3.0 ENVIRONMENTAL ANALYSIS

In this section, we describe the resources that are part of the affected environment and analyze the potential effects of the Proposed Action on these resources. Because implementation of PME measures would affect Project economics and other resources, we make our recommendations in section 5.1, *Comprehensive Development and Recommended Alternative*. Project economics are discussed in Chapter 4.0.

3.1 GENERAL DESCRIPTION OF THE BASIN

The Coeur d'Alene Lake-Spokane River Watershed lies within two geologic provinces, the old North American Continent to the east and the Columbia Plateau to the west. The old North American Continent is represented by the Rocky Mountains east of Coeur d'Alene Lake. Ancient rocks of the continental crust are more than 2 billion years old and consist of granite, gneiss, and schist. To the west along the Spokane River, the old continent disappears beneath the basalt rock of the Columbia Plateau. Enormous lava flows during the Miocene Period deposited fine-grained basalt across much of central Washington. Primary headwater tributaries of the combined Coeur d'Alene Lake-Spokane River Watershed drain the Bitterroot Mountains lying east of Coeur d'Alene Lake. Downstream of Coeur d'Alene Lake, the Spokane River enters a wide, flat valley created during the last Ice Age, when the large ice dams of glacial Lake Missoula collapsed, releasing a series of enormous floods and associated materials. Around this fluvial valley, the topography includes more rolling hills and subtle gradient changes. Between Post Falls, Idaho, and the City of Spokane's Upriver Dam, the Spokane River has a moderate gradient (a drop of about 140 feet over 18 miles) characterized by marginal channel entrenchment. Channel characteristics include unembedded cobble and boulder substrates, relatively stable banks, and direct hydrologic connections to the Spokane Valley-Rathdrum Prairie Aquifer.

Spokane Falls, the location of the Upper Falls and Monroe Street Developments, marks a noticeable shift in river channel characteristics and the underlying geology.

The river channel at Spokane Falls is highly entrenched, with a bedrock-dominant substrate. Below the falls, the river remains entrenched within a valley, with instream substrate dominated by unembedded cobble and boulder. Downstream of Spokane, the gently rolling terrain, punctuated by areas of steeper relief, continues to the Long Lake Development and beyond. Along the Spokane River itself, there are steep-sided gorges and rock formations, which are particularly visible in the unimpounded reach of river upstream of Nine Mile

Reservoir (e.g., in the Bowl and Pitcher whitewater area) and in the areas immediately downstream of the Nine Mile and Long Lake Developments.

The climate of the Spokane River Project area reflects the diversity of an intermountain region with both maritime and continental influences. The local climate is heavily influenced by maritime air masses from the Pacific Coast, which are in turn modified by continental air masses intruding southward from Canada (NPPC, 2000a,b). Summers are mild and relatively dry, while fall, winter, and spring have more precipitation in the form of both rain and snow. A seasonal snowpack can cover the landscape above 4,500 feet mean sea level from late November into May.

In the immediate Spokane vicinity, average annual precipitation is less than 20 inches, much of which consists of snowfall (FERC, 1997; NPPC, 2000a,b). Average annual temperature is 49 degrees Fahrenheit (ºF), with July being the warmest month and January the coldest. At Coeur d'Alene, Idaho, average precipitation is about 25 inches annually. Farther to the east, the Coeur d'Alene River and St. Joe River watersheds are much cooler and wetter. Much of the precipitation in the higher elevations occurs as snow, which is important to the subsequent runoff and seasonal streamflows.

3.2 CUMULATIVELY AFFECTED RESOURCES

Cumulative effects are defined as the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions (40 CFR § 1508.7). Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time, including hydropower and other land and water development activities.

Based on information in the license applications, agency comments, other filings related to the Projects, and preliminary staff analysis, we have identified the following resources that have the potential to be cumulatively affected by the continued operation of the Spokane River Project and the Post Falls Project in combination with other activities in the Coeur d'Alene Lake-Spokane River Basin: (1) water quantity; (2) water quality; (3) sediment supply and transport; (4) aquatic resources; (5) terrestrial resources; (6) recreation resources; and (7) cultural resources.

3.2.1 Geographic Scope

The geographic scope of the analysis defines the physical limits or boundaries of the Proposed Action's effects on the resources. Because the

Proposed Action would affect the resources differently, the geographic scope for each resource may vary.

In this case, the geographic scope for water quantity and water quality encompasses the tributaries of Coeur d’Alene Lake downstream to the Little Falls Project pool. For sediment supply and transport, the geographic scope includes the entire Project boundary. The geographic scope for aquatic resources includes the Coeur d’Alene Lake-Spokane River Basin from the Idaho tributaries to Coeur d’Alene Lake downstream to the Little Falls Project pool. The geographic scope for terrestrial resources and recreation resources is similar in that we defined the area as the Coeur d’Alene Lake-Spokane River Basin downstream to Long Lake Dam. For cultural resources, the geographic scope includes the Coeur d’Alene Lake-Spokane River Basin. Our reasons for defining the geographic scope as such are discussed below.

3.2.1.1 Water Quantity

Storage and release of water for power generation by the Project, along with other water uses, affect lake levels and Spokane River flows between hydroelectric developments and below the most downstream Project dam (Long Lake Development). This Project, in combination with other hydroelectric developments (Upriver Project, Little Falls Project, and Grand Coulee Dam), interrupt the free flow of water in the Spokane River. About 79 miles (71 percent) of the 111 river miles of the Spokane River (from the pre-Grand Coulee Dam confluence with the Columbia River upstream to the Coeur d’Alene Lake outlet) are affected by backwater from dams under full pool conditions.

3.2.1.2 Water Quality

Water quality is influenced by a variety of natural and human activities in the Coeur d’Alene Lake and Spokane River watersheds, including historical mining operations, mining-related cleanup, nutrient-rich wastewater treatment discharges, land management activities, current Project operations, and increasing human development in the vicinity of the Project.

Past upstream mining activities have contributed to metals contamination of some of the Project waters (NPPC, 2000a). Hangman Creek and the Little Spokane River have been identified as significant sources of fine sediment for the Spokane River (GEI, 2004). Nutrient loading from tributaries and wastewater treatment systems affect Project waters (Golder, 2004a). Water quality downstream of Project and non-Project dams along the Spokane River affects water temperature, dissolved oxygen (DO), and total dissolved gas (TDG), as well as instream habitat for aquatic species.

3.2.1.3 Sediment Supply and Transport

The current range of Coeur d'Alene Lake surface elevations is similar to its range over the last several thousand years (Earth Systems and Parametrix, 2004); however, operations at the Post Falls Project maintain lake levels during the summer at an elevation higher than pre-Project conditions. This, combined with powerboat wakes and natural wind-driven wave energy, has a cumulative effect on shorelines and on natural levees and deltas (Earth Systems and Parametrix, 2004). Creeks and rivers entering the lake are depositing sediment onto the inundated valley bottom, slowly building levees