 | 2 | 4 |
| 5 | Davis/Kent Creeks | 20 | -0.51 | 11 | 9 | 10 | 8 | 1 | 4 | 1 | 6 | 6 | 1 | 5 |

| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 54 | Lower Skookum Creek | 21 | -0.41 | 10 | 8 | 8 | 10 | 2 | 5 | 1 | 5 | 7 | 4 | 3 |
| 35 | Lower Sullivan Creek | 22 | -0.38 | 10 | 8 | 7 | 2 | 3 | 6 | 1 | 3 | 9 | 3 | 11 |
| 1 | Main Pend Oreille River | 23 | -0.33 | 8 | 8 | 6 | 8 | 2 | 5 | 1 | 4 | 6 | 3 | 8 |

Table 14.16. Tornado diagram for mountain whitefish in the Pend Oreille Subbasin. Degree of confidence for protection and current habitat conditions range from 0.0 to 1.0 with the greatest confidence equal to 1.0. Protection reach scores are presented on the left side and current habitat reach scores are presented on the right. Negative scores are in parentheses.

NP = Not present

| Sequence | Reach Name | Protection Confidence | Current Habitat Condition Confidence |
|---|---|---|---|
| 1 | Main Pend Oreille River | 0.50 | 0.38 |
| 2 | Bead Lake | NP | |
| 3 | Marshal Lake/Creek | 0.42 | 0.21 |
| 4 | Shearer Lake | NP | |
| 5 | Davis/Kent Creeks | 0.42 | 0.21 |
| 6 | McCloud Creek | 0.50 | 0.25 |
| 7 | Lower Calispell Creek | 0.33 | 0.17 |
| 8 | Kalispel Reservation | NP | |
| 9 | Dry Canyon | NP | |
| 10 | Maitlen Creek | NP | |
| 11 | Three Mile Creek | 0.33 | 0.17 |
| 12 | Lime Creek | 0.50 | 0.25 |
| 17 | Pocahontas Creek | 0.50 | 0.25 |
| 18 | Sullivan Lake | 0.50 | 0.25 |
| 19 | Sweet/Lunch Creek | 0.50 | 0.25 |
| 20 | Power Plant | NP | |
| 21 | Renshaw Creek | 0.50 | 0.25 |
| 27 | Slate Creek | 0.50 | 0.25 |
| 31 | Middle Sullivan Creek | 0.50 | 0.25 |
| 32 | Pass Creek | 0.50 | 0.25 |
| 33 | Mill Pond | NP | |
| 34 | North Fork Sullivan Creek | NP | |
| 35 | Lower Sullivan Creek | 0.50 | 0.25 |
| 36 | Lower Sand Creek | 0.50 | 0.25 |
| 38 | Lower Harvey Creek | 0.50 | 0.25 |
| 39 | Middle Harvey Creek | 0.50 | 0.25 |
| 40 | North and Middle Fork Harvey Creek | 0.50 | 0.25 |
| 41 | Lower West Brach LeClerc Creek | 0.50 | 0.25 |
| 42 | Middle West Branch LeClerc Creek | 0.50 | 0.25 |
| 43 | Upper West Branch LeClerc Creek | 0.50 | 0.25 |
| 44 | Middle Branch LeClerc Creek | 0.50 | 0.25 |
| 45 | Lower East Branch LeClerc Creek | 0.50 | 0.25 |
| 46 | Upper East Branch Leclerc Creek | 0.50 | 0.25 |
| 47 | Middle Creek | 0.50 | 0.25 |
| 48 | Lower Mill Creek | 0.50 | 0.25 |
| 49 | Upper Mill Creek | NP | |
| 50 | Lower CCA Creek | 0.50 | 0.25 |
| 51 | Upper CCA Creek | NP | |
| 52 | South Skookum Creek | 0.50 | 0.25 |
| 53 | North Skookum Creek | 0.50 | 0.25 |
| 54 | Lower Skookum Creek | 0.50 | 0.25 |
| 55 | Upper Skookum Creek/Lakes | NP | |
| 56 | Lower Indian Creek | 0.33 | 0.17 |
| 57 | Upper Indian Creek | 0.50 | 0.25 |
| 58 | South Fork Calispel Creek | 0.50 | 0.25 |
| 64 | Lower Winchester Creek | 0.33 | 0.17 |
| 65 | Upper Winchester Creek | 0.50 | 0.25 |
| 66 | Dorchester Creek | NP | |
| 67 | Lower Small Creek | 0.33 | 0.17 |
| 68 | Upper Small Creek | NP | |
| 69 | East Fork Small Creek | 0.50 | 0.25 |



| | | | | |
|---|---|---|---|---|
| 71 | Lower Trimble Creek | 0.33 | | 0.17 |
| 72 | Upper Trimble Creek | 0.33 | | 0.17 |
| 73 | South Fork Tacoma Creek | 0.50 | | 0.25 |
| 74 | Lower Tacoma Creek | 0.33 | | 0.17 |
| 75 | Upper Tacoma Creek | 0.50 | | 0.25 |
| 76 | Lower Cusick Creek | 0.33 | | 0.17 |
| 77 | Upper Cusick Creek | 0.50 | | 0.25 |
| 78 | Lower Ruby Creek | 0.50 | | 0.25 |
| 79 | Upper Ruby Creek | 0.50 | | 0.25 |
| 80 | South Fork Lost Creek | 0.50 | | 0.25 |
| 81 | Lower Lost Creek | 0.50 | | 0.25 |
| 82 | Upper Lost Creek | 0.50 | | 0.25 |
| 83 | Lower Muddy Creeks | 0.33 | | 0.17 |
| 84 | Lower Big Muddy Creek | 0.50 | | 0.25 |
| 85 | Upper Big Muddy Creek | 0.50 | | 0.25 |
| 86 | Little Muddy Creek | 0.50 | | 0.25 |
| 87 | Lower Cedar Creek | 0.33 | | 0.17 |
| 88 | Upper Cedar Creek | 0.50 | | 0.25 |
| 89 | Lost Lake Creek | 0.33 | | 0.17 |
| 90 | Pine/ Peewee Creeks | NP | | |
| 91 | Big/Blue Creeks | 0.17 | | 0.21 |

### 14.5.4 Current Management

Within the Pend Oreille Subbasin, mountain whitefish are currently managed under statewide size and daily bag limits for recreational fishing for this species, which identify no minimum size and a daily limit of 15 fish (Washington) and 25 fish (Idaho). Biologists have recognized the ecological and recreational importance of mountain whitefish and are aware of the many data gaps associated with this species. To avoid over exploitation of this species and create a baseline for future management strategies, more information is needed regarding life history strategies, population sizes, abundance, capacity, and genetic integrity.

## 14.6 Focal Species – Kokanee

Kokanee are not native to the Pend Oreille Subbasin but have established themselves as a keystone species in Lake Pend Oreille since being introduced through emigration from Flathead Lake in the 1930s. Kokanee are an important food item for bull trout, rainbow trout, lake trout, bald eagles, and other wildlife. In addition, kokanee provide cultural and recreational value.

### 14.6.1 Historic Status of Kokanee

Kokanee from Whatcom Lake, Washington were introduced into Flathead Lake, Montana in 1916. The species moved downstream into Lake Pend Oreille in a flood in 1933 (N. Horner, IDFG, personal communication, July 2003). Sustainable populations were established by the 1950s in Lake Pend Oreille and Priest Lake. Kokanee were also introduced in Sullivan Lake and Bead Lake in the early 1900s; however, the origin of these kokanee is unknown.

#### 14.6.1.1 Lake Pend Oreille Kokanee

The Lake Pend Oreille kokanee fishery was one of the most significant kokanee fisheries in the western U.S. and Canada from the 1940s to the 1970s (Bowles et al. 1991). From 1951 to 1965, kokanee harvest averaged 1 million fish annually with a high of 1.3 million

fish in 1953. This made Lake Pend Oreille the largest fishery in Idaho. Kokanee abundance began declining dramatically in 1966 concurrent with deeper drawdowns of the lake (Maiolie and Elam 1993) and the introduction of Mysis shrimp (*Mysis relicta)* (Figure 14.5). Further discussions about the decline of kokanee and efforts to rebuild the population in Lake Pend Oreille are presented in the next section, 14.6.2 Current Status.

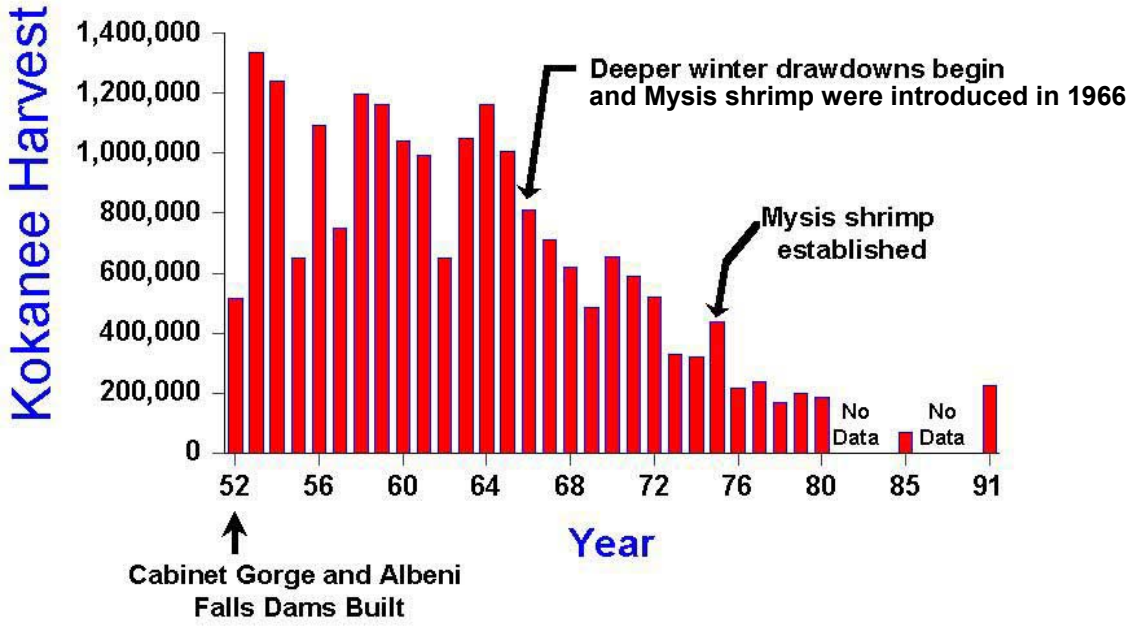



Figure 14.5. Decline in kokanee harvest from Lake Pend Oreille, Idaho concurrent with the deeper winter drawdowns and introduction of Mysis shrimp in the 1966. The establishment of Mysis shrimp occurred in the 1970s.

### 14.6.1.2 Priest Lake Kokanee

Kokanee were introduced into Priest Lake in the late 1940s from the same stock that colonized Lake Pend Oreille. They provided a very popular high yield fishery from the early 1950s until the early 1970s (Bowles et al. 1991) (refer to Figure 14.1). From 1956 to 1970 the average annual kokanee harvest was over 60,000 fish (Rieman et al. 1979, as cited in Bowles et al. 1991). Mysis shrimp were introduced to Priest Lake from 1965 to 1968 and became well established by the early 1970s concurrent with the increase in lake trout, which benefited from Mysis shrimp forage (Bowles et al. 1991). The kokanee fishery in Priest Lake collapsed in 1976, eight years after the introduction of Mysis shrimp (Bowles et al. 1991). Lake trout predation is believed to be the principal factor for fishery collapse (Bowles et al. 1991). In 2001, a substantial number of kokanee were observed spawning on a historic spawning bed in Priest Lake. Since then, the numbers have increased to where in 2003, over 3000 kokanee were recorded in single spawner counts along the shoreline of Priest Lake. Refer to Section 14.1.2, Artificial Production under subheading Priest River for more information regarding kokanee in Priest Lake.

### 14.6.1.3 Sullivan Lake Kokanee

The first documented stocking of kokanee in Washington state was in Sullivan Lake in 1904 when the U.S. Bureau of Fisheries planted 10,000 fry of unknown origin (Crawford 1979). Since then, kokanee were only stocked from 1933-1944 and once in 1976 by WDFW (Table 14.17) (WDFW, unpublished data).

Table 14.17. WDFW kokanee stocking records in Sullivan Lake 1933-1944, and 1976

| Lake | Year | Number | Lake | Year | Number |
|---|---|---|---|---|---|
| Sullivan | 1933 | 110000 | Sullivan | 1942 | 852700 |
| Sullivan | 1934 | 86000 | Sullivan | 1943 | 1500000 |
| Sullivan | 1935 | 75625 | Sullivan | 1943 | 60000 |
| Sullivan | 1936 | 54000 | Sullivan | 1944 | 190500 |
| Sullivan | 1936 | 23840 | Sullivan | 1944 | 76200 |
| Sullivan | 1937 | 60000 | Sullivan | 1944 | 228500 |
| Sullivan | 1937 | 15000 | Sullivan | 1945 | 92009 |
| Sullivan | 1938 | 200000 | Sullivan | 1945 | 184018 |
| Sullivan | 1939 | 227450 | Sullivan | 1945 | 92009 |
| Sullivan | 1940 | 73666 | Sullivan | 1945 | 337337 |
| Sullivan | 1941 | 208800 | Sullivan | 1976 | 197960 |

(*Source:* WDFW, unpublished data).

### 14.6.1.4 Bead Lake Kokanee

Historical stocking records from WDFW (unpublished data) indicate kokanee were stocked in Bead Lake between 1933 and 1949 (Table 14.18).

Table 14.18. The year and number of kokanee stocked in Bead Lake between 1933 and 1949

| Lake | Year | Number | Lake | Year | Number |
|---|---|---|---|---|---|
| Bead | 1933 | 216287 | Bead | 1945 | 249900 |
| Bead | 1934 | 175000 | Bead | 1945 | 373000 |
| Bead | 1935 | 140000 | Bead | 1945 | 374000 |
| Bead | 1935 | 60000 | Bead | 1945 | 183910 |
| Bead | 1935 | 56000 | Bead | 1946 | 149950 |
| Bead | 1935 | 23420 | Bead | 1946 | 199900 |
| Bead | 1936 | 150000 | Bead | 1946 | 399800 |
| Bead | 1937 | 99615 | Bead | 1946 | 178850 |
| Bead | 1938 | 150000 | Bead | 1947 | 323800 |
| Bead | 1938 | 77108 | Bead | 1947 | 237950 |
| Bead | 1939 | 318580 | Bead | 1947 | 12639 |
| Bead | 1940 | 299700 | Bead | 1947 | 8500 |
| Bead | 1941 | 828465 | Bead | 1947 | 33797 |

| Lake | Year | Number |
|---|---|---|
| Bead | 1941 | 362830 |
| Bead | 1941 | 147400 |
| Bead | 1942 | 229800 |
| Bead | 1943 | 850150 |
| Bead | 1943 | 100000 |
| Bead | 1943 | 98000 |
| Bead | 1944 | 99900 |
| Bead | 1944 | 99900 |
| Bead | 1944 | 99900 |
| Bead | 1944 | 99900 |
| Bead | 1944 | 99900 |
| Bead | 1944 | 99900 |
| Bead | 1944 | 99900 |
| Bead | 1944 | 99099 |
| Bead | 1944 | 99900 |
| Bead | 1944 | 99900 |
| Bead | 1944 | 144500 |

| Lake | Year | Number |
|---|---|---|
| Bead | 1947 | 22228 |
| Bead | 1947 | 7200 |
| Bead | 1947 | 5850 |
| Bead | 1947 | 17600 |
| Bead | 1947 | 9798 |
| Bead | 1948 | 15106 |
| Bead | 1948 | 33000 |
| Bead | 1948 | 27334 |
| Bead | 1948 | 244000 |
| Bead | 1949 | 36791 |
| Bead | 1949 | 35990 |
| Bead | 1949 | 64716 |

(*Source*: WDFW unpublished data)

## 14.6.2 Current Status

In the Pend Oreille Subbasin, kokanee salmon are currently present in Bead Lake, Sullivan Lake, Mill Pond, Priest Lake, Upper Priest Lake, and Lake Pend Oreille. Populations in Lake Pend Oreille had dropped significantly and are currently showing signs of recovery. The Priest Lake population, which had collapsed in the 1970s, may be making a comeback with spawner counts increasing over the last three years. Upper Priest Lake populations appear to remain depressed. Bead and Sullivan lakes have self-sustaining populations, however the Sullivan Lake kokanee population was enhanced in 2002 and 2003 through manual egg collection, rearing of fry in the Colville Hatchery, and release of fingerlings back into the lake.

### 14.6.2.1 Lake Pend Oreille Kokanee

Kokanee salmon populations in Lake Pend Oreille have declined precipitously since the mid-1960s (Figure 14.6). The kokanee population in Lake Pend Oreille is monitored annually by mid-water trawling and hydroacoustics. In 1999, kokanee abundance (ages 1 to 5) hit an all-time low of 2.8 million, with a biomass with a biomass of 249 metric tons, an annual production rate of 256 metric tons, and an annual yield to all sources of mortality of 271 metric tons (Maiolie et al. 2002). For comparison, abundance (ages 1 to 5) was 7.3 million kokanee in 1996, with a biomass of 353 metric tons, an annual production rate of 278 metric tons, and an annual yield of 275 metric tons (IDFG files). By 2003, kokanee abundance had turned the corner and recovered to pre-1997 flood estimates with total abundance (ages 1 to 5) estimated at 5.7 million (Maiolie et al. 2002).

These recent declines in kokanee abundance are considered very serious since even the higher abundance observed in 2003 was only at one-quarter of the population's recovery goal for an adult population size of 3.75 million. This estimate for an adult population

size would allow for a harvest goal of 750,000 fish per year. In an effort to re-establish a harvestable kokanee population, the kokanee fishery has been closed since 2000.

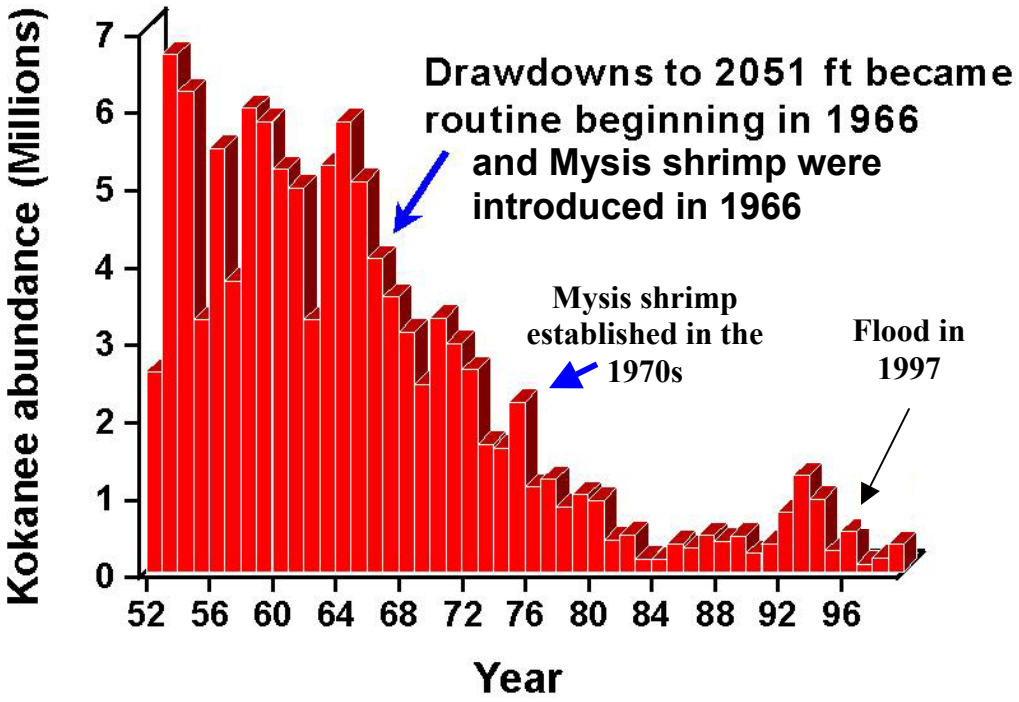



Figure 14.6. Estimates of kokanee abundance in Lake Pend Oreille, Idaho

There are several factors that have been identified with the decline of kokanee including competition by Mysis shrimp with kokanee fry for cladoceran zooplankters (Rieman and Falter 1981; Rieman and Bowler 1980), reductions of shoreline spawning gravels from dam operations (Maiolie et al. 2002; Fredericks et al. 1995; Paragamian and Ellis 1994; Maiolie and Elam 1993; Bowles et al. 1991), an increasing effect of predation as a result of the kokanee population being low (Maiolie et al. 2002), and a possible increase of predatory fish as a result of the Mysis shrimp prey base (M. Maiolie, Fisheries Biologist, IDFG, personal communication, 2003).

In general Mysis shrimp introduction in northern Idaho has resulted in both positive and negative effects on the fish community (Bowles et al. 1991). The overall management strategy associated with Mysis shrimp introduction in North America lakes has been to enhance the forage base for kokanee (Northcote 1991). However, long-term effects have often been detrimental (Bowles et al. 1991; Northcote 1991). Kokanee declines have been documented to be a result of competition between kokanee fry and Mysis shrimp for cladoceran zooplankters such as *Daphnia* spp. and *Bosmina longirostris* (Rieman and Falter 1981; Rieman and Bowles 1980). Higher mortality of smaller kokanee is consistent with the hypothesis Mysis shrimp adversely affect kokanee during their post-emergent stage of development while larger kokanee fry probably are able to feed more effectively on alternative forage items (Bowles et al. 1991). However, Clarke and Bennett (2002) found (in an in situ net pen experiment in Lake Pend Oreille) growth and survival of

emergent kokanee fry was possible on a diet dominated by copepods rather than cladoceran, thus contesting the previously mentioned hypothesis.

Mysis shrimp were introduced to Lake Pend Oreille in 1966 and in 1970 totaling between 50,000 to 300,000 Mysis shrimp (Rieman and Falter 1981). Water samples were not initiated until September 1969 (Rieman 1976), and Mysis shrimp were not detected in the water samples until 1972, six years after the initial introduction (Bowles et al. 1991). Shortly thereafter in 1976 (ten years after initial introduction), the Mysis shrimp population reached carrying capacity (Rieman and Falter 1981). Other studies have also shown within a period of 6 to 10 years after initial introduction, Mysis shrimp can establish a dense population (Langeland et al. 1991; Martinez and Bergersen 1991; Naesje et al. 1991). Additionally, this trend was observed in Flathead Lake located in northwest Montana, where Mysis shrimp approached carrying capacity within 10 years of introduction. In Lake Pend Oreille, records show kokanee harvest had decreased to one-third its former level before Mysis shrimp became well established in the 1970s (Figure 14.5).

Once Mysis shrimp were well established in Lake Pend Oreille (mid-1970s), it was hypothesized that Mysis shrimp were out-competing kokanee fry for cladoceran zooplankters (Rieman and Bowler 1980, Rieman and Falter 1981) since the adult kokanee numbers continued to decline after some adjustments were made to Albeni Falls Dam operations in the mid-1970s. Later it was concluded that Mysis shrimp provided no benefit for older age-classes of kokanee and provided “no indication of negative effects [to kokanee] either” (Bowles et al. 1991).

The establishment of Mysis shrimp in Lake Pend Oreille resulted in a less dramatic reduction in cladoceran zooplankters compared to Lake Tahoe where the kokanee population decline followed the establishment of Mysis shrimp (Bowles et al. 1991). In contrast to Lake Tahoe, the morphological characteristics of kokanee in Lake Pend Oreille, such as weight and length of kokanee, did not decline after the establishment of Mysis shrimp (Bowles et al. 1991) and the competition between Mysis shrimp and age-1 and older kokanee was concluded to be minimal (Maiolie et al. 2002; Clarke 1999; Bowles et al. 1991).

Fredericks et al. (1995) found significant declines in shoreline kokanee spawners, but no significant change in abundance of tributary spawning runs in the 1970s. From these data, Fredericks et al (1995) concluded kokanee abundance was related to survival and habitat of the shoreline spawning stock rather than competition from Mysis shrimp. Research by Maiolie et al. (2002) supported this conclusion and found zooplankton abundance was high enough to allow expansion of kokanee. High numbers of Mysis shrimp were not correlated to poorer kokanee egg-to-fry survival.

Historical population trends and harvest data from the 1950s and 1960s indicate winter pool elevation at Albeni Falls Dam affects both kokanee abundance and harvest (Maiolie and Elam 1993). Between 1955 and 1965, winter minimum elevations were about 626.7 m for flood control, while beginning in 1966 the lake was drawn down to 625.3 m to

enhance power production (Maiolie and Elam 1993). The change in drawdown (in 1966) occurred concurrent with the previously mentioned introduction of Mysis shrimp (Reiman and Falter 1981). The annual drawdown level necessary for adequate flood control downstream remains in dispute. Residents of Pend Oreille County (Cusick Valley) remain concerned regarding management of lake levels upstream, specifically for Lake Pend Oreille and the potential flooding impacts downstream. Reducing the flood storage of one or several of the reservoirs upstream may in effect change the timing of higher spring flows and incrementally increase the potential frequency and duration of flooding downstream in places such as the lower Pend Oreille River Valley. Refer to Section 18, Pend Oreille Management Plan, to see how objectives and strategies incorporate concerns regarding the flooding issue in the lower Pend Oreille River Valley. Refer to Appendix J for more information regarding flooding concerns expressed by participants in the Pend Oreille Subbasin Work Team, as well as other IMP Subbasin planning participants.

There are two issues regarding winter drawdown and kokanee survival and abundance including the date at which the minimum winter elevation is stabilized (November 15$^{th}$) and the actual winter pool elevation (Fredericks et al. 1995). Stabilizing the winter minimum elevation helps improve egg-to-fry survival while the winter pool elevation determines the area and location of suitable spawning gravels for kokanee (Fredericks et al. 1995). Historically when the winter pool level was higher than 625 m, kokanee were observed spawning in all shoreline areas of Lake Pend Oreille (Jeppson 1960). Consistent annual drawdowns of the lake to about 625m (2051 ft) exposes much of the historic shoreline gravel and limits kokanee spawning habitat (Fredericks et al. 1995; Maiolie and Elam 1993). Fredericks et al. (1995) estimated an area of 231,000 $m^2$ of suitable spawning gravel (<35 percent fine sediment) exists below the lake elevation of 626.7 m with 85 percent (196,000 $m^2$) of the suitable spawning gravel located between the lake elevations 625.1 m and 626.7 m. However, under current operations the lake elevation in September is drawn down to 625.1 m from the summer pool elevation of 628.6 m, which prevents access to 85 percent of the potential spawning habitat along the shoreline (Fredericks et al. 1995). Substrate below the winter pool elevation (625.1 m) consists of more large cobble and fine sediments (Maiolie and Elam 1993).

Currently, Lake Pend Oreille kokanee primarily spawn in the south end in Scenic Bay and near Bayview where spawning gravel are exposed to greater wave activity (Fredericks et al. 1995). Wave action sorts and cleans the gravel on the shorelines creating silt-free areas for kokanee spawning. Hassemer (1984, as cited in Maiolie and Elam 1993) estimated about 10 percent of the redds found were in areas of clean gravel and the remaining kokanee were spawning in poorer substrate, cleaning 1 to 4 cm of fine sediment before reaching clean gravel. Maiolie and Elam (1993) found historic spawning areas with high quality, clean wave-washed gravel was above the water line during winter drawdown (~625 m). As a result of lower winter pool elevations, the quality of available spawning substrate in these once prominent spawning grounds declined and substrate below the waterline contained more fine sediments (Maiolie and Elam 1993). Suitable spawning gravels were defined as areas with fine sediments (< 6 mm) representing less than 35 percent of the substrate (Fredericks et al. 1995). Gravel surveys conducted in

1994 determined that an increase of 1.6 m in the winter pool level (lake elevation raised to 626.7 m) would result in an increase in the amount of suitable kokanee spawning gravel by 560 percent from 35,370 $m^2$ at 625.1 m to 197,685 $m^2$ at 626.7 m (Fredericks et al. 1995). The additional spawning area would support an estimated additional 1.6 million female kokanee, which translates to a potential increase of about 390,000 female kokanee per 0.3 m increase in elevation (Fredericks et al. 1995). The expansion of spawning locations would also reduce potential for competition among fry (Fredericks et al. 1995).

The Council directed the USACE to change the winter elevation of Lake Pend Oreille beginning in 1996. The lake was to be kept above an elevation of 626 m (2055 ft) for three winters. The IDFG investigated the effect of changed lake levels on kokanee production, the movements of shoreline gravel and sediment, and changes in the abundance of warmwater fish species in the Pend Oreille River. The higher winter lake level (626 m) provided an additional 160,767 $m^2$ of suitable gravel available for kokanee (Fredericks et al. 1995). Kokanee utilized the newly available gravel for spawning and the survival rate for kokanee eggs-to-fry increased from 1.4 percent in 1995 to 9.6 percent in 1998, 6.0 percent in 1999, 10 percent in 2000, and 7 percent in 2001 (Maiolie et al. 2002). Summary results through 2001 are available in the completion report prepared for BPA by Maiolie et al. (2002).

Maiolie et al. (2002) also investigated questions regarding predation levels, the lake's energy budget, zooplankton, food availability for kokanee, Mysis shrimp, and Eurasian water milfoil (*Myriophyllum spicatum*). The study found survival rates of kokanee egg-to-fry improved with the higher winter pool elevation. In addition, locations of suitable spawning gravels changed and expanded with the higher winter pool elevation. Growth and food resources were not limiting for any age class of kokanee. However, predation was found to be high and limiting kokanee abundance in 2000 and 2001 (Maiolie et al. 2002). However by 2003, survival rates of kokanee improved. Kokanee biomass in the lake is increasing, indicating the population is recovering. The higher winter pool elevation also increased the numbers of warmwater fish in the Pend Oreille River (above Albeni Falls Dam) (Maiolie et al. 2002; Karchesky 2002). Lake levels were not found to influence the presence or absence of Eurasian milfoil, which is already well established in the Pend Oreille River above Albeni Falls Dam (Maiolie et al. 2002).

In addition to spawning habitat as a limiting factor, the growth of other exotic populations may be considered. There are a number of predatory fishes (lake trout, bull trout, and Kamloops trout) residing in Lake Pend Oreille contributing to the complexity of the lake's ecology. Recent lake trout population estimates show only 5,200 to 8,100 lake trout over 20 inches in length reside in Lake Pend Oreille (Peterson and Maiolie 2004), indicating a relatively low abundance of lake trout (M. Maiolie, Fisheries Biologist, IDFG, personal communication, 2004). Thus, lake trout predation is not considered a significant factor in depressing kokanee populations (M. Maiolie, Fisheries Biologist, IDFG, personal communication, 2004). Some believe the introduction of the Mysis shrimp in the mid-1960s were beneficial to the lake trout populations in Lake Pend Oreille while adversely impacting kokanee much like the case in Priest Lake (refer to

Bowles et al. 1991) (refer to Section 14.1.2 under subheading Priest River and Section 14.6.1 under subheading Priest Lake). However, the current abundance estimates of lake trout in Lake Pend Oreille (Peterson and Maiolie 2004) does not support this argument, since the lake trout population remains low after 80 years in the lake.

#### 14.6.2.2 Priest Lake and Upper Priest Lake Kokanee

Currently, there are not enough kokanee in Priest Lake to contribute to the fishery. Based on information presented by Bowles et al. (1991), the rehabilitation of the kokanee fishery in Priest Lake did not appear possible in 1991. However, kokanee appear to be making a comeback in Priest Lake without hatchery enhancement. In 2003, over 3000 kokanee spawners were observed along the shoreline in a single weekend count (IDFG files). Spawner counts remained high for three weeks (IDFG files). Refer to Section 14.1.2 Artificial Production under subheading Priest River for more information regarding kokanee in Priest Lake.

In Upper Priest Lake, the last kokanee population survey was conducted in 1989 and estimated 15,700 kokanee (M. Maiolie, Fisheries Biologist, IDFG, personal communication, 2004). Currently, kokanee are still observed spawning on the shoreline and in tributaries in Upper Priest Lake (M. Maiolie, Fisheries Biologist, IDFG, personal communication, 2004). Kokanee are also present in lake trout stomach samples.

#### 14.6.2.3 Sullivan Lake Kokanee

Sullivan Lake is important biologically for its self-sustaining kokanee population. However, the kokanee population has been enhanced the last couple of years (2002 and 2003) through manual egg collection, off site rearing at the Colville Hatchery, and planting fingerlings back in the lake (C. Vail, WDFW, personal communication, 2004). Genetic analysis by Dr. Scholz (Eastern Washington University) confirmed that the Sullivan Lake kokanee are not from the Lake Whatcom stock, but are distantly similar to the Rimrock Lake stock in WDFW Region 2 (C. Vail, WDFW, personal communication, 2004). Sullivan Lake kokanee spawn in Harvey Creek, which flows into the lake at its south end. In 2002 a pilot study was conducted to estimate the kokanee spawning population in Harvey Creek. A sum total of 3,498 unmarked kokanee were collected in the up and downstream traps, including the adjusted carcass count and the supplemental collections (McLellan, WDFW, personal communication, 2003). However, WDFW suspects the abundance of kokanee spawners was underestimated due to technical problems with the trap and will repeat this survey in fall of 2003 with a modified method.

Factors limiting kokanee in Sullivan Lake include a scarcity of stream spawning habitat and the fluctuation of lake level controlled by Sullivan Lake Dam during the spawning season (Andonaegui 2003). Sullivan Lake Dam was originally constructed in 1910 as a wood crib dam and raised the natural lake level 25 feet. The wood crib dam was replaced with a concrete structure in 1922 and does not have a fish passage facility. The dam continues to raise the natural lake level by about 25 feet between June and October. Approximately 1,000 feet of suitable spawning habitat exists in lower Harvey Creek before flows become subsurface. Approximately 12 miles of suitable habitat is presently inaccessible to kokanee above this barrier. The streambed condition may be due to

disruption of the hydraulic capability of the stream to move its bedload by the artificially higher level of the lake. However, it is unclear whether Harvey Creek has experienced an altered flow regime (USFS 1999ce, as cited in Andonaegui 2003).

Currently, there are also some kokanee present in Mill Pond. These kokanee spawn and rear in Sullivan Creek. Biologists have not determined whether this is a remnant kokanee population of sockeye prior to hydro development on the Pend Oreille River or originate from historical stocking conducted (Andonaegui 2003). Kokanee have not been stocked in Eastern Washington streams since the mid-1980s (USFS 1996).

### 14.6.2.4 Bead Lake Kokanee

At present, the Bead Lake fish community consists of kokanee, peamouth, northern pikeminnow, lake trout, pygmy whitefish, burbot, and largescale suckers (Figure 14.7). Currently, there are an estimated 39,755 kokanee (> 150mm) in Bead Lake based on a hydroacoustic and gill net survey conducted in September 1999 by WDFW (Polacek et al. 1999, unpublished data). The majority of kokanee spawn along the shoreline. Sexually mature kokanee spawners range in size 238-311 mm (Polacek et al. 1999, unpublished data) and do not appear to have changed size over the past two decades (C. Vail, Fisheries Biologist, WDFW, personal communication, 2004).

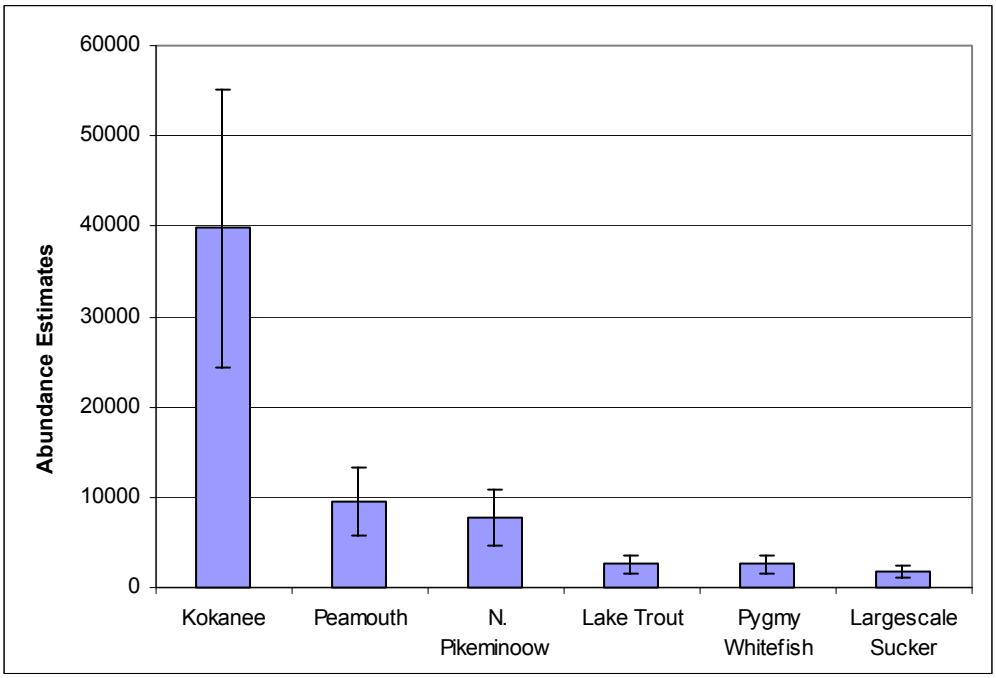



Figure 14.7. Estimated abundance numbers (± 2 standard errors of acoustic abundance) for species greater than 150 mm (Source: Polacek et al. 1999, unpublished data). Burbot were undetected during survey, but observed by local anglers.

The lake habitat is generally of high quality with cool water temperatures and low levels of fine material. Where spawning material is available, it has a low level of embeddedness. However, the littoral habitat having a more gentle topography and suitable substrate material is along the private shoreline. The rest of the lake has a

steepened shoreline unsuitable for spawning habitat with very little riparian or littoral habitat.

At present spawning habitat does not appear to be a limiting factor based on field observations (C. Vail, Fisheries Biologist, WDFW, personal communication, 2004). However, human activities are present in the drainage and could potentially influence spawning habitat in the future. The majority of residential development occurs on the shoreline and the loss of riparian vegetation, soil erosion, and potential increase in nutrients from old septic leakage could negatively impact kokanee spawners in the future.

### 14.6.3 Limiting Factors Kokanee Salmon

Kokanee are a lake species that often utilize riverine habitat for spawning and rearing, thus were included in the QHA approach to identify potential limiting factors to the life stage, spawning and incubation. The QHA method does not evaluate the condition of lake habitats, rather it only considers riverine habitat. Shoreline spawners would thus be excluded from this analysis since this life strategy uses lake habitat. Habitat disturbances impacting kokanee related to or caused by lake level changes were not examined and cannot be addressed through the QHA method. Details of the QHA process are provided in Section 3. Historically, kokanee were not present in the Pend Oreille Subbasin. However, for the purposes of analyzing the species with the QHA, it was necessary to rank the "historic" habitat for the species in the reaches where they presently exist. (QHA will not produce output for reaches where the species is rated as not being present historically.) Another way to consider this was that "historically present" meant "pre-dam construction" for the purpose of kokanee analysis. Kokanee were rated as being historically present in 18 of 167 delineated reaches and watersheds in the Pend Oreille Subbasin. Present habitat conditions of all 18 reaches were compared to reference conditions.

The riverine habitat attributes that were altered the most included channel stability, fine sediments, and low flows (see Table 14.19, also see 14.26). Many of the most disturbed habitats include the lower Clark Fork River and tributaries to Lake Pend Oreille. Kokanee are no longer present in Hoodoo Creek and the Pend Oreille River above Albeni Falls Dam (Table 14.19). The reaches that are most representative of reference habitat conditions are randomly distributed throughout the Subbasin. Upper Priest Lake is ranked the least disturbed, followed by Lake Sullivan watershed and Lake Pend Oreille tributaries (Table 14.20).

The tornado diagram (Table 14.21) and maps (Map PO-7, Map PO-8, located at the end of Section 14) present the reach scores for both current habitat condition (ranging from zero to positive one, Map PO-7) and protection (ranging from zero to negative one, Map PO-8). Scores closest to negative one depict reaches that are most representative of reference habitat conditions. Scores closest to positive one depict reaches with habitat conditions least similar to reference conditions. Confidence scores range from zero to one and are associated with the ratings assigned by local biologists based on documentation or their expert opinion regarding reference and current habitat attributes for each reach.

Table 14.19. Ranking of reaches with the largest deviation from the reference habitat conditions for kokanee in the Pend Oreille Subbasin. A reach rank equal to 1 has the greatest deviation from reference condition in comparison to other reaches. Reach scores range from 0 to 1, with 1 having the greatest deviation from reference. Values associated with each habitat attribute range from 1 to 11, a value of 1 indicates a habitat attribute having the greatest deviation from reference compared to the other attributes within that reach. In some cases multiple habitat attributes have a value of 1 indicating all attributes equally deviate the most from the reference.

| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 167 | Clark Fork River (below Cabinet Gorge Dam) | 1 | 0.4 | 10 | 5 | 6 | 8 | 3 | 3 | 10 | 6 | 9 | 1 | 2 |
| 166 | Lightning Creek below Porcupine Creek | 2 | 0.3 | 10 | 1 | 3 | 5 | 5 | 1 | 10 | 5 | 9 | 5 | 4 |
| 110 | Pend Oreille River above Albeni Falls Dam | 3 | 0.3 | 10 | 1 | 6 | 1 | 1 | 1 | 10 | 6 | 9 | 6 | 1 |
| 108 | Hoodoo Creek | 4 | 0.3 | 10 | 4 | 3 | 1 | 4 | 1 | 4 | 10 | 9 | 4 | 4 |
| 38 | Lower Harvey Creek | 5 | 0.2 | 7 | 1 | 4 | 2 | 5 | 5 | 7 | 7 | 7 | 7 | 2 |
| 158 | Granite Creek (LPO) | 6 | 0.2 | 8 | 1 | 4 | 4 | 4 | 1 | 8 | 8 | 7 | 8 | 1 |
| 5 | Davis/Kent Creeks | 7 | 0.2 | 7 | 1 | 3 | 1 | 7 | 7 | 7 | 4 | 6 | 7 | 5 |
| 159 | Cedar Creek | 8 | 0.2 | 9 | 4 | 7 | 2 | 4 | 2 | 9 | 4 | 7 | 9 | 1 |
| 161 | (South) Gold Creek | 9 | 0.2 | 8 | 3 | 6 | 2 | 3 | 3 | 8 | 8 | 8 | 1 | 7 |
| 163 | Twin Creek | 10 | 0.2 | 8 | 1 | 3 | 1 | 3 | 3 | 8 | 6 | 7 | 8 | 8 |
| 160 | North Gold Creek | 11 | 0.1 | 8 | 2 | 2 | 1 | 2 | 2 | 8 | 8 | 7 | 2 | 11 |
| 162 | Johnson Creek | 12 | 0.1 | 8 | 1 | 3 | 1 | 3 | 3 | 8 | 6 | 7 | 8 | 11 |
| 1 | Main Pend Oreille River | 13 | 0.1 | 8 | 2 | 8 | 8 | 4 | 2 | 8 | 7 | 4 | 4 | 1 |
| 155 | Trestle Creek | 14 | 0.1 | 8 | 1 | 6 | 1 | 8 | 1 | 8 | 8 | 7 | 1 | 5 |
| 18 | Sullivan Lake | 15 | 0.1 | 7 | 2 | 5 | 2 | 1 | 5 | 7 | 7 | 7 | 7 | 4 |
| 93 | Johnson Creek (Pend Oreille River) | 16 | 0.1 | 6 | 2 | 4 | 1 | 6 | 2 | 6 | 6 | 4 | 6 | 6 |

| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 164 | Lightning Creek above Rattle Creek | 17 | 0.1 | 6 | 1 | 3 | 6 | 1 | 6 | 6 | 3 | 5 | 6 | 6 |
| 129 | Upper Priest Lake | 18 | 0.0 | 4 | 1 | 3 | 4 | 4 | 1 | 4 | 4 | 4 | 4 | 4 |

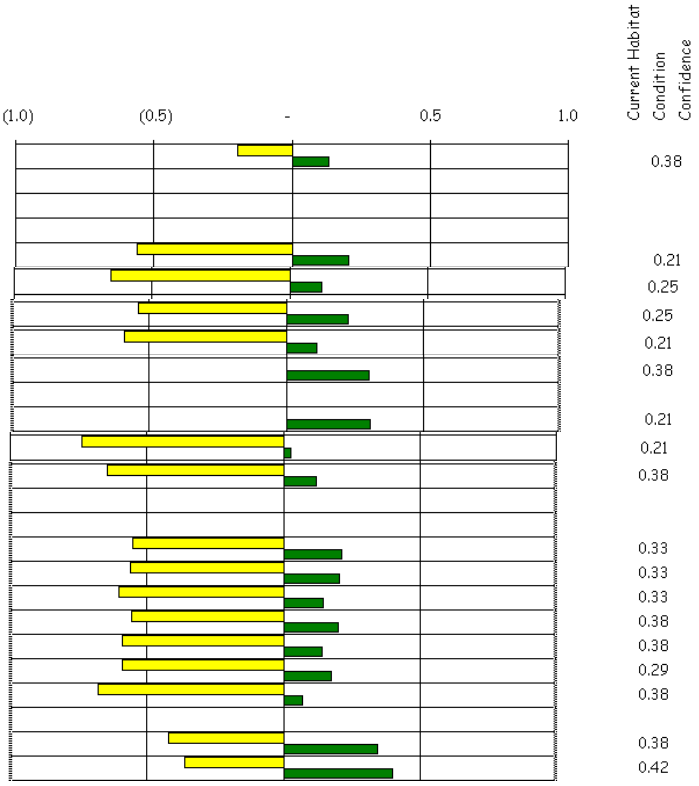
Table 14.20. Ranking of streams whose habitat is most similar to the reference condition for kokanee in the Pend Oreille Subbasin in comparison to other reaches. A reach rank equal to 1 reveals the reach with current conditions most similar to reference conditions in comparison to other reaches. Reach score ranges from 0 to -1, with -1 having the least deviation from reference. Values associated with each habitat attribute range from 1 to 11, a value of 1 indicates a habitat attribute being most similar to the reference compared to the other attributes within that reach. In some cases multiple habitat attributes have a value of 1 indicating all attributes are equally the most similar to the reference.

| Sequence | Reach Name | Reach Rank | Reach Score | Riparian Condition | Channel stability | Habitat Diversity | Fine sediment | High Flow | Low Flow | Oxygen | Low Temperature | High Temperature | Pollutants | Obstructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 129 | Upper Priest Lake | **1** | -0.74 | 11 | 6 | 9 | 1 | 1 | 6 | 1 | 1 | 10 | 1 | 8 |
| 164 | Lightning Creek above Rattle Creek | **2** | -0.68 | 11 | 6 | 9 | 1 | 6 | 1 | 1 | 5 | 10 | 1 | 8 |
| 18 | Sullivan Lake | **3** | -0.65 | 11 | 5 | 9 | 5 | 7 | 4 | 1 | 1 | 10 | 1 | 8 |
| 155 | Trestle Creek | **4** | -0.64 | 11 | 4 | 9 | 4 | 1 | 4 | 1 | 1 | 10 | 4 | 8 |
| 160 | North Gold Creek | **5** | -0.60 | 11 | 3 | 9 | 8 | 3 | 3 | 1 | 1 | 10 | 3 | 7 |
| 162 | Johnson Creek | **6** | -0.59 | 11 | 7 | 9 | 7 | 4 | 4 | 1 | 3 | 10 | 1 | 6 |
| 93 | Johnson Creek (Pend Oreille River) | **7** | -0.59 | 10 | 5 | 8 | 7 | 1 | 5 | 1 | 1 | 9 | 1 | 10 |
| 163 | Twin Creek | **8** | -0.59 | 11 | 7 | 9 | 7 | 4 | 4 | 1 | 3 | 10 | 1 | 6 |
| 159 | Cedar Creek | **9** | -0.56 | 11 | 3 | 8 | 6 | 3 | 6 | 1 | 3 | 10 | 1 | 9 |
| 5 | Davis/Kent Creeks | **10** | -0.56 | 11 | 7 | 10 | 7 | 1 | 1 | 1 | 5 | 9 | 1 | 6 |
| 161 | (South) Gold Creek | **11** | -0.56 | 11 | 3 | 8 | 6 | 3 | 3 | 1 | 1 | 9 | 9 | 6 |
| 158 | Granite Creek (LPO) | **12** | -0.55 | 11 | 6 | 8 | 4 | 4 | 6 | 1 | 1 | 10 | 1 | 9 |
| 38 | Lower Harvey Creek | **13** | -0.54 | 11 | 7 | 10 | 6 | 4 | 4 | 1 | 1 | 8 | 1 | 9 |
| 166 | Lightning Creek below Porcupine Creek | **14** | -0.42 | 9 | 9 | 8 | 2 | 2 | 9 | 1 | 2 | 7 | 2 | 6 |
| 167 | Clark Fork River (below Cabinet Gorge Dam) | **15** | -0.36 | 10 | 4 | 7 | 2 | 5 | 5 | 1 | 3 | 7 | 7 | 10 |
| 1 | Main Pend Oreille River | **16** | -0.20 | 7 | 7 | 7 | 7 | 2 | 3 | 1 | 4 | 6 | 5 | 7 |

Table 14.21 Tornado diagram for kokanee salmon in the Pend Oreille Subbasin. Degree of confidence for protection and current habitat conditions range from 0.0 to 1.0 with the greatest confidence equal to 1.0. Protection reach scores are presented on the left side and current habitat reach scores are presented on the right. Negative scores are in parentheses.

NP = Not present

| Sequence | Reach Name | Protection Confidence | Current Habitat Condition Confidence |
|---|---|---|---|
| 1 | Main Pend Oreille River | 0.50 | 0.38 |
| 2 | Bead Lake | NP | |
| 3 | Marshal Lake/Creek | NP | |
| 4 | Shearer Lake | NP | |
| 5 | Davis/Kent Creeks | 0.42 | 0.21 |
| 18 | Sullivan Lake | 0.50 | 0.25 |
| 38 | Lower Harvey Creek | 0.50 | 0.25 |
| 93 | Johnson Creek (Pend Orielle River) | 0.17 | 0.21 |
| 108 | Hoodoo Creek | 0.50 | 0.38 |
| 109 | Kelso | NP | |
| 110 | Pend Oreille River above Albeni Falls Dam | 0.17 | 0.21 |
| 129 | Upper Priest Lake | 0.17 | 0.21 |
| 155 | Trestle Creek | 0.50 | 0.38 |
| 156 | Strong Creek | NP | |
| 157 | Trout Creek | NP | |
| 158 | Granite Creek (LPO) | 0.42 | 0.33 |
| 159 | Cedar Creek | 0.42 | 0.33 |
| 160 | North Gold Creek | 0.42 | 0.33 |
| 161 | (South) Gold Creek | 0.50 | 0.38 |
| 162 | Johnson Creek | 0.50 | 0.38 |
| 163 | Twin Creek | 0.33 | 0.29 |
| 164 | Lightning Creek above Rattle Creek | 0.50 | 0.38 |
| 165 | ning Creek between Porcupine and Rattle Creek | NP | |
| 166 | Lightning Creek below Porcupine Creek | 0.50 | 0.38 |
| 167 | Clark Fork River (below Cabinet Gorge Dam) | 0.50 | 0.42 |




## 14.6.4 Current Management

### 14.6.4.1 Lake Pend Oreille Kokanee

Beginning in 2000, an emergency closure was imposed on kokanee harvest to maximize the number of spawners available to rebuild the population in Lake Pend Oreille (M. Maiolie, Fisheries Biologist, IDFG personal communication, 2004). Concurrent with these actions, harvest limits on lake trout and rainbow were relaxed. Kokanee are currently showing signs of improvement in older age classes along with improved survival in fry (Maiolie et al. 2002). Biomass has increased the last three years and numbers of age 1 to 5 year old kokanee have increased over the last four years (agency files). Too high of a predation level and the 1997 flood set the population recovery back and masked the benefits of the improvement in fry survival. The IDFG's management goals are to recover the adult population size to 3.75 million where they can provide forage for trophy species and produce an annual harvest of 750,000 kokanee (IDFG 2001).

### 14.6.4.2 Priest Lake and Upper Priest Lake Kokanee

Currently, kokanee numbers in Priest Lake and Upper Priest Lake are too low to support a recreational or subsistence fishery and kokanee was closed to harvest. The status of

kokanee is unknown for both lakes with the exception in Priest Lake where the number of spawners has been increasing over the last three years. If kokanee are to make a comeback in Priest Lake, the timing of the lake level drawdown needs to be better coordinated to ensure that the lake is down at its minimum level before kokanee spawning begins.

#### 14.6.4.2 Sullivan Lake Kokanee

Sullivan Lake and Harvey Creek are biologically significant for its support of the kokanee population's genetic make-up and its future as a source of eggs and fish for other waters. WDFW is trying to determine if the egg production in various naturally reproducing kokanee populations, such as Sullivan Lake kokanee, is adequate to provide some eggs for stocking programs while maintaining the wild populations at their current levels (McLellan 2003).

#### 14.6.4.3 Bead Lake Kokanee

Historically there was and currently remains limited public access to Bead Lake, although it has increased in the past few years. In order to evaluate the potential impacts from increased recreational use, a baseline study was conducted in September 1999 to estimate the kokanee population (Polacek et al. 1999, unpublished data). Future management decisions or adjustments will be considered or recommended based on deviations from the "baseline." Bead Lake kokanee egg production are not being considered for stocking programs since most of the kokanee are shoreline spawners and harvest of eggs would be too labor intensive.

## 14.7 Focal Species – Largemouth Bass

Largemouth bass was chosen as a focal species because of its value as a recreational and subsistence fishery. Over the past several decades, the largemouth bass fishery has received increasing interest from local Spokane and other statewide fishing clubs and has become an important fishery for Tribal and non-Tribal members.

### 14.7.1 Historic Status

Largemouth bass are not native to the Pend Oreille Subbasin and had no historical presence. In 1916, largemouth bass were introduced to Idaho where they continued to migrate into the Columbia River system.

### 14.7.2 Current Status

Largemouth bass are currently present in Boundary Reservoir (only one fish was observed, R2 Resource Consultants 1998), Box Canyon Reservoir (Ashe 1991), and upstream of Albeni Falls Dam to Lake Pend Oreille (Karchesky 2002). However, largemouth bass are most prevalent in Box Canyon Reservoir. Over-wintering habitat appears to be the primary limiting factor in largemouth bass distribution and abundance in the subbasin. Optimal over-wintering conditions for largemouth bass and other warmwater fishes include habitat with dissolved oxygen > 3 mg/L, water velocities < 0.01 m/s, and temperatures > 1 ˚C (Karchesky 2002).

Largemouth bass are the fourth most common species in Box Canyon Reservoir and have a high recreational value. Abundance is estimated at 600,000 fish, 8 percent of total fish population in the reservoir. Ashe (1991) indicated that largemouth bass growth rates during the first four years in Box Canyon Reservoir were lower than bass from other locations in the northern U.S. and, conversely, growth rates after the fourth year were comparable or even higher than those in other locations. Slower growth combined with a high rate of juvenile mortality associated with over-wintering has reduced the potential for the bass population within the reservoir. Other nonnative species such as yellow perch, pumpkinseed, northern pikeminnow, and adult largemouth bass can negatively impact hatchery supplementation efforts through predation. Once largemouth bass are large enough (age 1-2 years), they start to consume these predators.

In-stream habitat conditions created by Box Canyon Dam generally provide good largemouth bass habitat for spawning and rearing in spring, summer, and fall but not during winter (Fickeisen and Geist 1993). Juvenile over-wintering survival was determined to be the limiting factor for largemouth bass in the Box Canyon Reservoir (Ashe et al. 1991; Bennett and Liter 1991). Lack of cover is believed to be related to observed declines in standing crops of largemouth bass and may result in reduced food availability and higher predation on young-of-year (Brouha and von Geldern 1979). Box Canyon reservoir fluctuations measured at Cusick have had adverse effects on largemouth bass (Figures 14.8 to 14.10). Decreases in reservoir elevation during spawning may cause eggs to be exposed to air while increases in elevation during the same period may increase predator-related mortality. Reservoir fluctuations will result in a decrease in young-of-year age class, resulting in a decrease of overall population (Ashe and Scholz 1992). Over-winter habitat conditions need to provide at least 1.5 m of water depth and water velocities less than 0.06 m/s (Fickeisen and Geist 1993). Higher winter pool levels could result in a seven-fold increase in largemouth bass over-wintering area and a viable fishery (Bennett and DuPont 1990).

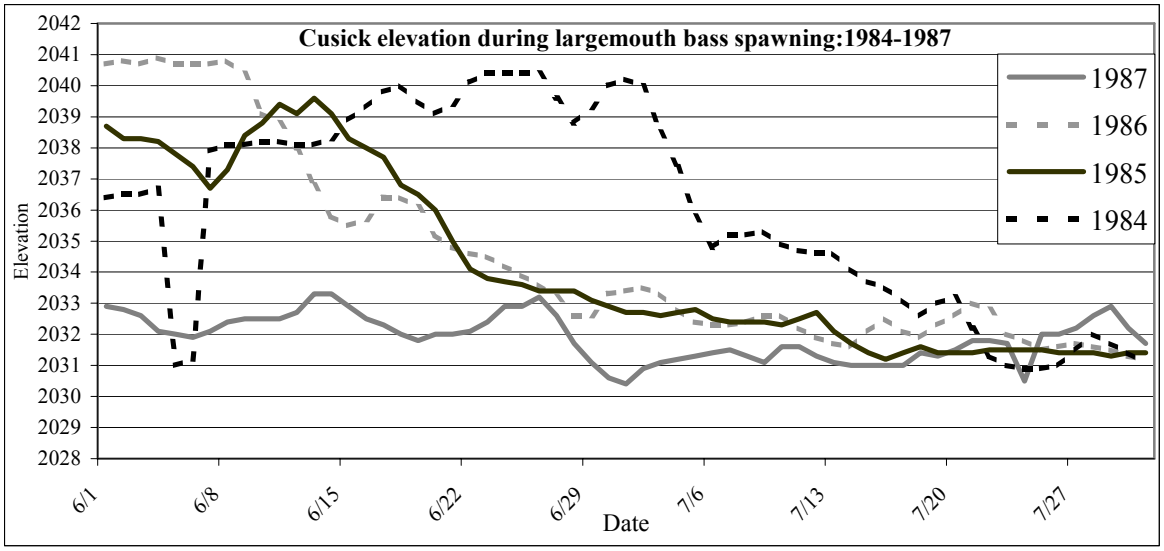


Figure 14.8. Cusick elevations during largemouth bass spawning, 1984 -1987

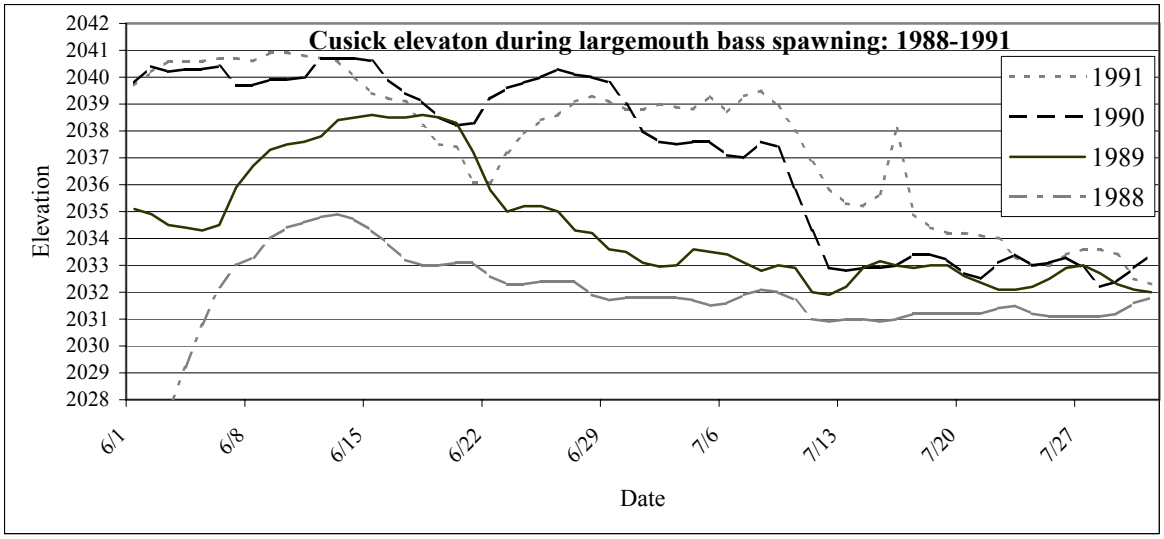



Figure 14.9. Cusick elevation during largemouth bass spawning, 1988 -1991

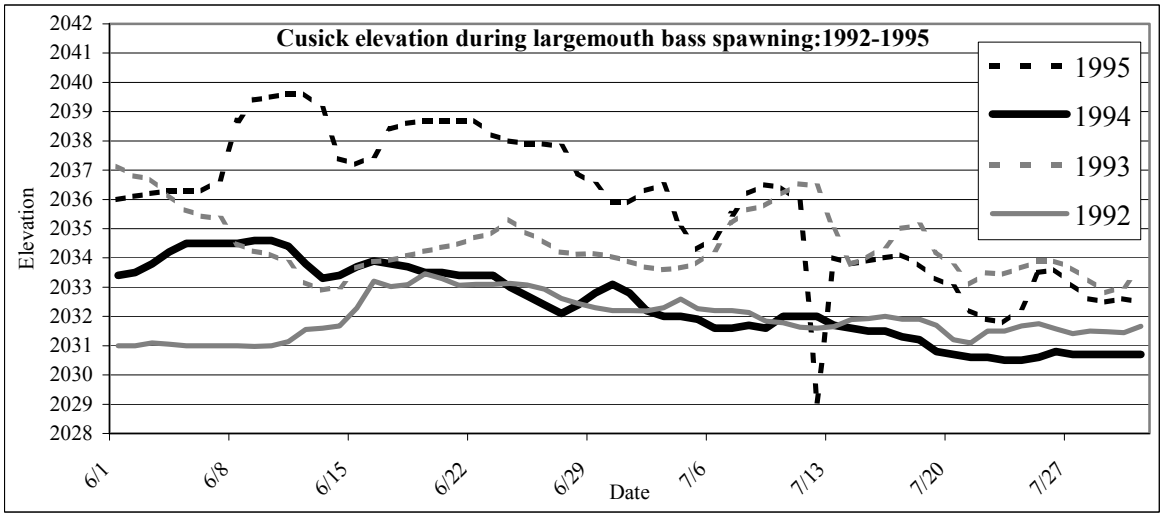



Figure 14.10. Cusick elevations during largemouth bass spawning, 1992 -1995

Although less abundant than in Box Canyon Reservoir, largemouth bass also provide an important recreational opportunity upstream of Albeni Falls Dam. The lack of available over-wintering habitat is suspected to be a limiting factor for largemouth bass above Albeni Falls Dam (Karchesky 2002). After the annual drawdown of 3.5 m (lake elevation 625.1 m) at Albeni Falls Dam, approximately four percent of the summer habitat is available and suitable for over-wintering (Dupont 1994, as cited in Karchesky 2002). From 1996 to 1998, the Council reduced the annual drawdown to 2.1 m (lake elevation 626.5 m), which provided an estimated 7.5 fold increase in available and suitable over-wintering habitat (Dupont 1994, as cited in Karchesky 2002). In 1999, Karchesky (2002) radio-tagged twenty adult largemouth bass and followed their movement through the 2.9 m winter drawdown conditions. He found adult largemouth bass moved to over-wintering

areas in November where they remained until mid-March. These over-wintering habitats were found along the main river channel (Figure 14.11) and included areas with low velocity (<1 cm/s), aquatic vegetation, and favorable thermal conditions. Backwaters were not used, most likely because of limited access to these channels, low water levels, and less than favorable thermal conditions. Karchesky (2002) also found a change in size and age structure of largemouth bass from higher winter water levels resulting in an increase in abundance (indicated by an increase in catch per unit effort) of older individuals and an increase in catchable-sized largemouth bass. Year-classes produced during the high winter water years of 1996,1997, and 1998 accounted for 86 percent of the catch in 1999. However, with a lower water year in 1999, Karchesky (2002) found a disproportionately low number of age 0 largemouth bass and suggested a recruitment failure occurred.

### 14.7.3 Current Management

The Kalispel Tribe substituted largemouth bass for the loss of anadromous salmon as a result of the hydroelectric development on the Columbia River. Currently, the Kalispel Tribal Hatchery is the only entity artificially propagating largemouth bass for the Box Canyon Reservoir, which is funded by the BPA. Annual production goals for the hatchery are 100,000 largemouth bass fry and 50,000 fingerlings (Kalispel Tribe of Indians 2002). The hatchery facility started in 1996.

Within the Washington portion of the Pend Oreille Subbasin largemouth bass are currently managed by WDFW as essentially a self-sustaining population. The main stem of the Pend Oreille River is open year round to fishing.

For the Pend Oreille River above Albeni Falls Dam, higher winter lake level for kokanee will directly benefit largemouth bass abundance. Higher winter lake levels have shown to increase juvenile bass over-wintering survival and thereby recruitment to the overall abundance of largemouth bass.

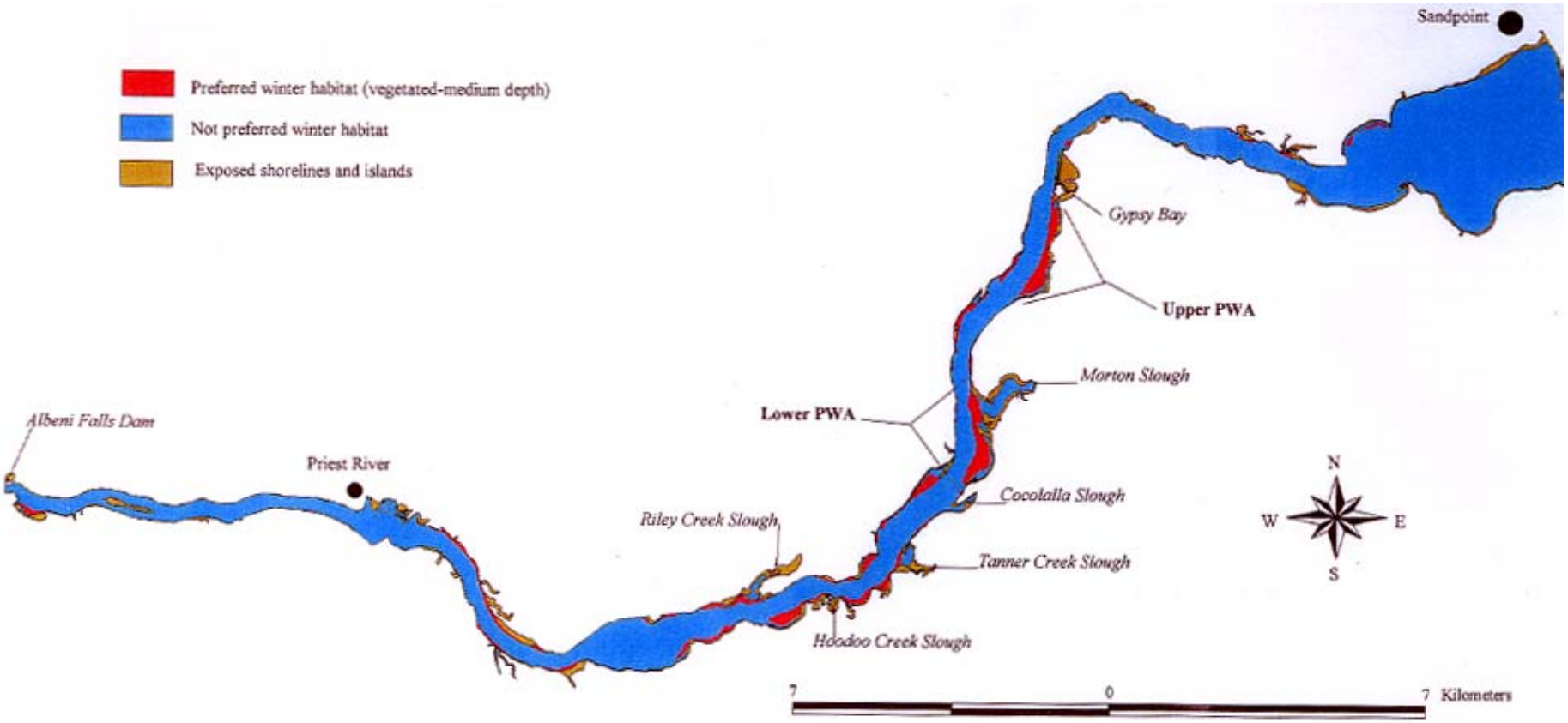



Figure 14.11. Largemouth bass over-wintering habitat between Albeni Falls Dam and the outlet of Lake Pend Oreille (at Sand Point), and their preferred wintering areas (PWA) based on radio telemetry data collected in 1999-2000. (*Source*: Karchesky 2002)

## 14.8 Environmental Conditions[2]

### 14.8.1 Environmental Conditions within the Subbasin

Euro-American settlement of the Clark Fork River Valley and Lake Pend Oreille was accompanied by forest clearing, agricultural development, logging, introduction of nonnative pests, mining, railroad construction, hydroelectric projects, and general urbanization (Entz and Maroney 2001). Natural and man-made fires, past timber harvest activities, and dams have heavily influenced the landscape in the Pend Oreille Subbasin. Native American inhabitants of the intermountain valleys also used wildfire as a game enhancement management tool (Barrett and Arno 1982).

Livestock ranchers and farmers settled the Calispell Valley of the lower Pend Oreille River in the 1880s and chose the fertile sites on the river where flooding frequently occurred (Bamonte 1996). Industry also began to develop in the area during this time. Mining in Metaline Falls encouraged the Idaho and Washington Railroad to construct a railroad from Spokane to Metaline Falls between 1909 and 1913 (Bamonte 1996). Local farmers on the west side of the valley agreed to have the railroad built on their land, which resulted in the construction of the embankment (ballast) for the railroad that also served as a dike during flood conditions. By 1913 the railroad was completed to Metaline Falls and three diking districts had formed in the valley. Flapper valves were located on small culverts that transected the dike; large culverts and pumps were installed in the major tributaries such as Calispell Creek that were behind the dike. In 1955 Box Canyon Dam was constructed and the Cusick Pumps were upgraded then and once again in 1977. The Pumps are operated by the Pend Oreille PUD in conjunction with operation of the dam. The combination of free flow, pumps and dikes/flapper valves reduced potential flooding in the Calispell Valley during the annual two-part spring flow of local runoff (March-April) and high flow runoff (June) coming from the upper Clark Fork and Flathead drainages in Idaho and Montana.

The Pend Oreille Subbasin was first logged from 1905 to 1930 and much of the old-growth timber was removed. Logging roads, railroad lines, and log flumes were used on the mainstem Pend Oreille River and several of its tributaries. Log flumes were common, simplified the in-stream habitat, and decreased the recruitment source for large woody debris. In more recent years, road construction and maintenance, timber harvest, and cattle grazing have degraded stream habitat conditions. Numerous forest fires occurred between 1910 and 1929 and impacted many watersheds. From 1917 to 1929, an estimated 60 to 70 percent of the LeClerc Creek watershed burned. The largest fire in the LeClerc Creek watershed occurred in 1929. Early logging removed much of the old-growth western red cedar in the Clark Fork River delta.

In the early and mid-1900s, hydroelectric facilities within the Pend Oreille Subbasin and upstream in the Clark Fork and Flathead drainages were present or under construction. Facilities in Idaho and Montana such as, Albeni Falls and Hungry Horse dams, as well as Kerr and Noxon dams were built for hydropower, flood protection, and recreation

[2] Large portions of Section 14.8 were contributed to by the Pend Oreille Subbasin Summary Report (2001) pp. 16-23, 79-83, 139-150.

(including fisheries) purposes (U.S. Senate, 1949). Recent changes in the Federal Columbia River Power System (FCRPS) flood control (FC) system, VARQ FC, and the Lake Pend Oreille kokanee experiment were initiated to assess potential benefits for fish species and resulted in higher than normal (625.1 m) winter reservoir levels (USACE 1999). The purpose of VARQ is "… to improve the multi-purpose operation [i.e., … flow objectives for the listed ESA species … ] of Libby and Hungary Horse [dams] while maintaining the current level of system flood control protection in the Columbia River" (USACE 1999). The Council requested the USACE to operate Albeni Falls Dam to support the kokanee experiment by sustaining a higher winter level in Lake Pend Oreille (McGrane 1999). Residents of Pend Oreille County (Cusick Valley) remain concerned regarding management of lake levels upstream, specifically for Lake Pend Oreille and the potential flooding impacts downstream. Reducing the flood storage of one or several of the reservoirs upstream may in effect change the timing of higher spring flows and incrementally increase the potential frequency and duration of flooding downstream in places such as the lower Pend Oreille River Valley.

Large-scale habitat degradation occurred due to operation of Cabinet Gorge, Noxon Rapids, and Albeni Falls dams. Upstream dams impeded sediment transport to the Clark Fork River delta, prohibiting development of delta landforms, and the protective lakeside beach. Widely fluctuating flows associated with dam operations continue to erode delta shorelines that would naturally be protected by armored streambeds during low fall/winter flows. Compounding these impacts is an unnaturally elevated lake level during the growing season due to operations of Albeni Falls Dam. This elevated lake level removed protective vegetation due to deep inundation in areas that were formerly seasonally flooded. Elevated lake levels and lack of protective vegetation and lakeside beach exposed the delta to accelerated erosion associated with a long wind fetch across Lake Pend Oreille. Further, following growing season inundation, poorly vegetated banks slough during drawdown in late summer and early fall. The result has been the loss of roughly 50 percent of functional delta wildlife-habitat and ongoing losses estimated at 3.2 to 4.8 ha per year (Parametrix 1998).

#### 14.8.1.1 Upper Pend Oreille Subbasin

The Pend Oreille River, prior to the construction of Albeni Falls Dam in 1952, provided free flowing riverine habitat that supported a coldwater fishery. Prior to construction of Albeni Falls and Cabinet Gorge dams, the lower Clark Fork River supported important fisheries for migrating kokanee salmon, mountain whitefish, and bull trout. Westslope cutthroat trout were also present in the river and provided a fishery for fluvial and adfluvial fish. Today, the upper Pend Oreille River supports a limited warmwater fishery and the presence of salmonids is very low (Bennett and DuPont 1993). Bennett and Dupont (1993) conducted a two-year survey (1991 to 1992) and found salmonids (native and nonnative species) only accounted for 1.9 percent of all species collected in 1991 and 0.6 percent in 1992. Management direction is to work with USACE on lake level management to improve conditions for fish species.

Fish habitat in tributary streams within the Upper Pend Oreille Subbasin has been impaired through delivery of excess bedload sediment, fine sediment delivery, loss of

large woody debris and riparian forest habitat, channelization, and isolation of streams from their floodplains (PBTTAT 1998). Man-made fish migration barriers and water diversions are scattered around the Subbasin, resulting in loss of access to spawning and rearing habitat and loss of flow and migrating fish to diversions.

During the summer and fall months, the lower 5.4 km of the Clark Fork River (the headwaters of Pend Oreille Lake) are flooded by backwater from Albeni Falls Dam, creating an unproductive environment for native and introduced salmonids. Riverine habitat has been further compromised by Cabinet Gorge Dam and its operations, resulting in blocked fish passage, rapidly fluctuating river flows, and during high water years (1997), total dissolved gas (TDG) levels exceeding 150 percent saturation (Weitkamp et al. 2003).

Cabinet Gorge Dam presents a complete migration block to fish migrating upstream from the Clark Fork River. Steps are underway to restore fish passage as part of the Federal Energy Regulatory Commission (FERC) re-licensing process. Recent studies (1997 to 2000) by Weitkamp et al. (2003) found TDG levels frequently exceeded 120 percent saturation in surface waters (< 2 m) of the lower Clark Fork River and Lake Pend Oreille as a result of river flows spilling over Cabinet Gorge Dam from April to June. The biological effects, such as gas bubble disease (GBD), of TDG supersaturation varied depending on the duration and frequency of exposure (Weitkamp et al. 2003). Many of the resident fishes showed no signs of GBD, which may be related to their depth distribution (Weitkamp et al. 2003). Shallow waters (< 2 m) with higher levels of supersaturation were known to have greater biological effects on fish than deeper waters (Weitkamp et al. 2003; Mesa et al. 2000). No research has been conducted on Lake Pend Oreille concerning the effects of TDG on kokanee eggs or sac fry still in the shoreline gravels.

Avista continues to work to reduce TDG levels and understand the biological effects of supersaturation. The new FERC license for the Clark Fork River projects resulted in an increase in minimum flows released from Cabinet Gorge Dam from 3,002 cfs (85 cubic meters per second, cms) to 5,015 cfs (142 cms). The increased minimum flow results in an improvement via increase of over 4 ha (40,000 $m^2$) of permanently wetted riffle habitat. The effects of modified flow regimes in the lower Clark Fork River resulting from Hungry Horse Dam operations are unknown.

Lake Pend Oreille system continues to provide areas of suitable rearing habitat for coldwater fish species, but Albeni Falls Dam operations (operated by USACE) have resulted in impaired shoreline spawning habitat for kokanee salmon. Over 190,000 $m^2$ of high quality kokanee spawning habitat are estimated to be lost due to current operations lowering the level of Lake Pend Oreille to 625.1 m during the winter months (Fredericks et al. 1995). Lowering of the lake to 625.1 m each year has not allowed for shoreline gravel to be cleaned and resorted at a depth where it is available for kokanee spawning and may be the single largest factor contributing to kokanee declines (Maiolie and Elam 1993). Consequently, most kokanee spawning takes place at the south end of the lake where conditions are favorable with less than 35 percent sediment fines and greater wave

activity (Fredericks et al. 1995). Studies are currently underway that address how dam operations may be changed to improve shoreline spawning.

Lake Pend Oreille's nutrient budget may also be affected by Albeni Falls Dam operations. Prior to impoundment, Lake Pend Oreille flooded well-vegetated shoreline areas during the spring, which likely resulted in an influx of nutrients to the lake at the onset of the summer growing season. Albeni Falls Dam operations inundated shoreline vegetation, resulting in an initial significant release of nutrients. Over time, that vegetation has been lost and higher elevation vegetation is only rarely flooded. Thus, it is possible that an important seasonal source of nutrients has been lost. Human caused eutrophication resulting in Lake Pend Oreille being included on the 303(d) list does not mitigate for the sterilization of the shoreline.

Open water nutrient levels in the lake are remaining largely unchanged over time. The deepness of the lake makes it a nutrient sink. Early summer nutrient releases would benefit plankton blooms and growth of kokanee salmon and other juvenile fish. Drawdown of Lake Pend Oreille results in an unproductive shoreline environment for production of aquatic invertebrates, potentially reducing a food source for shoreline feeding species such as cutthroat trout. Shoreline flooding would inundate emergent vegetation if the lake had good aquatic vegetation at its perimeter. Flooding and aquatic vegetation would provide productive environments for aquatic insects and rearing of small fishes. Cutthroat trout and bull trout would find a more available and abundant food source.

Raising the winter lake level by 1.2 m (4 ft) reduces the available spring storage in Lake Pend Oreille by 360,000 acre-feet (Kokanee Recovery Task Force 1999). One of the consequences of raising the lake levels in Lake Pend Oreille will be the potential increased risk of flooding around the lake and downstream below Albeni Falls Dam along the lower Pend Oreille River. Lake Pend Oreille, at lower winter elevations, may reduce the impacts of high runoff by acting as a cushion during the runoff months of May and June when residents and landowners are most affected. This risk in the lower Pend Oreille River may be further reduced if proper procedures are followed by the Pend Oreille PUD at Box Canyon Dam when certain reservoir water elevations are reached, if downstream pumping facilities are updated, and better cooperation takes place between the USACE, Pend Oreille PUD, and the downstream drainage districts (McGrane 1999).

#### 14.8.1.2 Lower Pend Oreille Subbasin

Historically, the lower Pend Oreille River in Washington, north of Metaline Falls, and Canada supported anadromous salmon that the Kalispel Tribe relied heavily upon for subsistence as well as ceremonial, religious and other cultural uses (Kalispel Tribe of Indians 2002). The construction of dams on the Columbia River, specifically Chief Joseph and Grand Coulee Dams, extirpated upstream anadromous fish migrations from traditional Kalispel Tribal fishing sites within the Pend Oreille Subbasin.

The Pend Oreille River, located in northeastern Washington, was historically a free flowing river. The Pend Oreille River (from the outlet of Pend Oreille Lake downstream

to Canada) was described in 1894 as "most places there [have] a good, strong current, becoming dangerous rapids in the narrower places" (Gilbert and Evermann 1895). Gilbert and Evermann (1895) characterized Box Canyon as a "narrow gorge about 1.5 miles long … [where] the river rushes through the narrow passage with a very strong current … [however], there is nothing here to stop the ascent of salmon." Gilbert and Evermann (1895) also described "the river between Box Canyon and Metaline Falls [as having] a good strong current, but no falls or rapids. The total fall [Metaline Falls] is perhaps as much as 30 feet, but it is in a series of rapids, there being no vertical drop at all. The stream is here enclosed between high rocky walls and is very turbulent for some distance. Salmon could probably ascend these falls without much difficulty."

In 1912, the USGS surveyed the Pend Oreille River from the U.S. to Canadian boundary upstream to the confluence with the Priest River. The USGS's survey covered more than 79 miles of the river, thus the reach scale is relatively large (reach = 1 mile distance). River reach gradients (ft/mile, presented in Table 14.22) between Z Canyon and Metaline Falls, Metaline Falls and Box Canyon, and Box Canyon to Albeni Falls were relatively low (less than < 1.5 percent). However, a low gradient stream does not translate to a water body having a low velocity. In contrast, the "slope is an inverse relationship of discharge" such that "as the quantity of water in a stream increases, the down-valley slope of the water surface decreases" (Bloom 1969). Furthermore, "water flows more efficiently in larger channels, and therefore requires less slope to maintain its velocity" (Bloom 1969). This is observed in other high order streams such as Columbia River, Snake River, Missouri River, and Mississippi River.

Table 14.22 Elevation change along the Pend Oreille River downstream from the U.S.-Canadian border upstream to where Box Canyon Dam is located today based on USGS survey data from 1912. Survey data shows a 20-30 foot vertical drop at Metaline Falls between RM 10 and RM 11.

| Location | River Mile | Elevation (ft) | ft/mile |
|---|---|---|---|
| **U.S.-Canadian Border** | 0 | 1744 | |
| | 1 | 1748 | 4 |
| **Downstream Z Canyon** | 2 | 1760 | 12 |
| | 2.5 | 1790 | 60 |
| | 3 | 1818 | 56 |
| | 4 | 1838 | 20 |
| | 5 | 1860 | 22 |
| | 6 | 1890 | 30 |
| | 7 | 1908 | 18 |
| | 8 | 1922 | 14 |
| | 9 | 1940 | 18 |
| **Downstream Metaline Falls** | 10 | 1948 | 8 |
| | 10.5 | 1949 | 2 |
| | 10.75 | 1968 | 76 |
| **Upstream Metaline Falls** | 11 | 1970 | 22 |
| **Upstream of Box Canyon Dam** | 19 | 1986 | 4 |
| **Upstream of Albeni Falls** | 75 | 2024 | 1 |

Currently, the lower Pend Oreille River is described to be:

> no longer suitable for the production of trout as it was known for. It appears that water temperature, lack of habitat diversity and possibly food availability are the major factors that limit trout production in the Box Canyon reach of the Pend Oreille River. Only about 8 miles (15 percent) of the Box Canyon reach is even close to being considered riverine habitat preferred by trout. … The other 46 miles of the river represents mainly shallow slow moving water, numerous sloughs and backwater areas and an abundance of macrophytes (Ashe and Scholz 1992, p. 198, as cited in Andonaegui 2003).

The consensus is that habitat for native salmonids has been altered and continues to be altered from historic conditions in the Pend Oreille River. However, the cause of these changes remains in dispute. The significant decline in native salmonid populations, particularly bull trout and westslope cutthroat trout, in the Lower Pend Oreille Subbasin are believed to be correlated to: 1) habitat degradation on the mainstem and tributaries, 2) introduction and management of nonnative species, 3) man-made fish barriers into tributaries, and 4) the five hydroelectric facilities on the mainstem of the Pend Oreille River (Andonaegui 2003). These mainstem hydroelectric facilities include Waneta (Canada), Seven Mile (Canada), Boundary (U.S.), Box Canyon (U.S.), and Albeni Falls (U.S.). None of these dams were built with fish passage facilities. Other dams and diversions located in Pend Oreille tributaries include Cedar Creek Dam, Sullivan Lake Dam, Mill Pond Dam, and Calispell Creek pumping station and further fragment the connectivity of native salmonid populations.

In 1955, Box Canyon Dam was constructed, inundating resident trout habitat in the river and creating many backwater and slough areas (Ashe and Scholz 1992), changing the Pend Oreille River from a free-flowing system to a slow flowing, run-of-the-river reservoir (Bennett and Liter 1991). Comparisons of pre-Box Canyon Dam to post-Box Canyon Dam data (USGS 1951-1956, 1962-1966) have shown how hydropower construction and operations have changed historic hydrologic characteristics of the Pend Oreille River (Entz and Maroney 2001). For example, data from USGS Water Resources Division archives (1951-1956; 1962-1966) compare similar or identical discharges measured at the same location (Newport Bridge) and show the mean velocities of Pend Oreille River decreased on the average 0.19 meters per second (mps, 0.63 feet per second, fps). Mean channel width increased an average 14.3 m (47 feet) and total area increased on the average 163 $m^2$ (1,752 square feet) after Box Canyon Dam was operating (Table 14.23). Spring flows (May-June) were not compared since gates start to be opened at Box Canyon Dam when discharge is greater than 28,500 cfs, until all gates are removed if flows exceed 90,000 cfs. Box Canyon Dam restricts the flows in the Box Canyon reach during flows below 90,000 cfs which usually occur from July to April, although sometimes flows do not exceed 90,000 cfs during the year. Operations of Box Canyon Dam would have less to no effect during the high flow period, discharge exceeding 90,000 cfs.

Table 14.23 A comparison of pre-Box Canyon Dam to post-Box Canyon Dam measured channel widths, areas as well as mean velocity (feet per second), and total discharge (cubic feet per second). All values (width, area, mean velocity, total discharge) were taken on the Pend Oreille River at Newport, Washington.

| Pre-Dam Date | Post-Dam Date | Width (ft) | Area (sq. ft.) | Mean Velocity (fps) | Total Discharge (cfs) |
|---|---|---|---|---|---|
| 3/11/1953 | | 986 | 4,940 | 2.73 | 13,500 |
| | 8/31/1963 | 1,015 | 7,020 | 1.85 | 13,000 |
| | | | | | |
| 3/21/1953 | | 782 | 2,940 | 1.61 | 4,740 |
| | 8/26/1963 | 1,000 | 5,710 | 0.85 | 4,870 |
| | | | | | |
| 7/3/1952 | | 1,076 | 8,830 | 3.15 | 27,800 |
| | 10/24/1963 | 1,075 | 11,400 | 2.49 | 28,400 |
| | | | | | |
| 12/16/1952 | | 996 | 5,330 | 2.78 | 14,800 |
| | 1/13/1964 | 1,035 | 7,870 | 1.93 | 15,200 |
| | | | | | |
| 7/12/1952 | | 1,040 | 6,920 | 2.98 | 20,600 |
| | 10/15/1964 | 1,060 | 9,500 | 2.15 | 20,400 |
| | 10/18/1966 | 814 | 3,000 | 2.13 | 20,800 |
| | | | | | |
| | | | | | |
| 8/14/1952 | | | | 2.4 | 7,210 |
| | 8/8/1965 | 1,005 | 5,630 | 1.15 | 6,540 |
| | | | | | |
| 7/15/1953 | | 1,056 | 7,940 | 2.95 | 23,400 |
| | 10/12/1965 | 1,060 | 9,960 | 2.42 | 24,100 |
| | | | | | |
| 4/27/1955 | | 1,030 | 7,120 | 3.05 | 21,700 |
| | 3/3/1966 | 1,060 | 9,490 | 2.24 | 21,300 |
| | | | | | |
| 8/30/1954 | | 941 | 3,990 | 2.63 | 10,500 |
| | 10/30/1955 | 1,016 | 5,480 | 1.9 | 10,400 |
| | | | | | |
| 7/3/1952 | | 1,076 | 8,830 | 3.15 | 27,800 |
| | 12/16/1955 | 1,070 | 9,800 | 2.84 | 27,800 |
| | | | | | |

| Pre-Dam Date | Post-Dam Date | Width (ft) | Area (sq. ft.) | Mean Velocity (fps) | Total Discharge (cfs) |
|---|---|---|---|---|---|
| 7/1/1952 | | 1,073 | 8,610 | 3.01 | 26,400 |
| | 1/22/1956 | 1,070 | 9,160 | 2.93 | 26,800 |
| | | | | | |
| 9/24/1953 | | 1,014 | 7,120 | 3.1 | 22,100 |
| | 2/25/1956 | 1,055 | 8,340 | 2.67 | 22,300 |
| | | 940 | 4,390 | | |
| 7/30/1952 | | | | 2.67 | 11,700 |
| | 9/1/1956 | 997 | 5,040 | 2.36 | 11,900 |
| | 10/4/1956 | 1,010 | 5,790 | 1.95 | 11,300 |
| | | | | | |
| 11/2/1953 | | 1,059 | 8,150 | 3.24 | 26,400 |
| | 11/12/1956 | 1,075 | 10,000 | 2.69 | 26,900 |
| | | | | | |
| 2/23/1955 | | 1,018 | 6,380 | 2.87 | 18,300 |
| | 12/9/1956 | 1,015 | 6,990 | 2.6 | 18,200 |
| | 8/3/1964 | 1,040 | 7,870 | 2.29 | 18,000 |

The alteration in aquatic habitat (from fast-flowing to shallow reservoirs) is also illustrated comparing historic to current aerial photos (T. Shuhda, Fisheries Biologist, USFS Colville National Forest, personal communication, 2004). Presently, the lower 0.2 to 2.0 miles of tributaries to Box Canyon Reservoir have been converted from fast flowing stream to slow moving slough habitat (T. Shuhda, Fisheries Biologist, USFS Colville National Forest, personal communication, 2003).

Currently, Box Canyon Reservoir has velocities ranging from 0.03 mps (0.01 fps) during summer low flows to upwards of 0.6 mps (2.0 fps) during high flows (Falter et al. 1991). Nonnative fish such as yellow perch, tench, and largemouth bass dominate the fish community in Box Canyon Reservoir and all of these fish species have an optimum rearing habitat preference for low velocities ranging from zero to 0.18 mps (0.59 fps) (Entz and Maroney 2001, E-3.0 Application for New License Box Canyon Project 2000). Habitat preference curves begin to reach zero for these fish when velocities are greater than 0.2 mps (0.8 fps).

The current velocities in Box Canyon Reservoir are considered unsuitable for native salmonids with the exception of mountain whitefish. Mountain whitefish were the fifth most abundant species captured in Box Canyon Reservoir from November 1988 to December 1989 (Barber et al. 1989). Gill netting, electrofishing and beach seining conducted in Box Canyon Reservoir by the University of Idaho during 1989 and 1990 captured 434 and 1,311 mountain whitefish respectively or 3 and 10 percent of the total fish captured in each year, respectively (Bennett and Liter 1991). During the1990 portion of the University of Idaho study, mountain whitefish represented 10 percent of relative

abundance of all fish captured as compared to 7 and 6 percent, respectively for tench and largemouth bass (Bennett and Liter 1991).

In addition to changes in velocity and channel morphology through inundation, the construction of the mainstem hydropower dams eliminated the stream connectivity for salmonid movement and migration including the connectivity for fluvial and adfluvial bull trout migratory life forms. Based on discussions with local Indians, Gilbert and Evermann (1895) reported bull trout were historically abundant in the lower Pend Oreille River and its tributaries. At present, this is not the case and bull trout are no longer in abundance (Andonaegui 2003). The five-mainstem dams (United States and Canada) have isolated bull trout sub-populations, eliminated individuals from sub-populations, and reduced or eliminated genetic exchange (Entz and Maroney 2001).

While entrainment at hydroelectric facilities has been identified as a threat to bull trout (USFWS 2002, 2000), specific studies designed to evaluate those impacts at Box Canyon and Boundary dams have not been conducted; feasibility studies at Albeni Falls Dam are ongoing to evaluate impacts to fish and determine fish passage needs. Other dams, control structures, and diversions without fish passage facilities (for example, Calispell Creek Pumps, Cedar Creek, Sullivan Creek, and Mill Pond dams) were constructed in tributaries to the Pend Oreille River and have further fragmented native populations and reduced connectivity (Andonaegui 2003, USFWS 2002).

Construction and operation of Box Canyon and Boundary dams have also resulted in the reduction of quality and quantity of available habitat for adult and juvenile salmonids. The mainstem Pend Oreille River has been altered with transformations in flow, bedload, large woody debris transport and recruitment, thermal regime, habitat complexity, introduction of nonnative warmwater fish species, and the introduction of invasive macrophytes (Andonaegui 2003). Typical salmonid spawning and rearing habitat such as pools, glides, riffles and side habitat in the Pend Oreille River and its tributaries have been eliminated in many areas. For example, 162 acres of run/riffle and side-channel habitat have been lost in the mainstem Box Canyon Reservoir and its tributaries (USFS 2002). Downstream of Box Canyon Dam, it is unclear whether the Boundary Dam reach could ever be considered a cold flowing section of river as Boundary Dam is a peaking facility with manipulated flows (< 90,000 cfs) year round. The loss or change in cold water upwellings and effects to tributary confluences due to inundation of the Pend Oreille River is currently unknown.

Elevated river temperatures during the summer months continue to be an environmental issue for native salmonids in the Pend Oreille River. Water received annually from Lake Pend Oreille to the Pend Oreille River is of a naturally elevated temperature that occurred historically during the summer months. Pend Oreille PUD suggest these warmer summer temperatures (greater than 20 $^{o}$C) may have been a natural occurrence prior to the construction of Albeni Falls Dam (P. Buckley, Pend Oreille PUD, personal communication, 2004). However, measurements of historical water temperatures prior to the construction of Albeni Falls Dam are not available. In August 1989 and 1990, river temperatures below Albeni Falls Dam were recorded at 22.8 $^{\circ}$C (Initial Consultation

Document, Box Canyon Hydroelectric Project FERC No. 2042) and ranged from 21.7-22.0 °C in July 2003 (Geist et al. 2004). Since water in the Idaho portion of the Pend Oreille River above Albeni Falls Dam is homeothermic, the temperature of water passing through Albeni Falls Dam downstream to the lower Pend Oreille cannot be manipulated by drawing water from depth (C. Vail, Fisheries Biologist, WDFW, personal communication, 2003).

Currently, surface water releases from Albeni Falls Dam exceed 20 °C (68 °F) from early July through late September and the Pend Oreille River is on the Washington State 303(d) list for temperature (FERC 2002). Modeling efforts by Environmental Protection Agency (EPA) and the Pend Oreille PUD were unable to show any significant change in water temperatures (increase greater than 1 C degree) along the mainstem Pend Oreille River (Cope 2002; EEC 2002), although the mainstem has shown increases in temperature ranging from 0.5 to 1.5 C degrees during the summer (Pelletier and Coots 1990; Falter et al. 1991; Pend Oreille PUD Box Canyon Draft License Application 1999). In addition, sloughs and backwaters in the Box Canyon Reservoir have been documented to be as much as 6 C degrees warmer than the main channel temperatures (FERC 2002). Comparisons of mainstem river temperatures on 2 August and 24 August 1988 in Box Canyon Reservoir indicate a mean water temperature increase between 0.7 and 1.5 C degrees from Newport to Ione, Washington (Pelletier and Coots 1990). In another study on 18 August 1990, a comparison of water temperatures from the Blueside area to Box Canyon Dam revealed an increase in water temperature of 1.1 C degrees (Falter et al. 1991). Temperature monitoring data in Box Canyon Reservoir also showed an increase in river temperatures between 0.5 and 0.6 C degrees from Ione to the forebay on 26 September 1997, from the forebay to the tailrace on 29 July 1997, from Newport to Usk on 17 September 1998, and from Ione to the forebay on 3 June 1998 (Pend Oreille PUD, Box Canyon Draft License Application 1999).

In addition to elevated river temperatures, TDGs at Albeni Falls, Box Canyon, and Boundary dams also continue to be an environmental concern for native salmonids when levels of saturation exceed the 110 percent saturation standard (WAC 173-201A-030 (2)(c) (iii)) during certain times of the year. Forebay TDG measurements at Box Canyon Dam typically range from 98 percent to 112 percent saturation. Levels of 98-112 percent are generally in compliance with the standard 110 percent saturation. One mile below the Box Canyon spillway, TDG levels have exceeded 135 percent saturation (Appendix E2-2 of Final License Application 2000, as cited in Entz and Maroney 2001).

Tributaries to the lower Pend Oreille River have also exceeded water quality criteria. Water quality monitoring studies have been/are being conducted by the WDOE (Pelletier and Coots 1990; Coots and Williams 1991), the Kalispel Tribe (unpublished data for ongoing program), and, most recently, the Pend Oreille Conservation District (POCD), and the Water Resource Inventory Area (WRIA) 62 Watershed Planning. Results found total phosphorus in Calispell and Trimble creeks exceeded the EPA's (1986) recommended guideline of 50 micrograms per liter (µg/l) phosphorus. Fecal coliform densities exceeded water quality criteria during sampling in the summer of 1990 in Skookum Creek, Bracket Creek, and South Fork Lost Creek. Skookum Creek accounted

for 87 percent of the fecal coliform river load (Coots and Williams 1991). The POCD is currently working with landowners along Bracket Creek to implement Best Management Practices (BMPs) aimed at reducing potential agricultural sources of elevated coliform levels in the tributaries.

In the fiscal year 2004 (FY 04) the WDOE will be examining WRIA 62 (Upper Pend Oreille Subbasin) and the Lower Pend Oreille Subbasin for Total Maximum Daily Load (TMDL). Water quality impairments have been identified on the 1998 303(d) list and include the following waters: Cedar Creek (temperature), Lost Creek (temperature), Pend Oreille River (exotic aquatic plants, pH, temperature, total dissolved gas), and Skookum Creek (fecal coliform). In FY 04 the WDOE intends to establish TMDLs for temperature and dissolved gas in the Pend Oreille River.

#### 14.8.1.3 Priest River Subbasin[3]

There are many historical factors that have affected the mainstem of Priest River. The early log drives changed the channel morphology and removed a considerable amount of large woody debris from the edges of the channel. The installation of Outlet Dam dramatically modified the flow regime of the river. Wildfire, roads, logging, and homesteading also contributed to habitat alteration of the Priest River Subbasin.

Water quality in Upper Priest Lake and Priest Lake is currently of very high quality and both lakes are classified as oligotrophic (Rothrock and Mosier 1997; Milligan et al. 1983). Nutrient inputs come primarily in the form of sediment off land managed by the USFS and IDL. Approximately 90 percent of the Priest River Subbasin is public land. Most of the shoreline is in public ownership and development has been clustered on private lands and along state and federal lease lots. Lakeshore cabins are generally on personal septic systems, but major communities have sewage treatment facilities. Productivity of both lakes is low and they are best suited for salmonids and native non-game fish, although some warmwater species are present in low abundance.

Most of the residential development is for seasonal use and is related to the growing recreational demands from the expanding urban areas in northern Idaho and eastern Washington. Impacts are particularly acute on Upper Priest and Priest lakes and the Thorofare, although Priest Lake is the only lake with lakeshore development. Most of the drainages that enter Priest Lake have experienced growing recreational use from resident and non-resident populations. Impacts are most pronounced in the Two Mouth Creek, Granite Creek, Kalispell Creek, the lower Priest River, and East River. These impacts will be expected to increase as the popularity of this area for recreational activities continues to grow.

Land management activities and natural events in the Priest River Subbasin have resulted in the loss and degradation of stream and riparian habitat. Excess sediment and channel instability has been linked to historic large fires; historic logging practices and initial construction of a transportation network to bring timber to market; current timber

[3] Large portions of Section 14.8.1.3 were contributed to by the Pend Oreille Subbasin Summary Report (2001) pp. 139-150.

activities and the existing road network; agricultural practices such as wet meadow draining through cross ditches, channel straightening, and cattle access to streams; urbanization with clearing and excavation in riparian areas; and construction of substandard private roads. Confounding the analysis of sediment effect on the biotic community is the issue of legacy land use, fire, sediment input from current land use activities, and the effects from introduced brook trout in streams and lake trout.

Land use development has taken place in the entire Priest River Subbasin, primarily from timber management and associated roads. As typically occurs in watersheds with an extensive history of timber harvest, many of the major haul roads encroached on the riparian zone causing sedimentation to streams. Increased use of these poorly designed and located road systems by recreationists add to the problem in this Subbasin. Problems are particularly apparent along portions of the Upper Priest River, Hughes Fork, the lakeshore of Priest Lake, Lion Creek, Two Mouth Creek, Granite Creek, Indian Creek, Kalispell Creek, Soldier Creek, the lower Priest River, and the East River drainage. Culvert barriers on forest roads that may have an impact on bull trout have been identified as potential fish passage impediments on Hughes Fork, Granite Creek, South Fork Granite Creek, and Kalispell Creek.

In portions of Hughes Fork and Trapper Creek, the road densities are very high, exceeding 5.6 km/km$^2$ of land, with many of the roads constructed in the riparian zone. Lime Creek has 2.25 road crossings per km of stream, and several other drainages exceed 0.8 crossings per km. Logging has occurred in 5 percent of the Upper Priest River watershed, 18 percent of the Hughes Fork, and 55 percent of Trapper Creek (PBTTAT 1998a).

In tributaries draining directly into Priest Lake, the portion of the subbasin with highly erodible soils ranges from 10-30 percent, with half or more of most watersheds in the rain-on-snow sensitive zone. Road densities tend to be lower (< 3.2 km/km² [3.0 mi/mi$^2$]) in the watersheds where bull trout spawning and rearing still occur: Caribou Creek, Lion Creek, Two Mouth Creek, Indian Creek, Granite Creek, and Soldier Creek. Major portions of the watersheds have been logged, including 23 percent of Caribou Creek, 35 percent of Lion Creek, 52 percent of Two Mouth Creek, 3 percent of Indian Creek, and 75 percent of Soldier Creek (PBTTAT 1998a). In the East River, the only drainage in the lower Priest River watershed with a known bull trout population, 25 percent of the watershed has highly erodible soil types and 41 percent is in the rain-on-snow sensitive zone. Road densities are very high, averaging 8.2 km/km$^2$ (5.1 mi/mi²), and there are 2.25 road crossings per kilometer of stream. The portion of the watershed that has been logged is high, but has not been quantified (PBTTAT 1998a).

The streambed of the mainstem Hughes Fork above the Hughes meadows is dominated by sands, but is hydrologically stable. A reach of the stream running through Hughes Meadows was channelized during the 1940s for construction of an airstrip, and is now extremely unstable. This instability is apparent further downstream in the excessive depositional features and the lack of sufficient large organic debris.

Approximately half the Priest River Subbasin has soil types that are classified as highly erodible, ranging from 15 percent in Lime Creek to 86 percent of the Rock Creek drainage (Fredenberg 2000, as cited in Entz and Maroney 2001). Half or more of the watersheds lie in the rain-on-snow sensitive zone, making them prone to flashy runoff patterns. These characteristics predispose the subbasin to habitat degradation with any ground disturbing activities. This is of special concern because the Upper Priest Lake watershed is the most intact habitat remaining for westslope cutthroat trout and bull trout in the Priest River Subbasin (Fredenberg 2000).

As of 1998, there are six stream segments within the Priest River Subbasin included in the Clean Water Act Section 303(d) Water Quality Limited Segments (WQLS) list (Table 14.24): Kalispell Creek, Reeder Creek, Binarch Creek, East River, Lower West Branch Priest River, and Priest River. These stream segments are not in compliance with standards for sediment, temperature, flow, and/or dissolved oxygen. The 2002 proposed 303(d) list (has not been approved by EPA) includes Kalispell, Lower West Branch Priest River, East River, Binarch, Reeder, Beaver, Goose and Granite creeks. Streams listed as WQLS are considered not fully supporting designated or existing beneficial uses. Many streams in the subbasin fail to meet temperature standards for salmonid spawning and specific temperature criteria for bull trout protection. The State of Idaho is currently in the process of determining beneficial uses and support status for water bodies throughout the subbasin (Rothrock 2000). TMDLs have been approved for Kalispell Creek, Lower West Branch Priest River, East River, Binarch, and Reeder creeks.

Table 14.24. Streams not meeting state water quality standards based on Idaho's 1998 303(d) list

| Stream Name | Hydrologic Unit Code- Water Quality Limit Segment | Boundaries as Listed in 1998 303(d) | Pollutant/ Parameter* |
|---|---|---|---|
| East River | ID-17010215-3415 | North Fork East River to Priest River | Sed, DO, Temp, Flow |
| Reeder Creek | ID-17010215-3424 | Headwaters to Priest Lake | Sed, Temp |
| Kalispell Creek | ID-17010215-3421 | WA line to Priest Lake | Sed, Temp |
| Binarch Creek | ID-17010215-3418 | Headwater to Priest River | Sed |
| Lower West Branch Priest River | ID17010215-3411 | WA line to Priest River | None Listed |
| Priest River | ID-17010215-3407 | Upper West Branch Priest River to Pend Oreille River | Sed |

*Sed: Sediment, Flow: Flow Alteration, Temp: Temperature, DO: Dissolved Oxygen

Water appropriations in the Priest River Subbasin equal the average annual runoff, but they are mainly non-consumptive. Water rights for recreation, aesthetics, fish and wildlife held by the State of Idaho comprise the largest appropriations. Based on Idaho Department of Water Resources (IDWR) records, approximately 24.7 million $m^3$ (20,000 acre-feet) of water are appropriated for consumptive uses annually within the Priest River Subbasin; this is one percent of the annual volume of the Priest River. The major consumptive uses are irrigation and domestic water supplies. Surface water is the principal water source in the basin. Less than one percent of the Subbasin's dedicated

water is from ground water, but it is relied on heavily for domestic supplies (IDWR 1995).

Concern for maintaining the primitive character and aesthetic quality of the subbasin and a desire to maximize recreational opportunities lead to the implementation of several protective measures. Protection included Protected River Designations under the Columbia Basin Fish and Wildlife Program, State designation of Natural and Recreational River sections, and application for minimum stream flow appropriations on basin rivers and streams (Table 14.25 and Figure 14.12). All these measures will help to preserve and protect valuable fish and wildlife in streams and riparian corridors in the Priest River Subbasin.

Table 14.25. Protected river reaches within the Priest River Subbasin

| River Reach | Length | Values | Designation | Conditions |
|---|---|---|---|---|
| Upper Priest River, Canadian border to Upper Priest Lake(1990) | 19.6 miles | Species of concern<br>Spawning<br>Recreation Area | Natural River | Prohibits- Construction or expansion of dams or impoundments, hydropower projects, or water diversion works: new dredge or placer mining: new mineral or sand and gravel extraction within the stream bed; stream bed alteration |
| Upper Priest Lake And The Thorofare (1990) | 5.9 miles | Species of concern<br>Boating opportunity<br>Scenic Area<br>Geologic Features | Natural River | Same as above |
| Hughes Fork (1990) | 14.1 miles | Species of concern<br>Spawning<br>Recreation Use<br>Scenic Area | Recreational River | Same as above except: allows for alteration of the stream bed for maintenance and construction of bridges and culverts, cleaning Maintenance and replacement Of water diversion works, and Installation of fisheries Enhancement structures |
| Rock Creek (1990) | 3.8 miles | Same as above | Recreational River | Same as above |
| Lime Creek (1990) | 3.9 miles | Same as above | Recreational River | Same as above |
| Cedar Creek (1990) | 4.2 miles | Same as above | Recreational River | Same as above |
| Trapper Creek (1990) | 7.9 miles | Same as above | Recreational River | Same as above |
| Granite Creek (1990) | 11.1 miles | Same as above | Recreational River | Same as above |
| Priest River, Priest Lake outlet structure To McAbee Falls (1990) | 43.7 miles | Wildlife<br>Boating<br>Opportunity | Recreational River | Same as above |
| Lion Creek (1995) | 11.1 miles | Species of concern<br>Spawning<br>Recreation Use<br>Scenic Area | Recreational River | Same as above |
| Two-Mouth Creek (1995) | 10.6 miles | Same as above | Recreational River | Same as above |
| Indian Creek (1995) | 10.5 miles | Same as above | Recreational River | Same as above |

(*Source*: Rothrock 2000)

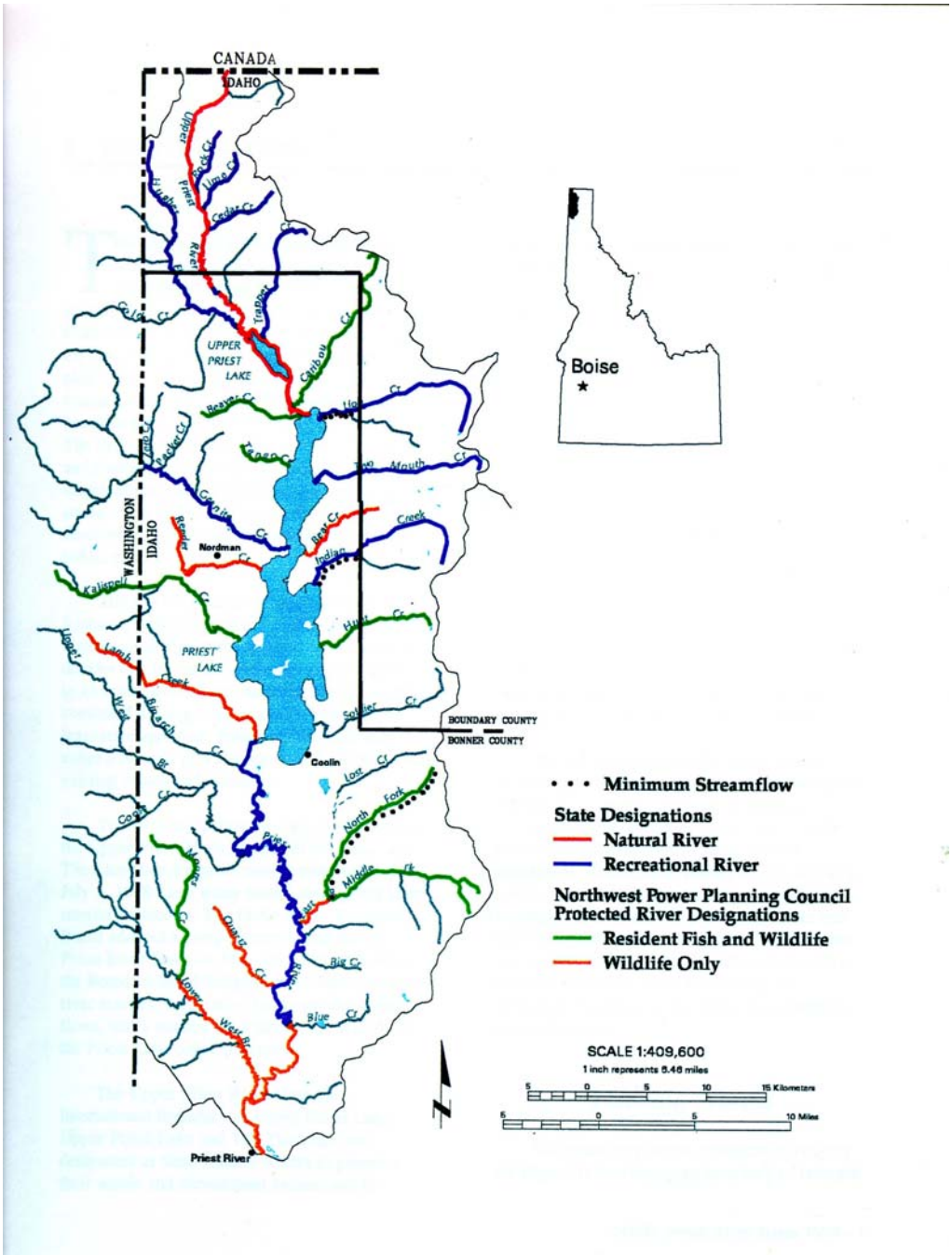



Figure 14.12. Protected river designations on streams and rivers in the Priest River Subbasin, Idaho (*Source*: IWRB 1995)

A small dam at the outlet of Priest Lake regulates the summer pool level of Upper Priest Lake and Priest Lake (Figure 14.13). This dam was constructed in 1951 by the State of Idaho for the purpose of maintaining Priest Lake at a constant summer pool level for recreational use [Idaho Code, Sec. 70-501 to 70-507]. The law requires the lake level to be maintained at 1 m (3.0 feet) on the USGS outlet gage until the end of the summer

recreational season. At this level, about 8.6 million $m^3$ (70,000 acre-feet) of water are stored in the system until September 30. Sometime between October 1 and November 30, the stored water is released to supplement flows in the Pend Oreille and Columbia rivers for fall hydropower production (Figure 14.13). The IDWR provides oversight of the dam, and Avista operates and maintains the dam (IWRB 1995).

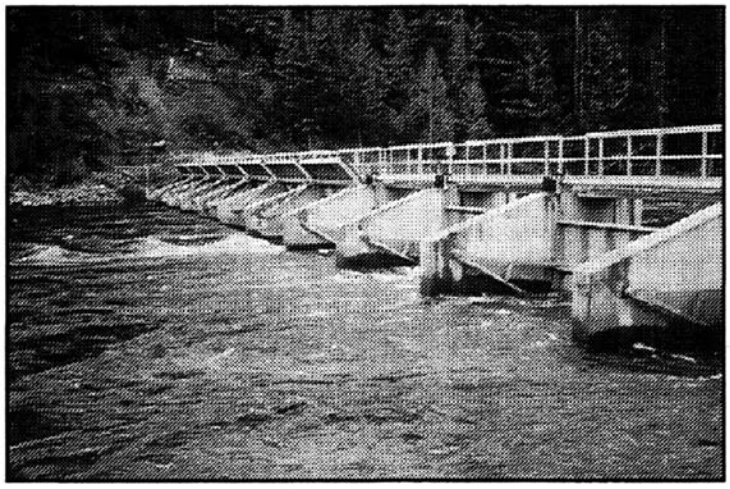


Figure 14.13. Dam on the outlet of Priest Lake, Idaho

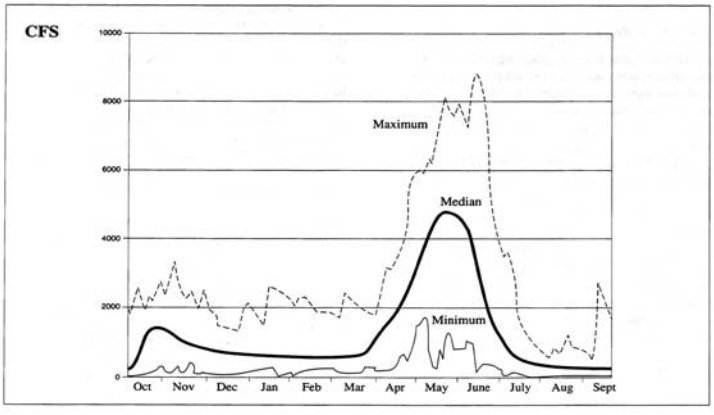



Figure 14.14. Average daily discharge for the Priest River at Dickensheet, 1951-1992 (*Source*: USGS gage station no. 12394000)

Maintenance of the summer minimum lake level elevation to benefit recreation at Priest Lake reduces flows in the Priest River during the warmest months of the year, August and September, and an unnaturally high flow period for a brief time in late October and November (Figure 14.14 and 14.15, IWRB 1995). Water temperatures exceeding 24 °C in the Priest River during the summer months can limit trout distribution to the mouths of tributary streams. Consideration was given to utilizing stored water in Priest Lake to supplement in-stream flows in the Priest River during critical times. However, it was not clear how far downstream favorable temperatures would extend. Recreation and power interests that favor current operations in Priest Lake were unwilling to consider changes in lake level management if it meant lower summer pool levels (R. Graham, Idaho Water Resource Board, 2000).

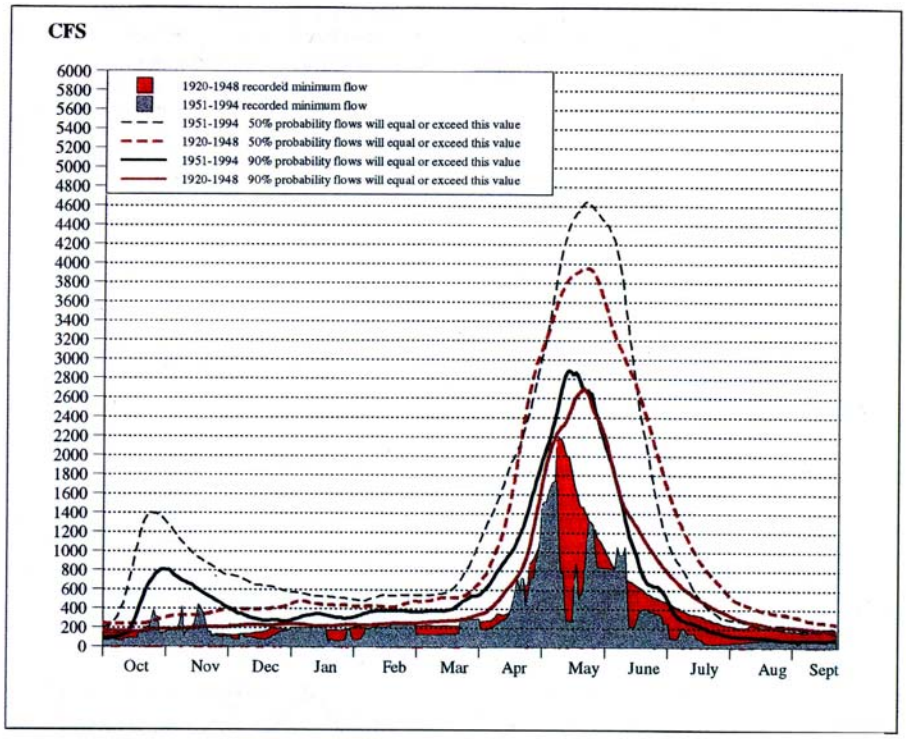



Figure 14.15. Comparison of pre-dam (1920-1948) and post-dam (1951-1994) discharge of the Priest River, Idaho, below the Outlet Dam at Priest Lake

### 14.8.2 Out-of-Subbasin Effects and Assumptions

Dams downstream and upstream of the Pend Oreille Subbasin have modified and currently regulate the hydrologic regime impacting the aquatic community. Dams downstream along the Columbia (for example, Chief Joseph and Grand Coulee) and on the Pend Oreille River prevent the upstream migration of anadromous fish and have isolated many native fish populations. The fragmentation of habitat has undoubtedly

altered the productivity, capacity, and genetic integrity of the aquatic and terrestrial communities, especially with regard to nutrient input from the ocean (salmon).

Upstream, Hungry Horse Dam has also modified the hydrograph of the South Fork, the Flathead, and subsequently the Clark Fork and the Pend Oreille rivers. This dam was constructed over 50 years ago and provides flood management for the Columbia River basin with 2,982,000 acre-feet of capacity assigned to flood control (U.S. Bureau of Reclamation 2003). Water is released for various purposes such as flood control, power generation, and as aid to downstream juvenile salmon migration. Direct impacts to native salmonids in the subbasin from these upstream dam operations are not known or quantified.

## 14.9 Limiting Factors and Conditions[4]

Limiting factors vary across the Pend Oreille basin and among species. In the Upper Pend Oreille Subbasin, limiting factors for fish relate to lake and stream habitat conditions; outside influences on the species including competition, hybridization, prey availability, and predation (including human predation); and biological constraints inherent to the species (PBTTAT 1998). Illegal harvest of some species, particularly bull trout, has been cited as a limiting factor in some spawning streams (PBTTAT 1998).

The two primary limiting factors in the Lower Pend Oreille Subbasin are habitat loss and nonnative species competition. Habitat loss includes losses of connectivity, quality, quantity, and diversity of aquatic environments. The loss of connectivity for fish movement on the mainstem Pend Oreille River and its tributaries refers to man-made barriers without fish passage facilities. Quality and quantity of habitat refers to water quality conditions (temperature, dissolved oxygen, TDGs, etc.) and area of suitable/accessible habitat. Diversity of aquatic environments refers to habitat complexity and structure that can provide sources of food, shelter, and spawning habitat. Many environmental and managed factors can contribute to these limiting factors (Andonaegui 2003; Shepard et al. 2002).

Limiting factors for fish in the Priest River Subbasin are related to both natural features and anthropogenic activities. The geology of the Priest River has low nutrient value, thus creates natural aquatic communities of low productivity. The northern latitude and elevation of the watershed also limits the growing season for fish. Native fish populations were naturally limited in numbers relative to more productive areas of the state. The availability of tributary spawning and rearing habitat further limited adfluvial westslope cutthroat and bull trout below what both Upper Priest Lake and Priest Lake would support (Entz and Maroney 2001). These low productivity watersheds help explain the evolutionary history of anadromous fish in the basin and the migrating nature of resident fish (Entz and Maroney 2001).

[4] Large portions of Section 14.4 are from the Pend Oreille Subbasin Summary Report (2001) pp. 21-25, 83-89, 146-151.

### 14.9.1 Physical Habitat Alterations/Limiting Habitat Attributes

QHA was utilized to compare historic versus current physical stream conditions with respect to 11 habitat attributes. Details of the analysis method are provided in Section 3. QHA model does not determine which habitat attributes are most biologically limiting, but does identify which physical attributes have undergone the greatest deviation from the reference stream/reach condition. These results, coupled with knowledge of local biologists and biological status and interactions of the focal species, can assist in identifying key limiting factors. This section provides QHA results on a subbasin level for the Pend Oreille Subbasin. Results specific to each focal species are discussed within each focal species section.

In the Pend Oreille Subbasin, all areas were delineated into watersheds or river reaches (Map, PO-9, located the end of this section). Using the QHA model, habitat conditions were analyzed where bull trout, westslope cutthroat trout, mountain whitefish, and kokanee salmon were historically and are currently distributed. Reaches with habitat attributes classified as less than optimal in the reference condition are presented in Table 14.26.

Table 14.26. Reaches that were ranked as containing less than optimal habitat conditions in the reference condition

| Sequence | Reach Name | Habitat Attribute < Optimal |
|---|---|---|
| 1 | Main Pend Oreille River | High Temperature, Obstructions |
| 16 | Flume Creek | Obstructions |
| 17 | Pocahontas Creek | Obstructions |
| 27 | Slate Creek | Obstructions |
| 34 | North Fork Sullivan Creek | Obstructions |
| 47 | Middle Creek | Obstructions |
| 48 | Lower Mill Creek | Obstructions |
| 51 | Upper CCA Creek | Obstructions |
| 61 | Lower North Fork Calispell Creek | Obstructions |
| 67 | Lower Small Creek | Obstructions |
| 69 | East Fork Small Creek | Obstructions |
| 119 | Kalispell Creek | Fine Sediment |
| 131 | Lion/Lucky Creek | Obstructions |
| 132 | Two Mouth Creek | Obstructions |
| 133 | Bear Creek | Obstructions |
| 135 | Upper Pack River | Obstructions |
| 136 | Hunt Creek | Obstructions |
| 139 | Soldier Creek | Obstructions |
| 144 | Sand Creek | Fine Sediment |
| 148 | Lower Pack River | Fine Sediment |
| 150 | Grouse Creek | Fine Sediment |
| 154 | Rapid Lightning Creek | Obstructions |
| 160 | North Gold Creek | Obstructions |
| 161 | (South) Gold Creek | Obstructions |
| 162 | Johnson Creek | Obstructions |

| Sequence | Reach Name | Habitat Attribute < Optimal |
|---|---|---|
| 164 | Lightning Creek above Rattle Creek | Obstructions |
| 167 | Clark Fork River (below Cabinet Gorge Dam) | High Temperature |

The habitat parameters with the greatest deviation from reference conditions vary by species and are presented in Table 14.27. This table should be interpreted as an indication of the types of habitat parameters that are problematic for the focal species in the Subbasin as a whole. Some reaches had more than one habitat parameter ranked as being equally deviant from the reference, hence the number of reaches listed adds up to more than the total number of reaches ranked. Most reaches had more than one habitat parameter that is currently ranked less than the reference. Table 14.27 only lists those habitat parameters that had the greatest deviation from reference; not all the parameters were less than optimal.

With respect to all focal species, the most common habitat attributes rated as having the greatest deviation from the reference condition included fine sediment, riparian condition, channel stability, and habitat complexity (Table 14.27). Other habitat attributes such as flow and temperature regimes, obstructions, and presence of pollutants have also been altered impairing stream habitat, however less common throughout the Subbasin as a whole. It is possible that any one or combination of altered habitat attributes may be key factors inhibiting full biological potential of some focal species populations. QHA can only identify limiting factors regarding stream habitat conditions, however, local biologists can compare results from the QHA to other records and data documenting biological conditions and determine any potential relationships or correlations that may help better manage, protect, or restore key stream reaches and focal species using these reaches.

Table 14.27. Habitat conditions with the greatest deviation from reference conditions as presented in the QHA model output for each focal species in Pend Oreille Subbasin. In parentheses are the number of reaches or watersheds with the particular habitat attribute exhibiting the largest deviation within that area.

| Whitefish (62) | Bull Trout (94) | Kokanee (17) | Cutthroat (129) |
|---|---|---|---|
| Fine Sediment (58) | Fine Sediment (53) | Channel Stability (9) | Fine Sediment (84) |
| High Flow (5) | Habitat Complexity (44) | Fine Sediment (8) | Riparian Condition (64) |
| Obstructions (5) | Riparian Condition (26) | Low Flow (5) | Habitat Diversity (64) |
| | Channel Stability (26) | Obstructions (4) | Channel Stability (40) |
| | Low Flow (16) | Pollutants (3) | Low Flow (24) |
| | High Temperature (8) | High Flow (3) | High Temperature (21) |
| | High Flow (8) | | Obstructions (13) |
| | Obstructions (6) | | High Flow (13) |
| | Pollutants (4) | | Pollutants (7) |

### 14.9.1 Description of Historic Factors Leading to Decline of Focal Species

Limiting factors leading to the decline of focal species have been attributed to the introduction of nonnative species, as well as habitat degradation and fragmentation in terrestrial and aquatic environments. The following section describes how habitat modifications to terrestrial and aquatic environments and the introduction of nonnative species have negatively impacted native focal species, mountain whitefish, bull trout and westslope cutthroat trout within the Pend Oreille Subbasin. There is little information available specific to mountain whitefish within the Subbasin. It is assumed that stream and lake connectivity along with water quality conditions important to bull trout and westslope cutthroat trout are similarly important to mountain whitefish as these factors are for other salmonids. The following describes the limiting factors present in tributary and mainstem habitats, as well as the non-adaptive biological factors impacting native focal species. Limiting factors impacting nonnative focal species, kokanee and largemouth bass, are discussed separately in section 14.6 and 14.7, respectively.

#### 14.9.1.1 Tributaries

Tributary habitat in the Pend Oreille Subbasin has been degraded by the following human disturbance including timber harvest in riparian areas, riparian impacts by livestock, fish impassable culverts, splashdams and dewatering, log transport, clearing of in-stream large woody debris, roads, forest fires, small hydroelectric dams, in-stream mining, conversion of forest land to agricultural and residential areas, diking, and water diversions (Entz and Maroney 2001).

Livestock grazing has impacted public and private riparian forests and uplands in most subbasin tributaries (Entz and Maroney 2001). The USFS has an extensive grazing program in many tributaries to the Pend Oreille River. Direct impacts are evidenced by water quality problems, bank erosion, over utilization of riparian vegetation, and sediment input. The available land base on which to farm limits agriculture in the Lower Pend Oreille Subbasin, but all available agricultural land is farmed. Agricultural practices have contributed to fisheries impacts through stream channelization, sediment input and water quality problems. Inadequate stream buffers on agricultural lands are a major problem. However the continued application and acceptance of BMPs as well as increased participation by landowners in voluntary riparian fencing programs throughout the Subbasin have secured miles of streambank protection to insure future habitat improvement projects will have a lasting effect.

Culvert installation and sediment input are the major problems caused by road maintenance and construction (Entz and Maroney 2001). Improper culvert placement prevents upstream migration and extirpates native salmonid gene flow into some subbasin tributaries. Many timber hauling roads are within the riparian zone and contribute to sedimentation to streams. Road densities from forest practices are high in the majority of the Subbasin. These factors associated with road construction continue to occur and contribute to further habitat fragmentation.

Extensive and intensive timber harvests have lead to the general decline in the quality of habitat available to native salmonid species. Riparian and upland management practices

aimed at extracting the maximum amount of timber have contributed to poor riparian buffer health, lack of large woody debris in the channel, poor large woody debris recruitment potential, mass wasting, and point and non-point sediment input. In 1999, the Washington State legislature endorsed the Forests and Fish Report and passed the Salmon Recovery Act. The Forests and Fish Report defines the conditions to implement the Salmon Recovery Act. This legislation is only a few years old and the problems that exist come from a century of abuse. Thus far, it has led to more restrictive harvest of riparian trees along fish-bearing streams.

In-stream habitat conditions that influence bull trout and westslope cutthroat trout distribution and abundance include flow, water temperature, cover, connectivity, geology, and habitat complexity. Living space for these species has been reduced in some streams through loss of flow; excess bedload filling in pools; widening of stream channels resulting in water too shallow to support fish; loss of large woody debris recruitment needed to create pools and cover; fine sediment covering spawning gravels; or filling in the spaces between rocks where juvenile bull fish hide. Shifting bedload in unstable streams may reduce incubation success by physically damaging eggs of fall spawning fish such as bull trout. Shifting bedload in unstable streams is believed to be a significant limiting factor in streams on the northern and eastern tributaries to Lake Pend Oreille, and is primarily associated with significant levels of timber harvest and road construction (PBTTAT 1998). Fine sediment can reduce the flow of oxygenated water into redds, reducing hatching success, and is a problem in upper Pack River tributaries (PBTTAT 1998).

Increasing development of residential and secondary home sites are expected to create further impacts to riparian areas and water quality.

#### 14.9.1.2 Mainstem Habitat

Mainstem habitat in the Pend Oreille Subbasin can be differentiated into three sections: (1) the lower Clark Fork River, (2) upper Pend Oreille River above Albeni Falls, and (3) the lower Pend Oreille River below Albeni Falls. In general, the hydropower development and operations on the Pend Oreille River have altered much of the hydrology of the river from that of a cold fast-moving river to warm and shallow reservoirs (Karchesky 2002).

Hydroelectric facilities built 50 to 100 years ago on the Clark Fork River have eliminated bull trout passage, beginning in 1913 with construction of Thompson Falls Dam in the middle of the Clark Fork River. The dams cut off hundreds of kilometers of spawning and rearing habitat for migratory species such as bull trout, westslope cutthroat trout, and mountain whitefish. After 1913, the accessible watershed available to Lake Pend Oreille fish upstream of Albeni Falls Dam consisted of the Pend Oreille River and its tributaries, Lake Pend Oreille and its tributaries, and the Clark Fork River and its tributaries upstream to Thompson Falls Dam. After construction of Cabinet Gorge Dam blocked the Lower Clark Fork River in September 1951, the total watershed area available to bull trout in Lake Pend Oreille, excluding the Priest River Subbasin and the Lower Pend Oreille Subbasin, was thus further reduced by about 43 percent (PBTTAT 1998). Overall,

it is estimated that less than 10 percent of the historic range of bull trout in the Upper Pend Oreille Subbasin is accessible to bull trout as a result of dam construction (PBTTAT 1998). Resident fracture populations still exist in these subbasins but at much lower densities and with restricted life histories. The introduction of brook trout further exacerbates the recovery of bull trout. Restoration of fish passage at Cabinet Gorge and Noxon Rapids dams is currently underway as an adaptive management program under the FERC Re-licensing Settlement Agreement of 2000. If this program is successful, it will begin to restore upstream gene flow back to conditions found between 1913 and 1952.

The lower 5 km of the Clark Fork River supports a seasonal coldwater fishery during the winter months. However, the summer pool flooding in otherwise productive riffle habitats compromises some of the most diverse and productive riverine habitat in the lower Clark Fork River. Peaking operations at Cabinet Gorge Dam lower the productivity of the Clark Fork River, but a good trout fishery is present year-round in free flowing reaches.

In the upper Pend Oreille River, upstream of Albeni Falls, over-wintering habitat was identified as the limiting factor for the development of a warmwater fishery (Karchesky 2002). Karchesky (2002) found that the population structure of largemouth bass, black crappie, and pumpkinseed had an increased abundance of larger and older fish following 3 years of higher winter water levels in the upper Pend Oreille River (above Albeni Falls). The increase in fish sizes and ages were attributed to improved winter survival during high water winter years.

The hydrological characteristics of the lower Pend Oreille River, downstream of Albeni Falls Dam, have been altered since the construction of the five mainstem dam facilities. The five mainstem dams have negatively altered habitat historically available and suitable for native salmonids. Bull trout numbers have declined in the Pend Oreille River due to factors such as habitat connectivity, habitat degradation, man-made barriers, and nonnative fish introductions (Andonaegui 2003). It is unknown which bull trout life stage is most limiting (Andonaegui 2003), but in general the mainstem Pend Oreille River is no longer suitable for trout compared to historical conditions (Ashe and Scholz 1992). Within the boundaries of the United States, native salmonids are limited by river temperatures exceeding 20 °C during the summer create unfavorable thermal conditions in Boundary and Box Canyon reservoirs, and the warmwater fishery is limited by the lack of suitable over-wintering habitat (Karchesky 2002).

#### 14.9.1.3 Non-Adaptive Biological Factors

The introduction of nonnative species has drastically and irrevocably altered the fish community and inter-species dynamics in the Pend Oreille Subbasin. Genetic change can occur by introductions of nonnative fish into populations, shrinking population size, and fragmentation of populations through migration barriers. Behavioral changes can occur through selective breeding in a hatchery environment or introductions of new genetic stocks. Before the introduction of nonnative fish species, bull trout and northern pike minnow were the top predators in Lake Pend Oreille and its tributaries (Pratt and Huston

1993). Today, bull trout and northern pike minnow share the predator niche with a minimum of six nonnative fish species (Pratt and Huston 1993).

Brook trout out-compete bull trout for the same space and resources (Gunckel et al. 2002). Hybridization with bull trout reduces the reproductive potential of bull trout. Kanda et al. (2002) used biochemical and molecular genetic techniques to evaluate the degree of introgressive hybridization between bull and brook trout in the Flathead River drainage in Montana. They found $F_1$ hybrids did successfully reproduce with parental species. However, none were found. Hybridization reduces fertility of $F_2$ genotypes. Kanda et al. (2002) concluded that hybridization wasted more reproductive energy for bull trout since the majority of hybridization was found between female bull trout and male brook trout because eggs contain more energy than sperm.

Other nonnative interactions may also be competing with bull trout. Competition for spawning areas between bull trout and brown trout can directly reduce reproductive success if there is redd superimposition. Bull and brown trout also utilize similar microhabitats as juveniles, but the interactions and effects at this life stage are unknown (Pratt and Huston 1993).

Competition for food or habitat that is in limited supply or predation can limit populations by reducing survival to spawning age. Nonnative lake trout also pose this threat to bull trout, westslope cutthroat trout, and kokanee in Lake Pend Oreille. In Lake Pend Oreille, most of the suitable lake trout habitat is in the northern end of the lake. This is also the part of the lake where the majority of the adfluvial bull trout smolts enter the lake from the Clark Fork and other lake tributaries. Kokanee are the primary prey species for lake, bull, and rainbow trout in the lake (Videgar 2000; Fredericks et al. 1995; Maiolie and Elam 1993). IDFG is concerned that the numbers of predators exceeds the prey base ability to support them such that bull trout in Lake Pend Oreille may become depressed if the kokanee forage base is lost (Fish and Wildlife Service 2000). Kokanee comprised of 66 percent of the diet for bull trout (n = 11) greater than 408 mm in Lake Pend Oreille (Videgar 2000). The loss of kokanee would likely favor lake trout over bull trout, because of the presence of Mysis shrimp.

In the Priest River lake system, bull trout declines are attributed to lake trout out-competing bull trout for habitat. Bull trout populations are threatened in both Priest Lake and Upper Priest Lake since there is no barrier to prevent lake trout movement between the lakes (Andonaegui 2003). In the river system, brook trout are further contributing to bull trout decline through hybridization and competition (Andonaegui 2003).

# SECTION 15 – Table of Contents

# 15 Pend Oreille Subbasin Inventory of Existing Programs – Aquatic[1]

## 15.1 Current Management Directions

State and Federal agencies and Tribal governments that have management authority over fish and wildlife resources in the Pend Oreille Subbasin include the U.S. Fish and Wildlife Service (USFWS), U.S. Forest Service (USFS), Idaho Fish and Game (IDFG), Washington Department of Fish and Wildlife (WDFW), and the Kalispel Tribe. The WDFW and the Kalispel Tribe have a Memorandum of Understanding to promote cooperation and coordination on management of fishery resources of the Pend Oreille River and its tributaries such as the management of largemouth bass in Box Canyon Reservoir and native trout in the tributaries. Other state and federal agencies, including, but not limited to, the U.S. Army Corps of Engineers (USACE), Environmental Protection Agency (EPA), the Natural Resources Conservation Service (NRCS), Idaho Department of Environmental Quality (IDEQ) and Washington Department of Ecology are involved in programs that affect the land or water that provide habitat for fish and wildlife. A complete list of state, federal, and Tribal entities that are involved in management of fish and wildlife or their habitats is included in section 2.4.1, along with a description of the agency's management direction.

Within the Pend Oreille Subbasin, Lake Pend Oreille supports a significant sport fishery. In 1991, anglers expended an estimated 465,000 hours fishing the lake with approximately 65 percent of the effort targeting trout and 35 percent of the effort targeting kokanee (Paragamian 1994). The world record bull trout, 14.5 kilograms (kg, 32 pounds), and the world record rainbow trout, 16.8 kg (37 pounds), were taken from Lake Pend Oreille in 1949 and 1947, respectively. Current and planned fisheries management direction in Lake Pend Oreille emphasizes kokanee as a keystone species with bull trout and rainbow trout managed for a trophy fishery. Westslope cutthroat trout will be managed primarily as a wild trout fishery with restrictive regulations. Lake trout are being actively managed for removal to reduce their impacts on preferred species. All fisheries are self-sustaining with the exception of supplemental stocking with kokanee fry, depending on their availability (N. Horner, IDFG, personal communication).

Currently, rainbow trout, brown trout, westslope cutthroat trout, and mountain whitefish are the important principal sport fishes in the lower Clark Fork River. Bull trout are also present and occasionally caught by anglers. Management direction is to improve habitat and recruitment to the river, with the fishery dependent on self-sustaining populations. Ecologically, restoring connectivity to the lower Clark Fork system via passage at Cabinet Gorge and Noxon Rapids dams is an important goal because it will restore access to the hundreds of miles of spawning and rearing habitat available in the Montana portion of the lower Clark Fork watershed. Enhanced migration and spawn areas are expected to increase native populations of bull trout, westslope cutthroat trout, and mountain whitefish.

[1] Large portions of Section 15 were contributed to by the Pend Oreille Subbasin Summary Report (2001) pp. 25-59, 89-116, 151-166.

WDFW management direction in the lower Pend Oreille River addresses native trout species protection and enhancement, while continuing to provide legislatively mandated recreational opportunities for the residents of Washington State. In 1995, fishing closures for bull trout on the mainstem and all tributaries of the lower Pend Oreille River in Washington state went into effect. A two trout, eight-inch minimum length, is in effect for all other trout in rivers and streams. Westslope cutthroat trout and triploid rainbow trout are stocked by WDFW into 28 lakes and ponds in the lower Pend Oreille Subbasin for public recreational opportunity. In addition, 30,000-45,000 rainbow trout are provided to a cooperative net pen project in the mainstem Pend Oreille River. The project releases the rainbow trout as catchable size fish in the fall of each year. Two isolated lakes are also stocked with eastern brook trout.

Upper Priest Lake has been managed as a refuge for native fish since 1994, with catch-and-release regulations, requiring artificial flies and lures with single barbless hooks and no bait. Much of the fishing in the lake is associated with camping or hike-in anglers, who may be less able to identify bull trout and more likely to keep them than more experienced boat fishermen. Illegal harvest is an issue in the Priest River drainage, but its impact is largely unquantified. Despite harvest restrictions on cutthroat trout and bull trout, neither population has responded in Upper Priest Lake and Priest Lake.

The Priest River below the outlet dam supports a seasonal fishery for westslope cutthroat trout during the spring spawning migration season. This river reach has historically been managed with a year-round season due, in part, to high temperatures that are thought to limit the westslope cutthroat trout population during the late summer. Protection was given to westslope cutthroat trout spawners by implementing seasonal recreation harvest from May 28 to November 30, during the 1994-95 fishing season. Major public opposition led to repeal after only one season; hence there was no evaluation of potential benefits (N. Horner, IDFG, personal communication).

Current and planned fisheries management direction in the Priest River drainage is primarily for wild native salmonids and to provide a yield lake trout fishery in Priest Lake with a year-round season and two-fish limit. Fisheries for westslope cutthroat trout, bull trout, and kokanee are closed to harvest. IDFG conducts supplemental stocking of catchable rainbow trout in isolated small ponds to provide harvest opportunity for unskilled anglers (N. Horner, IDFG, personal communication).

## 15.1.2 Local Government

### 15.1.2.1 Bonner County Soil and Water Conservation District (SWCD)

The Bonner County SWCD updates a 5-Year Resource Conservation Plan every year. The five priorities that are being addressed at this time are:

1. Water Quality. Goal – Meet rules, regulations of section 319 of Water Quality Act, the 1986 Safe Drinking Water Act and amendments of the 1972 Clean Water Act, Antidegredation Section.

2. Timber and Woodlands. Goal – Strengthen Forestry Resources in the district.

3. Fish, Wildlife and Recreation. Goal – Improve fish and wildlife habitat and increase native trout populations from a locally based, voluntary and cost-effective approach.

4. District Operations/Information and Education. Goal – Have an effective, pro-active Board of Supervisors and create public awareness of conservation concerns and practices.

5. Pasture and Hayland. Goal – Find alternative crops with better economic returns and improve yield of existing crops and pastures.

Bonner and Kootenai counties in Idaho have adopted comprehensive plans to guide growth and development on county administered lands. Bonner County's plan has been under revision for the past three years. Kootenai County adopted a site disturbance ordinance in 1999 that was designed to protect water quality.

The Cocolalla Lake Association and Bonner County SWCD developed a plan for improving water quality in the Cocolalla Creek watershed, which is a tributary of the Pend Oreille River.

## 15.2 Existing and Imminent Protections

Existing and imminent protection efforts include enforcement of existing habitat protections via the Washington State Hydraulic Code (RCW 75.20.100) and Forest Practice Rules (RCW 76.09)/Forests and Fish Agreement, enforcement of prohibition on taking of bull trout, enforcement of catch limit on harvest of westslope cutthroat trout, and eradication of non-native trout species, such as eastern brook trout (imminent).

The Timber, Fish, and Wildlife Plan is an agreement between WDOE and the timber industry regarding new criteria for protecting anadromous fish and bull trout habitat by specific protections of riparian forests along salmon bearing streams.

The State of Washington passed a Growth Management Act, which requires, among many things, that counties enact ordinances that identify and protect critical habitat, especially of ESA linked species of aquatic but also terrestrial species. This program is just beginning in 2003 but all counties will need to complete Habitat Plans by 2006.

## 15.3 Inventory of Recent Restoration and Conservation Projects

Refer to Appendix H for a comprehensive list of BPA and non-BPA funded projects within the IMP.

### 15.3.1 Pend Oreille Subbasin

#### 15.3.1.1 BPA Funded Research, Monitoring and Evaluation

***Joint Stock Assessment Project (#9700400)***

Discussed in section 2.4.3 Inventory of Restoration and Conservation Projects under the

subheading Resident Fish Stock Status Above Chief Joseph and Grand Coulee Dams (all of the IMP within Washington).

***Genetic Inventory of Bull Trout and Westslope Cutthroat Trout in the Pend Oreille Subbasin***

Project Description:

This project seeks to comprehensively identify the genetics characteristics of bull trout and westslope cutthroat trout within the Pend Oreille Subbasin. In addition, the extent of hybridization between bull trout and brook trout, and westslope cutthroat, and rainbow trout will be evaluated. Bull trout and westslope cutthroat trout samples will be obtained in 80 locations throughout the Priest Lake and Lower Pend Oreille subbasins, including the Salmo River watershed (Washington and Canada). The entire project will take place from 2002-2004. This project will enable managers to identify core areas (watersheds) where populations and habitat need protection and recovery efforts can be implemented.

Associated Monitoring:

Additional samples may be collected from original sites to determine if any gene flow has occurred. This is to assess the temporal stability/variability of the genetic profiles of the populations.

Accomplishments:

In 2002, the Kalispel Tribe collected 280 bull trout samples and 940 westslope cutthroat samples for a total of 1,220 samples from 40 watersheds. In 2003, the Kalispel Tribe collected an additional 232 bull trout and 1,282 westslope cutthroat trout for a total of 1,514 samples from 34 watersheds. The Washington Department of Fish and Wildlife's genetics lab has completed initial microsatellite DNA analysis of the 2002 samples. The WDFW genetic lab was able to run 24 loci on westslope cutthroat and 12 loci on bull trout.

Notes:

Due to the lack of westslope cutthroat trout and bull trout in some watersheds, alternate watersheds had to be selected. Equipment problems with the new Smith-Root LR-24 shockers have slowed collection. Collection has also been slowed because of unexpected fire restrictions due to an abnormal hot and dry summer.

### 15.3.1.2 Non-BPA Funded Research, Monitoring, and Evaluation Activities

***IDFG License and Federal Aid to Fish Restoration Program***

The IDFG has been involved with research, monitoring, and evaluation activities in the Lake Pend Oreille Subbasin since the 1950s. The IDFG conducted a year-long creel survey in 2000 on Lake Pend Oreille and the lower Clark Fork River to assess angler use, catch rates, harvest, catch composition, and angler. This survey was established to assess the response of the fishery to recent closure to kokanee harvest and liberalization of the harvest limits on rainbow trout and lake trout. The data will also be used to assess trends in the fishery by comparison with long-term data sets.

The IDFG regional fisheries staff assists Avista with bull trout redd counts; IDFG houses 18 years of the long-term trend data on Lake Pend Oreille bull trout redd counts. The IDFG also works with local sportsmen groups to monitor participation, catch, and harvest in biannual fishing derbies.

***IDFG - Albeni Cove Wetlands Restoration***

Project Description:

Ducks Unlimited will construct several wetlands areas with water management provided by dikes, water control structures, and engineered waterways.

Associated Monitoring:

IDFG will provide routine inspection, operation, rehabilitation, and maintenance necessary to maintain the continuing viability and functioning of the Albeni Cove Wetlands Restoration project throughout the term of this Agreement. They will manage the Site to provide habitat that is attractive to waterfowl production and migration, as well as beneficial to other wetland dependent wildlife.

Accomplishments:

Many species of waterfowl, neotropical passerines, raptors, and mammals species utilize the wetlands and waterways in the Pend Oreille River watershed, and these are being restored. This is a thirty-year agreement.

***Washington Department of Fish and Wildlife (WDFW)***

The WDFW applied for and received grant money from the Salmon Recovery Funding Board to initiate a pilot project in the Middle Branch of LeClerc Creek to remove eastern brook trout in March of 2001. The project is on hold pending environmental documentation processes within the agency, and other outside environmental agencies.

***U.S. Forest Service***

The USFS Sandpoint Ranger District annually monitors watershed and fish habitat conditions for tributary streams on National Forest System lands. Results are published in an annual monitoring report distributed by the Idaho Panhandle National Forest (IPNF) Supervisor's Office.

The Rocky Mountain Research Station in Boise, Idaho has conducted a significant amount of research on bull trout populations in the Upper Pend Oreille drainage. Studies have included assessing the validity of redd counts, determining timing of migration and spawning, comparison of stock sizes, estimation of mortality, estimating age of adults, monitoring for repeat spawning, estimating of persistence, and, in cooperation with the University of Montana, assessing the genetic structure of tributary bull trout populations. These studies have resulted in several publications, including Rieman and McIntyre 1993, Rieman and Myers 1997, and others.

The Colville National Forest monitors range condition, utilization, and range improvements on grazing allotments, road conditions and follow-up maintenance on system roads within the Subbasin.

***U.S. Geological Survey (USGS)***
As part of a larger study encompassing watersheds in the northern Rocky Mountains, the USGS is conducting fish and water quality assessments in the Lower Clark Fork subbasin.

***Idaho Department of Environmental Quality (IDEQ)***
The IDEQ periodically monitors water quality in the Upper Pend Oreille drainage, assessing such attributes as temperature, sediment, heavy metals, and nutrients.

The IDEQ is responsible for assessing waters of the state. The Clean Water Act (CWA) and EPA regulations direct that the State monitor and assess the physical, chemical, and biological integrity of water bodies. To accomplish this, IDEQ has developed the Beneficial Use Reconnaissance Project (BURP), and the Water Body Assessment Guidance (WBAG) program. Waters identified as potentially impaired also undergo a more rigorous water quality Subbasin Assessment that incorporates all available information and focuses on the cause and extent of impairments for development of a TMDL if necessary.

The purpose of the BURP program is to consistently provide the physical, chemical, and biological data necessary to assess the integrity and quality of waters. It relies heavily on macroinvertebrate sampling, habitat evaluation and measurement, bacterial sampling, and fish sampling. The BURP protocol closely follows EPA's *Rapid Bioassessment Protocols for Use in Streams and Rivers* (Plafkin et al. 1989). BURP data also documents existing uses, which must then be designated and protected under Idaho's water quality standards. It is the goal of the state to re-monitor water bodies on a rolling five-year schedule.

The WBAG was designed to use BURP data to answer questions about stream integrity, water quality, and beneficial use support status. It originally consisted of multi-metric indexes for macroinvertebrates and habitat, qualitative and quantitative fisheries assessments, and evaluation of criteria exceedances. Assessments of BURP data collected from 1993 through 1996 were conducted to generate the 1998 list of impaired waters required under section 303(d) of the CWA. Revisions to the assessment methodology are currently underway that would allow the use of more types of data, revise the macroinvertebrate and habitat indexes, add a multi-metric fish index, revise the salmonid spawning beneficial use assessment, and add an interpretation of criteria exceedances in the assessments. The revised water body assessment methodology is expected to be completed in 2001 for use in the next 303(d) and 305(b) reporting cycles, and in ongoing TMDL subbasin assessments.

***NRCS***
***Bismark Meadows Wetland Restoration***
Project Description:
Perpetual easements with seven landowners on 1,016 contiguous acres, mostly wet meadow. Filling ditches, plugging ditches, drop structures in Reeder Creek and four shallow water areas will restore functions and values of the meadow. Bluebird, swallow

and bat houses will be installed. Haying, grazing, and other uses will be eliminated except for quiet enjoyment by landowners.

Associated Monitoring:
Annual status review after construction in 2004. Annual plant surveys and photo points will be installed to track hydrology and plant restoration.

Accomplishments:
Interior fence removal, project plan drawn, project bid for construction next summer.

***Moores Creek Livestock Fencing & Tree Planting***
Project Description:
Fencing livestock from stream and planting trees along creek. This is a Continuous Conservation Reserve Program Contract for 15 years. 12,400 linear feet of creek fencing or 21.8 acres of fencing and tree planting will be completed. Two livestock creek crossings will also be installed.

Associated Monitoring:
Annual Status Review with Landowner by NRCS for five years.

Accomplishments:
The creek has been fenced off from livestock for 5,900 lineal feet or 6.7 acres to date. Trees will be planted in the spring. Another 6,500 lineal feet of fence or 15.12 acres will be fenced off next year with trees planted along creek the following spring.

### 15.3.1.3 Other Non-BPA Funded Research, Monitoring and Evaluation Activities

- Monitor and evaluate the effect instream structures have on the freshwater macroinvertebrate community.
- Conduct habitat assessments and snorkeling surveys in tributaries to Box Canyon Reservoir under the settlement agreement for the Box Canyon Dam license amendment. Funded by the Pend Oreille County PUD and implemented by the Kalispel Tribe.
    - WDFW's resident fish genetic analysis of fish stocks occurring within managed lakes of Pend Oreille County.
    - Ongoing bull trout recovery efforts within the Northeast Washington Recovery Unit.
    - Settlement for FERC license amendment for Box Canyon Dam, tributary fish population and habitat assessments. Funded by the Pend Oreille County PUD and implemented by the Kalispel Tribe.
    - Timber Fish and Wildlife-funded Riparian Management Zone research to determine fish and wildlife responses to Washington state forest practice standards and modified standards.
    - Pacific Salmon and Wildlife: Ecological Contexts, Relationships, and Implications for Management 2000.

- East LeClerc Creek road relocation project. Designed to reduce sedimentation loads and address fish passage issues in LeClerc Creek. Project cooperators include USFS, WDFW, Stimson Timber Company, Kalispel Tribe, and Federal Highways Department.

## 15.3.2 Upper Pend Oreille

### 15.3.2.1 BPA Funded Research, Monitoring, and Evaluation Activities

***Lake Pend Oreille Fishery Recovery Project***

BPA funded fishery research activities on Lake Pend Oreille are limited to the IDFG's Lake Pend Oreille Fishery Recovery Project. The goal of this project is recover fisheries that were directly impacted by the federal hydropower system. The research covers activities as diverse as predation, competition, mysis shrimp interactions, lake level effects, and recovery efforts in the Pend Oreille River above Albeni Falls Dam.

Every year since 1977, mid-water trawling was used to assess the kokanee population. Data on kokanee abundance and survival is obtained. Basic limnology, including temperature, oxygen, and secchi transparency is collected monthly throughout the spring, summer, and fall on the lake. Time-series data has also been collected on mysis shrimp during most years dating back to the early 1970s. Since 1995, BPA has sponsored annual hydroacoustic surveys of the lake to provide a second, less biased, estimate of kokanee abundance as well as an estimate of the open water predators of the lake. Sampling throughout the lake with a large fry net has also become a standard monitoring activity when information on kokanee fry abundance is needed. This has been done for the last four years. The substrate at five major spawning areas in the lake is also monitored annually. These data are related to lake levels to determine the effect of changes on the quality of spawning areas. Counts of kokanee spawning in tributary streams and on the shoreline of the lake are one of the longest running data sets. Each year since 1972, these spawning fish were counted as an index of the adult kokanee population.

Between 1985 and 1992 research focused on defining the best ways to stock kokanee into the lake to get the best returns. Results indicated stocking larger fry (50 mm) improved the survival during stocking and that stocking location did not significantly influence hatchery fry survival (Paragamian 1994). The Cabinet Gorge Hatchery has produced kokanee for Lake Pend Oreille since 1985. It was designed to produce enough fish so the lake could reach its recovery goal of 750,000 kokanee in the harvest. To date, supplemental stocking has not improved the kokanee population sufficient to meet this goal.

Currently BPA is funding several monitoring activities as part of the research program including (1) understanding kokanee population dynamics; (2) gaining an understanding of limiting factors for kokanee; (3) assessing the effects of a modified lake level management regime on kokanee spawning and recruitment; (4) examining the effects of the introduction of opossum shrimp; (5) determining whether or not food is limited for planktivorous species; and (6) identifying the effect of the hatchery program on the kokanee population.. As part of the ongoing research to evaluate effects of a modified

lake level the USACE held the lake higher for the past three years during winter while IDFG documented changes to the habitat and fish community in the lake and river.

***Cabinet Gorge Hatchery***

Cabinet Gorge Hatchery was constructed in 1986 as a cost-share project between BPA, IDFG, and Avista. It is operated with IDFG funds. The hatchery has a production capacity of 17 million kokanee fry, but in most years this capacity has not been met. The hatchery was constructed to mitigate for losses of kokanee spawning due to Albeni Falls and Cabinet Gorge Dam operations. While in some years hatchery reared kokanee appear to make up a significant proportion of the kokanee population in Lake Pend Oreille, the hatchery has not kept the kokanee population from continuing to decline. Prior to construction of the dams in the early 1950s, annual kokanee fry production in the lake and tributaries was estimated at approximately 200 million.

### 15.3.2.2 Non-BPA Funded Research, Monitoring, and Evaluation Activities

A substantial number of "on-the-ground" projects have been undertaken to improve the watershed conditions that sustain fish populations, directly improve habitat, or provide protection for fish through education and increased law enforcement. The projects listed below are in addition to regular management and enforcement activities conducted by the managing agencies.

***Lake Pend Oreille***

| | |
|---|---|
| 1998 | Education and enforcement to protect bull trout. Angler awareness of regulations and fish identification skills has improved. Avista, Trout Unlimited (TU), and IDFG. |
| 1997-2004 | Maintain high water elevations of Pend Oreille Lake during the winter months to improve kokanee spawning. Results: Survival of young of the year kokanee improved by 500 percent in 1998 and 1999. USACE. |
| 1994 | Harvest management of lake trout (limits removed in 2000). Results: Lake trout populations have remained low, and anglers harvest an increased number of lake trout caught. IDFG and Lake Pend Oreille Idaho Club (LPOIC). |
| 1996 | Legal harvest of bull trout eliminated on Lake Pend Oreille. Results: Redd counts have increased in several tributaries. IDFG. |
| 1997 | Color fish identification guide. Results: Improved fish identification skills by angler. IDFG and LPOIC. |
| 1997 | Fish information pamphlet. Results: Increased public awareness of fish habitat needs. IDFG, USFS, and Idaho Chapter of the American Fisheries Society. |

1998 Stabilized eroding lakeshore at Ponder Point in Lake Pend Oreille. Results: Reduced fine sediment delivery to the lake and halting loss of shoreline habitat. NRCS.

2000-present Lake Pend Oreille bull trout survival study is implemented by IDFG and funded by Avista.

1983-present Lake Pend Oreille bull trout redd counts implemented by IDFG and Avista.

***Trestle Creek***

1994-1996 Watershed restoration project, including road reclamation, culvert replacements, riparian re-planting, large woody debris placement. Results: 32 km of problem roads obliterated; bull trout redd counts remain high, average 263 per year since project completion; and security has improved for grizzly bears and elk. USFS.

1996 Adopted site specific Best Management Practices (BMPs) for timber harvest, requiring harvest plans, buffer strips, and other measures. Results: logging is more tightly regulated, particularly in the riparian areas, increased protection for bull trout, cutthroat trout, and cavity nesting species. Trestle Creek Local Working Committee and Idaho Department of Lands (IDL).

2000 Easements acquired on over 300 miles of creek frontage to protect habitat. Results: Long term protection for bull trout, cutthroat trout, and other species dependent on riparian forest. Avista Settlement Agreement.

***South Gold Creek***

1996 Replaced culverts, placed large woody debris, and completed channel restoration on two miles of creek. Results: Channel stability improved, reducing the threat to bull trout redds from mid-winter floods. USFS.

1997 Adopted site-specific best management practices for timber harvest. Results: logging is more tightly regulated, particularly in the riparian areas, increased protection for bull and cutthroat trout, and cavity nesting species. Lakeview Local Working Committee (LLWC) and IDL.

1998 Restricted vehicle access to Gold Creek with a gate to protect spawning habitat. Results: recreational vehicles in the stream channel prohibited, protecting bull trout redds. Avista.

1998-2004 Hand excavated channel through drawdown zone to allow adult bull trout to migrate back to Lake Pend Oreille. Results: Post-spawning bull trout survival has improved. IDFG.

2002 Remediation of the Kickbush Slide. IDEQ.

2003 Removal of Tailings at Idaho Lakeview Mine. IDEQ.

***North Gold Creek***

1997 Adopted site-specific best management practices for timber harvest. Results: Logging activity is more tightly regulated, particularly in the riparian areas, resulting in increased protection for bull and cutthroat trout, and cavity nesting species. LLWC and IDL.

1998-1999 Watershed restoration work, woody debris placement, headwater channel stabilization, riparian plantings, and road reclamation. Results: Problem roads have been obliterated; bull trout redd counts remain high; conditions improved for harlequin ducks; and improved security for elk. USFS.

1998-2003 Hand excavated channel through drawdown zone to allow adult bull trout to migrate back to Lake Pend Oreille. Results: Post-spawning bull trout survival has improved. IDFG.

***Granite Creek***

1997 Adopted site-specific best management practices for timber harvest. Results: Logging activity is more tightly regulated, particularly in the riparian areas, resulting in increased protection for bull and cutthroat trout, and cavity nesting species. LLWC and IDL.

1957-2000 Operated and maintained a kokanee spawning channel and egg taking facility in Sullivan Springs. Results: Egg take and wild production of fish from Sullivan Springs has forestalled the collapse of the kokanee fishery. IDFG, with assistance from LPOIC, TU, and Avista.

1996-1999 Placed cleaned gravel, removed fines, and redesigned kokanee trap to improve conditions for bull trout in Sullivan Springs. Results: Increased use of the spawning channel by bull trout and kokanee, reduced impact to bull trout redds and outmigrants from trapping operations. IDFG.

1998 Transported 40 bull trout spawners around intermittent reach of Granite Creek. Results: Increased egg deposition by bull trout. IDFG.

1997 Transported over 90 bull trout spawners around intermittent reach of Granite Creek. Results: Increased egg deposition by bull trout. IDFG.

1994-1997 Completed watershed restoration work, including channel stabilization, culvert removal, woody debris replacement, and placement of a fish ladder in a culvert. Results: Channel stability is improved, reducing the threat to bull trout redds from mid-winter floods, fish passage to approximately 1 km of habitat restored. USFS.

2000 Over 24 hectares (ha) of private land purchased. Results: Mature riparian forest habitat, floodplain, spawning channel, and bull trout rearing habitat are permanently protected from development. IDFG, Avista, LPOIC, and IDFG.

2001 The Willow Creek (Priest River) Aquatic Restoration project is sponsored by the Kalispel Tribe and encompasses the decommissioning of 8.4 miles of unstable Forest Service roads. The project was funded by the Washington State Salmon Recovery Funding Board.

2002 Fish passage and stream channel restoration project funded by Avista and implemented by IDFG, USFS, and Avista.

***Lightning Creek Complex***

1995 Relocated approximately 1 km of floodplain road. Results: Riparian forest habitat restored, floodplain habitat and channel conditions improved, and sediment input reduced in Lightning Creek. USFS.

1997 Recontoured road segments in the headwaters of Lightning Creek. Results: Improved watershed stability, increased security for grizzly bears and elk. USFS.

***Grouse Creek***

1996 Adopted site-specific best management practices for timber harvest. Results: Logging activity is more tightly regulated, particularly in the riparian areas, resulting in increased protection for bull trout, cutthroat trout, and cavity nesting species. Pack River LLWC and IDL

1990 Created 21 pools and 35 boulder clusters in Grouse Creek. Results: Increased rearing habitat for Gerrard rainbow trout. USFS, LPOIC, and TU.

1996 Planted riparian areas in Grouse Creek. Results: Improved bank stability, increased habitat for riparian wildlife species. USFS and Coldwater Creek Company.

1997 Placed 62 cover structures in North Fork Grouse Creek and 56 boulder clusters in Grouse Creek. Results: Increased rearing habitat for bull trout and Gerrard rainbow trout. USFS and TU.

1996-1997 Completed stream improvement work on four miles of stream in Grouse Creek. Results: Increased rearing habitat for Gerrard rainbow trout. USFS and CedaPine Veneer.

1995-1997 Obliterated roads, removed culverts, and restored fish passage in Grouse Creek tributaries. Results: Increased security for big game and grizzly bears, restored passage to over 5 km of spawning and rearing habitat for bull trout, improved conditions for harlequin ducks. USFS, with assistance from TU and IDFG.

***Johnson Creek***

1997 Added eight pool-and-cover structures in lower Johnson Creek and re-contoured roads in the headwaters. Results: Improved rearing habitat for bull trout and increased watershed stability and big game security. USFS.

2001 Bull trout and transport project on Johnson Creek is implemented by Avista and IDFG, and funded by Avista.

***Pack River***

1996 Adopted site-specific best management practices for timber harvest. Results: Logging activity is more tightly regulated, particularly in the riparian areas, resulting in increased protection for bull and cutthroat trout, and cavity nesting species. Pack River Local Working Committee and IDL.

1997 Closed 2.6 km of unstable road. Results: Reduced fine sediments into spawning and rearing habitat for bull trout, increased wildlife security. IDL.

1996-1997 Relocated and re-contoured roads, removed culverts, planted riparian areas, and completed in-channel work in upper Pack River and tributaries. Results: Reduced fine sediments into spawning and rearing habitat for bull trout and increased big game and grizzly bear security. USFS.

1999 Conducted bank stabilization projects on lower Pack River. Results: Reduced fine sediment delivery to Pack River and improved riparian habitat. NRCS.

1999 Stabilized 420 feet of bank along Hellroaring Creek. Annual Status Review by NRCS with Landowner. Improved fish habitat and banks stabilized from erosion.

***Twin Creek***

1997 Removed culvert from North Fork Twin Creek. Results: Reduced risk of culvert failure and impacts to downstream spawning and rearing habitat. USFS.

1998-2000 Planned, designed, and reconstructed over 2 km of previously channelized stream. Results: Channel length increased by approximately 300 meters, channel complexity increased, width-to-depth ratio was reduced, and

floodplain and riparian function restored. IDFG, the USFWS, Avista, TU, Ruen Family Trust, Bonner County, and Crown Pacific.

***Clark Fork River***

1995 Constructed spawning area for bull trout in spring-fed section of river. Results: Annual spawning by bull trout, averaging approximately five redds per year. Avista.

1998 Inspection at Cabinet Gorge to protect bull trout redds. Results: No more de-watering of bull trout redds in the Clark Fork spawning channel. IDFG, Avista, and IDEQ changed timing of Federal Energy Regulatory Commission (FERC).

1998 More than $950,000 annually to fund a native fish restoration project focused on providing fish passage; $400,000 annually for tributary restoration in Idaho; $475,000 annually for tributary restoration work in Montana; minimum flows in the lower Clark Fork River; recreational fish enhancements; habitat enhancement in the lower Clark Fork River in Idaho; and fisheries management assistance funding ($35,000 annually in Idaho). Results: Funded the Twin Creek, Granite Creek, and Trestle Creek projects in 2000; reconnected Lake Pend Oreille with upstream habitats in Montana; restored habitats in Montana and Idaho. Avista Settlement Agreement.

1999 Increased minimum flow release from Cabinet Gorge Dam from 85 cubic meters per second (cms) to 142 cms. Results: Over four hectares of productive riffle habitat restored and improved density of trout. Avista Settlement Agreement.

1999-2000 Initiated bull trout passage project for Cabinet Gorge Dam using an adaptive management approach. Results: Even though the project was recently initiated, several juvenile bull trout were safely transported downstream past Cabinet Gorge Dam from Montana tributaries. Avista, USFWS, IDFG, and Montana Department of Fish Wildlife and Parks (MDFWP).

1999-present Clark Fork River fishery monitoring project is implemented by IDFG and Avista and funded by Avista.

2001 A water control structure was constructed on Derr Creek. It allows water control on 75 acres of wetland. Annual status reviews by NRCS and FSA. A 48-inch gated water control structure was completed.

***Strong Creek***

1994 Placed fish ladder in previously impassable flume. Results: Access restored to over 0.5 km of spawning and rearing habitat for cutthroat trout and bull trout. IDFG and TU.

***Rapid Lightning Creek***

1997 Removed culvert and repaired stream crossing. Results: Reduced sediment delivery to stream. USFS.

1998 Implemented streambank stabilization project. Results: Reduced sediment delivery to stream. NRCS and landowner.

***Trout Creek***

1996 Pulled culverts, improved cross drainage, and improved stream crossings. Results: Reduced sediment delivery to stream. USFS.

***Hoodoo Creek***

1999 Installed riparian buffers. Results: Improved habitat for fish, songbirds, waterfowl, and furbearers. NRCS and landowners.

2000 Constructed manure pit and two manure storage slabs. Annual Status Review with Landowner by NRCS for five years. Above practices completed along with a nutrient management plan.

2001 Fencing creek off from livestock 4,214 lineal feet and tree planting on 7.5 acres inside fence next to creek. Annual Status Review with Landowner by NRCS for five years. Practices completed – no haying or grazing for 10 years at least.

***Cocolalla Creek***

1996-2000 Incentive program for management of riparian areas on private lands, restored fish passage, and improved water quality in the lake. Results: Improved water quality and improved trout fishery in the lake. Cocolalla Lake Association, Bonner County SWCD, NRCS, Soil Conservation Commission, IDL, IDEQ, and IDFG.

2001 Forest riparian buffer along Careywood Creek, wildlife pond and tree plantings. Ten years of haying and grazing restrictions. Annual status review by NRCS. Thus far 2,760 lineal feet of riparian buffer planted on 4.7 acres, one wildlife pond.

2002 Conservation Plan developed for Fish Creek. Water Quality Problem of bacteria and sediment. Replaced eroding culvert with bridge. Cocolalla Lake Association personnel are trained in doing stream walking, and they will be monitoring Fish Creek and send their data to the DEQ. The Cocolalla Lake Association was instrumental in outlining what they

thought were major problems in the Fish Creek Watershed.

***Clark Fork Settlement Agreement***

As part of the Settlement Agreement, Avista funds a full-time fisheries biologist for IDFG, the USFWS, and MDFWP in addition to having hired their own biologist. All four biologists work cooperatively as the Aquatic Implementation Team to implement projects in the Lake Pend Oreille and lower Clark Fork subbasins.

The Idaho biologist is responsible for implementing, monitoring, and evaluating the Idaho Tributary Habitat Acquisition and Fishery Enhancement Program. To date, this program has resulted in the acquisition of floodplain and riparian habitat on Granite Creek and Trestle Creek. Funds were also used to implement a 2 km stream channel restoration project in Twin Creek. Operational changes at Cabinet Gorge Dam have resulted in an increase in the minimum flow from 85 cms to 142 cms. Current monitoring activities include screw trapping of outmigrating fish in Trestle Creek and Twin Creek, cooperating with the USFS Rocky Mountain Research Station in estimating adult bull trout abundance in tributaries prior to spawning, annual redd counts of all known bull trout spawning areas, and spring and fall electrofishing on the Clark Fork River to estimate fish population size and community structure for comparison with pre-Settlement Agreement information. Research is being conducted to assess the influence of watershed condition on bull trout recruitment.

Current population studies on Twin Creek will allow for comparisons between habitat conditions and fish population responses to the channel restoration project. The *Lake Pend Oreille Bull Trout Conservation Plan* (Lake Pend Oreille Bull Trout Watershed Advisory Group 1999) is the primary document guiding implementation of the Tributary Habitat Acquisition and Fishery Enhancement Program.

The USFWS biologist is responsible for implementing, monitoring, and evaluating the Native Salmonid Restoration Plane (NSRP), developed as part of the Settlement Agreement. Projects in the Upper Pend Oreille subbasin include trapping and radio tagging adult bull trout to assess their movements in the Clark Fork River below Cabinet Gorge Dam to identify the best potential locations for a permanent trap site or fish ladder entrance. The project has also resulted in a description of the genetics of bull trout populations in tributaries to Lake Pend Oreille, and the lower Clark Fork River in Idaho and Montana, and in the trap and haul of juvenile bull trout downstream from Montana tributaries to the lower Clark Fork River in Idaho.

The Avista biologist is responsible for monitoring the effects on the downstream aquatic community of high TDG levels produced by spill at Cabinet Gorge Dam. Monitoring was contracted out to a consultant and includes collecting fish during spill events to assess the level of gas bubble disease (GBD), monitoring the health of penned fish in the Clark Fork River and Lake Pend Oreille, and assessing fish distribution during spill events. Research is ongoing, with preliminary results indicating some fish afflicted with GBD, and high TDG extending down the Clark Fork River, across the north arm of Lake Pend Oreille, and into the Pend Oreille River during large runoff events. In 2000, Avista started to

investigate engineering solutions to reduce entrainment of atmospheric gas at Cabinet Gorge Dam.

Montana biologists are implementing a tributary restoration and enhancement program upstream from Cabinet Gorge Dam similar to the Idaho project. If fish passage efforts are successful, improved conditions in the Montana tributaries should increase recruitment of bull trout and westslope cutthroat trout to Lake Pend Oreille. Trapping and tagging programs in the Montana tributaries will be used to monitor success of the restoration efforts.

Avista funded projects provide annual reports to the Management Committee, which oversees Settlement Agreement implementation.

### 15.3.3 Lower Pend Oreille

#### 15.3.3.1 BPA Funded Research, Monitoring, and Evaluation Activities

***Kalispel Tribe and Washington Department of Fish and Wildlife***

In 1995, the Kalispel Tribe, in cooperation with WDFW, initiated the Kalispel Resident Fish Project (NPPC Program Measure 10.8B.14-16, 18 and 19). This project consisted of habitat and population surveys to determine existing habitat conditions, fish distribution, and abundance. Habitat assessments were used to determine the types and habitat quality that were limiting to native bull trout and westslope cutthroat trout. Data collected in these assessments were compiled to develop recommendations for enhancement measures. From 1996 to 1998, the Kalispel Tribe implemented those recommendations in Whiteman Creek, Mineral Creek, Fourth of July Creek, Middle Branch LeClerc Creek, Indian Creek, Cee Cee Ah Creek, Browns Creek, and Mill Creek. Restoration efforts primarily include instream structures and riparian restoration. Instream structures perform specific improvements for fish habitat, including spawning habitat, rearing cover, feeding areas, and overwintering habitat. These structures provide desirable conditions in areas where the stream conditions have been degraded.

The goals of instream restoration are to improve habitat quality and quantity in degraded areas, and increase cutthroat trout and bull trout populations. Riparian restoration includes fencing and vegetation planting. The purpose of riparian restoration is to reduce the impacts of land use practices, and enhance the natural recovery process in disturbed stream areas. Monitoring and evaluation of these enhancement measures started in 1997 and will continue at least through 2001 and beyond. The Kalispel Tribe will continue to conduct habitat and fish population surveys and implement enhancement measures in additional tributaries. Since 1998, the Pend Oreille County PUD has surveyed an additional 104 km of stream. In 2001, an additional 56 km were surveyed.

The Kalispel Tribe, in cooperation with Pend Oreille County and WDFW, now provided permitting oversight, replaced culverts with arched bridges at Mill Creek in 1997 and Cee Cee Ah Creek in 1998 to improve fish passage. The Kalispel Tribe and the Pend Oreille County PUD, initiated an adfluvial trapping program in 1998 as part of the Resident Fish Stock Status above Chief Joseph and Grand Coulee Dams Project (JSAP). This project is a management tool using ecosystem principles to manage artificial fish assemblages in

altered environments within the Columbia River Basin above Chief Joseph and Grand Coulee dams.

For the past several years, the Kalispel Natural Resource Department (KNRD), the Washington Bass Anglers Sportsman Society (B.A.S.S.) Federation, and the Inland Empire Bass Club have participated in a bass habitat enhancement project on Box Canyon Reservoir. The project is intended to increase the survival of juvenile largemouth bass, thus enhancing recruitment of adult bass to the reservoir. These enhancement structures include Berkley Habitat Structures and Christmas trees. Funding sources for this project include the BPA, the Kalispel Tribe, Fish America Foundation, and the Washington State B.A.S.S. Federation.

In 1996, the KNRD constructed a largemouth bass hatchery, funded by BPA, to supplement populations of largemouth bass in Box Canyon Reservoir. Annual production includes 150,000 bass of which 100,000 are fry and 50,000 are fingerlings. The goal is to create a productive bass fishery in Box Canyon Reservoir that is available to tribal members and the public.

### 15.3.3.2 Non-BPA Funded Research, Monitoring, and Evaluation Activities

***Pend Oreille Watershed Planning Unit***

In 1998 Governor Locke signed HB 2514, the Watershed Management Act, providing the impetus for Watershed Planning Units to form throughout the State. Washington Department of Ecology administers this program through grants. In Water Resource Inventory Area (WRIA) 62, which encompasses the Lower Pend Oreille drainage, the Pend Oreille Conservation District is the Lead Agency facilitating the development of a Watershed Management Plan addressing three components: water quality, water quantity, and habitat. The Watershed Planning Unit is currently collecting water quality data from seven monitoring stations on four major tributaries to the Lower Pend Oreille.

***Pend Oreille Lead Entity Salmonid Recovery Team***

The Salmonid Recovery Team is developing and implementing the *Strategy for Protection and Improvement of Native Salmonid Habitat in the Pend Oreille Watershed, Washington Water Resource Inventory Area 62*. This Team solicits project applications annually and prioritizes those project applications for funding through the Washington Salmon Recovery Funding Board (SRFB) to achieve the goals outlined in the Strategy. To date four projects have been funded through this process by the SRFB in the Lower Pend Oreille. They are:

- Pend Oreille Conservation District and the Kalispel Tribe are conducting a barrier, habitat, and fish assessment survey on private lands in the Lower Pend Oreille River.

- The Cee Cee Ah Creek project, jointly sponsored by the Pend Oreille County Department of Public Works and the Kalispel Tribe, involved the removal of a double culvert under LeClerc Road that presented a velocity barrier to salmonids.

- The Middle Branch LeClerc Creek antimycin project is sponsored by the Washington Department of Fish and Wildlife and has been delayed awaiting permits to move on. Some riparian fencing work along the creek has been accomplished.

- The East Branch LeClerc Creek road relocation project is designed to reduce sedimentation loads and address fish passage issues in LeClerc Creek. Project cooperators include USFS, WDFW, Stimson Timber Company, Kalispel Tribe, and Federal Highways Department.

- The Willow Creek project is sponsored by the Kalispel Tribe and USFS. This project began in 2003 and in 2004, 8.4 miles of unstable roads in the North Fork of Granite and Willow Creek drainages will be decommissioned. Direct benefits to native salmonids from this proposed project would be protection and enhancement of existing spawning and rearing habitat. Fish habitat would be improved by restoring habitat connectivity and by removing the failing road system that is currently delivering sediment to the channel. This project is funded by the Washington State Salmon Recovery Funding Board.

***U.S. Forest Service***

The Colville National Forest has closed USFS roads in the Subbasin where it has become necessary to prevent resource damage and provide isolation for threatened and endangered species, such as grizzly bear and woodland caribou. In the LeClerc Creek watershed, the USFS, Stimson Lumber Co., the Kalispel Tribe, and Pend Oreille County Roads Department have built a bypass road and are reclaiming 3.6 km of existing road. Road resurfacing, riparian planting, enclosure fencing, the armoring of livestock crossings, and range utilization monitoring in LeClerc Creek have improved habitat conditions.

The USFS national road policy limits future road building in current roadless areas. The USFS has been inventorying all culverts on USFS service roads to determine whether the culverts are appropriate for maximum flows and whether they provide fish passage for all life stages of resident fish.

The USFS, Region 6, has signed a Memorandum of Agreement with the WDOE to continue to reduce sources of sediment from forest roads.

The Colville National Forest continues to conduct Hankin-Reeves stream inventory surveys on segments of Pend Oreille River tributaries on National Forest System lands. Survey results, in addition to the culvert inventory, are used to determine where instream and/or riparian habitat restoration is needed and indicate sources of ongoing direct and indirect effects.

### 15.3.4 Priest River

Fisheries management has largely focused on a shift away from stocking non-native species toward managing for native species with wild stocks. IDFG research and management on fish populations in the Priest River drainage has been funded through the Federal Sport Fish program. Recently, funding from the USFWS through Section 6 of the ESA has been used to document bull trout abundance in the Upper Priest Lake system and evaluate the threat posed by brook trout and lake trout.

Habitat management has been the responsibility of the major landowners in the Priest River drainage, primarily the USFS and the IDL. There is a need for a comprehensive survey of bull trout and cutthroat trout habitat conditions in the Priest River drainage to prioritize where restoration efforts would best be spent.

## 15.4 Strategies Currently Being Implemented Through Existing Projects

### 15.4.1 Limiting Factors and Strategies Currently Being Implemented

As described in Section 2.4.2, a database was developed that lists the recent projects that have been implemented in the Subbasin. Each project was coded for the limiting factors that were addressed, and the strategies that were employed.

In the Pend Oreille Subbasin, 102 recent restoration and conservation projects were identified. Of the projects identified, 70 were focused on resident fish, 16 primarily benefited wildlife, and 16 benefited both fish and wildlife.

The focus of most of the recent projects in the Pend Oreille Subbasin (71 percent) has been on addressing habitat related limiting factors, including habitat quality (30 percent), water quality or quantity (17 percent), habitat quantity (15 percent) or barriers (9 percent) (Figure 15.1). The lack of information has been addressed by 15 percent of the recent projects. Disease, competition, predation, and hybridization are limiting factors that have been addressed by 9 percent of the recent projects. Indirect mitigation is addressed with 2 percent of projects.

Projects have implemented a diverse array of strategies in the Pend Oreille Subbasin (Figure 15.2). Habitat improvement or restoration activities have been undertaken by 47 percent of the projects. Research, monitoring, and evaluation are the next largest category of projects by strategy, with 14 percent of projects engaged in this activity.

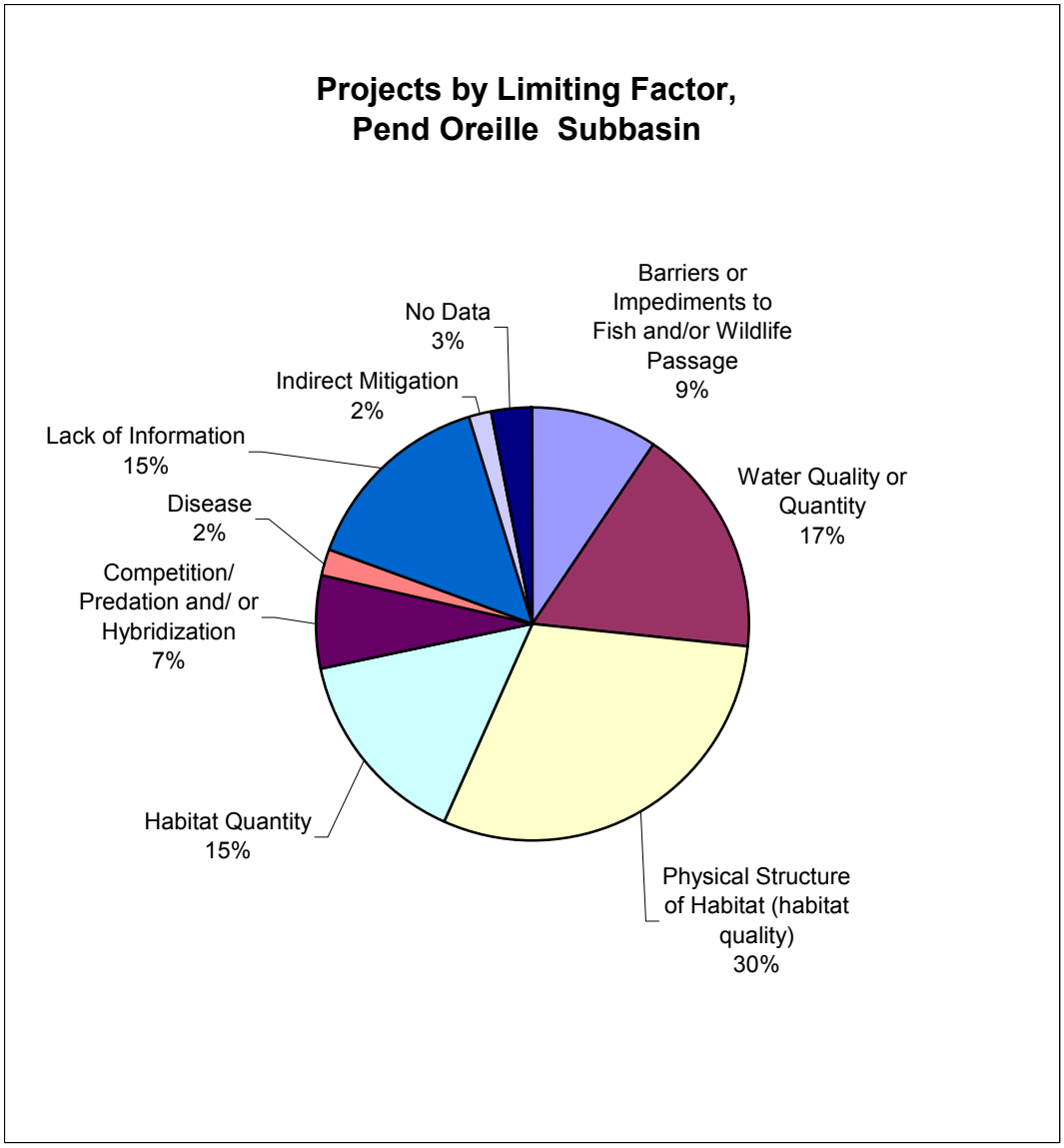



Figure 15.1. The percentage of the 102 recent restoration and conservation projects that addressed various limiting factors within the Pend Oreille Subbasin. Note that some projects addressed more than one type of limiting factor.

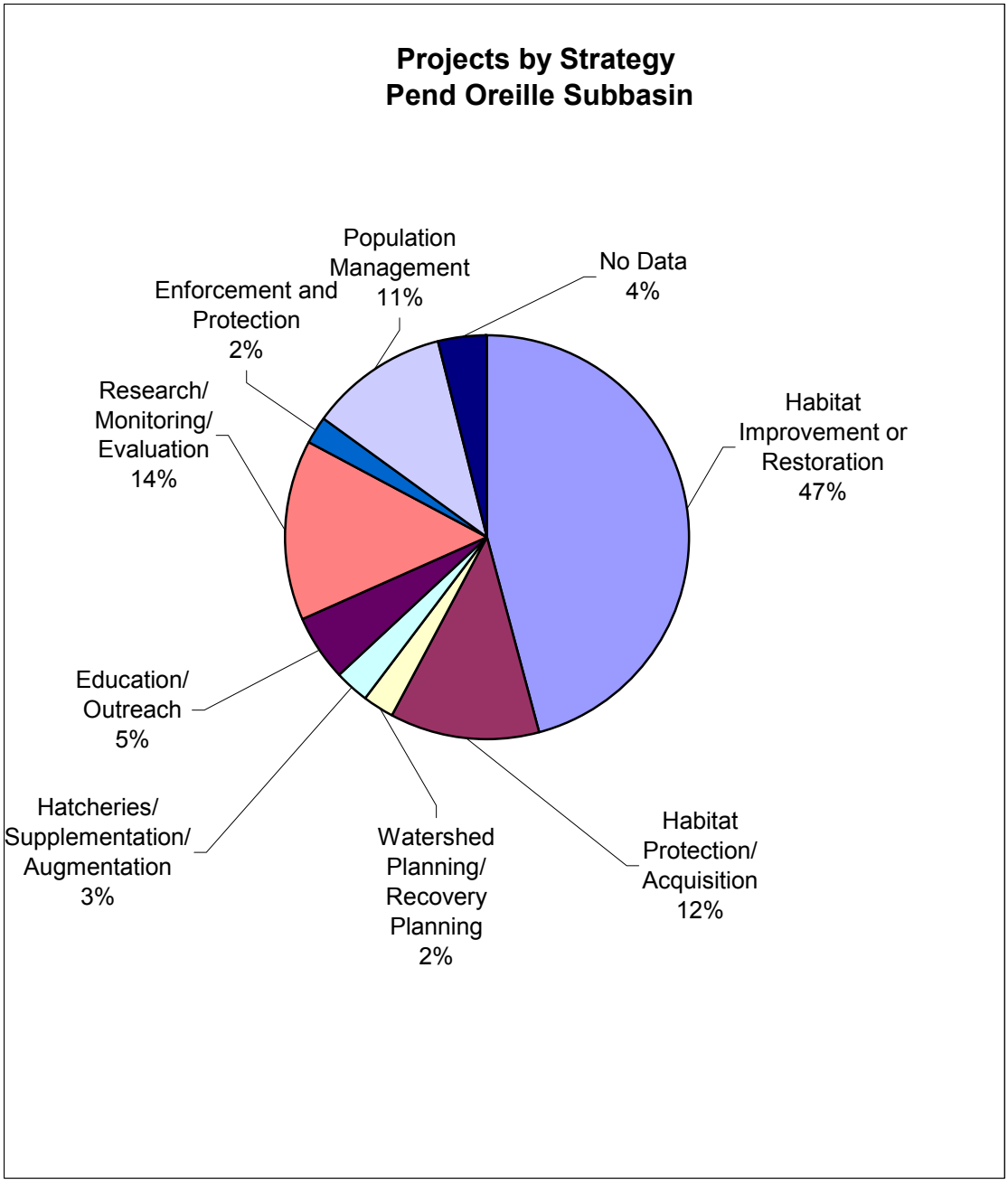



Figure 15.2. The percentage of the 102 recent restoration and conservation projects that addressed various limiting factors within the Pend Oreille Subbasin. Note that some projects employed more than one type of strategy and so are counted in multiple categories.

### 15.4.2 Gaps Between Actions Taken and Actions Needed

The information for this section was gathered at a meeting of the IMP Technical Coordination Group. The group was asked for their input on the degree to which past projects have addressed fish and wildlife issues in the Pend Oreille Subbasin. In addition, they were asked what needs the subbasin has for future projects. Table 15.1 provides a

summary of the needs that were identified through the inventory, with corresponding objectives and strategies from the management plan that address these needs.

The Pend Oreille Subbasin has some significant research needs. There is substantial information available about bull trout adults in tributaries to Lake Pend Oreille, but there is no information on bull trout habitat use in Lake Pend Oreille itself. In addition, there is very little information about juvenile bull trout. More research is needed on these topics. Numerous bull trout objectives and strategies are identified in the management plan, and several of these are research oriented (Table 15.1).

In addition, there is a need for a comprehensive evaluation of adfluvial westslope cutthroat trout in the Subbasin. The study should include an evaluation of population abundance and habitat conditions in streams, identification of limiting factors, and a prioritized list of habitat restoration projects. The concern about cutthroat trout is reflected in the management plan in Pend Oreille objective 2A4 (Table 15.1).

Another research need is the role of lake whitefish in Lake Pend Oreille. Lake whitefish are a potential forage fish for predacious species. They may have an effect on mysis abundance, kokanee, and the lake food web in general. There is almost no existing information on the status and distribution of pygmy whitefish in Lake Pend Oreille, Priest Lake, or Spirit Lake for mountain whitefish there is a need for data subbasin-wide. There is also a need for a kokanee and mysis shrimp monitoring project for Priest and Upper Priest lakes.

A comprehensive evaluation of fish passage barriers in this Subbasin is needed. Once barriers have been identified, they should be removed as appropriate. The management plan includes a strategy to develop entire drainage restoration plans to improve fish habitat. This would logically include a review of fish barriers.

In the Priest River drainage, there is a need for funding for the installation of a strobe light weir in the Thorofare between Priest Lake and Upper Priest Lake to limit lake trout access to upper Priest Lake for enhancement and protection of bull trout.

Subbasin-wide there is a need for funding of habitat restoration efforts to conserve and enhance vulnerable populations. In the lower Pend Oreille, there is a need for land acquisition and conservation easements for protection of bull trout.

On-site mitigation needs for fisheries includes a need for warmwater fish habitat improvements in Pend Oreille River.

Table 15.1. Summary of objectives and strategies from the management plan that address unmet needs that were highlighted in the inventory

| Identified Needs | Examples of management plan objectives and strategies that address needs |
|---|---|
| **Bull trout research** | **Subbasin Objective 1C2:** Research the effects of lake trout competition on bull trout and cutthroat trout in Priest Lake by 2015; implement corrective measures in accordance with recovery/restoration objectives.<br>**Subbasin Objective 1C5**: Pursue the objectives in the U.S Fish and Wildlife Service Draft Bull Trout Recovery Plan (2002). The goal of the bull trout recovery plan is to ensure the long-term persistence of self-sustaining, complex, interacting groups of bull trout distributed throughout the species' native range, so that the species can be delisted.<br>**Subbasin Objective 1A1*:** By 2010, quantitatively evaluate the impacts of hydropower facility construction and operation on water level fluctuation in Lake Pend Oreille, and other waterbodies in the subbasin, including effects on near shore productivity.<br>**Subbasin Objective 1C1:** Restore bull trout to a harvestable surplus (i.e., create and maintain a sport fishery) in the Pend Oreille Subbasin by 2030. Targets: Lake Pend Oreille: capable of providing 1,000 fish annually based on historic harvest rates of the 1960's through 1980's. Pend Oreille River: to be determined. Priest Lake: to be determined. |
| **Westslope cutthroat trout Research** | **Subbasin Objective 1B1**: Protect, enhance, and restore native fish habitat function to maintain or enhance ecological diversity and long-term viability of native and desirable nonnative fish species, including westslope cutthroat and bull trout, using a watershed-based approach.<br>**Subbasin Objective 1C3:** In Lake Pend Oreille reduce competition and predation by lake trout on bull and cutthroat trout by reducing lake trout abundance to <4000 adults, if feasible.<br>**Subbasin Objective 1C2:** Research the effects of lake trout competition on bull trout and cutthroat trout in Priest Lake by 2015; implement corrective measures in accordance with recovery/restoration objectives. |
| **Lake whitefish research** | **Subbasin Objective 1C11*:** By 2010, gain a better understanding of the kokanee food habits, potential competition with Mysid shrimp, and the ecological role of lake whitefish in reducing shrimp abundance. |
| **Thorofare strobe light to repel lake trout** | **Subbasin Objective 1C4:** Remove 90% or more of the lake trout from Upper Priest Lake and prevent re-establishment through the Thorofare. |
| **Habitat restoration** | **Subbasin Objective 1B1**: Protect, enhance, and restore native fish habitat function to maintain or enhance ecological diversity and long-term viability of native and desirable nonnative fish species, including westslope cutthroat and bull trout, using a watershed-based approach.<br>**Subbasin Objective 1B5**: Maintain 1.7 million square feet of clean shoreline gravel areas for kokanee spawning in Lake Pend Oreille throughout the duration of this plan. Note: Any studies should include evaluation of effects of proposed actions on flood control capability relative to current hydropower facility operations.<br>**Subbasin Objective 1B7:** Increase bass over-winter habitat in the Pend Oreille River above Albeni Falls Dam from its current 45 ha to >300 ha to provide an improved sport fishery.<br>**Subbasin Objective 1B8**: Enhance, conserve and protect riparian habitats to the extent that they are intact and functional**.** |
| **Warmwater fish habitat** | **Subbasin Objective 2C1**: Increase the amount of harvestable largemouth bass in Box Canyon Reservoir from the current levels of 6 pounds per acre to 12 pounds per acre by 2010, as long as this activity does not adversely impact native fish.<br>**Subbasin Objective 1B7:** Increase bass over-winter habitat in the Pend Oreille River above Albeni Falls Dam from its current 45 ha to >300 ha to provide an improved sport fishery. |

# SECTION 16 – Table of Contents

# 16 Pend Oreille Subbasin Assessment – Terrestrial

## 16.1 Focal Habitats: Current Distribution, Limiting Factors, and Condition

Vegetation in the Pend Oreille Subbasin is dominated by interior mixed conifer forest, with montane mixed conifer and lodgepole forests in the high elevations and small areas of montane coniferous wetlands and alpine habitats. Timber management is the primary land use in the Subbasin on National Forest System, BLM, Idaho Department of Lands, Washington Department of Natural Resources, Tribal, and private timberlands. Agriculture, grazing, and urban and rural residential development are other land uses. The largest urban areas within the Subbasin include Newport, Cusick, and Metaline, Washington, and Sandpoint, Priest River, and Clark Fork, Idaho.

Figure 13.2 (Section 13) shows the current distribution of wildlife-habitat types in the Pend Oreille Subbasin based on IBIS (2003). Table 16.1 presents the acres of habitats by wildlife-habitat type and by subbasin focal habitat. Five focal habitats were selected for the IMP: wetlands, riparian, steppe and shrub-steppe, upland forest, and cliff/rock outcrops. Four of the province-level focal habitats were selected as focal habitats for the Pend Oreille Subbasin: wetlands, riparian, upland forest, and cliff/rock outcrop (Ad Hoc Terrestrial Resources Tech Team May 5, 2003). Focal habitats comprise about 89 percent of the Subbasin, including upland forests (87 percent) and wetlands and riparian habitats (two percent, excluding open water). Developed habitats, including agricultural and urban lands, currently comprise approximately three percent of the Subbasin. Cliff/rock outcrop habitats are not mapped in the IBIS system.

The IBIS data is based on satellite imagery at a scale that tends to under-represent habitats that are small in size or narrow in shape. Additional information on habitats and wildlife within the Pend Oreille Subbasin is available for selected ownerships and/or jurisdictions; these sources include the WDFW, Washington Priority Habitats and Species database, USFWS and IDFG Conservation Data Center. Data from these sources has been used where available to provide more specific information on habitat distribution within the Subbasin.

Historical vegetation data for the Subbasin is not available at a scale similar to the current condition IBIS data. Native vegetated habitats in the Subbasin have been converted to developed habitats and have also been modified through changes to vegetation type and structure. Refer to Section 4 for a discussion of historical vs. current habitat types in the IMP and factors influencing the distribution and quality of those habitats.

Table 16.1. Current wildlife-habitat types in the Pend Oreille Subbasin

| Wildlife-Habitat Type | Pend Oreille Current Acres | Percent of Total |
|---|---|---|
| **Wetlands (Focal Habitat)** | | |
| Lakes, Rivers, Ponds, and Reservoirs | 139,569 | 6.7% |
| Herbaceous Wetlands | 2,580 | 0.1% |
| Montane Coniferous Wetlands | 26,969 | 1.3% |
| **Riparian and Riparian Wetlands (Focal Habitat)** | | |
| Eastside (Interior) Riparian Wetlands | 11,566 | 0.6% |
| **Steppe and Shrub-Steppe** | | |

| Wildlife-Habitat Type | Pend Oreille Current Acres | Percent of Total |
|---|---|---|
| Eastside (Interior) Grasslands | 80,927 | 3.9% |
| Shrub-Steppe | 1,442 | 0.1% |
| **Upland Forest (Focal Habitat)** | | |
| Westside Lowland Conifer-Hardwood Forest | 23,210 | 1.1% |
| Montane Mixed Conifer Forest | 143,240 | 6.9% |
| Eastside (Interior) Mixed Conifer Forest | 1,381,574 | 66.6% |
| Lodgepole Pine Forest and Woodlands | 37,230 | 1.8% |
| Ponderosa Pine Forest and Woodland | 112,147 | 5.4% |
| Upland Aspen Forest | 4,772 | 0.2% |
| **Alpine and Subalpine** | | |
| Subalpine Parklands | 204 | 0.0% |
| Alpine Grasslands and Shrublands | 50,772 | 2.4% |
| **Developed** | | |
| Agriculture, Pasture, and Mixed Environs | 52,327 | 2.5% |
| Urban and Mixed Environs | 5,861 | 0.3% |
| **Total** | **2,074,390** | **100.0%** |

(*Source*: IBIS 2003)

## 16.1.1 Open Water, Wetlands, and Riparian Areas

The IBIS wildlife-habitat map (Figure 13.2) is based in part on National Wetlands Inventory (NWI) mapping, but does not utilize all of the wetland categories or show the full extent of very small mapped areas. Information provided below on wetlands and riparian areas is based on IBIS (2003) and the Pend Oreille Subbasin Summary (Entz and Maroney 2001), unless otherwise cited. Other sources of information include a report on the conservation status of northern Idaho wetlands by Jankovsky-Jones (1997).

### 16.1.1.1 Open Water

Open water habitats of natural and human origin comprise almost seven percent of land cover in the Pend Oreille Subbasin. Lake Pend Oreille is the largest lake in the Subbasin, located in the Upper Pend Oreille watershed. The Clark Fork River is the primary tributary to Lake Pend Oreille, which is drained by the Pend Oreille River. Priest Lake and Upper Priest Lake are located in the Priest River watershed, which drains via the Priest River into the Pend Oreille River above Albeni Falls Dam. The Lower Pend Oreille watershed includes the Pend Oreille River between Albeni Falls Dam and the Canadian border. Sullivan Creek is the largest tributary. The watershed supports numerous small and medium-sized lakes including Bead, Sullivan, and Calispell lakes.

The Upper Pend Oreille watershed is bounded by hydroelectric facilities at its upstream and downstream boundaries. Cabinet Gorge Dam is located on the Clark Fork River at the upstream boundary and Albeni Falls Dam is located on the Pend Oreille River at the downstream end, about 23 miles downstream of Lake Pend Oreille. Water level in Priest and Upper Priest lakes and the Thorofare is controlled by a dam at the outlet of Priest Lake. In the Lower Pend Oreille watershed, the Box Canyon Reservoir extends almost 56 miles from the Box Canyon Dam upstream to the Albeni Falls Dam, occupying about 7,370 acres at full pool. Boundary Dam, located about a mile upstream of the Canadian border, creates a 17.5

mile-long reservoir with a full pool surface area of about 1,640 acres. Water level in Sullivan Lake is controlled by a dam at the outlet.

The federal hydrosystem project at Albeni Falls, along with other water resources projects, has strongly influenced the major rivers and lakes in the Pend Oreille Subbasin. Commercial and residential development, timber management, agricultural practices, and grazing also have influenced the Subbasin's waterbodies.

### 16.1.1.2 Wetlands and Riparian Areas

Wetland habitats in the northern Idaho panhandle were evaluated by Jankovsky-Jones (1997). The study area included most of Boundary and Bonner counties, and a small portion of Kootenai County. The analysis is based on NWI mapping for about 1.4 million acres in the northern Idaho, a portion of which are located in the Pend Oreille Subbasin; the remainder in the adjacent Kootenai Subbasin. Information on land ownership and management direction to retain natural resource values was used to identify lands with "protected" status. Table 16.2 shows the wetland habitats by NWI category and protected status.

Table 16.2. Idaho Panhandle wetland summary

| Idaho Panhandle: Wetland and Deepwater Habitat and Protected Status | | | | |
|---|---|---|---|---|
| **System Classification** | | **Acres Protected** | **Total Acres** | **Percent of Type Protected** |
| **Palustrine** | | | | |
| | Emergent | 1,598 | 22,443 | 7.1% |
| | Scrub-Shrub | 441 | 9,920 | 4.4% |
| | Forested | 471 | 8,011 | 5.8% |
| | Aquatic Bed | 40 | 643 | 6.2% |
| | Unconsolidated Bottom | 49 | 1,099 | 4.4% |
| | Unconsolidated Shore | 0 | 11 | 0.0% |
| | **Total Palustrine** | **2,599** | **42,127** | **6.2%** |
| **Lacustrine** | | | | |
| | Limnetic | 2,010 | 102,655 | 1.9% |
| | Littoral | 414 | 11,430 | 3.6% |
| | **Total Lacustrine** | **2,424** | **114,085** | **2.1%** |
| **Riverine** | | | | |
| | Upper Perennial | 339 | 8,367 | 4.1% |
| | **Total Riverine** | **339** | **8,367** | **4.1%** |
| **Total All Types** | | **5,362** | **164,579** | **3.2%** |

(*Source*: Jankovsky-Jones 1997)

Approximately 12 percent of the study area is classified as wetlands; lacustrine systems (primarily deepwater habitats) make up over 69 percent of this area. The dominant vegetated wetland types in the Subbasin include palustrine emergent (14 percent), palustrine scrub-shrub (six percent), and palustrine forested (five percent). Most of the wetlands are open water habitats on state lands, about 2.9 percent of wetlands are on National Forest System lands, and less than 1 percent is on USFWS lands. About 23 percent of the wetlands in the study area are located on private lands. Approximately 5,362 acres of wetland habitats are protected in the study area, representing less than four percent of all wetland types. The largest category of vegetated wetlands under protection is the palustrine emergent type, with

about seven percent of the acres within the type protected, or about one percent of the total wetland area. The Jankovsky-Jones study includes analysis of wetland habitat quality and ranks sites for future protection. Several Class I and II wetland sites on private land are located within the Pend Oreille Subbasin, including sites at the Clark Fork Delta and Upper Priest Lake. The study provides a good reference for evaluation of wetland parcels for acquisition.

Riparian vegetation surrounding Lake Pend Oreille currently includes emergent wetlands, deciduous forested wetlands, and small quantities of deciduous scrub-shrub wetlands. Operation of Albeni Falls Dam results in drawdown of Lake Pend Oreille by as much as eleven feet during the winter months, primarily for flood control purposes. During the summer, water levels are held at or near full pool. This operation pattern results in a band of unvegetated habitat along the reservoir margin. Pioneering species are unable to successfully establish in this zone due to the combined effects of the seasonal prolonged drawdown and inundation periods, as well as short-term water level fluctuations of up to several meters. Wave action also affects the stability of shoreline soils and the ability of plants to colonize the fluctuation zones. Prior to construction of the dam, wetlands surrounding the lake were typically flooded in the late winter and spring months, with water receding gradually to a late summer low. As a result of the project's construction and operation, large areas of emergent and deciduous forested wetlands have been converted to open water (at full pool) and exposed mudflats (during drawdown) (Martin et al. 1988). Very small quantities of scrub-shrub wetlands (73 acres) were created as a result of raising the lake's water level. The species diversity of emergent wetland habitats, and their forage value to wildlife, appears to have shifted over time. Sedges, spikerushes, arrowheads, bulrushes and smartweeds, which are valuable wildlife foods, are reduced in abundance and the occurrence of reed canarygrass and cattails has increased (Martin et al. 1988). The latter two species tolerate long drawdown periods, but are of relatively low value for most waterfowl and wildlife.

Martin, et al. (1988) also noted changes to the aquatic macrophyte communities in the shallow water zones of Lake Pend Oreille. The abundance of various species of *Potamogeton* has been reduced, apparently in favor of less valuable waterfowl forage species such as *Chara* and *Nitella* that tolerate deeper water levels.

Wetlands also are associated with the mouths of streams and rivers in Lake Pend Oreille where sediments accumulate in deltas. Due to the effects of water regulation, vegetation is lacking within the fluctuation zone which is inundated by higher summer water levels, and exposed during the winter drawdown period. Erosion that has resulted from wave action and undercutting of the unvegetated banks also inhibits the establishment of vegetation. Erosion of habitat is of special concern at the Clark Fork River delta, Pack River delta, Strong's Island, and the mouths of Priest River, Hoodoo Creek, Hornby Creek, and Carr Creek. Annual erosion of surface area as a result of the Albeni Falls Project was estimated at about 30 acres per year, with half occurring in the Clark Fork River delta (Martin et al. 1988). Loss of sediment input from upstream hydroelectric projects on the Clark Fork River may contribute to this effect.

Regulated flows have been shown to affect the ability of colonizing species, such as black cottonwood and willow, to become established within riparian zones (Braatne and Jamieson 2001; Scott et al. 1997). A potential effect of the operation of the Albeni Falls Project is a

lack of recruitment of woody riparian trees and shrubs along affected reaches of the Pend Oreille and Clark Fork rivers and Lake Pend Oreille. Historical photos show cottonwoods and red cedar forests along the Clark Fork delta and portions of the Lake Pend Oreille shoreline (Martin et al. 1988). Currently, deciduous and coniferous-forested wetlands are limited in these areas.

Along the Lower Pend Oreille River, the floodplain is well developed and includes a variety of wetland and riparian habitats. Remnant cottonwood galleries are present in some areas, but are decadent, fragmented, and limited in distribution (Entz and Maroney 2001). Within the 55-mile reach affected by the Box Canyon Hydroelectric Project, stage pattern and reservoir inundation affect the recruitment of cottonwood, through hydrology and through lack of active channel processes that create sediment bars and islands suitable for colonization (Rood and Braatne 2002). Seasonally flooded wetlands, including agricultural lands, are extensive. Scrub-shrub and forested wetlands, seasonally flooded fields, persistently flooded emergent wetlands, shallow riverine sloughs, and ponds are present within and adjacent to the floodplain. Riparian habitats are greatly modified from historic conditions through timber harvest, residential development, and agricultural land uses. Bank sloughing has also reduced the extent of riparian vegetation along some river reaches. A major contiguous reach of floodplain, riparian, and wetland habitat (over 1,700 acres) is protected along the Lower Pend Oreille at the mouths of Tacoma and Trimble creeks. This area consists of property acquired by the Kalispel Tribe as mitigation for the Albeni Falls Project, combined with USFWS and Pend Oreille Public Utility District properties.

Riparian and riparian wetlands throughout the Subbasin have been affected by water regulation, natural and human-caused fire events, draining of agricultural and grazing lands, timber management, roads, and residential development.

### 16.1.2 Upland Forests

Upland forests in the Pend Oreille Subbasin are dominated by interior mixed conifer forests (67 percent of Subbasin, Table 16.1). Montane mixed conifer forests (seven percent) are present in the high elevations of the Selkirk and Cabinet mountains. Ponderosa pine forests (five percent) are present primarily in the lower elevations in the southern part of the Subbasin. Lodgepole pine dominated forests (two percent) are present on a variety of higher elevation sites disturbed by timber harvest or fire, particularly to the southwest of Priest Lake.

Timber harvest has been a primary land use in the Pend Oreille Subbasin for over a century. Timber harvest has resulted in the elimination of most mature and old growth stands and their replacement with stands of younger age and less complex structure. With timber management and increased population of the area, fire suppression became a standard practice. Effects of fire suppression include changes in seral stages and species composition of the forest stands. In general, early seral-stage forests of western larch, lodgepole pine, ponderosa pine, and western white pine have decreased while shade tolerant species such as Douglas fir and grand fir have increased. This general effect of timber management is seen at all elevations on the Idaho Panhandle National Forest, where the gradual replacement of species requiring high levels of sunlight with those more tolerant of shaded, dense stand conditions has been documented in detail (USFS 2003a).

Construction and operation of the Albeni Falls Project did not directly affect upland forests.

### 16.1.3 Other Terrestrial Resource Limiting Factors

As noted in Section 4, numerous specific habitat elements (called key environmental correlates, or KECs, in IBIS terminology) influence the value of wildlife-habitat types to individual wildlife species. Habitat elements may include natural attributes, such as snags, downed wood, soil types, and also include anthropogenic features such as buildings, chemical contaminants, and roads. Information on site-specific habitat elements is critical to determination of habitat suitability for wildlife; however, data is not available at a subbasin-wide level for most habitat elements. Information on selected habitat elements that have important influences on habitat quality and wildlife use has been compiled for this assessment, including road density and salmonid nutrients lost to the IMP.

#### 16.1.3.1 Road Density

Figure 13.3 shows road density, by density class, for each sixth order watershed in the Pend Oreille Subbasin. The majority of the Subbasin is ranked as high road density (1.7 to 4.7 miles of road per square mile). Several areas surrounding Lake Pend Oreille and Priest Lake, a reach of the Pend Oreille River west of Newport, and an area near Metaline Falls, are ranked moderate (0.7 to 1.7 miles of road per square mile). The far northern portion of the Subbasin is ranked as low road density (0.1 to 0.7 miles of road per square mile).

High road densities are indicative of human land uses and activities. In the Pend Oreille Subbasin, high road densities are typically associated with managed timberlands. Road density values in excess of 1.5 miles per square mile are considered sub-optimal for mule deer and Rocky Mountain elk summer range; values greater than 0.5 miles per square mile (mule deer) and 1.0 miles per square mile (elk) are suboptimal for the same species on their winter ranges (WDFW 1991). Most of the Pend Oreille Subbasin currently supports road density levels considered suboptimal for these game species.

#### 16.1.3.2 Loss of Salmonid Nutrient Base

Construction and operation of the Chief Joseph and Grand Coulee dams on the Columbia River eliminated the potential for salmon to return to areas traditionally and culturally used by the Kalispel, Coeur d'Alene, and other native American Tribes, including portions of the Pend Oreille River Subbasin. The loss of anadromous fish affected not only Tribal and recreational use of the fisheries resource, but also affected salmon-dependent wildlife and modified the nutrient input to the overall ecosystem.

Appendix E of the 1987 Columbia Basin Fish and Wildlife Program (Council 1987) presents the results of several alternative calculations to determine the loss of salmon within the Columbia River system due to hydropower development. Based on the pre-1850 run size, with no dams in place, the number of adults at spawning grounds in reaches above Chief Joseph Dam would total 3,175,000 fish, with sockeye comprising greater than 55 percent, summer Chinook 19 percent, and fall Chinook, spring Chinook, coho, and steelhead the remaining 26 percent. Although the analysis does not break out the returns by major river and stream systems, it can be assumed that a significant number of fish would have returned to Metaline Falls on the lower Pend Oreille River in the absence of other human-induced barriers.

Scholz, et al. (1985) compiled information on salmon and steelhead run size and harvest above Grand Coulee Dam. The results of four different techniques to estimate adult run size of the total Columbia River were summarized, showing a range of 1.2 million to 35 million fish. The authors selected the catch-based estimation technique as the most reasonable estimate of total Columbia River run size, equaling 13.1 million fish. The percentage of the total run migrating to the Upper Columbia River was estimated at 5 percent Chinook, 8 percent sockeye, 3 percent coho, and 41 percent steelhead. Using the catch-based total run size, an estimate of run size into the Upper Columbia Basin, prior to major development, was calculated at 1.1 million fish. Minimum annual catch was estimated at 644,000 fish.

The impact of the loss of salmon to focal wildlife is discussed in Section 4.5.2 (Key Wildlife Species of the Intermountain Province).

### 16.1.4 Land Ownership and Gap Status

Land ownership in the Pend Oreille Subbasin is summarized in Table 16.3 (IBIS 2003). A map of ownership categories across the IMP is presented in Section 4, Figure 4.3. The Pend Oreille Subbasin is dominated by federal ownership (45 percent), with the majority of this in National Forest System lands on the Colville and Idaho Panhandle National Forests. Private ownership totals approximately 36 percent, state ownership is estimated at 13 percent, and Tribal ownership is less than 1 percent.

Relative protection levels of native habitats in the Pend Oreille Subbasin based on the Gap Analysis Program (GAP) are shown in Table 16.4. Approximately four percent of lands within the Subbasin are categorized as Status 1, High Protection. These lands are located primarily in three relatively large blocks in the Salmo-Priest Wilderness Area of northeastern Washington, and on National Forest System lands around Upper Priest Lake and east of Priest Lake. Within the Status 1 designation, over 87 percent of the protected land is the focal habitat upland forest and less than one percent is wetlands. Habitats protected under Status 2, Medium Protection (less than 1 percent of total), include upland forest and less than 100 acres of wetlands at two primary locations: Mt. Spokane State Park and just west of Lake Pend Oreille. Lands under Status 3, Low Protection levels, total almost 54 percent of the Subbasin, reflecting the multiple use mandate of the USFS allowing both resource extraction and wildlife-habitat protection. The low protection category includes USFS inventoried roadless areas on National Forest System lands. Private lands with a Status 4 ranking total about 36 percent of the Subbasin. Due to the scale of mapping, small parcels may be incorrectly categorized in this analysis.

Table 16.3. Land ownership in the Pend Oreille Subbasin by wildlife-habitat type

| Wildlife-Habitat Type (acres) | Federal Lands | Native American Lands | State Lands | Local Gov't. Lands | Non-Gov't. Org. Lands | Private Lands | Water | Total |
|---|---|---|---|---|---|---|---|---|
| **Wetlands (Focal Habitat)** | | | | | | | | |
| Lakes, Rivers, Ponds, and Reservoirs | 4,438 | 119 | 3,922 | 0 | 0 | 22,876 | 115,262 | 146,618 |
| Herbaceous Wetlands | 111 | 0 | 36 | 0 | 0 | 2,326 | 22 | 2,495 |
| Montane Coniferous Wetlands | 3,987 | 1,265 | 980 | 0 | 0 | 21,687 | 3 | 27,922 |
| **Riparian and Riparian Wetlands (Focal Habitat)** | | | | | | | | |
| Interior Riparian Wetlands | 3,022 | 0 | 929 | 0 | 0 | 6,591 | 71 | 10,613 |
| **Steppe and Shrub-Steppe** | | | | | | | | |
| Interior Grasslands | 14,248 | 0 | 6,336 | 0 | 0 | 67,399 | 0 | 87,983 |
| Shrub-steppe | 2 | 0 | 656 | 0 | 0 | 994 | 0 | 1,651 |
| **Upland Forest (Focal Habitat)** | | | | | | | | |
| Mesic Lowland Conifer-Hardwood Forest | 12,064 | 0 | 4,622 | 0 | 0 | 6,469 | 0 | 23,155 |
| Montane Mixed Conifer Forest | 91,171 | 0 | 38,604 | 0 | 0 | 15,724 | 0 | 145,498 |
| Interior Mixed Conifer Forest | 743,084 | 1,922 | 176,516 | 0 | 112 | 430,565 | 0 | 1,352,200 |
| Lodgepole Pine Forest & Woodlands | 20,768 | 21 | 8,358 | 0 | 2 | 10,294 | 0 | 39,443 |
| Ponderosa Pine Forest & Woodlands | 17,129 | 695 | 10,638 | 0 | 0 | 91,946 | 0 | 120,408 |
| Upland Aspen Forest | 5,144 | 38 | 175 | 0 | 0 | 3,713 | 0 | 9,070 |
| **Alpine and Subalpine** | | | | | | | | |
| Subalpine Parkland | 395 | 0 | 3 | 0 | 0 | 17 | 0 | 415 |
| Alpine Grasslands and Shrublands | 23,959 | 0 | 15,321 | 0 | 0 | 11,603 | 0 | 50,883 |
| **Developed** | | | | | | | | |
| Agriculture, Pasture, and Mixed Environs | 1,722 | 476 | 1,153 | 0 | 0 | 47,158 | 0 | 50,509 |
| Urban and Mixed Environs | 57 | 0 | 22 | 0 | 0 | 5,465 | 0 | 5,544 |
| **Total Acres** | **941,302** | **4,537** | **268,271** | **0** | **113** | **744,826** | **115,358** | **2,074,407** |

(*Source*: IBIS 2003)

Table 16.4. GAP status of lands in the Pend Oreille Subbasin by wildlife-habitat type

| Wildlife-Habitat Type (acres) | 1 - High Protection | 2 - Medium Protection | 3 - Low Protection | 4 - No Protection | Water | Total |
|---|---|---|---|---|---|---|
| **Wetlands (Focal Habitat)** | | | | | | |
| Lakes, Rivers, Ponds, and Reservoirs | 486 | 429 | 4,548 | 22,858 | 120,640 | 148,961 |
| Herbaceous Wetlands | - | 27 | 117 | 2,327 | 24 | 2,495 |
| Montane Coniferous Wetlands | 39 | 12 | 5,298 | 22,514 | 16 | 27,880 |
| **Riparian and Riparian Wetlands (Focal Habitat)** | | | | | | |
| Interior Riparian Wetlands | 92 | 51 | 3,788 | 6,591 | 99 | 10,621 |
| **Steppe and Shrub-Steppe** | | | | | | |
| Interior Grasslands | 243 | 216 | 21,385 | 66,146 | 0 | 87,990 |
| Shrub-steppe | 0 | 623 | 34 | 992 | 0 | 1,649 |
| **Upland Forest (Focal Habitat)** | | | | | | |
| Mesic Lowland Conifer-Hardwood Forest | 524 | 0 | 16,133 | 6,470 | 0 | 23,127 |
| Montane Mixed Conifer Forest | 33,598 | 0 | 95,460 | 16,390 | 0 | 145,448 |
| Interior Mixed Conifer Forest | 34,042 | 6,211 | 875,036 | 434,797 | 0 | 1,350,087 |
| Lodgepole Pine Forest & Woodlands | 1,552 | 8 | 27,497 | 10,257 | 0 | 39,315 |
| Ponderosa Pine Forest & Woodlands | 46 | 240 | 28,577 | 91,556 | 0 | 120,419 |
| Upland Aspen Forest | 80 | 4 | 5,427 | 3,528 | 0 | 9,039 |
| **Alpine and Subalpine** | | | | | | |
| Subalpine Parkland | 134 | 0 | 264 | 17 | 0 | 415 |
| Alpine Grasslands and Shrublands | 9,608 | 0 | 29,425 | 11,878 | 0 | 50,912 |

| Wildlife-Habitat Type (acres) | 1 - High Protection | 2 - Medium Protection | 3 - Low Protection | 4 - No Protection | Water | Total |
|---|---|---|---|---|---|---|
| **Developed** | | | | | | |
| Agriculture, Pasture, and Mixed Environs | 0 | 50 | 4,023 | 46,432 | 0 | 50,505 |
| Urban and Mixed Environs | 0 | 9 | 57 | 5,480 | 0 | 5,546 |
| **Total Acres** | **80,443** | **7,879** | **1,117,073** | **748,234** | **120,779** | **2,074,409** |

(*Source*: IBIS 2003)

**GAP Status Definitions** (*Source*: USGS 2000):
**Status 1 – High Protection**: An area having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a natural state within which disturbance events (of natural type, frequency, intensity, and legacy) are allowed to proceed without interference or are mimicked through management.
**Status 2 – Medium Protection**: An area having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a primarily natural state, but which may receive uses or management practices that degrade the quality of existing natural communities, including suppression of natural disturbance.
**Status 3 – Low Protection**: An area having permanent protection from conversion of natural land cover for the majority of the area, but subject to extractive uses of either a broad, low-intensity type (e.g., logging) or localized intense type (e.g., mining). It also confers protection to federally-listed endangered and threatened species throughout the area.
**Status 4 – No or Unknown Protection**: There are no known public or private institutional mandates or legally recognized easements or deed restrictions held by the managing entity to prevent conversion of natural habitat types to anthropogenic habitat types. The area generally allows conversion to unnatural land cover throughout.

## 16.2 Wildlife of the Pend Oreille Subbasin

### 16.2.1 Wildlife Occurring in the Pend Oreille Subbasin

The Pend Oreille Subbasin provides a wide range of wildlife-habitat types dominated by interior mixed conifer forest, with montane mixed conifer and lodgepole forests in the high elevations, and small areas of montane coniferous wetlands and alpine habitats.

There are approximately 335 terrestrial vertebrate wildlife species using these habitats, many of which are important for ecological, cultural, and/or economic reasons. Table 16.5 presents the terrestrial vertebrate wildlife species occurring within the Pend Oreille Subbasin (IBIS 2003). Due to the large number of wildlife species in the Subbasin, the following discussion focuses on wildlife species that are important indicators of habitat quality, those that represent other wildlife species, and those with special management status. For further information on the broader spectrum of wildlife species in the Subbasin, refer to the Pend Oreille Subbasin Summary (Entz and Maroney 2001).

Table 16.5. Number of wildlife species (and percent of province total) in the Pend Oreille Subbasin

| | Occurring Species (Percent of Province Total) | HEP/Priority Species | HEP/Priority Species Closely Associated With Herbaceous Wetlands | HEP/Priority Species Closely Associated With Riparian Wetlands | HEP/Priority Species That Feed Upon Salmon | Occurring Species That Feed Upon Salmon |
|---|---|---|---|---|---|---|
| Amphibians | 12 (71%) | 2 | 2 | 2 | 0 | 1 |
| Birds | 231 (84%) | 14 | 4 | 4 | 7 | 56 |
| Mammals | 80 (79%) | 12 | 1 | 2 | 5 | 22 |
| Reptiles | 12 (67%) | 0 | 0 | 0 | 0 | 2 |
| **Total** | **335 (81%)** | **28** | **7** | **8** | **12** | **81** |

(S*ource*: IBIS 2003)

### 16.2.2 HEP and Priority Species of the Pend Oreille Subbasin

Subbasin planners selected a group of wildlife species to represent the focal habitats and wildlife of the Pend Oreille Subbasin. Species used in the Albeni Falls Project Habitat Evaluation Procedures (HEP) study (Martin et al. 1988) were selected because they were used to assess the construction and inundation losses for the federal hydrosystem project, and because they will be used in the future to evaluate mitigation for the project. Additional wildlife species were selected due to their management, cultural, and or economic values in the Subbasin; these species also represent specific focal habitats. The list of HEP and priority species for the Subbasin, including federal and state-listed threatened and endangered species, is presented in Table 16.6. The Pend Oreille Subbasin also identified four wildlife guilds as high priority for their ecological, cultural, and/or game value: bats, cavity nesters, migratory birds, and waterfowl.

Table 16.6. Federal and state endangered/threatened, HEP, and priority wildlife species of the Pend Oreille Subbasin and degree of association[1] with focal habitats during breeding

| Common & Scientific Names | Federal/ ID/WA Listing Status[2] | HEP/ Priority Status[3] | Focal Habitats | | | | |
|---|---|---|---|---|---|---|---|
| | | | Cliff/ Rock Outcrop | Wetland | Riparian | Steppe/ Shrub-Steppe | Upland Forest |
| American white pelican *Pelecanus erythrorhynchos* | - / - / e | P(4) | - | Close | - | - | - |
| Bald eagle *Haliaeetus leucocephalus* | T / e / t | HEP | - | - | General | - | General |
| Black bear *Ursus americanus* | - | P(1,2) | - | General | General | - | General |
| Black-capped chickadee *Poecile atricapillus* | - | HEP | - | - | General | - | General |
| Canada goose *Branta canadensis* | - | HEP | General | Close | - | General | - |
| Canada lynx *Lynx canadensis* | T / - / t | P(1,4) | - | - | - | - | Close |
| Fisher *Martes penannti* | - / - / e | P(4) | - | General | - | - | Close |
| Gray wolf *Canis lupus* | T / e / e | P(1,3,4) | - | - | General | General | General |
| Great blue heron *Ardea herodias* | - | P(1) | - | - | Close | - | General |
| Grizzly bear *Ursus arctos* | T / t / e | P(1,3,4) | - | - | - | - | General |
| Harlequin duck *Histrionicus histrionicus* | - | P(1) | - | - | Close | - | - |
| Long-toed salamander *Ambystoma macrodactylum* | - | P(1) | - | Close | Close | General | General |
| Mallard *Anas platyrhyncos* | - | HEP | - | Close | Close | General | - |
| Moose *Alces alces* | - | P(1,2) | - | General | General | - | General |
| Mule deer *Odocoileus hemionus hemionus* | - | P(1,2,3) | - | General | General | General | General |
| Muskrat *Ondatra zibethica* | - | HEP | - | Close | Close | - | - |
| Northern goshawk *Accipiter gentilis* | - | P(1) | - | General | General | - | Close |
| Northern leopard frog *Rana pipiens* | - / - / e | P(1) | - | Close | Close | - | - |
| Osprey *Pandion haliaetus* | - | P(1) | - | Close | General | General | General |
| Peregrine falcon *Falco peregrinus* | - / e / - | P(1,4) | Close | - | General | General | General |
| Pileated woodpecker *Dryocopus pileatus* | - | P(1) | - | General | General | - | General |
| Redhead *Aythya americana* | - | HEP | - | Close | - | - | - |
| Rocky Mountain elk | - | P(1,2,3) | - | General | General | General | General |

| Common & Scientific Names | Federal/ ID/WA Listing Status[2] | HEP/ Priority Status[3] | Focal Habitats | | | | |
|---|---|---|---|---|---|---|---|
| | | | Cliff/ Rock Outcrop | Wetland | Riparian | Steppe/ Shrub-Steppe | Upland Forest |
| *Cervus elaphus nelsoni* | | | | | | | |
| White-headed woodpecker *Picoides albolarvatus* | - | P(1) | - | - | General | - | Close |
| White-tailed deer *Odocoileus virginianus* | - | HEP | - | - | Close | General | General |
| Wolverine *Gulo gulo* | - | P(1) | General | General | - | - | General |
| Woodland caribou *Rangifer tarandus* | E / e / e | P(1,3,4) | - | General | General | - | General |
| Yellow warbler *Dendroica petechia* | - | P(1) | - | - | Close | - | - |
| Bat guild | - | P(1) | Close | General | General | General | General |
| Cavity-nester guild | - | P(1) | - | General | General | - | Close |
| Neo-tropical migrant bird guild | - | P(1) | - | General | General | General | General |
| Waterfowl guild | - | P(1) | - | Close | General | - | - |

(*Sources*: IBIS 2003 and Pend Oreille Subbasin Work Team)

[1] **Close** = Animal dependent on the habitat for part or all of its life history requirements. **General** = Animal adaptive and supported by numerous habitats.

[2] **E** = Federal Endangered. **T** = Federal Threatened. **e** = State Endangered. **t** = State Threatened. State listings for Idaho and Washington shown in that order.

[3] **HEP** = Species evaluated via Habitat Evaluation Procedures loss assessment for Albeni Falls Dam (Martin et al. 1988)
**P** = Priority species designated as important because it is **(1)** ecological indicator for habitat or other animals, **(2)** game animal, **(3)** highly culturally prized, or **(4)** special status for management. Many priority species were selected to represent one or more focal habitat types; the habitat(s) a species represents is(are) indicated by underlined degree of association (e.g., close).

The province-wide status and trends of federal and state threatened and endangered species are discussed in Section 4, Terrestrial Resources in the Intermountain Province. Subbasin-level information on occurrence and management of threatened and endangered species is provided in this section. The occurrence of HEP and priority species in the Subbasin also is discussed briefly below. Some species were selected primarily as indicators of wildlife guilds or of a focal habitat; for many of these species detailed information on status in the Subbasin is not available.

### 16.2.2.1 Federal and State Threatened and Endangered Species

***American white pelican*.** Breeding populations of pelican are not documented in the Pend Oreille Subbasin. A single observation is recorded for the Washington portion of the Subbasin, consisting of ten pelicans foraging on the Pend Oreille River just north of Newport (WDFW 2003b). For the Idaho portion of the Subbasin, Sibley (2003) notes this species could be present during migration or post-breeding dispersal; however, the Idaho Conservation Data Center (IDFG 2003) has no data because it does not monitor the pelican.

***Bald eagle.*** The Idaho side of this Subbasin contains 18 historic nests at locations near Priest Lake, the Priest River, Lake Pend Oreille, the Pend Oreille River, Blanchard Lake, and Little Sand Creek (IDFG 2003). There is one wintering site near the Pend Oreille River. In Washington, there are approximately 12 nesting territories along the Pend Oreille River — nearly all using large cottonwood trees to nest — and three territories near Calispell Lake, Mountain Meadows Lake, and Sullivan Lake (WDFW 2003b). The Subbasin has the highest number of documented nesting territories in the IMP, with a total of up to 30 nesting territories. Lake Pend Oreille supports up to several hundred bald eagles during the winter when spawned-out kokanee and waterfowl are available as food sources (Martin et al. 1988). The Albeni Falls Project construction resulted in a loss of 4,508 Habitat Units for breeding bald eagles and 4,365 Habitat Units for wintering bald eagles.

***Canada lynx.*** The Idaho portion of the Pend Oreille Subbasin has numerous sightings of lynx in the Priest River drainage during the 1990s, and a few sightings in the Pend Oreille River drainage (IDFG 2003). On the Washington side of the Subbasin, evidence of lynx presence was plentiful in the north half of the Subbasin from dozens of records into the 1990s (WDFW 2003b). Limited surveys and track sighting confirmation efforts by the WDFW have yielded lynx observations in 4 LAUs in the Pend Oreille River drainage since 1997 (Base and Zender 2003). The Little Pend Oreille Lynx Management Zone (LMZ) includes the Calispell Mountain Range and consists of ten lynx analysis units (LAUs), seven of which are located within the Pend Oreille River Subbasin. The Salmo-Priest LMZ includes the Selkirk Mountain Range and the Lower Pend Oreille and Priest River areas.

***Fisher.*** The Washington portion of the Subbasin has more sightings of fisher (11 of 14 total) than any other Subbasin in the IMP (WDFW 2003b). Most sightings occurred in the 1990s, and none occurred after 1997. Except for two sightings, all are north of Township 36. Many fisher sightings are reported to the WDFW but cannot be confirmed by biologists. Department efforts to confirm fisher sightings in the northern Selkirk Mountains using baited camera stations in the mid- to late-1990s produced no fisher observations (S. Zender, WDFW Biologist, personal communication, April 2, 2004). In Idaho, the Subbasin has eight fisher records for the Priest Lake and Priest River drainage during the 1990s; none occurred after 1999 (IDFG 2003). No records are known for the area around Lake Pend Oreille.

***Gray wolf.*** On the Washington side of the Subbasin, at least 15 wolf sightings or howlings were reported between 1990 and 2002 (WDFW 2003b). Thirteen occurred east of the Pend Oreille River, and 11 were in the northern half of the Subbasin. No known wolf packs are established in Washington and sightings in the last decade are based primarily on interviews with credible observers. Generally, observations have not been confirmed (S. Zender, WDFW Biologist, personal communication, April 2, 2004). In Idaho, wolves pass through the Priest River basin, but no resident packs are currently established (Entz and Maroney 2001).

***Grizzly bear.*** Approximately 75 percent of all grizzly sightings on the Washington side of the IMP have occurred in the Pend Oreille Subbasin (WDFW 2003b). Since 1980, all but one of those 23 sightings occurred in the northern half of the Subbasin; that one exception was in the Calispell Peak Creek drainage in 2002. In Idaho, the grizzly may be present in Bonner and Boundary counties.

***Northern leopard frog.*** The only reported leopard frog sightings in the entire IMP occurred in this Subbasin. Specifically, they were (1) near Idaho's Lake Pend Oreille between 1892 and 1955 (IDFG 2003), (2) in the vicinity of the lower Pend Oreille River in Washington in the late 1950s (Leonard and McAllister 1996), and (3) along the Pend Oreille River on the Kalispel Indian Reservation in Pend Oreille County during 2001 and 2003 (R. Entz, Wildlife Biologist, Kalispel Tribe, personal communication, April 10, 2004).

***Peregrine falcon.*** No sightings are recorded in the Idaho or Washington portions of this Subbasin (IDFG 2003; WDFW 2003b). Department of Fish and Wildlife surveys in the subbasin have not documented peregrine falcon nesting territories (S. Zender, WDFW, personal communication, April 2, 2004). Zender further points out that the Priority Habitats and Species database may not have recorded single birds if those sightings were suspected as migrants passing through.

***Woodland caribou.*** Since the 1960s, woodland caribou have been restricted to the Selkirk Mountains in northern Idaho, northeastern Washington, and southeastern British Columbia (USFWS 1994). In the Washington portion of the Subbasin, there were 15 sightings of caribou individuals or tracks between 1981 and 1997 (WDFW 2003b). All were north of approximately the town of Ione, and all except one were east of the Pend Oreille River. The Selkirk Mountains woodland caribou subpopulation was augmented in 1996-1998 with 43 additional cariobou placed into Washington and British Columbia, immediately north of the border. Since 1996, caribou have occurred in Washington as far south as Molybdenite Mountain. The Idaho Conservation Data Center does not report distribution of caribou, but anecdotes indicate a presence in the northern half of the Idaho portion of the Subbasin.

A caribou recovery zone covers portions of British Columbia, Washington, and Idaho, including areas within the Pend Oreille Subbasin. As part of the Selkirk Mountains woodland caribou recovery effort, cooperators including the WDFW transplanted a total of 43 caribou from British Columbia into Washington and British Columbia immediately north of the United States border in 1996-1998 (Almack 2001). Since 1996, caribou have occurred in Washington as far south as Molybdenite Mountain.

#### 16.2.2.2 Albeni Falls HEP Species

***Bald eagle.*** Refer to preceding section describing federal and state threatened and endangered species.

***Black-capped chickadee.*** General references such as Sibley (2003) show year-round presence for this species throughout the Subbasin. The Albeni Falls Project construction caused the loss of 2,286 Habitat Units for this species.

***Canada goose.*** Canada geese breed throughout the Subbasin, but winter presence may depend on mild temperatures limiting ice cover on the larger water bodies. A loss of 4,699 Habitat Units for Canada goose was reported from the construction of the Albeni Falls Project.

***Mallard.*** Mallards breed throughout the Subbasin, but winter presence may depend on mild temperatures limiting ice cover on the larger water bodies. The species lost 5,985 Habitat Units as a result of construction of the Albeni Falls hydropower project.

***Muskrat***. The extensive river system of the Pend Oreille Subbasin allowed the muskrat to populate nearly everywhere. In Washington, the muskrat harvest in Pend Oreille County is among the highest of any counties in the state (Appendix G). In Idaho, the muskrat harvest is relatively minor in Bonner and Boundary counties when compared to other counties in the state. Construction of the Albeni Falls hydropower project caused the loss of 1,756 Habitat Units for muskrat.

***Redhead.*** General references such as Sibley (2003) indicate breeding season presence across the Subbasin, but the species commonly migrates to warmer latitudes in winter. The Washington GAP Analysis Project (Smith et al. 1997) documented probable evidence of breeding near the Pend Oreille River. The redhead duck lost 3,379 Habitat Units as a result of construction of the Albeni Falls Project.

***White-tailed deer and mule deer.*** In this Subbasin, white-tailed deer are much more abundant than mule deer. WDFW management objectives for white-tailed deer harvest are to provide abundant hunting opportunity while not exceeding 75 percent buck mortality. Pre-hunting-season surveys should produce at least 27 bucks per 100 does. The most recent pre-hunting-season data (1998-2001) measured an average white-tailed deer buck:doe ratio of 30.5 (range 29-32), close to the minimum limit (Appendix G). White-tailed deer experienced significant losses from epizootic hemorrhagic disease (EHD) in GMU 117.

WDFW mule deer management objectives are to provide conservative hunting opportunity, improve buck ratios, and increase productivity and populations levels. Mule deer seem to be suffering long-term population declines attributed to habitat change and fragmentation (S. Zender, WDFW, personal communication, April 2, 2004).

The IDFG white-tailed deer management objective is to maintain a harvest of at least 30 percent bucks with 4 or more antler points per side, and at least 7 percent bucks with 5 or more antler points per side. The most recent data (years 2000-02) varied by analysis area from 52 to 53 percent bucks with 4 or more antler points per side, and from 21 to 23 percent bucks with 5 or more antler points per side (Appendix G). These numbers greatly exceed management minimums.

An estimate of deer hunting harvest and recreation within the Subbasin is presented in Table 16.7. It show that the Washington portion of the Subbasin produces between two

and three percent of that state's deer harvest and hunting recreation. The Idaho side accounts for approximately six percent of that state's deer harvest and hunting recreation.

Table 16.7. White-tailed deer and mule deer hunting harvest and recreation within the Pend Oreille Subbasin[1]

| | Harvest | | | | | | Hunter-Days | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Quantity | | | % of State Total | | | Quantity | | | % of State Total | | |
| Year | ID | WA | Total | ID | WA | Total | ID | WA | Total | ID | WA | Total |
| 1999 | 2,647 | 826 | 3,474 | 7.3 | 2.6 | 5.1 | 54,191 | 38,441 | 92,632 | 6.6 | 2.6 | 4.1 |
| 2000 | 2,046 | 1,051 | 3,097 | 5.6 | 2.8 | 4.2 | n.d. | 25,888 | - | - | 2.7 | - |
| 2001 | 2,491 | 843 | 3,334 | 5.9 | 2.3 | 4.3 | 35,028 | 17,669 | 52,697 | 6.3 | 2.1 | 3.8 |
| 2002 | 1,929 | 785 | 2,714 | 5.1 | 2.3 | 3.8 | 45,358 | 18,673 | 64,031 | 5.9 | 2.2 | 4.0 |
| Average | 2,278 | 876 | 3,155 | 6.0 | 2.5 | 4.3 | 44,859 [2/] | 25,168 | 69,787 [2/] | 6.3 [2/] | 2.4 | 4.0 [2/] |

(S*ource*: Appendix G)

[1] Includes all or portions of Idaho Big Game Units 1, 2, and 4A, plus Washington Game Management Units 109, 113, and 117.
[2] Average of 3 years instead of 4.
n.d. = No data.

Construction of the Albeni Falls Project resulted in a loss of 1,680 Habitat Units for white-tailed deer.

### 16.2.2.3 Other Priority Species

***Bat guild***. Little detailed information exists regarding the distribution and occurrence of bats in the Pend Oreille Subbasin, but as many as nine species may be present (Entz and Maroney 2001). The life history and habitat associations of individual species are so diverse as to greatly complicate management if designed for the entire guild. For this reason, further analysis in this plan is omitted.

***Black bear***. The WDFW black bear population management goals are to perpetuate and manage black bear and their habitats to ensure healthy, productive populations. WDFW will minimize threats to public safety and property damage from black bears while managing populations for sustained yield. Acceptable harvest guidelines in Washington include 35-39 percent females in the harvest, median age of females acceptable at 5-6 years, median age of males acceptable at 2-4 years (WDFW 2003c).

The IDFG is striving for less than 30 percent female bears in the total harvest, while the male harvest has greater than 35 percent males aged five years or older. Black bear harvest in the last reporting years (1999-2002) included females averaging 30 percent of the total harvest, and males older than five years averaging 49 percent of the male component.

***Cavity-nester guild***. The cavity nester guild consists of a large number of species of birds and other animals. Many of these species depend on primary excavators, such as the pileated woodpecker, to create suitable cavities in decaying trees. These species are indicative of forested habitats providing a range of sizes of cavities for reproduction and

roosting. Nearly all cavity-nesting birds contribute a valuable ecological function by consuming forest insects, thereby contributing to the control of insect populations. Little detailed information is available on the occurrence and distribution of these species. The life history and habitat associations of individual species in this guild are so diverse as to greatly complicate management if designed for the entire group. For this reason, further analysis in this plan is omitted.

***Great blue heron***. In the Washington portion of the Subbasin, four heronries are known, two along the Pend Oreille River and two others in tributary drainages (WDFW 2003b). The species is also present in Idaho, but specific nesting locations are not reported.

***Harlequin duck***. On the Washington side of the Subbasin, harlequin ducks are observed on several streams with breeding records on Sullivan and Granite creeks (Zender 1995).

***Long-toed salamander***. Long-toed salamander is probably present throughout the Subbasin; however, no occurrence data is available for the species.

***Moose***. WDFW moose population management objectives call for maintaining a healthy population and providing quality hunting opportunity through limited entry permits. Generally, conditions for moose production appear to be optimal for the next few decades. IDFG manages moose on a controlled hunt basis with conservative permit levels. Populations are steadily expanding where timber harvesting and fire have created favorable shrub fields. Illegal kills and vehicle collisions in the Panhandle region during 1999-2002 caused significant moose losses, averaging 14 percent and 12 percent, respectively, of the legal hunting harvest.

Table 16.8 presents an estimate of moose hunting harvest and recreation in the Pend Oreille Subbasin. The Washington portion produces 33 percent of that state's moose harvest and 39 percent of its moose hunting recreation. The Idaho side contributes about 10 percent of Idaho's moose harvest.

Table 16.8. Moose hunting harvest and recreation within the Pend Oreille Subbasin[1]

| | Harvest | | | | | | Hunter-Days | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Quantity | | | % of State Total | | | Quantity | | | % of State Total | | |
| Year | ID | WA | Total | ID | WA | Total | ID | WA | Total | ID | WA | Total |
| 1999 | 50 | 16 | 66 | 6.5 | 37.3 | 8.1 | [2] | 155 | - | [2] | 56.4 | - |
| 2000 | 58 | 22 | 79 | 7.4 | 33.8 | 9.4 | [2] | 165 | - | [2] | 42.1 | - |
| 2001 | 107 | 24 | 131 | 11.7 | 31.7 | 13.2 | [2] | 176 | - | [2] | 25.9 | - |
| 2002 | 105 | 23 | 128 | 12.3 | 28.5 | 13.7 | [2] | 267 | - | [2] | 32.6 | - |
| Average | 80 | 21 | 101 | 9.5 | 32.8 | 11.1 | - | 191 | - | - | 39.3 | - |

(*Source*: Appendix G)

[1] Includes all or portions of Idaho Big Game Units 1, 2, and 4A, plus Washington Game Management Units 109, 113, and 117.
[2] No data.

***Neo-tropical migratory bird guild***. The neo-tropical migratory bird guild includes a large number of species with diverse habitat associations and life histories. These species breed within the Subbasin, but migrate south to winter at warmer latitudes in the United States, Mexico, or Central America. Migratory birds are of concern due to recent declines in breeding populations of many species. Many of these species perform an important ecological function by feeding primarily on insects, thereby contributing to control of insect populations. The life history and habitat associations of individual species in this guild are so diverse as to greatly complicate management if designed for the entire group. For this reason, further analysis in this plan is omitted.

***Northern goshawk***. This forest raptor is a year-round resident across the Subbasin. Specific occurrence data are not available.

***Osprey***. Osprey are common breeders in the Pend Oreille Subbasin. In 1989, the last year that WDFW conducted a comprehensive survey, approximately 52 active nests and 19 inactive nests were documented in Pend Oreille County (Entz and Maroney 2001).

***Pileated woodpecker***. In the Washington portion of the Subbasin, a single nesting record for pileated woodpecker was reported just north of the Kalispel Indian Reservation (WDFW 2003b). The species is presumed to be more widespread than this single record would indicate.

***Rocky Mountain elk***. The WDFW management objectives for the Selkirk Elk Herd are to: (1) increase the 800 animal population in eastern Stevens and Pend Oreille counties to 1,000, possibly by transplants; (2) achieve a post-hunting-season ratio of at least 15 bulls per 100 cows, along with an overall bull mortality under 50 percent.

The IDFG objective for the Idaho Panhandle Elk Management Zone, which incorporates the Coeur d'Alene and Pend Oreille subbasins, is to establish an elk population of 2,900-3,900 cows and 600-800 bulls, including 350-475 adult bulls. In survey year 2002, the management zone population was calculated to be 3,025 cows, 438 bulls, and 318 adult bulls. Until the 1980s and 1990s, habitat conditions in core elk areas had declined from their optimum of 30 years earlier. Since then, however, timber harvest, prescribed fire, and pioneering of elk into new areas have increased elk numbers. Conversely, the accompanying high road densities and loss of large areas for elk security are threats to continued population growth.

Table 16.9 presents an estimate of elk hunting harvest and recreation in the Pend Oreille Subbasin. The Washington portion produces less than one percent of the state's elk harvest and about two percent of its hunting recreation (Appendix G). The Idaho side contributes approximately two percent of its elk harvest and three percent of its elk hunting recreation.

Table 16.9. Rocky Mountain elk hunting harvest and recreation within the Pend Oreille Subbasin[1]

| | Harvest | | | | | | Hunter-Days | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Quantity | | | % of State Total | | | Quantity | | | % of State Total | | |
| Year | ID | WA | Total | ID | WA | Total | ID | WA | Total | ID | WA | Total |
| 1999 | 205 | 46 | 251 | 1.9 | 0.8 | 1.5 | 17,394 | 14,414 | 31,807 | 3.2 | 2.2 | 2.7 |
| 2000 | 226 | 37 | 263 | 1.9 | 0.5 | 1.4 | n.d. | 9,825 | - | - | 2.1 | - |
| 2001 | 249 | 26 | 275 | 2.2 | 0.5 | 1.6 | 11,174 | 5,696 | 16,870 | 3.0 | 1.3 | 2.1 |
| 2002 | 221 | 36 | 257 | 1.9 | 0.6 | 1.4 | 14,703 | 5,755 | 20,457 | 3.0 | 1.3 | 2.2 |
| Average | 225 | 36 | 261 | 2.0 | 0.6 | 1.5 | 14,424[2] | 8,922 | 23,045[2] | 3.1[2] | 1.7 | 2.3[2] |

(*Source*: Appendix G)

[1] Includes all or portions of Idaho Big Game Units 1, 2, and 4A, plus Washington Game Management Units 109, 111, 113, and 117.
[2] Average of 3 years instead of 4.
n.d. = No data

***Waterfowl guild***. Waterfowl are important game and cultural species, and are closely tied to emergent wetlands and open water habitats in the Pend Oreille Subbasin. There are approximately 39 species in this guild, including loons, grebes, cormorants, mergansers, ducks, geese, and swans. The life history and habitat associations of individual species in this guild are so diverse as to greatly complicate management if designed for the entire group. For this reason, further analysis in this plan is omitted.

***White-headed woodpecker***. The WDFW (2003b) has no records of this species in the Subbasin. The Washington GAP Analysis Project (Smith et al. 1997) also reports no evidence of breeding. The species is uncommon, but presumed to breed locally within pine-dominated forests in the Subbasin.

***Wolverine***. At least 12 sightings of wolverine individuals or tracks were recorded between 1979 and 1995 in the Washington portion of the Pend Oreille Subbasin (WDFW 2003b). This represents two-thirds of all wolverine sightings in the Washington portion of the IMP. Most sightings were in the northern half of the Subbasin and east of the Pend Oreille River. In Idaho, the Conservation Data Center does not monitor this species so population status is not known.

***Yellow warbler***. This neo-tropical migrant bird is presumed to breed throughout the Subbasin, primarily in interior riparian habitats with significant components of deciduous shrubs and trees.

## 16.3 Summary of Terrestrial Resource Limiting Factors

### 16.3.1 Direct Effects of Federal Hydrosystem Projects

Development of the Albeni Falls Project resulted in direct loss of wildlife and wildlife-habitats in the Pend Oreille Subbasin. The habitat losses associated with construction of project facilities and inundation of project reservoirs were assessed in the Albeni Falls Wildlife Protection, Mitigation, and Enhancement Plan Final Report (Martin et al. 1988) through a Habitat Evaluation Procedures (HEP) study. The study provides the number of habitat units to be provided in compensation for the construction losses (Council 2000)

and identifies potential mitigation areas. Mitigation for the construction losses is directed by the Albeni Falls Interagency Work Group, which includes the Coeur d'Alene Tribe, Kalispel Tribe, Kootenai Tribe of Idaho, IDFG, USFWS, USACE, NRCS, and USFS. Priority mitigation focus areas were established with consideration for in-place and in-kind opportunities, threat to wetland habitats in primary impact areas, location relative to other management areas, and availability of protection opportunities (Albeni Falls Interagency Work Group Operating Guidelines and Guiding Principles for Mitigation Implementation 1998).

Habitat losses due to construction of the Albeni Falls Project are summarized in Table 16.10 (Martin et al. 1988).

Table 16.10. Acres of habitat types affected by Albeni Falls project construction and inundation

| Project | Habitat Type | Acres of Habitat Inundated |
|---|---|---|
| **Albeni Falls** | | |
| | Herbaceous wetland | 4,376 |
| | Deciduous forested wetland | 2,314 |
| | Shallow open water | **655** |
| **Total** | | **7,345** |

(*Source*: Martin et al. 1988)

The loss of wildlife-habitat value for individual species, as determined through the HEP study and expressed in Habitat Units (HUs), is summarized in Table 16.11. The HEP evaluation species were selected based on their use of specific habitat types and structural elements, and to represent other wildlife species that use those habitats. The HEP study results are provided in terms of Habitat Units, which are units of value based on both quality and quantity of habitat. Progress made to date toward implementing the recommended mitigation strategies is summarized below in terms of Habitat Units by species.

The current status of completed mitigation for the Albeni Falls Project also is shown in Table 16.11; approximately 83 percent of the mitigation remains to be implemented. Habitat Units by species were not available at the time of publication for all recently acquired parcels for the Albeni Falls Mitigation Project. Acquisition of mitigation parcels began in earnest in 1992. To date, over 5,000 acres have been acquired and are under management by the Kalispel Tribe, IDFG, or the Coeur d' Alene Tribe (Terra-Burns 2002). These projects are described in the Province Inventory, Section 2, and the Subbasin Inventory, Section 17.

Table 16.11. Status of mitigation for construction and inundation wildlife-habitat losses, Albeni Falls project[1]

| Project | Species | Habitat Units lost | Habitat Units acquired | Percent complete |
|---|---|---|---|---|
| **Albeni Falls** | | | | |
| | Bald eagle (breeding) | 4,508 | 313 | 6.9% |
| | Bald eagle (wintering) | 4,365 | 329 | 7.5% |
| | Black-capped chickadee | 2,286 | 318 | 13.9% |
| | Canada goose | 4,699 | 1,229 | 26.2% |
| | Mallard | 5,985 | 465 | 7.8% |
| | Muskrat | 1,756 | 138 | 7.9% |
| | Redhead duck | 3,379 | | 0% |
| | White-tailed deer | 1,680 | 147 | 8.8% |
| | Yellow warbler | - | 93 | |
| | HU estimates other parcels | | 1,790 | |
| **Total all species** | | **28,658** | **4,822** | **16.8%** |

(*Sources*: BPA 2002, KT 2004; HUs by species not available for all parcels)

[1] Note: This table shows the total HUs lost at the Albeni Falls Project; mitigation of this loss may occur in part within the Coeur d'Alene Subbasin, with the approval of the Albeni Falls Interagency Work Group.

Mitigation required for the Albeni Falls Project will occur largely within the Pend Oreille Subbasin. However, with the approval of the Albeni Falls Interagency Work Group, mitigation may be provided, in part, within the Coeur d'Alene Subbasin (refer to Section 8, Terrestrial Resources of the Coeur d'Alene Subbasin). The total number of HUs to be acquired as mitigation for the Albeni Falls Project (28,658) is presented in corresponding tables in both subbasin chapters. However, note that this figure represents a single target for the Albeni Falls Project, rather than independent subbasin targets.

### 16.3.2 Operational Effects of Federal Hydrosystem Projects

Assessment and mitigation of operational impacts of the Albeni Falls Project are required under the Northwest Power Act. An assessment of operational impacts has not been undertaken for the Albeni Falls Project. Terrestrial resources issues related to operation of the Albeni Falls Project and downstream FCRPS projects include:

1) reduction in area of wetland habitats, and associated loss of primary productivity, wildlife-habitat, and wildlife forage, within the fluctuation zone of Lake Pend Oreille and associated rivers;
2) reduction of species diversity in emergent and aquatic bed wetlands within Lake Pend Oreille;
3) loss of wildlife-habitat due to erosion of lake and river shorelines;
4) loss of wildlife through disturbance/inundation/desiccation of breeding sites within and adjacent to fluctuation zone of Lake Pend Oreille and associated rivers;

5) lack of recruitment of black cottonwood and other woody species along the Pend Oreille River, Lake Pend Oreille, and lower Clark Fork River; and
6) loss of key food source for wildlife and reduction of nutrient input to the ecosystem due to extirpation of salmon and other anadromous species from the Lower Pend Oreille watershed via downstream FCRPS projects.

### 16.3.3 Secondary Effects of Federal Hydrosystem Projects and Other Limiting Factors

Human impacts on wildlife have been accelerated in the Subbasin as a result of development of the Albeni Falls Project and other federal hydropower projects in the region. A reliable and affordable power source, irrigation water supply, and employment opportunities provided impetus for development of agriculture and other industry, particularly in the adjacent Spokane Subbasin. This development has led to increased human disturbance of wildlife populations and increased human use of wildlife. Extirpation of anadromous fishes in the Lower Pend Oreille watershed and adjacent subbasins has led to increased harvest pressure on wildlife for subsistence, cultural, and recreational uses. Factors that currently limit terrestrial resources in the Pend Oreille Subbasin are dominated by modification of forested stands through timber management and the combined effects of grazing, agriculture, water resource projects, roads, and residential development. Development, including agriculture, has converted approximately three percent of lands in the Subbasin to non-vegetated habitats.

## 16.4 Interpretation and Synthesis

The Pend Oreille Subbasin has been substantially modified from historic conditions in terms of native habitats. Timber management has been practiced in the Pend Oreille Subbasin for over 100 years, with notable effects to riparian habitats and upland forest structure. Agriculture and urban/residential development has occurred in the major river valleys and surrounding Pend Oreille and Priest lakes. Approximately three percent of all lands in the Subbasin have been converted from native habitats to agriculture and other developed uses (Table 16.1). Road densities throughout the majority of the Subbasin exceed the levels considered optimal for big game summer and winter habitat security. About four percent of lands in the basin are protected at the high or medium levels, 54 percent are at the low protection level, and 36 percent have no protection (Table 16.4).

Construction of the federal hydrosystem project at Albeni Falls resulted in loss of 6,690 acres of wetland habitats, converted 655 acres of shallow open water habitats to deep water, and also modified the hydrology of more than 26 miles of river. In the lowermost portions of the Subbasin, anadromous fish were extirpated by construction of downstream FCRPS projects lacking fish passage facilities. Operation of the project continues to impact wildlife and wildlife habitats through altered hydrology; detailed assessments of operational effects have not been performed. Secondary effects of the project continue to affect wildlife of the Subbasin through human land uses and disturbance.

Wildlife mitigation related to the federal hydropower project at Albeni Falls is approximately 17 percent complete. Completion of the wildlife mitigation for construction of the FCRPS project is the highest terrestrial resources priority of the

Subbasin Work Team, followed by assessment and mitigation of operational impacts of the project.

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# 17 Pend Oreille Subbasin Inventory of Existing Programs – Terrestrial

## 17.1 Current Management Directions

State and Federal agencies and Tribal governments that have management authority over wildlife resources in the Pend Oreille Subbasin include the U.S. Fish and Wildlife Service (USFWS), U.S. Forest Service (USFS), Idaho Fish and Game (IDFG), Washington Department of Fish and Wildlife (WDFW), the Kalispel Tribe (KT), the Kootenai Tribe of Idaho, and the Coeur d'Alene Tribe. Other state and federal agencies, including, but not limited to, the U.S. Army Corps of Engineers (USACE), Environmental Protection Agency (EPA), the Natural Resources Conservation Service (NRCS), Idaho Department of Environmental Quality (IDEQ) and Washington Department of Ecology (WDOE) are involved in programs that affect the land or water that provide habitat for fish and wildlife. A complete list of state, federal, and Tribal entities that are involved in management of fish and wildlife or their habitats is included in section 2.4.1, along with a description of the agency's management direction.

Section 11.3E.1 of the Council 1995 Program directed the states and Tribes to form long-term agreements within three years following the adoption of the program for all wildlife mitigation. In response, IDFG, KT, Coeur d' Alene Tribe, Kootenai Tribe of Idaho, USFWS, USACE, NRCS, and USFS formalized the Work Group and signed an agreement. The *Albeni Falls Interagency Work Group Operating Guidelines and Guiding Principles for Mitigation Implementation* (1998) guides the implementation of wildlife mitigation projects. The impetus for the agreement was provided not only by the members' desire to meet the Program directive, but more importantly, the members wanted to implement the Program at a local level by providing the mechanism for non-profit organizations, watershed groups, and other members of the public to propose projects directly to the fish and wildlife managers.

### 17.1.1 Local Government

**Bonner County Soil and Water Conservation District (SWCD) and NRCS**

The Bonner County SWCD updates a 5-Year Resource Conservation Plan every year. The five priorities that are being addressed at this time are:

1. Water Quality. Goal – Meet rules, regulations of section 319 of Water Quality Act, the 1986 Safe Drinking Water Act and amendments of the 1972 Clean Water Act, Antidegredation Section.
2. Timber and Woodlands. Goal – Strengthen forestry resources in the district.
3. Fish, Wildlife and Recreation. Goal – Improve fish and wildlife habitat and increase native trout populations from a locally based, voluntary and cost-effective approach.

4. District Operations/Information and Education. Goal – Have an effective, proactive Board of Supervisors and create public awareness of conservation concerns and practices.

5. Pasture and Hayland. Goal – Find alternative crops with better economic returns and improve yield of existing crops and pastures.

NRCS's mission statement is to provide leadership in a partnership effort to help people conserve, maintain, and improve our natural resources and environment. A major thrust of NRCS at this time is to help write Total Maximum Daily Loads (TMDLs).

Conservation districts, the Idaho Soil Conservation Commission, and the NRCS have forged a unique local, state and federal partnership to help people get conservation on the land. They are bound together by mutual conservation objectives, legislation and formal agreements with the Secretary of Agriculture and the State. Employees usually share the same office and phone number at the local level.

Bonner and Kootenai counties in Idaho have adopted comprehensive plans to guide growth and development on county administered lands. Bonner County's plan has been under revision for the past three years. Kootenai County adopted a site disturbance ordinance in 1999 that was designed to protect water quality.

The Cocolalla Lake Association and Bonner County SWCD developed a plan for improving water quality in the Cocolalla Creek watershed, which is a tributary of the Pend Oreille River.

## 17.2 Existing and Imminent Protections

Refer to Section 2.4 for a description of the natural resources management agencies and organizations and their primary authorities at the federal, state, and regional levels. Many State and Federal laws and regulations protect natural resources within the IMP. Tribal governments and local governments also have regulations that protect specific areas or locations within the IMP. The following section summarizes the existing and imminent protections for federal and state threatened and endangered wildlife species known or potentially occurring in the Pend Oreille Subbasin.

### 17.2.1 Endangered Species Act

**Bald Eagle**

Bald eagles are currently listed as threatened under the federal Endangered Species Act. This provides protection from "take" (i.e., harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect…). Bald eagles were proposed for removal from the endangered species list in 1999. That action has not been taken, in part because one prerequisite for delisting, a nationwide monitoring plan, has not yet been met. If a development project occurs on federal land or involves federal funding (i.e., nexus), an endangered species consultation may be required by the USFWS.

Bald eagles are classified as threatened in Washington and endangered in Idaho.

In 1984, Chapter 77.12.655 RCW was adopted by the Washington State Legislature, requiring the establishment of rules defining buffer zones around bald eagle nests and roost sites. The law states that the rules shall take into account the need for variation of the extent of the buffer zone on a case by case basis.

In 1986, the Bald Eagle Protection Rules (WAC 232-12-292) were adopted by the Washington Wildlife Commission. The rules require permitting agencies (i.e., Department of Natural Resources, counties, cities) to review the database of bald eagle nest and communal roost locations prior to issuing permits for timber harvest, clearing land, residential development, etc. If the activity is within ½ mile of an eagle nest, the permitting agency notifies WDFW, who works with the applicant to develop a Bald Eagle Management Plan (see WAC 232-12-292 (4.4)).

Deliberate harassment of eagles is prohibited by state and federal law (Chapter 77.15.130 RCW; Bald Eagle Protection Act; Endangered Species Act; and, Migratory Bird Treaty Act).

**Canada Lynx**

The lynx was listed as a state threatened species in Washington in 1993 and was listed as a federally threatened species under ESA in April 2000. Lynx is not given special management status in Idaho.

Legal take of lynx in Washington ceased in 1991 and consequent designation as a threatened species presently provides complete protection from hunting or trapping at both the state (Chapter 77.16.120 RCW) and federal level.

Over 90 percent of lynx habitat in Washington is managed under federal jurisdiction. Habitat is present in six Lynx Management Zones (LMZ) in Washington. The Little Pend Oreille LMZ includes the Calispell Mountain Range and consists of ten lynx analysis units (LAUs), seven of which are located within the Pend Oreille River Subbasin. The Salmo-Priest LMZ includes the Selkirk Mountain Range and the Lower Pend Oreille and Priest River areas.

In 2000, the U.S. Forest Service signed an agreement with the USFWS to manage habitat specifically for lynx in order to minimize the impact of federal actions. Most state and private land in the northeastern Washington LMZs are covered under Lynx Management Plans that theoretically provide for maintaining suitable habitat through time. Forest practice regulations in Washington allow landowners to prepare special wildlife management plans in lieu of being subject to critical habitat rule (WAC 222-16-080). The three major non-federal landowners in Washington have WDFW approved plans in place. Each lynx management plan includes a process for monitoring the plan's effectiveness and annual or biennial reporting (Stinson 2001).

**Fisher**
The fisher will become a candidate for federal listing under the ESA in the near future (USFWS 2004). Fisher is a state endangered species in Washington; it is not given special management designation in Idaho.

In Washington, fisher is managed based on the findings of the WDFW status report (Lewis and Stinson 1998). Protection of fisher in Washington from hunting, possession, or control is provided under Chapter 77.16.120 RCW. Washington further charges those convicted of illegal take of state endangered species with a $2,000 reimbursement for each animal taken or possessed (Chapter 77.21.070 RCW).

**Gray Wolf**
The gray wolf is listed as a federally threatened species under the ESA. Both Idaho and Washington classify the species as endangered.

In Washington, protection of gray wolf from hunting, possession, or control is provided under Chapter 77.16.120 RCW. Washington further charges those convicted of illegal take of state endangered species with a $2,000 reimbursement for each animal taken or possessed (Chapter 77.21.070 RCW).

**Grizzly Bear**
The grizzly bear listed as a threatened species under ESA, as a threatened species in the State of Idaho, and as an endangered species in the state of Washington. Most of the Pend Oreille Subbasin is within the Selkirk Grizzly Bear Recovery Zone. Protection of grizzly bear in Washington from hunting, possession, or control is provided under Chapter 77.16.120 RCW. Washington further charges those convicted of illegal take of state endangered species with a $2,000 reimbursement for each animal taken or possessed (Chapter 77.21.070 RCW).

The current population of grizzly bears within the Selkirk Recovery Zone is deemed to be below a level necessary for long-term viability (Wielgus et al. 1994, Wakkinen, pers. comm. 2001, as cited in Base 2003). Human caused mortality, especially of females, by illegal shooting or killing bears in self-defense is apparently the limitingfactor in the recovery of the Selkirk Grizzly Bear population (McLellan et al. 1999; Knick and Kasworm 1989, as cited in Base 2003). To address this problem and help restore a viable population of grizzly bears into the Selkirk Mountains Ecosystem, the Interagency Grizzly Bear Committee (IGBC) recommends the following actions:

(a) develop and implement strategies to prevent human caused mortalities of grizzlies;
(b) develop a strategic conservation plan which includes provisions for grizzly bear population monitoring as well as provisions for informing & educating the public on the needs of grizzly bears. This plan must insure that increasing demands for human recreational usage within the Selkirk Zone are compatible with grizzly bear recovery; and
**(c)** improve community relations and garnish local support for grizzly bear recovery efforts. WDFW has made significant efforts toward accomplishing these actions

as recommended by the IGBC. WDFW has devoted substantial staff time to make contact with recreational users, especially during hunting seasons, to distribute information and education materials, and to generally monitor human activities within and surrounding the Washington portion of the Selkirk Mountains Recovery Zone**.**

Since 1989, the Colville National Forest has gated over 300 miles of road or 42 percent of the existing road network within the Sullivan Lake Ranger District. In addition 132 miles of road within the Sullivan Lake Ranger District have been permanently blocked and are in the process of forest reclamation. Most of the eliminated roadways along with year-round restricted roadways are within the Selkirk Grizzly Bear Recovery Zone (Borysewicz 2001).

**Woodland Caribou**

The woodland caribou is listed as endangered by the federal government and states of Idaho and Washington. Portions of the Pend Oreille Subbasin are within a federally designated woodland caribou recovery zone that extends through British Columbia, Washington, and Idaho. Caribou habitat has been delineated on federal, state, and private lands within the Selkirk ecosystem. In Washington, the majority of caribou habitat is managed by the U.S. Forest Service where vegetation management guidelines have been developed for protection or management of these allocated lands (USFWS 1994).

Protection of woodland caribou in Washington from hunting, possession, or control is provided under Chapter 77.16.120 RCW. Washington further charges those convicted of illegal take of a woodland caribou with a $5,000 reimbursement for each animal taken or possessed (Chapter 77.21.070 RCW).

**American White Pelican**

The American white pelican is listed as an endangered species in Washington; it is not given special management status in Idaho. Protection of American white pelican in Washington from hunting, possession, or control is provided under Chapter 77.16.120 RCW. Washington further charges those convicted of illegal take of an American white pelican with a $2,000 reimbursement for each animal taken or possessed (Chapter 77.21.070 RCW).

**Northern Leopard Frog**

The northern leopard frog is classified as an endangered species in Washington; it is not provided special management status in Idaho. Protection of northern leopard frog in Washington from hunting, possession, or control is provided under Chapter 77.16.120 RCW. Washington further charges those convicted of illegal take of northern leopard frog with a $2,000 reimbursement for each animal taken or possessed (Chapter 77.21.070 RCW).

**Peregrine Falcon**

Peregrine falcon is classified as an endangered species in Idaho.

Refer to the Pend Oreille Subbasin Terrestrial Resources Assessment, Section 16, for description of the occurrence and status of federal and state threatened and endangered species in the Subbasin.

## 17.3 Inventory of Recent Restoration and Conservation Projects

Below is a summary of some BPA and non-BPA funded projects identified within the Subbasin. Projects that are relevant to both terrestrial and aquatic resources may be presented in the aquatic inventory section for this Subbasin (see Section 23). Refer to Section 2.4, Inventory of Projects in the IMP, for description of projects involving more than one subbasin. Major Grand Coulee Dam wildlife mitigation projects are located and managed in more than one subbasin. Refer to Appendix H for a more comprehensive list of the BPA and non-BPA funded projects conducted in this Subbasin and the entire IMP.

### 17.3.1 BPA Funded Project

**Pend Oreille Wetlands Wildlife Mitigation Project**

The Pend Oreille Wetlands Wildlife Mitigation Project was proposed as partial mitigation for wildlife losses associated with the construction of Albeni Falls Dam. A total of approximately 600 acres of floodplain property was purchased by BPA (436 acresin 1992 and 164 acres in 1997) and is being managed by the KT to benefit wildlife habitats and associated species. Seven habitat types exist on the project including forested wetland, scrub-shrub wetland, emergent wetland, wet meadow or floodplain grassland, open water, upland forest, and riparian deciduous forest. The HEP is used to monitor and evaluate habitat, and is an accounting tool used to credit for wildlife mitigation. Restoration and enhancement activities include riparian reforestation, bio-engineered bank stabilization, hardwood stand enhancement, water control structures/water level management, prescribed burning, native vegetation enhancement, coniferous stand improvements, pasture management, nesting island construction, and general operations and maintenance activities that include monitoring and evaluation. In addition to the target species, species/guilds and populations that benefit from the project include: reptilian and amphibian guilds, native and nonnative resident fish populations, black bear, neotropical migratory birds, and small mammal populations. Specific activities associated with this project include:

- Cottonwood restoration techniques, vegetation plots funded as part of the Pend Oreille Wetlands Project.
- Acquisition and enhancement of 3,707 acres (1,500 ha) (Pend Oreille Wetlands Project).
- Acquisition and enhancement of 7,722 acres (3,125 ha) (Albeni Falls Wildlife Mitigation Project).

### 17.3.2 Non-BPA Funded Projects

- Reed canarygrass management project (cooperative project with Washington Statue University and the KT).
- Cougar predation study to determine impacts on caribou.

- LeClerc Creek Wildlife Area. Comprised of four disjunct parcels owned by WDFW (1,532 total ha). These areas are managed primarily for big game, waterfowl, and raptors.
- Caribou relocation project in cooperation with WDFW, IDFG, USFS, and British Columbia
- Implementation of wildlife habitat compensation for Box Canyon Dam. $2.5 million to acquire and enhance/restore 403 Average Annual Habitat Units (AAHUs).
- Lynx surveys
- Monitoring elk re-located from Hanford, Washington.
- Grizzly bear surveys
- Bald eagle surveys
- Osprey surveys
- Great blue heron surveys
- Bighorn sheep capture and disease control monitoring
- Mountain goat surveys
- Goshawk surveys/inventories
- Deer/elk harvest surveys
- Trapper harvest surveys
- Fisher distribution research
- Winter furbearer surveys (fisher, lynx, and wolverine)
- Waterfowl surveys (includes ducks, geese, and swans)

## 17.4 Strategies Currently Being Implemented Through Existing Projects

### 17.4.1 Limiting Factors and Strategies

Refer to Figure 15.1 of the Aquatic Inventory section for a graph displaying the percent of all fish and wildlife mitigation projects in the Subbasin that respond to specific limiting factors. Wildlife mitigation projects in the Subbasin respond primarily to the limiting factors of habitat quantity and quality through land acquisition, protection, restoration, and enhancement activities. In addition, lack of information is addressed by projects involving research and data collection, including mule deer studies, bat surveys, and a cougar predation study. Relocation of caribou is being undertaken as part of recovery efforts for the species; elk have also been relocated into the Subbasin. Monitoring of disease is part of the bighorn sheep study.

Figure 15.2 of the Aquatic Inventory section shows the types of management strategies used in the fish and wildlife mitigation projects in the Subbasin. Wildlife mitigation projects in the Subbasin rely heavily on habitat acquisition and habitat improvement/restoration strategies. Other strategies widely used in the Subbasin include watershed planning/recovery planning, RM&E, population management, and education.

### 17.4.2 Gaps Between Actions Taken and Actions Needed

The primary terrestrial resources mitigation need in the Subbasin, with respect to the FCRPS, is completion of the construction loss mitigation for the Albeni Falls Project.

The construction loss assessment was completed in 1988 (Martin et al. 1988); acquisition of mitigation parcels through the Albeni Falls Interagency Work Group began in earnest in 1992. As of the 2002 Albeni Falls Wildlife Mitigation Project Annual Report (Terra-Burns 2002), a total of 5,248 acres had been acquired on a total of 18 parcels. Currently, the mitigation for the construction wildlife losses in terms of HUs is about 17 percent complete (refer to Section 16). Acquisition of HUs for the federally threatened bald eagle is less than 10 percent complete for breeding and wintering HUs. Additional funding for habitat acquisitions, enhancement and/or restoration measures, and maintenance funding will be necessary to meet the existing construction loss mitigation obligation.

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# 18 Pend Oreille Subbasin Management Plan

The Pend Oreille Subbasin Management Plan was developed by the Pend Oreille Subbasin Work Team. Detailed information describing the membership and formation of the Subbasin Work Teams and the process used to develop and adopt the management plan can be found in Section 1.2. In general, the components of the management plan, including the subbasin vision, guiding principles, and prioritized biological objectives and strategies were developed in a series of six meetings between June 2003 and March 2004.

The Oversight Committee (OC), Technical Coordination Group, and the Pend Oreille Subbasin Work Team worked collaboratively to establish technically sound objectives and strategies that respond to the limiting factors identified in the subbasin assessment. The management plan was developed in several iterations between the OC and Subbasin Work Teams and the Technical Coordination Group.

Biological objectives were developed using a tiered approach. The Council developed the Columbia River Basin biological goals based on the scientific principles identified in the 2000 Fish and Wildlife Plan. The OC established the province level objectives under the Columbia River Basin level goals by responding to recommendations from the GEI Team, the Technical Coordination Group, and the Subbasin Work Teams. The Subbasin Work Teams developed the subbasin level biological objectives and strategies under the Province objectives, with assistance from the Technical Coordination Group and the GEI Team.

## 18.1 Summary of Pend Oreille Assessment and Limiting Factors

The vision and biological objectives of the management plan reflect what is learned in the assessment and inventory work. In the Pend Oreille Subbasin, the aquatic and terrestrial assessments and inventories are described in detail in sections 14 to 17 of this document. A brief overview of the key limiting factors that are addressed in this management plan is included below.

### 18.1.1 Pend Oreille Aquatic Assessment and Limiting Factors

Focal species selected for the Pend Oreille Subbasin were bull trout, westslope cutthroat trout, mountain whitefish, largemouth bass, and kokanee salmon. Historically bull trout, westslope cutthroat trout, and mountain whitefish were abundant in the Pend Oreille Subbasin. Both westslope cutthroat trout and bull trout populations have been significantly reduced in numbers and distribution from the historic conditions. Kokanee are currently a key forage species in Lake Pend Oreille and are a highly sought after game fish. Largemouth bass provide an important fishery in the Pend Oreille River.

QHA modeling was used to help assess the limiting factors in the rivers and stream of the subbasin. The most significant stream habitat limiting factors for the focal species are listed in Tables 18.1-1, 18.1-2, 18.1-3, and 18.1-4. In parentheses is the number of reaches or watersheds within the Pend Oreille Subbasin where that particular habitat attribute is the worst habitat-related limiting factor. The numbers in the objective column

correspond to the subbasin objectives that were developed in this management plan to address this limiting factor. Aquatic objectives for the Pend Oreille Subbasin are described in more detail in section 18.3.

Within the Pend Oreille Subbasin, fine sediment had the highest frequency of being in the most deteriorated state. For kokanee salmon, channel stability and fine sediment were the two most problematic variables.

Table 18.1-1. Stream habitat conditions that currently most deviate from the reference for mountain whitefish, Pend Oreille Subbasin. The number in parenthesis is the number of reaches or watersheds within the Pend Oreille Subbasin where that particular habitat attribute is the worst habitat-related limiting factor. The numbers in the Objective column correspond to the subbasin objective that was developed to address this limiting factor in Section 18.3.

| Mountain Whitefish | |
|---|---|
| **Habitat Condition** | **Objective** |
| Fine Sediment (58) | 1B4, 1B3 |
| High Flow (5) | 1B1 |
| Obstructions (5) | 1B1, 2B1 |

Table 18.1-2. Stream habitat conditions that currently most deviate from the reference for bull trout, Pend Oreille Subbasin. The number in parenthesis is the number of reaches or watersheds within the Pend Oreille Subbasin where that particular habitat attribute is the worst habitat-related limiting factor. The numbers in the Objective column correspond to the subbasin objective that was developed to address this limiting factor in Section 18.3.

| Bull Trout | |
|---|---|
| **Habitat Condition** | **Objective** |
| Fine Sediment (53) | 1B4, 1B3 |
| Habitat Complexity (44) | 1B1, 1B3 |
| Riparian Condition (44) | 1B8 |
| Channel Stability (26) | 1B1, 1B3 |
| Low Flow (16) | 1B1 |
| High Temperature (8) | 1B2, 2B1 |
| High Flow (8) | 1B1 |
| Obstructions (6) | 1B1, 2B1 |
| Pollutants (4) | 1B2, 2B1 |

Table 18.1-3. Stream habitat conditions that currently most deviate from the reference for kokanee, Pend Oreille Subbasin. The number in parenthesis is the number of reaches or watersheds within the Pend Oreille Subbasin where that particular habitat attribute is the worst habitat-related limiting factor. The numbers in the Objective column correspond to the subbasin objective that was developed to address this limiting factor in Section 18.3.

| Kokanee | |
|---|---|
| **Habitat Condition** | **Objective** |
| Channel Stability (9) | 1B1, 1B3 |
| Fine Sediment (8) | 1B4, 1B3 |
| Low Flow (5) | 1B1 |
| Obstructions (4) | 1B1, 2B1 |
| Pollutants (3) | 1B2, 2B1 |
| High Flow (3) | 1B1 |

Table 18.1-4. Stream habitat conditions that currently most deviate from the reference for westslope cutthroat trout, Pend Oreille Subbasin. The number in parenthesis is the number of reaches or watersheds within the Pend Oreille Subbasin where that particular habitat attribute is the worst habitat-related limiting factor. The numbers in the Objective column correspond to the subbasin objective that was developed to address this limiting factor in Section 18.3.

| Westslope Cutthroat | |
|---|---|
| **Habitat Condition** | **Objective** |
| Fine Sediment (84) | 1B4, 1B3 |
| Riparian Condition (64) | 1B8 |
| Habitat Diversity (64) | 1B1, 1B3 |
| Channel Stability (40) | 1B1, 1B3 |
| Low Flow (24) | 1B1 |
| High Temperature (21) | 1B2, 2B1 |
| Obstructions (13) | 1B1, 2B1 |
| High Flow (13) | 1B1 |
| Pollutants (7) | 1B2, 2B1 |

Although habitat variables listed in tables 18.1-1 through 18.1-4 influence native fish populations in the Pend Oreille Subbasin, other factors have influenced and contributed to the decline in native salmonids within the Subbasin. The construction of five dams on the mainstem Pend Oreille River has reduced the amount of riverine habitat and created large reaches of disjunct reservoir habitat. All five dams located on the mainstem Pend Oreille River are without fish passage facilities, thus restricting biological connectivity to limited downstream gene flow and to upstream gene flow between dams. Management objectives that have been developed to address impacts from the dams include objectives 1A1, 1A2, 1B5, 1B7, 2C1, 1C12, and 2C1.

For largemouth bass, over-winter habitat appears to be the primary limiting factor. Limiting factors for kokanee in Lake Pend Oreille include predation and an inadequate

quantity of shoreline spawning habitat. Objectives to address these limiting factors include 1C8, 1C11, 1B5 and 1B7.

Although the change in habitats has been detrimental to many native fishes, it has increased the habitat capacity within the Subbasin for nonnative fishes like largemouth bass, yellow perch, and pumpkinseed. The increase in nonnative game fishes within the subbasin has increased the diversity of the sport fishery, while possibly jeopardizing the native fish assemblage. Management plan objectives that address nonnative species impacts to focal species in the Subbasin include 1B6, 1C4, 1C2, 1C7, 1C6, and 2A2.

### 18.1.2 Pend Oreille Terrestrial Assessment and Limiting Factors

Wildlife in the Pend Oreille Subbasin are limited by habitat quantity and quality. Construction of the Albeni Falls Project affected approximately 6,690 acres of land and 655 acres of shallow open water in the Subbasin, resulting in loss of 28,658 HUs. In addition, the FCRPS projects had a number of secondary effects to terrestrial resources within the Pend Oreille Subbasin, including accelerated rates of industrial, agricultural, and residential development leading to loss of habitat; increased hunting pressure on wildlife; and, to a limited extent, loss of salmonid nutrients to the ecosystem.

Factors that currently limit terrestrial resources in the Pend Oreille Subbasin are dominated by loss of habitat through conversion and modification of habitat quality as a result of human land uses. Modification of forested stands through timber management and the combined effects of mining, grazing, agriculture, and residential development, including roads, are all evident in the Subbasin. Development, including agriculture, has converted a total of three percent of native habitats to other cover types.

Management plan objectives that address the losses from the construction of and inundation from Albeni Falls Dam are Objective 1A and associated sub-objectives. Management plan objectives that address the operational impacts to terrestrial species and habitats are objective 1B, and associated sub-objectives. Objectives 2A through 2D address secondary impacts of the hydropower system as well as other subbasin effects to terrestrial resources.

## 18.2 Subbasin Vision

The Pend Oreille Subbasin vision is:

> *We envision the Pend Oreille Subbasin being comprised of and supporting viable/sustainable diverse fish and wildlife populations and their habitat contributing to the social, cultural and economic wellbeing of the Pend Oreille subbasin and Region.*

In addition to the vision, the Pend Oreille Subbasin Work Team members drafted the following guiding principles:

1. We believe subbasin planning should be consistent with the Northwest Power Act, Northwest Power and Conservation Council's Fish and Wildlife Program,

and Technical Guidance for Subbasin Planning, while complimenting existing plans, policies, and planning efforts.
2. We believe the subbasin plan should be sensitive to local interests who know the area and have to live with the results and impacts of the implemented management strategies.
3. Our subbasin plan should consider ecological, not political, boundaries.
4. Human interests including economics and recreational interests should be addressed along with fish and wildlife needs.
5. Our subbasin plan needs to display our concern about public health and safety issues including drinking water, flood control, levees, and dikes.
6. The subbasin plan should promote a stewardship mentality for future generations.
7. The subbasin plan should have a long-term versus short-term view.
8. Wildlife and fish species and habitat should be managed in perpetuity based on ecological, biological, and adaptive management principles.
9. The subbasin plan will address cultural and subsistence issues.
10. Public outreach and education are essential for successful plan development and implementation.

## 18.3 Aquatic Objectives and Strategies

Columbia River Basin level aquatic resource objectives were developed by the Northwest Power and Conservation Council in their 2000 Fish and Wildlife Program. Subbasin planners in the IMP developed province level aquatic resource objectives that are tiered to the Columbia River Basin level goals. In addition, subbasin planners in the six subbasins in the IMP developed subbasin specific objectives and strategies, which are tiered to both the Columbia River Basin and IMP goals. Objectives and strategies also included in the research, monitoring, and evaluation plan are marked with an asterisk.

The Pend Oreille Subbasin Work Team did not rank Category 1 and 2 objectives against each other, per direction of the OC indicating that the two categories are of equal priority. Within categories 1 and 2, the province level objectives were all considered high priority; relative levels of priority were assigned by the Work Team as priority 1, 2, and 3, but it should be emphasized that all are considered high priority. The Work Team ranked the subbasin objectives in order of priority under each Province level objective, but did not rank all objectives against one another independently of the Province level objectives. Strategies were prioritized within each subbasin level objective and are listed in priority order.

### Columbia River Basin Level Category 1: Mitigate for resident fish losses.

**Columbia River Basin Level Goal 1A:**
Complete assessments of resident fish losses throughout the Columbia River Basin resulting from the federal and federally-licensed hydrosystem, expressed in terms of the various critical population characteristics of key resident fish species.

**Province Level Objective 1A:**
Fully mitigate fish losses related to construction and operation of federally-licensed and federally operated hydropower projects. (High, priority 1)

**Subbasin Objective 1A:** Assess and mitigate fisheries effects due to construction and operation of federal and federally-licensed hydropower projects, including a resident fish loss assessment.

**Subbasin Objective 1A1*:** By 2010, quantitatively evaluate the impacts of hydropower facility construction and operation on water level fluctuation in Lake Pend Oreille and other waterbodies in the subbasin, including effects on near-shore productivity[1]. (Priority 1)

**Strategy a:** Write a loss assessment for Lake Pend Oreille, the lower Clark Fork River, and the Pend Oreille River above and below Albeni Falls Dam which quantifies the impacts of the construction and operation of Albeni Falls Dam on aquatic and economic resources. The study should reflect how any proposed actions would affect flood control capability relative to current hydropower facility operations.

**Strategy b:** Determine the increase in near-shore productivity that could be achieved by modifying the annual hydrologic cycle affecting lake levels in Lake Pend Oreille including evaluation of effects of proposed actions on flood control capability relative to current hydropower facility operations.

**Strategy c:** Assess the effects of water level management and shoreline development on erosion and spawning gravel recruitment/quantity/quality in Lake Pend Oreille, including development of proposals to reduce erosion and maintain gravels suitable for spawning. Include evaluation of effects of proposed actions on flood control capability relative to current hydropower facility operations.

**Strategy d:** Follow the Biological Opinion for Pend Oreille bull trout and its recommendations for lake levels. Include evaluation of effects of proposed actions on flood control capability relative to current hydropower facility operations.
(Refer to http://pacific.fws.gov/bulltrout/recovery.htm.)

**Subbasin Objective 1A2:** Develop, prioritize, and implement projects on- and off-site to fully mitigate these effects by year 2020. (Priority 2, sequential)

**Strategy a:** Develop, prioritize, and implement on- and off-site projects to fully mitigate these losses, including evaluation of effects of proposed

[1] Not all members of the Pend Oreille Work Team agreed with the concept of modifying winter lake levels in Lake Pend Oreille. See text for more explanation.

actions on flood control capability relative to current hydropower facility operations.

**Columbia River Basin Level Goal 1B:**
Maintain and restore healthy ecosystems and watersheds, which preserve functional links among ecosystem elements to ensure the continued persistence, health and diversity of all species including game fish species, non-game fish species, and other organisms. Protect and expand habitat and ecosystem functions as the means to significantly increase the abundance, productivity, and life history diversity of resident fish at least to the extent that they have been affected by the development and operation of the federal and federally-licensed hydrosystem.

**Province Level Objective 1B:**
Protect and restore instream and riparian habitat to maintain functional ecosystems for resident fish, including addressing the chemical, biological, and physical factors influencing aquatic productivity. (High, ranked second priority with 1C)

Note: Habitat sub-objectives ranked high, water quality sub-objectives ranked medium, and assessment sub-objectives ranked low priority by the Work Team.

**Subbasin Objective 1B1:** Protect, enhance, and restore native fish habitat function to maintain or enhance ecological diversity and long-term viability of native and desirable nonnative fish species, including westslope cutthroat and bull trout, using a watershed-based approach. (High priority)

**Strategy a:** Develop criteria for prioritizing streams and/or stream reaches for native resident and desirable nonnative fishes, including prioritization of identified core recovery areas for bull trout as noted within the USFWS Draft Bull Trout Recovery Plan (2002), and identified high quality (genetically pure) resident westslope cutthroat trout populations.

**Strategy b*:** Assess quality and quantity of available spawning and rearing habitat and prioritize stream reaches for protection and enhancement measures.

**Strategy c:** Develop and prioritize subbasin-wide habitat protection, restoration, and enhancement measures for native resident and desirable nonnative fishes.

**Strategy d:** Implement fish habitat protection, restoration, and enhancement measures using a variety of means including acquisition, conservation easements, landowner cooperative agreements, or other measures.

**Subbasin Objective 1B2:** Improve water quality to meet or exceed applicable water quality standards in the Pend Oreille Subbasin. (Medium priority)

**Strategy a:** Support the current effort by conservation districts, state and federal agencies to develop and implement non-point source TMDL Implementation Plans as per the IDEQ and WDOE subbasin assessments for the Priest River and Pend Oreille watersheds.

**Strategy b*:** Determine TDG contribution of each hydroproject in the subbasin above background level; prioritize TDG contributors based on greatest to least percentage; identify proven methods of TDG abatement; apply appropriate abatement methods to facilities according to prioritization. (Equal priority with strategy a)

**Strategy c:** Identify reaches of stream reaches not meeting 18$^{o}$C maximum temperature; on a stream by stream and reach by reach basis, identify causes of temperature exceedance (including a determination if the condition is natural); apply corrective actions such as riparian fencing, planting of riparian vegetation, etc. where necessary and appropriate. Note: Currently, the technical ability to measure temperature within the mosaic of the stream environment, and to determine its effects on fish, is imperfect.

**Strategy d*:** Identify pollution sources, causes, and constituents on tributaries and mainstem Pend Oreille River; determine and implement actions necessary to eliminate or mitigate effects.

**Strategy e*:** Continue monitoring the water quality of Lake Pend Oreille, Clark Fork River and Pend Oreille River to insure it meets State and Federal standards.

**Subbasin Objective 1B3*:** Conduct watershed assessments in drainages where sediment transport/bed load issues are negatively impacting resident fish habitat by 2008. (Low priority)

**Strategy a*:** Conduct watershed assessment to determine sedimentation sources (natural or human caused) that are negatively impacting fish habitat.

**Subbasin Objective 1B4:** Develop, prioritize, and implement projects to remove or reduce sediment sources negatively influencing fish habitat, using a coordinated watershed approach with a broad coalition of partners. (Medium priority)

**Strategy a:** Develop criteria for prioritizing streams and/or stream reaches for sediment reduction improvements, including prioritization of identified core recovery areas for bull trout as noted within the USFWS Draft Bull Trout Recovery Plan (2002) and for westslope cutthroat trout.

**Strategy b*:** Research and identify methods of sediment reduction, removal and/or disposal of bedload and sediment from stream reaches; implement sediment reduction methodologies on prioritized streams.

**Subbasin Objective 1B5:** Maintain 1.7 million square feet of clean shoreline gravel areas for kokanee spawning in Lake Pend Oreille throughout the duration of this plan. Note: Any studies should include evaluation of effects of proposed actions on flood control capability relative to current hydropower facility operations. (High priority)

**Strategy a:** Continue to work with the USFWS to determine a pattern of lake level management reflecting the current Biological Opinion, which will enhance shoreline gravel. (High priority, equal to strategies b and c)

**Strategy b:** Continue to work closely with the US Army Corps of Engineers and FCRPS managers to set annual lake levels. Evaluate the effects of proposed actions on flood control capability relative to current hydropower facility operations. (High priority, equal to strategies a and c)

**Strategy c*:** Monitor shoreline gravel areas for quality (as shoreline spawning areas). Vary lake levels between years, if necessary, to insure cleaning and re-sorting occurs. (High priority, equal to strategies a and b)

**Strategy d:** Implement measures to protect and restore kokanee spawning habitats, such as the shoreline areas at the south end of Lake Pend Oreille, including acquisition through purchase, easements, or other means such as:

- Remove docks, revegetate shoreline to reduce run-off
- Minimize the disturbance to kokanee spawning from factors such as boat propwash and siltation
- Develop areas for public summer uses that will protect spawning areas (most kokanee fry are out of the gravel by July). (Medium priority)

**Strategy e:** Fully utilize hydrojets on barges to clean gravel-spawning beds. Treat new gravel beds at lower lake elevations. (Low priority, equal to strategy f)

**Strategy f*:** Evaluate the impact on near-shore productivity from barge hydrojets to clean kokanee gravel spawning beds. (Low priority, equal to strategy e)

**Subbasin Objective 1B6:** Control the spread (allow 0 acres) of Eurasian Watermilfoil in the subbasin. (Medium priority)

**Strategy a:** Support the development and implementation of better and more efficient methods of milfoil management.

**Strategy b*:** Continue to inventory and map locations of milfoil occurrence.

**Strategy c*:** Evaluate the impact of extended dewatering and exposure to freezing temperatures on milfoil shoots.

**Subbasin Objective 1B7:** Increase bass over-winter habitat in the Pend Oreille River above Albeni Falls Dam from its current 45 ha to >300 ha to provide an improved sport fishery. (High priority)

**Strategy a:** Evaluate the costs and effects of raising the river level above Albeni Falls Dam to flood some of the rivers floodplain and provide over-winter habitat for warm water fish, including effects to kokanee spawning areas, and effects to flood control capability.

**Subbasin Objective 1B8:** Enhance, conserve and protect riparian habitats to the extent that they are intact and functional. (High priority)

**Strategy a:** Use acquisition and/or conservation easements or other measures in riparian areas to prevent degradation.

**Columbia River Basin Level Goal 1C:**
Restore resident fish species (subspecies, stocks and populations) to near historic abundance throughout their historic ranges where suitable habitat conditions exist and/or where habitats can be restored.

**Province Level Objective 1C1:**
Protect, enhance, restore, and increase distribution of native resident fish populations and their habitats in the IMP with primary emphasis on sensitive, native salmonid stocks.

**Province Level Objective 1C2:**
Maintain and enhance self-sustaining, wild populations of native game fish, and subsistence species, to provide for harvestable surplus.

**Province Level Objective 1C3:**
Minimize negative impacts (for example, competition, predation, introgression) to native species from nonnative species and stocks.

**Province Level Objective 1C4:**
Increase cooperation and coordination among stakeholders throughout the province.

In the Pend Oreille Subbasin, objectives that address Province Level objectives 1C1-1C4 are addressed under Category 2, below. The 1C objectives are high, ranked second priority with 1B.

**Province Level Objective 1C5:**
Meet and exceed the recovery plan goals for federally-listed threatened and endangered fish species.

**Subbasin Objective 1C1:** Restore bull trout to a harvestable surplus (that is, create and maintain a sport fishery) in the Pend Oreille Subbasin by 2030. Targets: Lake Pend Oreille: capable of providing 1,000 fish annually based on historic harvest rates of the 1960s through 1980s. Pend Oreille River: to be determined. Priest Lake: to be determined. (Priority 2)

**Strategy a:** Establish connectivity for bull trout throughout the Subbasin. (High priority, equal to strategy b)

**Strategy b*:** Evaluate fish passage for Priest Lake Dam, Boundary Dam, Albeni Falls Dam, Box Canyon Dam, Cabinet Gorge Dam, Noxon Dam and Thompson Falls Dam, utilizing ongoing studies where available, and implement passage mechanisms where appropriate. (High priority, equal to strategy a)

**Strategy c**: Protect and increase the amount of available stream spawning and rearing habitat used by bull trout. (Priority 2)

**Strategy d:** Determine the harvestable surplus of the strongest bull trout stocks. (Priority 3)

**Strategy e***: Continue research into limiting factors of the kokanee and bull trout populations. (Priority 4)

**Strategy f:** Reduce threats to bull trout in the Pend Oreille Subbasin by maintaining a strong forage base. (Priority 5)

**Strategy g**: Coordinate bull trout and other native fish species restoration activities with Canada, particularly with regard to the Salmo watershed. (Priority 6, equal to h and i)

**Strategy h:** Provide additional enforcement and education to protect bull trout. (Priority 6, equal to g and i)

**Strategy i*:** Study to see if the bull trout are utilizing the larger than anticipated lake whitefish population in Lake Pend Oreille. (Priority 6, equal to g and h)

**Subbasin Objective 1C2:** Research the effects of lake trout competition on bull trout and cutthroat trout in Priest Lake by 2015; implement corrective measures in accordance with recovery/restoration objectives. (Priority 5)

> **Strategy a*:** Significantly reduce lake trout with liberal harvest limits and other means, such as large commercial trapnets.

**Subbasin Objective 1C3:** In Lake Pend Oreille reduce competition and predation by lake trout on bull and cutthroat trout by reducing lake trout abundance to <4000 adults, if feasible. (Priority 4)

> **Strategy a:** Evaluate methods for determining population estimates, including the use of large commercial trap nets and hydroacoustics; determine the number of lake trout in Lake Pend Oreille and their bioenergetic food demands; and if lake trout abundance or population structure is resulting in unacceptable predation or other risks to native and desirable nonnative fish, research methods to reduce the energetic demand or competitive impact of the lake trout population. For example, determine if the consumption rate of an "old-growth" lake trout population is less than the consumption of a faster growing, younger (harvested) population or determine methods of direct lake trout removal.

**Subbasin Objective 1C4:** Remove 90 percent or more of the lake trout from Upper Priest Lake and prevent re-establishment through the Thorofare. (Priority 3)

> **Strategy a:** Continue to suppress lake trout in Upper Priest Lake using nets or other appropriate gear, install and evaluate an array of strobe lights across the Thorofare to prevent lake trout immigration, monitor the effectiveness of these actions, and develop new approaches if these measures are not successful.

**Subbasin Objective 1C5:** Pursue the objectives in the U.S Fish and Wildlife Service Draft Bull Trout Recovery Plan (2002). The goal of the bull trout recovery plan is to ensure the long-term persistence of self-sustaining, complex, interacting groups of bull trout distributed throughout the species' native range, so that the species can be delisted. The current draft goals and objectives for the Northeast Washington Recovery Unit (USFWS 2002) and the Clark Fork River Recovery Unit (USFWS 2002) are listed in the Appendix at the end of this section. If these objectives should change in the future, the Subbasin plan should be adjusted accordingly. (Priority 1)

> **Strategy a:** Follow the USFWS Draft Bull Trout Recovery Plan (2002), until superceded by Final Plan and supplemented by state recovery plans, to prioritize restoration projects.

**Province Level Objective 1C6:**
Restore resident fish species (subspecies, stocks and populations) to near historic abundance throughout their historic ranges where suitable habitat conditions exist and/or where habitats can be restored. (High, ranked third priority):

**Subbasin Objective 1C6:** Improve the genetic purity of Gerrard rainbow trout in Lake Pend Oreille by infusing pure strain fish from Kootenai Lake, B.C. into the gene pool. (Priority 5)

**Strategy a:** Once the forage base can sustain additional predators (maintaining appropriate predator**:**prey balance), stock pure Gerrard rainbow trout into Lake Pend Oreille; ensure all disease concerns are addressed before importing fish.

**Subbasin Objective 1C7:** By 2020 restore kokanee populations in Lake Pend Oreille to allow sustainable harvest of 750,000 fish/year, as long as this activity does not adversely impact native fish. (Priority 1, equal to 1C9)

**Strategy a*:** Continue to vary the winter lake level so as to increase the amount, and quality of, spawning gravel on the shores of Lake Pend Oreille; monitor shoreline spawning substrate; and monitor kokanee abundance through hydroacoustics and trawling, to determine response to lake level changes.

**Strategy b*:** Research factors that may influence lake productivity, such as the effect of the altered hydrologic cycle of the lake (no slowly receding shoreline allowing annual growth of wetland vegetation down to typical low pool) and take corrective actions. Evaluate the impacts of controlling Lake Pend Oreille level to more “natural” curves.

**Strategy c*:** Develop methods to monitor predator abundance and balance predator and kokanee populations.

**Strategy d*:** Determine the ecological role of lake whitefish in limiting Mysis shrimp abundance (their primary food) and potential benefits to zooplankton.

**Strategy e*:** Determine the cause of shoreline sedimentation and erosion that is placing sediments on the kokanee gravels.

**Subbasin Objective 1C8:** By 2010 balance predator (lake trout, rainbow trout, bull trout)/prey (kokanee) populations in Lake Pend Oreille (1:10 biomass ratio). (Priority 3)

**Strategy a*:** Develop monitoring methods, annually monitor predator and prey biomasses, and recommend fishing regulation changes or active predator reduction methods to restore predator**:**prey balance if needed.

**Subbasin Objective 1C9:** Improve the stocking program for kokanee in Lake Pend Oreille so that it contributes 375,000 kokanee to the harvest annually. (Priority 1, equal to 1C7)

**Strategy a*:** Monitor survival of each age classes of hatchery kokanee and compare to wild survival rates to determine why hatchery kokanee have not contributed more to the recovery of the fishery in Lake Pend Oreille; based on these findings, develop fish culture techniques that will improve kokanee survival.

**Subbasin Objective 1C10:** As prey base improves in Lake Pend Oreille, restore the rainbow trout fishery to a sustainable harvest of >4,000 fish/year. (Priority 4)

**Strategy a*:** Model rainbow trout population and test regulation changes designed to improve the quality of the sport fishery.

**Strategy b:** Use appropriate management tools to restore Gerrard rainbow trout to numbers consistent with what can be supported by the prey base.

**Subbasin Objective 1C11*:** By 2010, gain a better understanding of the kokanee food habits, potential competition with Mysis shrimp, and the ecological role of lake whitefish in reducing shrimp abundance. (Priority 2)

**Strategy a*:** Conduct study to better understand kokanee food habits, particularly with regard to Mysis shrimp and the ecological role of lake whitefish in reducing shrimp abundance. Study should include estimation of lake whitefish abundance and quantification of their foraging effects on Mysis shrimp.

**Strategy b*:** Examine the over-winter growth of kokanee in Lake Pend Oreille and compare to grow rates in Priest Lake, Coeur d'Alene Lake and Spirit Lake.

**Subbasin Objective 1C12.** Improve bass fishery above Albeni Falls Dam. (Unintentionally omitted from ranking)

**Strategy a**: Create 250+ acres of bass over-winter habitat above Albeni Falls Dam by building impoundments or other structures.

## Columbia River Basin Level Category 2: Substitute for anadromous fish losses.

**Columbia River Basin Level Goal 2A:**
Restore resident fish **s**pecies (subspecies, stocks and populations) to near historic abundance throughout their historic ranges where suitable habitat conditions exist and/or where habitats can be feasibly restored.

**Province Level Objective 2A1:**
Protect, enhance, restore, and increase distribution of native resident fish populations and their habitats in the IMP with primary emphasis on sensitive, native salmonid stocks.

**Province Level Objective 2A2:**
Maintain and enhance self-sustaining, wild populations of native game fish, and subsistence species, to provide for harvestable surplus.

**Province Level Objective 2A3:**
Minimize negative impacts (for example, competition, predation, introgression) to native species from nonnative species and stocks.

**Province Level Objective 2A4:**
Increase cooperation and coordination among stakeholders throughout the province.

Note: While only a small portion of the Pend Oreille Subbasin was in the range of anadromous fish, any area within the Subbasin could be used as off-site resident fish substitution area for other FCRPS projects.

The following subbasin objectives address province objectives 2A1 – 2A4. Province level objectives 2A1 – 2A4 were all ranked high, first priority.

**Subbasin Objective 2A1:** Protect, enhance, or restore stable, viable native fish populations. (Priority 1)

**Strategy a:** Develop criteria for prioritizing streams and/or stream reaches for habitat improvements, including prioritization of identified core recovery areas for bull trout as noted within the USFWS Draft Bull Trout Recovery Plan (2002), and implement projects to meet recovery plan objectives.

**Strategy b**: Produce via aquaculture, genetically appropriate native salmonids (for example, westslope cutthroat trout) for restoring populations.

**Subbasin Objective 2A2:** Manage nonnative species, including brook trout, in a way that minimizes negative impacts to native species. (Priority 2)

**Strategy a:** Utilize chemical, mechanical, or other means to control populations of undesirable fish for the purpose of enhancing native fish species populations.

**Strategy b:** Eliminate creel limit of eastern brook trout in the Lower Pend Oreille Subbasin.

**Strategy c**: Utilize sport fishing regulation mechanisms to target management efforts, which will assist in minimizing nonnative fish species impacts upon native species.

**Subbasin Objective 2A3:** Enhance the native westslope cutthroat trout population so that it can sustain a sport fishery in the Pend Oreille River and its tributaries by 2020. (Priority 3)

**Strategy a***: Determine 1) the status of westslope cutthroat trout in Pend Oreille River, 2) limiting factors on the species, and 3) westslope cutthroat genetic purity and prospects for recovery.

**Strategy b***: Identify key westslope cutthroat trout tributary habitat and develop a plan for protection and restoration.

**Columbia River Basin Level Goal 2B**:
Provide sufficient populations of fish and wildlife for abundant opportunities for Tribal trust and treaty right harvest and for non-Tribal harvest.

**Province Level Objective 2B**
Focus restoration efforts on habitats and ecosystem conditions and functions that will allow for expanding and maintaining diversity within, and among, species in order to sustain a system of robust populations in the face of environmental variation. (High, ranked fourth priority)

**Subbasin Objective 2B1:** Where opportunity exists, implement habitat restoration, protection, and enhancement projects that benefit multiple resources on a watershed basis to improve habitats and populations benefiting both tribal and non-tribal utilization.

**Columbia River Basin Level Goal 2C:**
Administer and increase opportunities for consumptive and non-consumptive resident fisheries for native, introduced, wild, and hatchery reared stocks that are compatible with the continued persistence of native resident fish species and their restoration to near historic abundance (includes intensive fisheries within closed or isolated systems).

**Province Level Objective 2C1:**
Artificially produce sufficient salmonids to supplement consistent harvest to meet

management objectives. (High, ranked second priority)

**Province Level Objective 2C2:**
Provide both short and long-term harvest opportunities that support both subsistence activities and sport-angler harvest. (High, ranked second priority)

**Subbasin Objective 2C1:** Increase the amount of harvestable largemouth bass in Box Canyon Reservoir from the current levels of 6 pounds per acre to 12 pounds per acre by 2010, as long as this activity does not adversely impact native fish.

**Strategy a:** Operate and maintain a largemouth bass hatchery.

**Strategy b:** Construct and place artificial cover structures to increase the amount of largemouth bass fry winter cover.

**Columbia River Basin Level Goal 2D:**
Reintroduce anadromous fish into blocked areas where feasible[2].

**Province Level Objective 2D1:**
Develop an anadromous fish re-introduction feasibility analysis by 2006 for Chief Joseph and by 2015 for Grand Coulee[3]. (High, ranked third priority)

**Province Level Objective 2D2:**
Develop an implementation plan within five years of feasibility determination for each facility. (High, ranked third priority)

**Subbasin Objective 2D1:** Most of the Pend Oreille Subbasin is upstream of the natural upper limit of anadromous salmon, therefore this objective will have limited impact on the waters of the Pend Oreille Subbasin.

### 18.3.1 Prioritization of Aquatic Objectives and Strategies

Not all members of the Pend Oreille Work Team agreed with the objectives and strategies as written. A minority report was requested by Jim Carney, who is concerned about the proposal to fluctuate winter water levels in Lake Pend Oreille. His concern is that there are potential negative downstream impacts which need to be evaluated and addressed.

[2] OC notes that "where feasible" is actual language from Council's Program.

[3] At this time the WDFW has no formal agency position, pro or con, on possible reintroduction and/or establishment of anadromous Chinook or steelhead above Grand Coulee Dam. Consideration for re-establishment of anadromous salmonid stocks above Grand Coulee Dam should be carefully evaluated in light of local habitat conditions, and potential impacts upon existing resident fish substitution programs currently in place to partially mitigate for the loss of historic anadromous fish resources.

A detailed discussion of the methods used to prioritize the objectives and strategies is found in Section 1.2. In the Pend Oreille Subbasin, the members of the Subbasin Work Team delegated the task of conducting preliminary prioritizations to several individual Work Team members. These individuals prioritized either a portion of the objectives or the strategies and distributed their preliminary ranking to the rest of the Work Team prior to the sixth Work Team meeting. The Work Team discussed the preliminary prioritization results for the objectives and strategies at the sixth Work Team meeting, and, based on a consensus decision, agreed to the final prioritization of the objectives and strategies.

The final prioritization of the aquatic objectives and strategies for the Pend Oreille Subbasin is displayed in Table 18.3-1.

Table 18.3-1. Summary of Aquatic Resources Objective Ranking for Pend Oreille Subbasin. Category 1 objectives are ranked separately from Category 2 objectives. Both categories are of equal importance.

| Objectives in Priority Order | Strategies | Limiting Factor(s) Addressed |
|---|---|---|
| **1st Priority**** | | |
| **Category 1**<br>**Province Level Objective 1A:** Fully mitigate fish losses related to construction and operation of federally-licensed and federally operated hydropower projects. | | |
| **(1) Subbasin Objective 1A1*:** By 2010, quantitatively evaluate the impacts of hydropower facility construction and operation on water level fluctuation in Lake Pend Oreille, and other waterbodies in the subbasin, including effects on near-shore productivity. | **Strategy a:** Write a loss assessment for Lake Pend Oreille, the lower Clark Fork River, and the Pend Oreille River above and below Albeni Falls Dam which quantifies the impacts of the construction and operation of Albeni Falls Dam on aquatic and economic resources. The study should reflect how any proposed actions would affect flood control capability relative to current hydropower facility operations.<br>**Strategy b:** Determine the increase in near-shore productivity that could be achieved by modifying the annual hydrologic cycle affecting lake levels in Lake Pend Oreille including evaluation of effects of proposed actions on flood control capability relative to current hydropower facility operations<br>**Strategy c:** Assess the effects of water level management and shoreline development on erosion and spawning gravel recruitment/quantity/quality in Lake Pend Oreille, including development of proposals to reduce erosion and maintain gravels suitable for spawning. Include evaluation of effects of proposed actions on flood control capability relative to current hydropower facility operations.<br>**Strategy d:** Follow the Biological Opinion for Pend Oreille bull trout and its recommendations for lake levels. Include evaluation of effects of proposed actions on flood control capability relative to current hydropower facility operations. | Lack of information, hydropower construction and operation impacts to aquatic habitat |
| **(2) Subbasin Objective 1A2**: Develop, prioritize, and implement projects on- and off-site to fully mitigate these effects by year 2020. | **Strategy a:** Develop, prioritize, and implement on- and off-site projects to fully mitigate these losses, including evaluation of effects of proposed actions on flood control capability relative to current hydropower facility operations. | Hydropower construction and operation impacts to aquatic habitat |
| **2nd Priority**** | | |

| Objectives in Priority Order | Strategies | Limiting Factor(s) Addressed |
|---|---|---|
| **Category 1**<br>**Province Level Objective 1B:** Protect and restore instream and riparian habitat to maintain functional ecosystems for resident fish, including addressing the chemical, biological, and physical factors influencing aquatic productivity.<br>**Province Level Objective 1C1 – 1C5:** Protect, enhance, restore, and increase distribution of native resident fish populations and their habitats in the IMP with primary emphasis on sensitive, native salmonid stocks. Maintain and enhance self-sustaining, wild populations of native game fish, and subsistence species, to provide for harvestable surplus. Minimize negative impacts (e.g., competition, predation, introgression) to native species from nonnative species and stocks. Increase cooperation and coordination among stakeholders throughout the province. Meet and exceed the recovery plan goals for federally listed threatened and endangered fish species. | | |
| **(1) Subbasin Objective 1B1**: Protect, enhance, and restore native fish habitat function to maintain or enhance ecological diversity and long-term viability of native and desirable nonnative fish species, including westslope cutthroat and bull trout, using a watershed-based approach.<br>**Subbasin Objective 1B5**: Maintain 1.7 million square feet of clean shoreline gravel areas for kokanee spawning in Lake Pend Oreille throughout the duration of this plan. Note: Any studies should include evaluation of effects of proposed actions on flood control capability relative to current hydropower facility operations.<br>**Subbasin Objective 1B7:** Increase bass over-winter habitat in the Pend Oreille River above Albeni Falls Dam from its current 45 ha to >300 ha to provide an improved sport fishery.<br>**Subbasin Objective 1B8**: Enhance, conserve and protect riparian habitats to the extent that they are intact and functional**.**<br>**Subbasin Objective 1C5**: Pursue the objectives in the U.S Fish and Wildlife Service Draft Bull Trout Recovery Plan (2002). The goal of the bull trout recovery plan is to ensure the long-term persistence of self-sustaining, complex, interacting groups of bull trout distributed throughout the species' native range, so that the species can be delisted. | **Subbasin Objective 1B1 Strategy a:** Develop criteria for prioritizing streams and/or stream reaches for native resident and desirable nonnative fishes, including prioritization of identified core recovery areas for bull trout as noted within the USFWS Draft Bull Trout Recovery Plan (2002), and identified high quality (genetically pure) resident westslope cutthroat trout populations.<br>**Strategy b*:** Assess quality and quantity of available spawning and rearing habitat and prioritize stream reaches for protection and enhancement measures.<br>**Strategy c:** Develop and prioritize subbasin-wide habitat protection, restoration, and enhancement measures for native resident and desirable nonnative fishes.<br>**Strategy d:** Implement fish habitat protection, restoration, and enhancement measures using a variety of means including acquisition, conservation easements, landowner cooperative agreements, or other measures.<br>**Subbasin Objective 1B5: Strategy a:** Continue to work with the USFWS to determine a pattern of lake level management reflecting the current Biological Opinion, which will enhance shoreline gravel. (High priority, equal to strategies b and c)<br>**Strategy b:** Continue to work closely with the US Army Corps of Engineers and FCRPS managers to set annual lake levels. Evaluate the effects of proposed actions on flood control capability relative to current hydropower facility operations. (High priority, equal to strategies a and c)<br>**Strategy c*:** Monitor shoreline gravel areas for quality (as shoreline spawning areas). Vary lake levels between years, if necessary, to insure cleaning and re-sorting occurs. (High priority, equal to strategies a and b)<br>**Strategy d:** Implement measures to protect and restore kokanee spawning habitats, such as the shoreline areas at the south end of | Habitat degradation, loss of opportunities for fishing, riparian habitat degradation, loss of native bull trout populations. |

| Objectives in Priority Order | Strategies | Limiting Factor(s) Addressed |
|---|---|---|
| | Lake Pend Oreille, including acquisition through purchase, easements, or other means such as:<br>• remove docks, revegetate shoreline to reduce runoff<br>• Minimize the disturbance to kokanee spawning from factors such as boat propwash and siltation<br>• Develop areas for public summer uses that will protect spawning areas (most kokanee fry are out of the gravel by July).<br>**Strategy e:** Fully utilize hydrojets on barges to clean gravel-spawning beds. Treat new gravel beds at lower lake elevations. (Low priority, equal to strategy f)<br>**Strategy f*:** Evaluate the impact on near shore productivity from barge hydrojets to clean kokanee gravel spawning beds. (Low priority, equal to strategy e)<br>**Subbasin Objective 1B7: Strategy a:** Evaluate the costs and effects of raising the river level above Albeni Falls Dam to flood some of the rivers floodplain and provide over-winter habitat for warm water fish, including effects to kokanee spawning areas, and effects to flood control capability.<br>**Subbasin Objective 1B8**: **Strategy a:** Use acquisition and/or conservation easements, or other measures in riparian areas to prevent degradation.<br>**Subbasin Objective 1C5**: **Strategy a:** Follow the USFWS Draft Bull Trout Recovery Plan (2002), until superceded by Final Plan and supplemented by state recovery plans, to prioritize restoration projects. | |
| **(2) Subbasin Objective 1B2**: Improve water quality to meet or exceed applicable water quality standards in the Pend Oreille Subbasin.<br>**Subbasin Objective 1B4:** Develop, prioritize, and implement projects to remove or reduce sediment sources negatively influencing fish habitat, using a coordinated watershed approach with a broad coalition of partners.<br>**Subbasin Objective 1B6**: Control the spread (allow 0 acres) of Eurasian | **Subbasin Objective 1B2**: **Strategy a:** Support the current effort by conservation districts, state and federal agencies to develop and implement non-point source TMDL Implementation Plans as per the IDEQ and WDOE subbasin assessments for the Priest River and Pend Oreille watersheds.<br>**Strategy b*:** Determine TDG contribution of each hydroproject in the subbasin above background level; prioritize TDG contributors based on greatest to least percentage; identify proven methods of TDG abatement; apply appropriate abatement methods to facilities according to prioritization.<br>**Strategy c:** Identify reaches of stream reaches not meeting 18$^{o}$C maximum temperature; on a stream by stream and reach by reach | Water quality, sediment, nonnative invasive plants, loss of fishing opportunities |

| Objectives in Priority Order | Strategies | Limiting Factor(s) Addressed |
|---|---|---|
| Watermilfoil in the subbasin.<br>**Subbasin Objective 1C1:** Restore bull trout to a harvestable surplus (i.e., create and maintain a sport fishery) in the Pend Oreille Subbasin by 2030. Targets: Lake Pend Oreille: capable of providing 1,000 fish annually based on historic harvest rates of the 1960s through 1980s. Pend Oreille River: to be determined. Priest Lake: to be determined. | basis, identify causes of temperature exceedance (including a determination if the condition is natural); apply corrective actions such as riparian fencing, planting of riparian vegetation, etc. where necessary and appropriate. Note: Currently, the technical ability to measure temperature within the mosaic of the stream environment, and to determine its effects on fish, is imperfect.<br>**Strategy d*:** Identify pollution sources, causes, and constituents on tributaries and mainstem Pend Oreille River; determine and implement actions necessary to eliminate or mitigate effects.<br>**Strategy e*:** Continue monitoring the water quality of Lake Pend Oreille, Clark Fork River and Pend Oreille River to insure it meets State and Federal standards.<br>**Subbasin Objective 1B4: Strategy a**: Develop criteria for prioritizing streams and/or stream reaches for sediment reduction improvements, including prioritization of identified core recovery areas for bull trout as noted within the USFWS Draft Bull Trout Recovery Plan (2002) and for westslope cutthroat trout.<br>**Strategy b*:** Research and identify methods of sediment reduction, removal and/or disposal of bedload and sediment from stream reaches; implement sediment reduction methodologies on prioritized streams.<br>**Subbasin Objective 1B6**: **Strategy a:** Support the development and implementation of better and more efficient methods of milfoil management.<br>**Strategy b***: Continue to inventory and map locations of milfoil occurrence.<br>**Strategy c*:** Evaluate the impact of extended dewatering and exposure to freezing temperatures on milfoil shoots.<br>**Subbasin Objective 1C1: Strategy a:** Establish connectivity for bull trout throughout the subbasin. (High priority, equal to strategy b)<br>**Strategy b*:** Evaluate fish passage for Priest Lake Dam, Boundary Dam, Albeni Falls Dam, Box Canyon Dam, Cabinet Gorge Dam, Noxon Dam and Thompson Falls Dam, utilizing ongoing studies where available, and implement passage mechanisms where appropriate. (High priority, equal to strategy a)<br>**Strategy c**: Protect and increase the amount of available stream spawning and rearing habitat used by bull trout.<br>**Strategy d:** Determine the harvestable surplus of the strongest bull trout stocks. | |

| Objectives in Priority Order | Strategies | Limiting Factor(s) Addressed |
|---|---|---|
| | **Strategy e***: Continue research into limiting factors of the kokanee and bull trout populations.<br>**Strategy f:** Reduce threats to bull trout in the Pend Oreille Subbasin by maintaining a strong forage base.<br>**Strategy g**: Coordinate bull trout and other native fish species restoration activities with Canada, particularly with regard to the Salmo watershed.<br>**Strategy h:** Provide additional enforcement and education to protect bull trout.<br>**Strategy i*:** Study to see if the bull trout are utilizing the larger than anticipated lake whitefish population in Lake Pend Oreille. (Priority 6, equal to g and h) | |
| **(3) Subbasin Objective 1B3*:** Conduct watershed assessments in drainages where sediment transport/bed load issues are negatively impacting resident fish habitat by 2008.<br>**Subbasin Objective 1C4:** Remove 90% or more of the lake trout from Upper Priest Lake and prevent re-establishment through the Thorofare. | **Subbasin Objective 1B3*: Strategy a***: Conduct watershed assessment to determine sedimentation sources (i.e., natural or human caused) that are negatively impacting fish habitat.<br>**Subbasin Objective 1C4: Strategy a:** Continue to suppress lake trout in Upper Priest Lake using nets or other appropriate gear, install and evaluate an array of strobe lights across the Thorofare to prevent lake trout immigration, monitor the effectiveness of these actions, and develop new approaches if these measures are not successful. | Lack of information, sediment, stream instability, nonnative fishes |
| **(4) Subbasin Objective 1C3:** In Lake Pend Oreille reduce competition and predation by lake trout on bull and cutthroat trout by reducing lake trout abundance to <4000 adults, if feasible. | **Subbasin Objective 1C3: Strategy a:** Evaluate methods for determining population estimates, including the use of large commercial trap nets and hydroacoustics; determine the number of lake trout in Lake Pend Oreille and their bioenergetic food demands; and if lake trout abundance or population structure is resulting in unacceptable predation or other risks to native and desirable nonnative fish, research methods to reduce the energetic demand or competitive impact of the lake trout population. For example, determine if the consumption rate of an "old-growth" lake trout population is less than the consumption of a faster growing, younger (harvested) population or determine methods of direct lake trout removal. | Nonnative fish impacts |
| **(5) Subbasin Objective 1C2:** Research the effects of lake trout competition on bull trout and cutthroat trout in Priest Lake by 2015; implement corrective measures in accordance with recovery/restoration objectives. | **Subbasin Objective 1C2: Strategy a*:** Significantly reduce lake trout with liberal harvest limits and other means, such as large commercial trapnets. | Nonnative fish impacts |
| **3rd Priority**** | | |

| Objectives in Priority Order | Strategies | Limiting Factor(s) Addressed |
|---|---|---|
| **Category 1**<br>**Province Level Objective 1C6:** Restore resident fish species (subspecies, stocks and populations) to near historic abundance throughout their historic ranges where suitable habitat conditions exist and/or where habitats can be restored. | | |
| **(1) Subbasin Objective 1C7:** By 2020 restore kokanee populations in Lake Pend Oreille to allow sustainable harvest of 750,000 fish/year, as long as this activity does not adversely impact native fish.<br>**Subbasin Objective 1C9:** Improve the stocking program for kokanee in Lake Pend Oreille so that it contributes 375,000 kokanee to the harvest annually. | **Subbasin Objective 1C7: Strategy a*:** Continue to vary the winter lake level so as to increase the amount, and quality of, spawning gravel on the shores of Lake Pend Oreille; monitor shoreline spawning substrate; and monitor kokanee abundance through hydroacoustics and trawling, to determine response to lake level changes.<br>**Strategy b*:** Research factors that may influence lake productivity, such as the effect of the altered hydrologic cycle of the lake (i.e., no slowly receding shoreline allowing annual growth of wetland vegetation down to typical low pool) and take corrective actions. Evaluate the impacts of controlling LPO level to more "natural" curves.<br>**Strategy c*:** Develop methods to monitor predator abundance and balance predator and kokanee populations.<br>**Strategy d*:** Determine the ecological role of lake whitefish in limiting Mysis shrimp abundance (their primary food) and potential benefits to zooplankton.<br>**Strategy e*:** Determine the cause of shoreline sedimentation and erosion that is placing sediments on the kokanee gravels.<br>**Subbasin Objective 1C9: Strategy a*:** Monitor survival of each age classes of hatchery kokanee and compare to wild survival rates to determine why hatchery kokanee have not contributed more to the recovery of the fishery in Lake Pend Oreille; based on these findings, develop fish culture techniques that will improve kokanee survival. | Loss of fishing opportunity |
| **(2) Subbasin Objective 1C11*:** By 2010, gain a better understanding of the kokanee food habits, potential competition with Mysis shrimp, and the ecological role of lake whitefish in reducing shrimp abundance. | **Subbasin Objective 1C11*: Strategy a*:** Conduct study to better understand kokanee food habits, particularly with regard to Mysis shrimp and the ecological role of lake whitefish in reducing shrimp abundance. Study should include estimation of lake whitefish abundance and quantification of their foraging effects on Mysis shrimp.<br>S**trategy b*:** Examine the over-winter growth of kokanee in Lake Pend Oreille and compare to grow rates in Priest Lake, Coeur d'Alene Lake and Spirit Lakes. | Loss of fishing opportunity |

| Objectives in Priority Order | Strategies | Limiting Factor(s) Addressed |
|---|---|---|
| **(3) Subbasin Objective 1C8:** By 2010 balance predator (lake trout, rainbow trout, bull trout)/prey (kokanee) populations in Lake Pend Oreille (1:10 biomass ratio). | **Subbasin Objective 1C8: Strategy a*:** Develop monitoring methods, annually monitor predator and prey biomasses, and recommend fishing regulation changes or active predator reduction methods to restore predator**:**prey balance if needed. | Loss of fishing opportunity, nonnative species impacts |
| **(4) Subbasin Objective 1C10:** As prey base improves in Lake Pend Oreille, restore the rainbow trout fishery to a sustainable harvest of >4,000 fish/year. | **Subbasin Objective 1C10: Strategy a*:** Model rainbow trout population and test regulation changes designed to improve the quality of the sport fishery.<br>**Strategy b:** Use appropriate management tools to restore Gerrard rainbow trout to numbers consistent with what can be supported by the prey base. | Loss of fishing opportunity |
| **(5) Subbasin Objective 1C6:** Improve the genetic purity of Gerrard rainbow trout in Lake Pend Oreille by infusing pure strain fish from Kootenai Lake, B.C. into the gene pool. | **Strategy a:** Once the forage base can sustain additional predators (maintaining appropriate predator**:**prey balance), stock pure Gerrard rainbow trout into Lake Pend Oreille; ensure all disease concerns are addressed before importing fish. | Loss of fishing opportunity |
| **Priority unknown. Subbasin Objective 1C12**: Improve bass fishery above Albeni Falls Dam. | **Subbasin Objective 1C12**: **Strategy a**: Create 250+ acres of bass over-winter habitat above Albeni Falls Dam by building impoundments or other structures. | Loss of fishing opportunity |
| **1st Priority**** | | |
| **Category 2**<br>**Province Level Objective 2A1 – 2A4:** Protect, enhance, restore, and increase distribution of native resident fish populations and their habitats in the IMP with primary emphasis on sensitive, native salmonid stocks. Maintain and enhance self-sustaining, wild populations of native game fish, and subsistence species, to provide for harvestable surplus. Minimize negative impacts (e.g., competition, predation, introgression) to native species from nonnative species and stocks. Increase cooperation and coordination among stakeholders throughout the province. | | |
| **(1) Subbasin Objective 2A1:** Protect, enhance, or restore stable, viable native fish populations.<br>**Subbasin Objective 2B1:** Where opportunity exists, implement habitat restoration, protection, and enhancement projects that benefit multiple resources on a watershed basis to improve habitats and populations benefiting both Tribal and non-Tribal utilization. | **Subbasin Objective 2A1 Strategy a:** Develop criteria for prioritizing streams and/or stream reaches for habitat improvements, including prioritization of identified core recovery areas for bull trout as noted within the USFWS Draft Bull Trout Recovery Plan (2002), and implement projects to meet recovery plan objectives.<br>**Strategy b**: Produce via aquaculture, genetically appropriate native salmonids (e.g. westslope cutthroat trout) for restoring populations. | Loss of fishing opportunity, habitat degradation |

| Objectives in Priority Order | Strategies | Limiting Factor(s) Addressed |
|---|---|---|
| **(2) Subbasin Objective 2A2:** Manage nonnative species, including brook trout, in a way that minimizes negative impacts to native species. | **Strategy a:** Utilize chemical, mechanical, or other means to control populations of undesirable fish for the purpose of enhancing native fish species populations.<br>**Strategy b:** Eliminate creel limit of eastern brook trout in the Lower Pend Oreille Subbasin.<br>**Strategy c**: Utilize sport fishing regulation mechanisms to target management efforts, which will assist in minimizing nonnative fish species impacts upon native species. | Nonnative species impacts |
| **(3) Subbasin Objective 2A3:** Enhance the native westslope cutthroat trout population so that it can sustain a sport fishery in the Pend Oreille River and its tributaries by 2020. | **Strategy a***: Determine 1) the status of westslope cutthroat trout in Pend Oreille River, 2) limiting factors on the species, and 3) westslope cutthroat genetic purity and prospects for recovery.<br>**Strategy b***: Identify key westslope cutthroat trout tributary habitat and develop a plan for protection and restoration | Loss of fishing opportunity |
| **2nd Priority**** | | |
| **Category 2**<br>**Province Level Objective 2C1:** Artificially produce sufficient salmonids to supplement consistent harvest to meet management objectives.<br>**Province Level Objective 2C2:** Provide both short and long-term harvest opportunities that support both subsistence activities and sport-angler harvest. | | |
| **(1) Subbasin Objective 2C1:** Increase the amount of harvestable largemouth bass in Box Canyon Reservoir from the current levels of 6 pounds per acre to 12 pounds per acre by 2010, as long as this activity does not adversely impact native fish. | **Strategy a:** Operate and maintain a largemouth bass hatchery.<br>**Strategy b:** Construct and place artificial cover structures to increase the amount of largemouth bass fry winter cover. | Loss of fishing opportunity |
| **3rd Priority**** | | |
| **Category 2**<br>**Province Level Objective 2D1:** Develop an anadromous fish re-introduction feasibility analysis by 2006 for Chief Joseph and by 2015 for Grand Coulee<br>**Province Level Objective 2D2:** Develop an implementation plan within 5 years of feasibility determination for each facility. | | |
| **(1) Subbasin Objective 2D1:** Most of the Pend Oreille subbasin is upstream of the natural upper limit of anadromous salmon, therefore this objective will have limited impact on the waters of the Pend Oreille Subbasin. | No strategies identified | Loss of anadromous life history |
| **4th Priority**** | | |
| **Category 2**<br>**Province Level Objective 2B:** Focus restoration efforts on habitats and ecosystem conditions and functions that will allow for expanding and maintaining diversity within, and among, species in order to sustain a system of robust populations in the face of environmental variation. | | |

| Objectives in Priority Order | Strategies | Limiting Factor(s) Addressed |
|---|---|---|
| **(1) Subbasin Objective 2B1:** Where opportunity exists, implement habitat restoration, protection, and enhancement projects that benefit multiple resources on a watershed basis to improve habitats and populations benefiting both Tribal and non-Tribal utilization. | No strategies identified | Loss of fishing opportunity, loss of anadromous life history |

* = Objectives and strategies that are included in the RM&E plan.

** = Note that Category 1 and Category 2 were considered of equal priority and were not ranked relative to each other. Within each category, the Work Team considered all objectives to be high priority, but provided relative rankings of 1st, 2nd, 3rd, and 4th priority. Refer to meeting notes of Work Team Meeting 6, March 16, 2004, for further details on prioritization.

### 18.3.2 Discussion of Aquatic Priorities

The Pend Oreille Subbasin Work Team did not rank Category 1 and 2 objectives against each other, per direction of the OC indicating that the two categories are of equal priority. Within categories 1 and 2, the province level objectives were all considered high priority; relative levels of priority were assigned by the Work Team as priority 1, 2, and 3, but it should be emphasized that all are considered high priority. The Work Team ranked the subbasin objectives in order of priority under each Province level objective, but did not rank all objectives against one another independently of the Province level objectives. Strategies were prioritized within each subbasin level objective and are listed in priority order.

In Category 1, the top priority is the mitigation for fish losses related to construction and operation of the hydropower system. This is rated as a top priority because the development and operation of the hydrosystem has resulted in losses of numbers and diversity of native resident fish in the Pend Oreille Subbasin. These losses have not been mitigated to date.

Habitat restoration and protecting native resident fish were considered to be of equal importance, and second in priority in Category 1. Habitat restoration objectives were generally ranked as higher priority than water quality objectives. Research objectives were lower than habitat or water quality objectives.

Objectives that addressed nonnative resident sport fishes were ranked third priority within Category 1.

In Category 2, the top priority is to protect, enhance, restore, and increase distribution of native resident fish populations and their habitats in the IMP with primary emphasis on sensitive, native salmonid stocks; maintain and enhance self-sustaining, wild populations of native game fish, and subsistence species, to provide for harvestable surplus; minimize negative impacts (for example, competition, predation, introgression) to native species from nonnative species and stocks; and increase cooperation and coordination among stakeholders throughout the province. These objectives were ranked higher than the others in this category because they address native fishes and habitats. Artificial production of fish, anadromous reintroduction, and terrestrial habitat improvements were rated lower, although they are all considered high priority.

## 18.4 Terrestrial Objectives and Strategies

Columbia River Basin-level terrestrial resource objectives were developed by the Council in their 2000 Fish and Wildlife Program. Subbasin planners in the IMP developed province level terrestrial resource objectives that are tiered to the Columbia River Basin level goals. In addition, subbasin planners in the six subbasins in the IMP developed subbasin specific objectives and strategies, which are tiered to both the Columbia River Basin and IMP goals.

The Province level objectives were prioritized by the OC. Subbasin objectives and strategies were prioritized by the Subbasin Work Team during the fifth and sixth meetings. These objectives are presented below with the prioritization is given after the objective. The strategies are also listed in priority order beneath each objective. Objectives and strategies also addressed in the research, monitoring, and evaluation plan are marked with an asterisk.

## Columbia River Basin Level Category 1:

A primary overarching objective of the Columbia River Basin 2000 Fish and Wildlife Program is the completion of mitigation for the adverse effects to wildlife caused by the development and operation of the hydrosystem.

***Priority 1:*** **Columbia River Basin Level Goal 1A:**
Complete the current Wildlife Mitigation Program for construction and inundation losses of federal hydrosystem as identified in Appendix C, Table 11-4 of the Columbia River Basin 2000 Fish and Wildlife Program.

> **Province Level Objective 1A**:
> Fully mitigate for construction and inundation losses incurred from the Chief Joseph Dam, Grand Coulee Dam, and Albeni Falls projects per the requirements of the Northwest Power Act and the current Wildlife Mitigation Program (Appendix C, Table 11-4 of the Columbia River Basin 2000 Fish and Wildlife Program) by **2015.** This includes developing and implementing projects within the IMP that protect, enhance, or restore Habitat Units for HEP evaluation species and habitats as specified in the construction loss assessments for Chief Joseph, Grand Coulee, and Albeni Falls dams (Kuehn and Berger 1992; Creveling and Renfrow 1986; Martin et al. 1988); coordinated planning; provision of adequate funding for long-term Operations and Maintenance (O&M); and effectiveness monitoring of projects.
>
> > **Pend Oreille Subbasin Objective 1A**: Fully mitigate wildlife habitat losses associated with the construction and inundation of the Albeni Falls Project per the requirements of the Council's 2000 Fish and Wildlife Program and Northwest Power Act. Complete the compensation mitigation consistent with the HEP loss assessment (Appendix C, Table 11-4 of the Columbia River Basin 2000 Fish and Wildlife Program) and the Albeni Falls Dam Wildlife Mitigation Project Operating Guidelines by year 2015. (These requirements will be met in coordination with the Coeur d'Alene Subbasin.) (Highest priority)

Sub-objectives 1A1 through 1A8 and 1A9 are all high priority under this objective, not prioritized individually.

> > **Objective 1A1:** Protect, enhance, or restore bald eagle breeding Habitat Units to address coniferous and deciduous forest and forested wetland habitat losses resulting from construction of Albeni Falls Project.

**Objective 1A2:** Protect, enhance, or restore bald eagle wintering Habitat Units to address coniferous and deciduous forest habitat losses resulting from construction of Albeni Falls Project.

**Objective 1A3:** Protect, enhance, or restore black-capped chickadee Habitat Units to address deciduous forest habitat losses resulting from construction of Albeni Falls Project.

**Objective 1A4:** Protect, enhance, or restore Canada goose Habitat Units to address floodplain meadow, shoreline, open water and herbaceous wetland habitat losses resulting from construction of Albeni Falls Project.

**Objective 1A5:** Protect, enhance, or restore mallard Habitat Units to address floodplain meadow, scrub-shrub, open water, and herbaceous wetland habitat losses resulting from construction of Albeni Falls Project.

**Objective 1A6:** Protect, enhance, or restore muskrat Habitat Units to address herbaceous wetland and open water habitat losses resulting from construction of Albeni Falls Project.

**Objective 1A7:** Protect, enhance, or restore white-tailed deer Habitat Units to address scrub-shrub wetland habitat losses resulting from construction of Albeni Falls Project.

**Objective 1A8:** Protect, enhance, or restore redhead Habitat Units to address open water and near-shore floating aquatic weed bed habitat losses resulting from construction of Albeni Falls project.

> **Strategy a** (**for Objectives 1A1-1A8):** Identify and protect habitat through fee title acquisition, conservation easements, lease, or management agreements. The Council defines protection as any action that protects habitat in perpetuity. (Priority 1)
>
> **Strategy b (for Objectives 1A1-1A8)*:** Develop management plans consistent with Columbia Basin Fish and Wildlife Authority (CBFWA) Guidelines for Enhancement, Operation, and Maitenance Activities for Wildlife Mitigation Projects (CBFWA Wildlife Managers 1998). Management plans will address roaded and non-roaded access, livestock, habitat connectivity (to other lands managed for wildlife), soil, vegetation enhancement and management of unwanted species, fire and fuels, nonnative wildlife, and monitoring. (Priority 3)
>
> **Strategy c** (**for Objectives 1A1-1A8)*:** Identify and evaluate sites for potential use in mitigation, including a) opportunities for

enhancement and restoration on federal, state, and Tribal lands, and b) opportunities for cooperative restoration and enhancement efforts with private landowners, when habitat protections can be demonstrated to be permanent. (Priority 4)

**Objective 1A9:** Maintain wildlife habitat values (Habitat Units) for the life of the project on existing and newly acquired mitigation lands through adequate long-term Operations and Maintenance (O&M) funding.

**Strategy a:** Ensure long-term protection, enhancement, and monitoring of habitat units through secured funding for O&M. (Priority 2)

***Priority 2:*** **Columbia River Basin Level Goal 1B:**
Quantify the operational effects of federal hydrosystem projects on terrestrial resources, develop mitigation plan in coordination with other resource mitigation and resource planning efforts, and implement projects to mitigate the impacts, including maintenance and monitoring.

**Province Level Objective 1B:**
Quantitatively assess and mitigate operational impacts of the Chief Joseph Dam, Grand Coulee Dam, and Albeni Falls projects per the requirements of the Northwest Power Act and the current Wildlife Mitigation Program. Complete assessment of operational impacts by 2008; develop mitigation plan by 2010; implement initial mitigation by 2015; incorporate formal methods for review and update of effects assessment and mitigation plan on a three-year cycle, to respond to changes in operation and to effectiveness of mitigation actions.

**Pend Oreille Subbasin Objective 1B ***: Quantitatively assess and mitigate operational impacts of Albeni Falls Project on terrestrial resources in the Pend Oreille Subbasin by year 2015.

**Objective 1B1*:** Complete the assessment of operational effects on terrestrial resources by year 2008. (Priority 2)

**Strategy a*:** Conduct the assessment and consider the fluctuation zone, hydrologic alterations (based on current hydropower facility operations), loss of nutrients in watershed from loss of salmon, identify recreational effects to terrestrial resources, BPA transmission lines, habitat connectivity, and erosion. (Priority 1)

**Objective 1B2:** Complete development of mitigation plan by year 2010 and complete the implementation of initial mitigation by year 2015. (Priority 3)

**Objective 1B3*:** Perform review and update of effects assessment and mitigation plan on a three-year cycle, to respond to changes in operation and to effectiveness of mitigation actions. (Priority 4)

## Columbia River Basin Level Category 2:

In consideration of the primary overarching objectives of the Columbia River Basin 2000 Fish and Wildlife Program, provide: 1) sufficient populations of wildlife for abundant opportunities for tribal trust and treaty right harvest and for non-tribal harvest; 2) recovery of wildlife species affected by the development and operation of the hydrosystem that are listed under the Endangered Species Act; and 3) a Columbia River ecosystem that sustains an abundant, productive, and diverse community of fish and wildlife.

***Priority 3:*** **Columbia River Basin Level Goal 2**:
Mitigate for wildlife losses that have occurred through secondary effects of hydrosystem development, including assessment, development of mitigation plan in coordination with other resources and resource managers, implementation, maintenance, and monitoring.

*The following two Province level objectives (2A and 2B) are lower in priority than 1A and 1B, but were not prioritized relative to each other by the OC. Sub-objectives under these two province level objectives were prioritized by the Subbasin Work Team, and are presented below with the priority shown in parentheses after each Subbasin objective. Strategies under the objectives are presented in order of priority beneath each objective.*

**Province Level Objective 2A**:
Mitigate for wildlife losses that have occurred through secondary effects of hydrosystem development by protecting, enhancing, restoring, and sustaining populations of wildlife for aesthetic, cultural, ecological, and recreational values. Objective includes assessment of secondary impacts, development of mitigation plan in coordination with other resources and resource managers, implementation, maintenance, and monitoring. Because the secondary effects of hydrosystem development are tightly intermingled with the effects of other activities in the province, this objective also incorporates other actions to maintain or enhance populations of federal, state, and Tribal species of special concern, and other native and desirable nonnative wildlife species, within their present and/or historical ranges in order to prevent future declines and restore populations that have suffered declines or been extirpated.

**Objective 2A1:** Increase the Selkirk woodland caribou herd to 75 animals or more by 2010, with the intent to meet ESA delisting criteria by 2020. (Priority 15)

**Objective 2A2:** Maintain bald eagle populations at or above present levels (2004) within the Pend Oreille Subbasin. (Priority 7)

**Strategy a:** Identify, map, and provide long-term protection to current and/or potential winter perching, nesting, and foraging habitat.

**Objective 2A3**: Restore a self-sustaining population of grizzly bears in the Selkirk Recovery Zone that meets the *Grizzly Bear Recovery Plan* goals (USFWS objective) (Table 18.4-1). (Priority 8)

Table 18.4-1. Grizzly Bear Recovery Plan goals

| Criterion | Targets (achieved for three consecutive years |
|---|---|
| Female with cubs | At least 6 females with young observed per year |
| Mortality Limit | Maximum of 0.50 bears killed per year |
| Female Mortality Limit | Maximum of 0.15 female bears killed per year |
| Distribution of females with young | Females with young observed in at least 7 of 10 Bear Management Units |

**Objective 2A4*:** Identify, prioritize, and implement habitat improvements that address limiting factors in order to restore or maintain viable lynx populations in the Pend Oreille Subbasin. (Priority 16)

**Objective 2A5**: Restore and sustain state threatened and endangered species, tribal and state species of special concern, federal candidate species, BLM and USFS sensitive species, and USFS indicator species, including the following: wolverine, fisher, otter, northern flying squirrels, northern bog lemming, pygmy shrew, Townsend's big-eared bat (and other members of the bat guild), peregrine falcon, northern goshawk, osprey, great-blue heron, common loon, pygmy nuthatch, flammulated owl, boreal owl, great gray owl, northern pygmy owl, pileated woodpecker, white-headed woodpecker, three-toed woodpecker, upland sandpiper, yellow warbler, northern alligator lizard, ring-necked snake, rough-skinned newts, tailed frog northern leopard frog, long-toed salamander, and Coeur d'Alene salamander. (Priority 17)

**Objective 2A6:** Protect, restore, enhance, and sustain populations of big game species such as black bear, elk, mountain goat, moose mountain lion, mule deer, and white-tailed deer. (Priority 9)

**Objective 2A7:** Protect, restore, enhance, and sustain populations of waterfowl, upland game, and furbearers under traditional levels of recreational and subsistence use. (Priority 11)

**Objective 2A8:** Maintain or enhance neo-tropical migrant bird populations relative to current levels within present use areas and identify limiting factors for these populations within the Pend Oreille Subbasin. (Priority 13)

**Objective 2A9:** Maintain or enhance populations of cavity nesting species relative to current levels within present use areas and identify limiting factors within the Subbasin. (Priority 18)

**Strategy a (for Objectives 2A1-2A11)*:** Identify limiting factors for species/guilds, and identify relationships to indicator species/habitats analyzed in HEP loss assessments.

**Strategy b (for Objectives 2A1-2A11)*:** Use current subbasin Plan Assessment to determine current distribution and population status of species/guild and define target species/guilds; supplement with additional inventory as needed.

**Strategy c (for Objectives 2A1-2A11):** Develop and implement mitigation to address limiting factors for species/guilds, with consideration of benefits that can be acquired through acquisition of HUs for indicator species/habitats used in HEP loss assessments.

**Objective 2A10:** Maintain or enhance amphibian and reptile populations relative to current levels within present use areas and identify limiting factors within the subbasin. (Priority 12)

**Objective 2A11:** Maintain or enhance invertebrate populations relative to current levels within present use areas and identify limiting factors for these populations within the subbasin. (Priority 14)

**Province Level Objective 2B:**
Mitigate for wildlife losses that have occurred through secondary effects of hydrosystem development by protecting, enhancing, restoring, and sustaining native wildlife habitat function to maintain or enhance ecological diversity and security for native and desirable nonnative wildlife species. Objective includes assessment of secondary impacts, development of mitigation plan in coordination with other resources and resource managers, implementation, maintenance, and monitoring. Because the secondary effects of hydrosystem development are tightly intermingled with the effects of other activities in the province, this objective also incorporates other actions to identify, maintain, restore, and enhance priority habitats (wetlands, riparian areas, upland forests, steppe and shrub-steppe, cliffs and rock outcrops, caves, grasslands, and other priority habitats) including their structural attributes, ecological functions, and distribution and connectivity across the landscape to optimize conditions required to increase overall wildlife productivity of desired species assemblages. Strategies may include land acquisition, conservation easements, management contracts, and/or partnerships with other landowners.

**Province Level Objective 2B1:** Identify and implement strategies and opportunities for restoring the diversity, block size, and spatial arrangement of habitat types needed to sustain target wildlife species at ecologically sound levels.

**Province Level Objective 2B2:** Restore the connectivity of habitat types needed to sustain wildlife populations at the landscape level. Encourage and support the implementation of all forest practices, including road building and maintenance, as specified in the Washington Department of Natural Resources (WDNR) and the Idaho Department of Lands (IDL) Forest Practices Rules and Subbasin Forest Plans for all National Forests within the Subbasin.

**Objective 2B1:** Fully mitigate for all FERC hydropower terrestrial resources effects within the Pend Oreille Subbasin in-kind and in-place when possible. Complete all mitigation requirements consistent with approved and active guidelines, agreements, and applicable federal (FERC) licenses. (Priority 6)

**Objective 2B2*:** Identify, maintain, restore, and enhance priority habitats (wetlands, riparian areas, upland forests, steppe and shrub-steppe, cliffs and rock outcrops) within the Pend Oreille Subbasin, including their structural attributes, ecological functions, and distribution and connectivity across the landscape. (Priority 5)

**Strategies for Objectives 2B1 through 2B2:**

**Strategy a:** Acquire land management rights to identified native wildlife habitats of concern through fee title acquisition, lease, conservation easement, or management plan.

**Strategy b:** Develop management plans to enhance and/or restore native habitats. Management plans should address roaded and non-roaded access, livestock, nonnative plant and animal species; soils, and vegetation management activities to improve habitat quality.

**Strategy c:** Implement management plans and conduct implementation and effectiveness monitoring to ensure that objectives are being met.

**Strategy d:** Improve enforcement of existing state and Tribal hunting regulations and modify regulations where needed to improve success of achieving wildlife management objectives.

**Objective 2B3:** Reverse long-term mule deer population decline by providing for a 25-year increasing trend in the quantity and quality of mule deer habitats, particularly winter and spring habitats. (Priority 10)

**Strategy a:** Secure and enhance winter and spring ranges; protect from human development.

**Strategy b:** Manage motorized traffic in critical mule deer spring and winter ranges.

**Strategy c:** Manage forests for a variety of successional stages to meet mule deer habitat needs on a site-specific basis; use fire and forest management to increase quality and quantity of shrubs and mature forest cover.

**Strategy d:** Increase the area of aspen stands.

**Strategy e:** Modify state and Tribal hunting regulations to help increase mule deer populations.

**Strategy f:** Restore grasses and forbs where noxious weeds have impacted mule deer habitat.

**Strategy g:** Develop, prioritize, and implement projects and/or research to address identified limiting factors for mule deer.

**Strategy h:** Improve enforcement of state and Tribal hunting regulations.

**Strategy i*:** Continue funding to complete WDFW cooperative Mule Deer Project.

**Objective 2B4*:** Identify and implement strategies and opportunities for restoring the diversity, block size, and spatial arrangement of habitat types needed to sustain target wildlife species at ecologically sound levels. (Priority 19)

**Objective 2B5:** Restore the connectivity of habitat types needed to sustain wildlife populations at the landscape level. Encourage and support the implementation of all forest practices, including road building and maintenance, as specified in the WDNR and IDL Forest Practices Rules and Subbasin Forest Plans for all National Forests within the Subbasin. (Priority 20)

### 18.4.1 Prioritization of Terrestrial Objectives and Strategies

A detailed discussion of the methods used to prioritize the objectives and strategies is found in Section 1.2. In Pend Oreille Subbasin, the members of the Subbasin Work Team delegated the task of conducting preliminary prioritizations to several individual Work Team members. These individuals prioritized either a portion of the objectives or the strategies and distributed their preliminary ranking to the rest of the Work Team prior to

the sixth Work Team meeting. The Work Team discussed the preliminary prioritization results for the objectives and strategies at the sixth Work Team meeting, and, based on a consensus decision, agreed to the final prioritization of the objectives and strategies.

The final prioritization of the terrestrial objectives and strategies for the Pend Oreille Subbasin is displayed in Table 18.4-1.

Table 18.4-1. Summary of prioritization of terrestrial objectives and strategies for Pend Oreille Subbasin, with the limiting factors each objective addresses

| Objectives in priority order | Strategies | Limiting Factor(s) Addressed |
|---|---|---|
| **Provincial Priority 1 – Mitigate for construction and inundation losses** | | |
| **Objective 1A:** Fully mitigate wildlife habitat losses associated with the construction and inundation of the Albeni Falls Project per the requirements of the Council's 2000 Fish and Wildlife Program and Northwest Power Act. Complete the compensation mitigation consistent with the HEP loss assessment (Appendix C, Table 11-4 of the Columbia River Basin 2000 Fish and Wildlife Program) and the Albeni Falls Dam Wildlife Mitigation Project Operating Guidelines by year 2015. (These requirements will be met in coordination with the Coeur d'Alene Subbasin.) | (Refer to strategies for **sub-objectives 1A1 – 1A9**) | Terrestrial resource losses incurred from construction and inundation of the Albeni Falls Dam. |
| **(Highest priority)**<br>**Objective 1A1:** Protect, enhance, or restore bald eagle breeding Habitat Units to address coniferous and deciduous forest and forested wetland habitat losses resulting from construction of Albeni Falls Project.<br>**Objective 1A2:** Protect, enhance, or restore bald eagle wintering Habitat Units to address coniferous and deciduous forest habitat losses resulting from construction of Albeni Falls Project.<br>**Objective 1A3:** Protect, enhance, or restore black-capped chickadee Habitat Units to address deciduous forest habitat losses resulting from construction of Albeni Falls Project.<br>**Objective 1A4:** Protect, enhance, or restore Canada goose Habitat Units to address floodplain meadow, shoreline, open water and herbaceous wetland habitat losses resulting from construction of Albeni Falls Project.<br>**Objective 1A5:** Protect, enhance, or restore mallard Habitat Units to address floodplain meadow, scrub-shrub, open water, and herbaceous wetland habitat losses resulting from construction of Albeni Falls Project.<br>**Objective 1A6:** Protect, enhance, or restore muskrat Habitat Units to address herbaceous wetland and open water habitat losses resulting from construction of Albeni Falls Project.<br>**Objective 1A7:** Protect, enhance, or restore white-tailed deer Habitat Units to address scrub-shrub wetland habitat losses resulting from construction of Albeni Falls Project.<br>**Objective 1A8:** Protect, enhance, or restore redhead Habitat Units to address open water and near-shore floating aquatic weed | **Strategy a** (**for Objectives 1A1-1A8) (Priority 1):** Identify and protect habitat through fee title acquisition, conservation easements, lease, or management agreements. The Council defines protection as any action that protects habitat in perpetuity.<br><br>**Strategy b (for Objectives 1A1-1A8)* (Priority 3):** Develop management plans consistent with Columbia Basin Fish and Wildlife Authority (CBFWA) Guidelines for Enhancement, Operation, and Maintenance Activities for Wildlife Mitigation Projects (CBFWA Wildlife Managers 1998). Management plans will address roaded and non-roaded access, livestock, habitat connectivity (to other lands managed for wildlife), soil, vegetation enhancement and management of unwanted species, fire and fuels, nonnative wildlife, and monitoring.<br><br>**Strategy c** (**for Objectives 1A1-1A8)* (Priority 4):** Identify and evaluate sites for potential use in mitigation, including a) opportunities for enhancement and restoration on federal, state, and tribal lands, and b) opportunities for cooperative restoration and enhancement efforts with private landowners, when habitat | Terrestrial resource losses incurred from construction and inundation of the Albeni Falls Dam. |

| Objectives in priority order | Strategies | Limiting Factor(s) Addressed |
|---|---|---|
| bed habitat losses resulting from construction of Albeni Falls project.<br>**Objective 1A9:** Maintain wildlife habitat values (Habitat Units) for the life of the project on existing and newly acquired mitigation lands through adequate long-term Operations and Maintenance (O&M) funding. | protections can be demonstrated to be permanent.<br><br>**Strategy a (for Objective 1A9) (Priority 2):** Ensure long-term protection, enhancement, and monitoring of habitat units through secured funding for Operations and Maintenance. | |
| **Provincial Priority 2 – Quantify and mitigate for operational impacts** | | |
| **(2)** Complete the assessment of operational effects on terrestrial resources by year 2008. **Objective 1B1*** | **Strategy a *:** Conduct the assessment and consider the fluctuation zone, hydrologic alterations (based on current hydropower facility operations), loss of nutrients in watershed from loss of salmon, identify recreational effects to terrestrial resources, BPA transmission lines, habitat connectivity, and erosion. | Lack of data on operational impacts |
| **(3)** Complete development of mitigation plan by year 2010 and complete the implementation of initial mitigation by year 2015. **Objective 1B2** | **Strategy a**: Develop and implement mitigation plan for operational effects. | Need for mitigation operational impacts. |
| **(4)** Perform review and update of effects assessment and mitigation plan on a three-year cycle, to respond to changes in operation and to effectiveness of mitigation actions. **Objective 1B3*** | **Strategy a**: Implement three-year review and update of mitigation plan. | Adaptive management, changing conditions |
| **Provincial Priority 3 –Mitigate for secondary effects of FCRPS and other subbasin effects** | | |
| **(5)** Identify, maintain, restore, and enhance priority habitats (wetlands, riparian areas, upland forests, steppe and shrub-steppe, cliffs and rock outcrops) within the Pend Oreille Subbasin, including their structural attributes, ecological functions, and distribution and connectivity across the landscape. **Objective 2B2*** | **Strategy a:** Acquire land management rights to identified native wildlife habitats of concern through fee title acquisition, lease, conservation easement, or management plan.<br><br>**Strategy b:** Develop management plans to enhance and/or restore native habitats. Management plans should address roaded and non-roaded access, livestock, nonnative plant and animal species; soils, and vegetation management activities to improve habitat quality.<br><br>**Strategy c:** Implement management plans and conduct implementation and effectiveness monitoring to ensure that objectives are being | Secondary effects of FCRPS and other subbasin effects to priority habitats |

| Objectives in priority order | Strategies | Limiting Factor(s) Addressed |
|---|---|---|
| | met.<br><br>**Strategy d:** Improve enforcement of existing state and tribal hunting regulations and modify regulations where needed to improve success of achieving wildlife management objectives. | |
| **(6)** Fully mitigate for all FERC hydropower terrestrial resources effects within the Pend Oreille Subbasin in-kind and in-place when possible. Complete all mitigation requirements consistent with approved and active guidelines, agreements, and applicable federal (FERC) licenses. **Objective 2B1** | Refer to **strategies a–d for Objective 2B1**, above | Other subbasin effects, specifically FERC hydropower impacts |
| **(7)** Maintain bald eagle populations at or above present levels (2004) within the Pend Oreille Subbasin. **Objective 2A2** | **Strategy a (for Objective 2A2):** Identify, map, and provide long-term protection to current and/or potential winter perching, nesting, and foraging habitat. | Secondary effects of FCRPS and other subbasin effects to bald eagles |
| **(8)** Restore a self-sustaining population of grizzly bears in the Selkirk Recovery Zone that meets the *Grizzly Bear Recovery Plan* goals (USFWS objective). **Objective 2A3** | **Strategy a (for Objectives 2A1-2A11)*:** Identify limiting factors for species/guilds, and identify relationships to indicator species/habitats analyzed in HEP loss assessments.<br><br>**Strategy b (for Objectives 2A1-2A11)*:** Use current subbasin Plan Assessment to determine current distribution and population status of species/guild and define target species/guilds; supplement with additional inventory as needed.<br><br>**Strategy c (for Objectives 2A1-2A11):** Develop and implement mitigation to address limiting factors for species/guilds, with consideration of benefits that can be acquired through acquisition of HUs for indicator species/habitats used in HEP loss assessments. | Secondary effects of FCRPS and other subbasin effects to grizzly bears |
| **(9)** Protect, restore, enhance, and sustain populations of big game species such as black bear, elk, mountain goat, moose mountain lion, mule deer, and white-tailed deer. **Objective 2A6** | Refer to **strategies a-c for Objectives 2A1-2A11**, above. | Secondary effects of FCRPS and other subbasin effects to big game species. |
| **(10)** Reverse long-term mule deer population decline by providing for a 25-year increasing trend in the quantity and quality of mule deer habitats, particularly winter and spring habitats. **Objective** | **Strategy a:** Secure and enhance winter and spring ranges; protect from human development. | Secondary effects of FCRPS and other subbasin effects to mule |

| Objectives in priority order | Strategies | Limiting Factor(s) Addressed |
|---|---|---|
| **2B3** | **Strategy b:** Manage motorized traffic in critical mule deer spring and winter ranges.<br><br>**Strategy c:** Manage forests for a variety of successional stages to meet mule deer habitat needs on a site-specific basis; use fire and forest management to increase quality and quantity of shrubs and mature forest cover.<br><br>**Strategy d:** Increase the area of aspen stands.<br><br>**Strategy e:** Modify state and tribal hunting regulations to help increase mule deer populations.<br><br>**Stragegy f:** Restore grasses and forbs where noxious weeds have impacted mule deer habitat.<br><br>**Strategy g:** Develop, prioritize, and implement projects and/or research to address identified limiting factors for mule deer.<br><br>**Strategy h:** Improve enforcement of state and tribal hunting regulations.<br><br>**Strategy i*:** Continue funding to complete WDFW cooperative Mule Deer Project. | deer habitats |
| **(11)** Protect, restore, enhance, and sustain populations of waterfowl, upland game, and furbearers under traditional levels of recreational and subsistence use. **Objective 2A7** | Refer to **strategies a-c for Objectives 2A1-2A11**, (see priority 8, above) | Secondary effects of FCRPS and other subbasin effects to waterfowl, upland game, and furbearers |
| **(12)** Maintain or enhance amphibian and reptile populations relative to current levels within present use areas and identify limiting factors within the subbasin. **Objective 2A10** | Refer to **strategies a-c for Objectives 2A1-2A11**, (see priority 8, above) | Secondary effects of FCRPS and other subbasin effects to amphibians and reptiles |
| **(13)** Maintain or enhance neo-tropical migrant bird populations relative to current levels within present use areas and identify limiting factors for these populations within the Pend Oreille | Refer to **strategies a-c for Objectives 2A1-2A11**, (see priority 8, above) | Secondary effects of FCRPS and other subbasin effects to neo- |

| Objectives in priority order | Strategies | Limiting Factor(s) Addressed |
|---|---|---|
| Subbasin. **Objective 2A8** | | tropical migrant birds |
| **(14)** Maintain or enhance invertebrate populations relative to current levels within present use areas and identify limiting factors for these populations within the subbasin**. Objective 2A11** | Refer to **strategies a-c for Objectives 2A1-2A11**, (see priority 8, above) | Secondary effects of FCRPS and other subbasin effects to invertebrate populations |
| **(15)** Increase the Selkirk woodland caribou herd to 75 animals or more by 2010, with the intent to meet ESA de-listing criteria by 2020. **Objective 2A1** | Refer to **strategies a-c for Objectives 2A1-2A11**, (see priority 8, above) | Secondary effects of FCRPS and other subbasin effects to Selkirk woodland caribou |
| **(16)** Identify, prioritize, and implement habitat improvements that address limiting factors in order to restore or maintain viable lynx populations in the Pend Oreille Subbasin. **Objective 2A4*** | Refer to **strategies a-c for Objectives 2A1-2A11**, (see priority 8, above) | Secondary effects of FCRPS and other subbasin effects to lynx |
| **(17)** Restore and sustain state threatened and endangered species, tribal and state species of special concern, federal candidate species, BLM and USFS sensitive species, and USFS indicator species. **Objective 2A5** | Refer to **strategies a-c for Objectives 2A1-2A11**, (see priority 8, above) | Secondary effects of FCRPS and other subbasin effects to TES species |
| **(18)** Maintain or enhance populations of cavity nesting species relative to current levels within present use areas and identify limiting factors within the subbasin. **Objective 2A9** | Refer to **strategies a-c for Objectives 2A1-2A11**, (see priority 8, above) | Secondary effects of FCRPS and other subbasin effects to cavity nesting species |
| **(19)** Identify and implement strategies and opportunities for restoring the diversity, block size, and spatial arrangement of habitat types needed to sustain target wildlife species at ecologically sound levels. **Objective 2B4*** | No specific strategies identified. | Secondary effects of FCRPS and other subbasin effects to target wildlife habitat |
| **(20)** Restore the connectivity of habitat types needed to sustain wildlife populations at the landscape level. Encourage and support the implementation of all forest practices, including road building and maintenance, as specified in the WDNR and IDL Forest Practices Rules and Subbasin Forest Plans for all National Forests within the subbasin. **Objective 2B5** | No specific strategies identified. | Secondary effects of FCRPS and other subbasin effects to habitat connectivity |

* = Objectives and strategies that are included in the RM&E plan.

### 18.4.2 Discussion of Terrestrial Prioritization

The ranking of the terrestrial objectives directly reflects the priorities established in the Council's 2000 Fish and Wildlife Program. The overall top priority terrestrial objective for the Pend Oreille Subbasin is to fully mitigate for terrestrial resource losses incurred from construction and inundation of the Albeni Falls Dam per the requirements of the Northwest Power Act (Pend Oreille Objective 1A, and nine sub-objectives). This objective was ranked the highest priority due to connection to direct effects of FCRPS. These impacts and resulting mitigation are the sole responsibility of the FCRPS. This includes all protection, restoration, enhancement, O&M, and monitoring.

Development of federal hydropower system projects resulted in direct loss of wildlife habitats due to construction of project facilities and inundation of project reservoirs. The Albeni Falls Wildlife Protection, Mitigation, and Enhancement Plan Final Report (Martin et al. 1988) provides the Habitat Evaluation Procedures (HEP) assessment of wildlife and wildlife habitat losses for construction of the project. The results of this study were amended into the Council's Fish and Wildlife Program in 1987 and specify the number of habitat units to be provided in compensation for the construction losses. The study also identified potential mitigation areas. Mitigation for the construction losses is directed by the Albeni Falls Interagency Work Group, which includes the Coeur d'Alene Tribe, Kalispel Tribe, Kootenai Tribe of Idaho, IDFG, USFWS, USACOE, NRCS, and USFS. Priority mitigation focus areas were established with consideration for in-place and in-kind opportunities, threat to wetland habitats in primary impact areas, location relative to other management areas, and availability of protection opportunities (Albeni Falls Interagency Work Group Operating Guidelines and Guiding Principles for Mitigation Implementation 1998).

The Subbasin Work Team did not assign individual priorities to the wildlife HEP species, as it was agreed that most habitat management projects address multiple wildlife species. The strategy addressing maintenance of wildlife-habitat values was rated highly as it is critical that mitigation parcels be managed and maintained over the long term in order to provide the anticipated benefits and achieve the mitigation objectives.

The next level of priority is quantifying and mitigating for the operational impacts of the FCRPS per the requirements of the Northwest Power Act. In the Pend Oreille Subbasin, no assessment of operational impacts has been conducted. Therefore, this is the first priority in this category of objectives. Once the impacts have been identified the next priority will be to develop a mitigation plan and to implement the mitigation plan, and then update the mitigation plan on a three-year cycle.

The third priority in the IMP is to mitigate for secondary effects of the hydrosystem development in combination with other subbasin effects to terrestrial resources. In this category of objectives, the Pend Oreille Subbasin Work Team ranked increasing priority habitats and mitigating for the non-federal hydropower impacts as the highest priorities. Mitigating for secondary losses to bald eagle and grizzly bear, two federally-listed threatened species, were the next highest priorities. Other, lower priority, species or habitats included mule deer, big game, waterfowl, and furbearers.

## 18.5 Appendix – Draft Bull Trout Recovery Plan for Pend Oreille Subbasin

The following information was taken from the USFWS Draft Bull Trout Recovery Plan (2002). Pend Oreille Aquatic Objective 1C5 is to pursue the objectives in this Recovery Plan so that the species can be delisted. Included in this document are the goals and objectives from the Recovery Plan, with the understanding that the Recovery Plan is still in draft. If the Recovery Plan changes when finalized, then the objectives of this Subbasin Management Plan will be adjusted accordingly.

The goal of the USFWS Draft Bull Trout Recovery Plan (2002) is to ensure the long-term persistence of self-sustaining, complex, interacting groups of bull trout distributed throughout the species' native range, so that the species can be delisted.

To achieve this goal the following objectives have been identified for bull trout in the **Northeast Washington Recovery Unit:**

- Maintain current distribution of bull trout and restore distribution in previously occupied areas within the Northeast Washington Recovery Unit.
- Maintain stable or increasing trends in abundance of bull trout.
- Restore and maintain suitable habitat conditions for all bull trout life history stages and strategies.
- Conserve genetic diversity and provide opportunity for genetic exchange.

Recovery criteria identified for the **Northeast Washington Recovery Unit** are the following (USFWS, 2003):

> **1. Bull trout will be distributed among at least nine local populations in the Northeast Washington Recovery Unit.**
>
> Local populations under a recovered condition include: Slate Creek, Indian Creek, Sullivan Creek (including Sullivan Lake and tributaries), Mill Creek, Cedar Creek (Pend Oreille County), Tacoma Creek, Ruby Creek, Calispell Creek, and the LeClerc Creek complex (including Fourth of July Creek, East Branch LeClerc Creek, and West Branch LeClerc Creek).
>
> **2. Estimated abundance of bull trout among all local populations in the Northeast Washington Recovery Unit will be between 1,575 and 2,625 migratory adults.**
>
> Recovered population estimates for individual local population are: Indian Creek 50 to 100 adults, Slate Creek 25 to 75 adults, Mill Creek 50 to 150 adults, Cedar Creek 150 to 250 adults, Ruby Creek 100 to 200 adults, Tacoma Creek 150 to 350 adults, Calispell Creek 50 to 100 adults,

Sullivan Creek (including Sullivan Lake and tributaries) 600 to 850 adults, and LeClerc Creek 400 to 550 adults.

**3. Adult bull trout exhibit a stable or increasing trend for at least two generations at or above the recovered abundance level within the Pend Oreille Core Area.**

The development of a standardized monitoring and evaluation program, which would accurately describe trends in bull trout abundance, is identified as a priority research need.

**4. Specific barriers to bull trout migration in the Northeast Washington Recovery Unit will have been addressed.**

The Northeast Washington Recovery Unit Team has identified that the primary impediment to bull trout recovery is the fragmentation of habitat within the system by hydroelectric facilities. The Northeast Washington Recovery Unit Team recommends that to achieve recovery in the Pend Oreille Core Area, connectivity needs to be restored at Albeni Falls, Box Canyon, and Boundary dams.

Recovery criteria for the Northeast Washington Recovery Unit were established to assess whether recovery actions are resulting in the recovery of bull trout. The Northeast Washington Recovery Unit Team expects that the recovery process will be dynamic and will be refined as more information becomes available. While removal of bull trout as a species under the Endangered Species Act (delisting) can only occur for the entity that was listed (Columbia River distinct population segment), the criteria listed above will be used to determine when the Northeast Washington Recovery Unit is fully contributing to recovery of the population segment.

To achieve this goal the following objectives have been identified for bull trout in the **Clark Fork River Recovery Unit:**

Lake Pend Oreille is considered to be a primary core area for the Clark Fork Recovery Unit. In Lake Pend Oreille, 13 relatively complete basin-wide redd counts were conducted between 1983 and 2000. These counts found an average of 657 redds in 18 streams (range 412 to 881). The 2000 redd count located 740 redds. Five drainages (Grouse, Gold, Granite, Trestle, and Lightning creeks) consistently support over 25 redds, with the strongest (Gold and Trestle creeks) normally exceeding 100 redds each. Johnson Creek also exceeded the 25 redd level in two of the 4 years between 1997 and 2000.

In the Lake Pend Oreille Core Area, at least 6 local populations must contain more than 100 adult bull trout. In addition, adult populations will exceed 2,500 fish in Lake Pend Oreille.

Trend criteria will be met when the overall bull trout population in the Clark Fork Recovery Unit is accepted, under contemporary standards of the time, to be stable or increasing, based on at least 10 years of monitoring data.

Connectivity criteria will be met when functional fish passage is restored or determined to be unnecessary to support bull trout recovery at Milltown, Thompson Falls, Noxon Rapids, Cabinet Gorge, and Priest Lake dams and when dam operational issues are satisfactorily addressed at Hungry Horse, Bigfork, Kerr, and Albeni Falls dams (as identified through license conditions of the FERC and the Biological Opinion of the USFWS. In the Priest Recovery Subunit, fish passage needs must be fully evaluated at Priest Lake Dam (FERC license), and year round fish passage must be provided if determined biologically necessary.

# SECTION 19 – Table of Contents

# 19 Pend Oreille Research, Monitoring and Evaluation Plan

In light of the various ongoing efforts to develop a regional monitoring plan, the Intermountain Province (IMP) has chosen to develop a monitoring plan based on existing monitoring methods described in the scientific literature. The IMP approach to the Research, Monitoring and Evaluation (RM&E) is as follows:

- Research is handled separately from the M&E design. A wish list of research needs is identified based on the biological objectives, strategies and critical uncertainties identified in the subbasin management plans and subbasin assessments. Many of the subbasin work teams developed preliminary research needs lists. Although there is an extensive "wish list" of research questions in the IMP, the limitations of available funding made it important to prioritize the research questions into two categories: "need to know" and "would like to know."

- For the M&E component, the IMP developed a framework to link specific objectives and strategies identified in the IMP subbasin management plans to a suite of M&E protocols and existing programs (an M&E "tool box"). To do this the subcommittee identified a broad list of existing M&E protocols and existing M&E program, which represent: peer reviewed, scientifically validated approaches to M&E; are appropriate to a range of geographic scales; and include the range of the Independent Science Review Panel's (ISRP) three tiers of RM&E. Specific M&E objectives and strategies from each of The Subbasin management plans, and from the province level, were then linked in Table 19.1 to:

    - The type of generic approach to addressing limiting factors that is addressed by the strategy or objective (same list used to categorize the inventory of projects)
    - The type of M&E protocol that would be most appropriate
    - Which ISRP M&E tier level of RM&E would be appropriate
    - Which of the "tool box" tools would be used.

The complete tool box bibliography is found in Appendix I. More detailed information on the process for developing the RM&E plan is found in Section 2.

Table 19.1. Pend Oreille Subbasin aquatic research, monitoring, and evaluation plan

| AQUATIC | | | | | |
|---|---|---|---|---|---|
| **Strategy & Objective** | **Strategy Type[1]** | **Monitoring Type[2]** | **Tier[3]** | **Scale[4]** | **Tool Box Tool[5]** |
| **Columbia River Basin Level Goal 1A:** Complete assessments of resident fish losses throughout the basin resulting from the hydrosystem, expressed in terms of the various critical population characteristics of key resident fish species. | 1,2,5,6,9,10 | | | 1, 2, 3 | 1, 3, 4, 6, 8, 11, 12, 14, 17, 22, 26, 28 |
| **Subbasin Objective 1A:** Assess and mitigate fisheries effects due to construction and operation of federal and federally licensed hydropower projects, including a resident fish loss assessment. | 1,2,5,6,9,10 | | | 1, 2, 3 | 1, 3, 4, 6, 8, 11, 12, 14, 17, 22, 26, 28 |
| **Subbasin Objective 1A1:** By 2010, quantitatively evaluate the impacts of hydropower facility construction and operation on water level fluctuation in Lake Pend Oreille, and other waterbodies in the Subbasin, including effects on near-shore productivity. | 1,2,6,9,10 | survey, survey and mapping | 1,3 | 1 | 3,13, 23, |
| **Columbia River Basin Level Goal 1B:** Maintain and restore healthy ecosystems and watersheds, which preserve functional links among ecosystem elements to ensure the continued persistence, health and diversity of all species including game fish species, non-game fish species, and other organisms. Protect and expand habitat and ecosystem functions as the means to significantly increase the abundance, productivity, and life history diversity of resident fish at least to the extent that they have been affected by the development and operation of the hydrosystem. | all | all | all | all | all |
| **Province Level Objective 1B**: Protect and restore instream and riparian habitat to maintain functional ecosystems for resident fish, including addressing the chemical, biological, and physical factors influencing aquatic productivity. | 1,3,4, 5,6,10 | all | 1,2 | 1,2,3 | 1, 2,3, 4, 6, 9, 10, 11, 14, 15, 17, 19, 20, 21, 22, |
| **Subbasin Objective 1B2**: Improve water quality to meet or exceed applicable water quality standards in the Subbasin. | | | | | |
| **Strategy c:** Identify pollution sources, causes, and constituents on tributaries and mainstem Pend Oreille River; determine and implement actions necessary to eliminate or mitigate effects. | 1,3,5,6,10 | TMDL | 1 | 1,2 | 17,20, |

| AQUATIC | | | | | |
|---|---|---|---|---|---|
| **Strategy & Objective** | **Strategy Type[1]** | **Monitoring Type[2]** | **Tier[3]** | **Scale[4]** | **Tool Box Tool[5]** |
| **Proposed Strategy e:** Continue monitoring the water quality of Lake Pend Oreille, Clark Fork River and Pend Oreille River to insure it meets State and Federal standards. | 1,3,5,6,10 | TMDL | 1 | 1 | 17,20 |
| **Subbasin Objective 1B3:** Conduct watershed assessments in drainages where sediment transport/bed load issues are negatively impacting resident fish habitat by 2008. | 1,2,5,6,7 | Holistic ecosystem monitoring (i.e., All) | | | 1, 3, 4, 5, 6, 9, 10, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 36, 37 |
| **Strategy a:** Conduct watershed assessment to determine sedimentation sources (i.e., natural or human caused) that are negatively impacting fish habitat. | 1,2,5,6,7 | Holistic ecosystem monitoring (i.e., All) | | | 1, 3, 4, 5, 6, 9, 10, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 36, 37 |
| **Subbasin Objective 1B4:** Develop, prioritize, and implement projects to remove or reduce sediment sources negatively influencing fish habitat, using a coordinated watershed approach with a broad coalition of partners. | | | | | 1, 4, 5, 6, 9, 10, 14, 15, 16, 17, 18, 19, 20, 21, 23, 25, 26, 28 |
| **Strategy b:** Research and identify methods of sediment reduction, removal and/or disposal of bedload and sediment from stream reaches; implement sediment reduction methodologies on prioritized streams. | 1,2,5,6,7 | Population, Habitat Surveys | 1, 2, 3 | 1, 2, 3 | 1, 4, 5, 6, 9, 10 . . . |
| **Strategy a:** Map available spawning and rearing tributaries and pursue stream protection measures. | 1,2,5 | Mapping, Habitat Surveys | 1, 2, 3 | 1, 2, 3 | 1, 4, 5, 6, 9, 10 . . . |
| **Strategy c:** Develop entire drainage restoration plans to improve fish habitat. | 1,2,3,4,5,6,8 | Mapping, Population/Habitat Surveys, | 2 | 1, 2, 3, 4 | 4, 5, 6, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 25, 26, 27, 28 |

| AQUATIC | | | | | |
|---|---|---|---|---|---|
| **Strategy & Objective** | **Strategy Type[1]** | **Monitoring Type[2]** | **Tier[3]** | **Scale[4]** | **Tool Box Tool[5]** |
| **Subbasin Objective 1B6:** Maintain 1.7 million square feet of clean shoreline gravel areas for kokanee spawning in Lake Pend Oreille throughout the duration of this plan. Note: Any studies should include evaluation of effects of proposed actions on flood control capability relative to current hydropower facility operations. | 1,2,6,10 | survey, survey and mapping | 1,2,3 | 1 | 3,13,21, |
| **Strategy c:** Monitor shoreline gravel areas for quality (as shoreline spawning areas). Vary lake levels between years, if necessary, to insure cleaning and re-sorting occurs. | 1,2,6,10 | survey, survey and mapping | 1,2,3, | 1 | 3,13,21, |
| **Proposed strategy e:** Evaluate the impact on near shore productivity from barge hydrojets to clean kokanee gravel spawning beds. | 1,5,10 | | | | |
| **Subbasin Objective 1B9:** Control the spread (allow 0 acres) of Eurasian Watermilfoil in the Subbasin. | 1,5,10 | survey and mapping | 1 | 1,2, | new tool |
| **Strategy a:** Inventory and map locations of milfoil occurrence. | 1,5,10 | survey and mapping | 1 | 1,2, | 45 |
| **Strategy b:** Evaluate the impact of extended dewatering and exposure to freezing temperatures on milfoil shoots. | 1,5,10 | survey and mapping | 1 | 1,2, | 45 |
| **Columbia River Basin Level Goal 1C:** Restore resident fish species (subspecies, stocks and populations) to near historic abundance throughout their historic ranges where suitable habitat conditions exist and/or where habitats can be restored. | | | | | |
| **Province Level Objective 1C:** Meet and exceed the recovery plan goals for federally listed threatened and endangered fish species. | | | | | |
| **Proposed strategy b:** Continue research into limiting factors of the kokanee and bull trout populations. | 1,2,4,5,9,10 | Presence absence and trend survey | 1,2,3, | 1,2,3 | 3,4,6,13,20,21,22, |
| **Subbasin Objective 1C2:** Research the effects of lake trout competition on bull trout and cutthroat trout in Priest Lake by 2015; implement corrective measures in accordance with recovery/restoration objectives. | 2,9 | Survey | 1,2 | 1 | new tool |

| AQUATIC | | | | | |
|---|---|---|---|---|---|
| **Strategy & Objective** | **Strategy Type[1]** | **Monitoring Type[2]** | **Tier[3]** | **Scale[4]** | **Tool Box Tool[5]** |
| **Proposed Strategy a:** Significantly reduce lake trout predation on other species using such approaches as liberal harvest limits, large commercial trapnets, or changing the age structure of the population. | 2,8,9 | survey | 3 | 1 | |
| **Subbasin Objective 1C3:** In Lake Pend Oreille reduce competition and predation by lake trout on bull and cutthroat trout by reducing lake trout abundance to <4000 adults, if feasible, by year **2015**. | | | | | |
| **Proposed Strategy a:** Determine the number of lake trout in Lake Pend Oreille and their bioenergetic food demands. | 2,9 | Presence absence and trend survey | 3 | 1 | |
| **Proposed strategy b:** Evaluate the use of large commercial trap nets and hydroacoustics for making population estimates. | 2,9 | 2 | survey | 2 | 46 |
| **Proposed strategy c:** If lake trout abundance or population structure is resulting in unacceptable predation or other risks to native and desirable nonnative fish, research methods to reduce the energetic demand or competitive impact of the lake trout population. | 9 | survey | 3 | 1 | |
| **Subbasin Objective 1C4:** Remove 90% or more of the lake trout from Upper Priest Lake and prevent re-establishment through the Thorofare. | | Population | | | |
| **Proposed strategy c:** Monitor the effectiveness of these actions and develop new approaches if needed. | 2,9 | Population, Habitat Surveys | 1, 3 | 1, 2, 3 | 1, 3, 4, 5, 6, 8, 12, 17, 18, 22, 36, 37 |
| **Subbasin Objective 1C5:** Restore bull trout to a harvestable surplus in the Subbasin by 2030. Targets: Lake Pend Oreille: capable of providing 1,000 fish annually based on historic harvest rates of the 1960s through 1980s. Pend Oreille River: to be determined. Priest Lake: to be determined. | | | | | |
| **Proposed strategy c:** Determine the harvestable surplus of bull trout stocks. | 2 | | | | |

| AQUATIC | | | | | |
|---|---|---|---|---|---|
| **Strategy & Objective** | **Strategy Type[1]** | **Monitoring Type[2]** | **Tier[3]** | **Scale[4]** | **Tool Box Tool[5]** |
| **Proposed strategy e:** Research the habitat used by bull trout in Lake Pend Oreille and Priest Lake to determine overlap with lake trout. | 1,2,5 | | | | |
| **Proposed strategy g:** Conduct research on bull trout population to determine factors limiting their population. | 1,2,3,4,5,6,7,10 | | | | |
| **Proposed strategy h:** Evaluate fish passage for Priest Lake Dam, Boundary Dam, Albeni Falls Dam, Box Canyon Dam, Cabinet Gorge Dam, Noxon Dam and Thompson Falls Dam. | 2,4, | | | | |
| **Proposed strategy i:** Study to see if the bull trout are utilizing the larger than anticipated lake whitefish population in Lake Pend Oreille. | 1 | survey | 2 | 1 | 0 |
| **Subbasin Objective 1C7:** Investigate the feasibility, cost benefit, and biological effects of fish passage at Albeni, Box Canyon and Boundary dams. | | | | | |
| **Subbasin Objective 1C8:** Conduct a study to determine the economic impact of inundating 26 miles of the Pend Oreille River above Albeni Falls Dam and the lower 2 miles of the Clark Fork River. | | | | | |
| **Proposed strategy a:** Determine the positive and negative economic impacts that occurred as a result of inundating 26 miles of the Pend Oreille River above Albeni Falls Dam and the lower 2 miles of the Clark Fork River. | 10 | survey | 2 | 1 | |
| **Province Level Objective 1D:** Restore resident fish species (subspecies, stocks and populations) to near historic abundance throughout their historic ranges where suitable habitat conditions exist and/or where habitats can be restored | | | | | |
| **Subbasin Objective 1D2:** Manage nonnative fish to maximize use of available habitats to provide a subsistence and sport fishing resource, without adversely affecting native fish populations. | | | | | |

| AQUATIC | | | | | |
|---|---|---|---|---|---|
| **Strategy & Objective** | **Strategy Type[1]** | **Monitoring Type[2]** | **Tier[3]** | **Scale[4]** | **Tool Box Tool[5]** |
| **Proposed Strategy b:** Research the effectiveness of hatchery kokanee stocking and potential impacts between wild and hatchery fish. | 2, 9 | survey | 2 | 1 | 13, 46 |
| **Proposed Strategy c:** Develop methods and annually monitor predator and prey biomasses in Lake Pend Oreille. | 2,9 | survey | 2 | 1 | Maiolie et al. 2002 |
| **Subbasin Objective 1D3:** By 2020 restore kokanee populations in Lake Pend Oreille to allow sustainable harvest of 750,000 fish/year, as long as this activity does not adversely impact native fish. | 1,2,10 | survey | 1,2,3, | 1 | 3,new |
| **Proposed Strategy a:** Continue to vary the winter lake level so as to increase the amount, and quality of, spawning gravel on the shores of Lake Pend Oreille. | 1,2,6,9,10 | survey and mapping | 1,2,3 | 1 | 3, 46 |
| **Proposed Strategy b:** Monitor shoreline spawning substrate to determine benefits. | 1,6,10 | survey | 1,2,3, | 1 | 3, 46 |
| **Proposed Strategy c:** Monitor kokanee abundance in Lake Pend Oreille, through hydroacoustics and trawling, to determine response to lake level changes. Finally, adjust lake levels based on the annual monitoring. | 1,2,6,10 | survey | 1,2,3, | 1 | 3, 46 |
| **Proposed Strategy d:** Research factors that may influence lake productivity, such as the effect of the altered hydrologic cycle of the lake (i.e., no slowly receding shoreline allowing annual growth of wetland vegetation down to typical low pool) and take corrective actions. Evaluate the impacts of controlling LPO level to more “natural” curves. | 1,6 | survey and mapping | 2,3 | 1 | |
| **Proposed Strategy e:** Determine the ecological role of lake whitefish in limiting Mysis shrimp abundance (their primary food) and potential benefits to zooplankton. | 2,9 | survey | 2 | 1 | |

| AQUATIC | | | | | |
|---|---|---|---|---|---|
| **Strategy & Objective** | **Strategy Type[1]** | **Monitoring Type[2]** | **Tier[3]** | **Scale[4]** | **Tool Box Tool[5]** |
| **Proposed Strategy f:** Develop methods to monitor predator abundance and balance predator and kokanee populations. | 2,9 | survey | 1,2,3 | 1 | 46 |
| **Proposed Strategy g:** Reduce the amount of dissolved gases that come down the Clark Fork River to within State water quality standards. | 5,10 | TMDL | 1 | 1, 2 | ? |
| **Proposed Strategy h:** Research the effectiveness of hatchery kokanee stocking and potential impacts between wild and hatchery fish. | 2,9 | survey | 2 | 1 | 46 |
| **Proposed strategy i:** Fully utilize hydrojets on barges to clean gravel-spawning beds. Treat new gravel beds at lower lake elevations. | ? | | | | |
| **Proposed strategy k:** Determine the cause of shoreline sedimentation and erosion that is placing sediments on the kokanee gravels | ? | | | | |
| **Subbasin Objective 1D4:** By 2010 balance predator (lake trout, rainbow trout, bull trout)/prey (kokanee) populations in Lake Pend Oreille (1:10 biomass ratio). | | | | | |
| **Proposed Strategy a:** Develop methods and annually monitor predator and prey biomasses. Based on monitoring, recommend fishing regulation changes or active predator reduction methods to restore predator**:**prey balance if needed. | 2 | survey | 1 | 1 | 46 |
| **Subbasin Objective 1D5:** Improve the stocking program for kokanee in Lake Pend Oreille so that it contributes 375,000 kokanee to the harvest annually. | | | | | |
| **Proposed Strategy a:** Research why hatchery kokanee have not contributed more to the recovery of the fishery in Lake Pend Oreille. To determine this, monitor the survival of each age classes of hatchery kokanee and compare to wild survival rates. Then based on these findings, develop fish culture techniques that will improve kokanee survival. | 2,9 | survey | 2 | 1 | 46 |

| AQUATIC | | | | | |
|---|---|---|---|---|---|
| **Strategy & Objective** | **Strategy Type[1]** | **Monitoring Type[2]** | **Tier[3]** | **Scale[4]** | **Tool Box Tool[5]** |
| **Subbasin Objective 1D6**: As prey base improves in Lake Pend Oreille, restore the rainbow trout fishery to a sustainable harvest of >4,000 fish/year. | | | | | |
| **Proposed Strategy a:** Use appropriate management tools to restore Gerrard rainbow trout to numbers consistent with what can be supported by the prey base. | 9 | survey | 1 | 1 | 46 |
| **Proposed strategy b:** Model rainbow trout population and test regulation changes designed to improve the quality of the sport fishery. | 2,9 | survey | 1 | 1 | |
| **Subbasin Objective 1D7:** By 2010, gain a better understanding of the kokanee food habits, potential competition with Mysis shrimp, and the ecological role of lake whitefish in reducing shrimp abundance. | | | | | |
| **Proposed Strategy a:** Conduct study to better understand kokanee food habits, particularly with regard to Mysis shrimp and the ecological role of lake whitefish in reducing shrimp abundance. This should include estimating the abundance of lake whitefish by mark and recapture or hydroacoustic surveys. Then, quantify lake whitefish food habits and potential consumption of Mysis shrimp. | 2 | survey | | | |
| **Proposed Strategy b:** Determine if kokanee growth is impacted by shrimp. This could be examined by comparing the over-winter growth of kokanee in Lake Pend Oreille to grow rates and survival rates of kokanee in Priest Lake, Coeur d'Alene Lake and/or Spirit Lake, since these systems do not have Mysis shrimp. | 2,9 | survey | 3 | 1 | 3,13, |
| **Subbasin Objective 2A4:** Enhance the native westslope cutthroat trout population so that it can sustain a sport fishery in the Pend Oreille River and its tributaries by 2020. | | | | | |

| AQUATIC | | | | | |
|---|---|---|---|---|---|
| **Strategy & Objective** | **Strategy Type[1]** | **Monitoring Type[2]** | **Tier[3]** | **Scale[4]** | **Tool Box Tool[5]** |
| **Proposed strategy a:** Determine the status of cutthroat trout in Pend Oreille River. | | Population, Habitat Surveys | 1, 2, 3 | 1, 2, 3 | 1, 4, 5, 6, 9, 10 . . . |
| **Proposed strategy b:** Define westslope cutthroat genetic purity and prospects for recovery. | | Mapping, Population/Habitat Surveys, Genetics | 2, 3 | 1, 2, 3, 4 | 1, 4, 5, 6, 7, 8, 12, 14, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, 26, 27, 28 |
| **Proposed strategy c:** Determine westslope cutthroat limiting factors in the environment. | | Mapping, Population/Habitat Surveys, Genetics | 2, 3 | 1, 2, 3, 4 | 1, 4, 5, 6, 7, 8, 12, 14, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, 26, 27, 28 |
| **Proposed strategy d:** Identify key westslope cutthroat trout tributary habitat and develop a plan for protection and restoration. | | Mapping, Population/Habitat Surveys, | 1, 2, 3 | 1, 2, 3 | 1, 4, 5, 6, 9, 10, 14, 15, 16, 17, 18, 19, 20, 21, 23, 25, 26, 28 |

[1] ***Strategy types:***

1) Habitat Assessments
2) Population Assessments
3) Instream Diversion
4) Instream Passage
5) Instream Habitat
6) Riparian Habitat
7) Upland Habitat
8) Education/Coordination
9) Population Management
10) Reservoir Operations

[2] ***Monitoring Protocol (e.g., type of monitoring protocol [note: the specific reference to detailed monitoring protocol is identified in the "tool box"]):***

- TMDL
- Survey
- Survey and mapping

- HEP
- P/A and trend surveys
- All habitat

[3]***ISRP Tier Level:***

1) Tier 1: trend or routine monitoring
2) Tier 2: statistical (status) monitoring
3) Tier 3: experimental research (effectiveness) monitoring

[4]***Scale of Monitoring and Evaluation:***

1) Project
2) Subbasin
3) Province
4) Columbia Basin

[5]***Tool Box Tool***

The Tool Box is found in Appendix I.

Table 19.2. Pend Oreille Subbasin terrestrial research, monitoring, and evaluation plan

| **TERRESTRIAL** | | | | | |
|---|---|---|---|---|---|
| **Strategy & Objective** | **Strategy Type[1]** | **Monitoring Type[2]** | **Tier[3]** | **Scale[4]** | **Tool Box-tool[5]** |
| **Pend Oreille Subbasin Objective 1A (Highest Priority)**: Fully mitigate wildlife habitat losses associated with the construction and inundation of the Albeni Falls Project per the requirements of the NWPPC 2000 Fish and Wildlife Program and Northwest Power Act. Complete the compensation mitigation consistent with the HEP loss assessment (Appendix C, Table 11-4 of the Columbia River Basin 2000 Fish and Wildlife Program) and the Albeni Falls Dam Wildlife Mitigation Project Operating Guidelines by year 2015. (These requirements will be met in coordination with the Coeur d'Alene and Kootenai Subbasins.) | | | | | |
| **Objective 1A.1:** Protect, enhance, or restore bald eagle breeding Habitat Units to address coniferous and deciduous forest and forested wetland habitat losses resulting from construction of Albeni Falls Project. | | | | | |
| **Objective 1A.2:** Protect, enhance, or restore bald eagle wintering Habitat Units to address coniferous and deciduous forest habitat losses resulting from construction of Albeni Falls Project. | | | | | |
| **Objective 1A.3:** Protect, enhance, or restore black-capped chickadee Habitat Units to address deciduous forest habitat losses resulting from construction of Albeni Falls Project. | | | | | |

| TERRESTRIAL | | | | | |
|---|---|---|---|---|---|
| **Strategy & Objective** | **Strategy Type[1]** | **Monitoring Type[2]** | **Tier[3]** | **Scale[4]** | **Tool Box-tool[5]** |
| **Objective 1A.4:** Protect, enhance, or restore Canada goose Habitat Units to address floodplain meadow, shoreline, open water and herbaceous wetland habitat losses resulting from construction of Albeni Falls Project. | | | | | |
| **Objective 1A.5:** Protect, enhance, or restore mallard Habitat Units to address floodplain meadow, scrub-shrub, open water, and herbaceous wetland habitat losses resulting from construction of Albeni Falls Project. | | | | | |
| **Objective 1A.6:** Protect, enhance, or restore muskrat Habitat Units to address herbaceous wetland and open water habitat losses resulting from construction of Albeni Falls Project. | | | | | |
| **Objective 1A.7:** Protect, enhance, or restore white-tailed deer Habitat Units to address scrub-shrub wetland habitat losses resulting from construction of Albeni Falls Project. | | | | | |
| **Objective 1A.8:** Protect, enhance, or restore redhead Habitat Units to address open water and near-shore floating aquatic weed bed habitat losses resulting from construction of Albeni Falls project. | | | | | |
| **Strategy a** (**for Objectives 1A.1-1A.8) (Priority 1):** Identify and Protect habitat through fee title acquisition, conservation easements, lease, or management agreements. NPPC defines protection as any action that protects habitat in perpetuity. | 1,2,6,7,9 | Population/Habitat Surveys, | 1,2 | 1,2 | 32,33,34,52 |
| **Strategy b (for Objectives 1A.1-1A.8)* (Priority 3):** Develop management plans consistent with Columbia Basin Fish and Wildlife Authority (CBFWA) Guidelines for Enhancement, Operation, and Maitenance Activities for Wildlife Mitigation Projects (CBFWA Wildlife Managers 1998). Management plans will address roaded and non-roaded access, livestock, habitat connectivity (to other lands managed for wildlife), soil, vegetation enhancement and management of unwanted species, fire and fuels, non-native wildlife, and monitoring. | 1,2,6,7,9 | Population/Habitat Surveys, | 1,2 | 1,2 | 32,33,34,52 |

| TERRESTRIAL | | | | | |
|---|---|---|---|---|---|
| **Strategy & Objective** | **Strategy Type[1]** | **Monitoring Type[2]** | **Tier[3]** | **Scale[4]** | **Tool Box-tool[5]** |
| **Strategy c** (**for Objectives 1A.1-1A.8)* (Priority 4):** Identify and evaluate sites for potential use in mitigation, including a) opportunities for enhancement and restoration on federal, state, and tribal lands, and b) opportunities for cooperative restoration and enhancement efforts with private landowners, when habitat protections can be demonstrated to be permanent. | 1,2,6,7,9 | Population/Habitat Surveys, | 1,2 | 1,2 | 32,33,34,52 |
| **Objective 1A.9:** Maintain wildlife habitat values (Habitat Units) for the life of the project on existing and newly acquired mitigation lands through adequate long-term Operations and Maintenance (O&M) funding. | | | 1,2 | 1,2 | |
| **Strategy a (Priority 2):** Ensure long-term protection, enhancement, and monitoring of habitat units through secured funding for Operations and Maintenance. | 1,2,6,7,9 | Population/Habitat Surveys, | 1,2 | 1,2 | 32,33,34,52 |
| **Province Level Objective 1B*:** Quantitatively assess and mitigate **operational impacts** of the Chief Joseph, Grand Coulee Dam, and Albeni Falls projects per the requirements of the Northwest Power Act and the current Wildlife Mitigation Program. Complete assessment of operational impacts by **2008**; develop mitigation plan by **2010**; implement initial mitigation by **2015**; incorporate formal methods for review and update of effects assessment and mitigation plan on a three-year cycle, to respond to changes in operation and to effectiveness of mitigation actions. | | | | | |
| **Pend Oreille Subbasin Objective 1B *:** Quantitatively assess and mitigate operational impacts of Albeni Falls Project on terrestrial resources in the Pend Oreille Subbasin by year 2015. | | | | | |
| **Objective 1B.1(Second Priority) *:** Complete the assessment of operational effects on terrestrial resources by year 2008. | | | | | |
| **Strategy a (Priority 1)*:** Conduct the assessment and consider the fluctuation zone, hydrologic alterations (based on current hydropower facility operations), loss of nutrients in watershed from loss of salmon, identify recreational effects to terrestrial resources, BPA transmission lines, habitat connectivity, and erosion. | 1,10 | Mapping, Population/Habitat Surveys, | 2,3 | 1,2 | 32,33,34,35 |

| TERRESTRIAL | | | | | |
|---|---|---|---|---|---|
| **Strategy & Objective** | **Strategy Type[1]** | **Monitoring Type[2]** | **Tier[3]** | **Scale[4]** | **Tool Box-tool[5]** |
| **Objective 1B.2 (Third Priority):** Complete development of mitigation plan by year 2010 and complete the implementation of initial mitigation by year 2015. | | | | | |
| **Objective 1B.3 (Fourth Priority)*:** Perform review and update of effects assessment and mitigation plan on a three-year cycle, to respond to changes in operation and to effectiveness of mitigation actions. | | | | | |
| **Province Level Objective 2A**: Mitigate for wildlife losses that have occurred through **secondary effects** of hydrosystem development by protecting, enhancing, restoring, and sustaining **populations of wildlife** for aesthetic, cultural, ecological, and recreational values. Objective includes assessment of secondary impacts, development of mitigation plan in coordination with other resources and resource managers, implementation, maintenance, and monitoring. | | | | | |
| **Province Level Objective 2B*:** Mitigate for wildlife losses that have occurred through **secondary effects** of hydrosystem development by protecting, enhancing, restoring, and sustaining **native wildlife habitat** function to maintain or enhance ecological diversity and security for native and desirable non-native wildlife species. Objective includes assessment of secondary impacts, development of mitigation plan in coordination with other resources and resource managers, implementation, maintenance, and monitoring. | | | | | |
| **Objective 2B.2*:** Identify, maintain, restore, and enhance priority habitats (wetlands, riparian areas, upland forests, steppe and shrub-steppe, cliffs and rock outcrops) within the Pend Oreille Subbasin, including their structural attributes, ecological functions, and distribution and connectivity across the landscape. | | | | | |
| **Objective 2B.1:** Fully mitigate for all FERC hydropower terrestrial resources effects within the Pend Oreille Subbasin in-kind and in-place when possible. Complete all mitigation requirements consistent with approved and active guidelines, agreements, and applicable federal (FERC) licenses | | | | | |
| **Strategy a:** Acquire land management rights to identified native wildlife habitats of concern through fee title acquisition, lease, conservation easement, or management plan. | 1,2,6,7,9 | Population/Habitat Surveys, | 1,2 | 1,2 | 32,33,34,35, 52 |

| TERRESTRIAL | | | | | |
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| **Strategy & Objective** | **Strategy Type[1]** | **Monitoring Type[2]** | **Tier[3]** | **Scale[4]** | **Tool Box-tool[5]** |
| **Strategy b:** Develop management plans to enhance and/or restore native habitats. Management plans should address roaded and non-roaded access, livestock, non-native plant and animal species; soils, and vegetation management activities to improve habitat quality. | 1,2,6,7,9 | Population/Habitat Surveys, | 1,2 | 1,2 | 32,33,34,35, 52 |
| **Strategy c:** Implement management plans and conduct implementation and effectiveness monitoring to ensure that objectives are being met. | 1,2,6,7,9 | Population/Habitat Surveys, | 1,2 | 1,2 | 32,33,34,35, 52 |
| **Strategy d:** Improve enforcement of existing state and tribal hunting regulations and modify regulations where needed to improve success of achieving wildlife management objectives. | 1,2,6,7,9 | Population/Habitat Surveys, | 1,2 | 1,2 | 32,33,34,35, 52 |
| **Objective 2A.2:** Maintain bald eagle populations at or above present levels (2004) within the Pend Oreille Subbasin. | | | | | |
| **Strategy a:** Identify, map, and provide long-term protection to current and/or potential winter perching, nesting, and foraging habitat. | 1,2,6,7,9 | Population/Habitat Surveys, | 2,3 | 1,2 | 32,33,34,35, 52 |
| **Objective 2A.3**: Restore a self-sustaining population of grizzly bears in the Selkirk Recovery Zone that meets the *Grizzly Bear Recovery Plan* goals (USFWS objective) | | | | | |
| **Objective 2A.6:** Protect, restore, enhance, and sustain populations of big game species such as black bear, elk, mountain goat, moose mountain lion, mule deer, and white-tailed deer. | | | | | |
| **Objective 2B.3:** Reverse long-term mule deer population decline by providing for a 25-year increasing trend in the quantity and quality of mule deer habitats, particularly winter and spring habitats. | | | | | |
| **Strategy a:** Secure and enhance winter and spring ranges; protect from human development. | 6,7,9 | Population/Habitat Surveys, | 1,2 | 1,2,3 | 32,33,34,35 |
| **Strategy e:** Manage motorized traffic in critical mule deer spring and winter ranges. | 6,7,9 | Population/Habitat Surveys, | 1 | 1,2,3 | 32,33,34,35 |

| TERRESTRIAL | | | | | |
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| **Strategy & Objective** | **Strategy Type[1]** | **Monitoring Type[2]** | **Tier[3]** | **Scale[4]** | **Tool Box-tool[5]** |
| **Strategy b:** Manage forests for a variety of successional stages to meet mule deer habitat needs on a site-specific basis; use fire and forest management to increase quality and quantity of shrubs and mature forest cover. | 6,7,9 | Population/Habitat Surveys, | 1,2 | 1,2,3 | 32,33,34,35 |
| **Strategy d:** Increase the area of aspen stands | 6,7,9 | Population/Habitat Surveys, | 1,2 | 1,2,3 | 32,33,34,35 |
| **Strategy i:** Modify state and tribal hunting regulations to help increase mule deer populations. | 9 | Population/Habitat Surveys, | 1 | 1,2,3 | 32,33,34,35 |
| **Strategy c:** Restore grasses and forbs where noxious weeds have impacted mule deer habitat. | 6,7,9 | Population/Habitat Surveys, | 1,2 | 1,2,3 | 32,33,34,35 |
| **Strategy g:** Develop, prioritize, and implement projects and/or research to address identified limiting factors for mule deer. | 6,7,9 | Population/Habitat Surveys, | 1,2 | 1,2,3 | 32,33,34,35 |
| **Strategy h:** Improve enforcement of state and tribal hunting regulations. | 6,7,9 | Population/Habitat Surveys, | 1 | 1,2,3 | 32,33,34,35 |
| **Strategy f*:** Continue funding to complete WDFW cooperative Mule Deer Project | 6,7,9 | Population/Habitat Surveys, | 2,3 | 1,2,3 | 32,33,34,35 |
| **Objective 2A.7:** Protect, restore, enhance, and sustain populations of waterfowl, upland game, and furbearers under traditional levels of recreational and subsistence use. | | | | | |
| **Objective 2A.10:** Maintain or enhance amphibian and reptile populations relative to current levels within present use areas and identify limiting factors within the subbasin. | | | | | |
| **Objective 2A.8:** Maintain or enhance neo-tropical migrant bird populations relative to current levels within present use areas and identify limiting factors for these populations within the Pend Oreille subbasin. | | | | | |
| **Objective 2A.11:** Maintain or enhance invertebrate populations relative to current levels within present use areas and identify limiting factors for these populations within the subbasin. | | | | | |

| TERRESTRIAL | | | | | |
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| **Strategy & Objective** | **Strategy Type[1]** | **Monitoring Type[2]** | **Tier[3]** | **Scale[4]** | **Tool Box-tool[5]** |
| **Objective 2A.1:** Increase the Selkirk woodland caribou herd to 75 animals or more by 2010, with the intent to meet ESA de-listing criteria by 2020. | | | | | |
| **Objective 2A.4*:** Identify, prioritize, and implement habitat improvements that address limiting factors in order to restore or maintain viable lynx populations in the Pend Oreille Subbasin. | | | | | |
| **Objective 2A.5**: Restore and sustain state threatened and endangered species, tribal and state species of special concern, federal candidate species, BLM and USFS sensitive species, and USFS indicator species | | | | | |
| **Objective 2A.9:** Maintain or enhance populations of cavity nesting species relative to current levels within present use areas and identify limiting factors within the subbasin. | | | | | |
| **Strategy b (for Objectives 2A.1-11)*:** Identify limiting factors for species/guilds, and identify relationships to indicator species/habitats analyzed in HEP loss assessments. | 1,2 | Population/Habitat Surveys, | 1,2 | 1,2 | 32,33,34,35, 52 |
| **Strategy a (for Objectives 2A.1-11)*:** Use current Subbasin Plan Assessment to determine current distribution and population status of species/guild and define target species/guilds; supplement with additional inventory as needed. | 1,2 | Population/Habitat Surveys, | 1,2 | 1,2 | 32,33,34,35, 52 |
| **Strategy c (for Objectives 2A.1-11):** Develop and implement mitigation to address limiting factors for species/guilds, with consideration of benefits that can be acquired through acquisition of HUs for indicator species/habitats used in HEP loss assessments. | 1,2 | Population/Habitat Surveys, | 1,2 | 1,2 | 32,33,34,35, 52 |
| **Objective 2B.4*:** Identify and implement strategies and opportunities for restoring the diversity, block size, and spatial arrangement of habitat types needed to sustain target wildlife species at ecologically sound levels. | | | | | |

| TERRESTRIAL | | | | | |
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| **Strategy & Objective** | **Strategy Type[1]** | **Monitoring Type[2]** | **Tier[3]** | **Scale[4]** | **Tool Box-tool[5]** |
| **Objective 2B.5:** Restore the connectivity of habitat types needed to sustain wildlife populations at the landscape level. Encourage and support the implementation of all forest practices, including road building and maintenance, as specified in the WDNR and IDL Forest Practices Rules and Subbasin Forest Plans for all National Forests within the Subbasin. | | | | | |

[1] ***Strategy types:***

1) Habitat Assessments
2) Population Assessments
3) Instream Diversion
4) Instream Passage
5) Instream Habitat
6) Riparian Habitat
7) Upland Habitat
8) Education/Coordination
9) Population Management
10) Reservoir Operations

[2]***Monitoring Protocol e.g. type of monitoring protocol [note: the specific reference to detailed monitoring protocal is identified in the "tool box"]):***

a. TMDL
b. Survey
c. Survey and mapping
d. HEP
e. P/A and trend surveys
f. All habitat

[3]***ISRP Tier Level:***

1) Tier 1: trend or routine monitoring
2) Tier 2: statistical (status) monitoring
3) Tier 3: experimental research (effectiveness) monitoring

[4]***Scale of Monitoring and Evaluation:***

1) Project
2) Subbasin
3) Province
4) Columbia Basin

[5] **Tool Box Tool**

The Tool Box is found in Appendix I.

# SECTION – 20 Pend Oreille Subbasin Tables and Figures

Tables and figures are embedded within the text in sections 13 through 19.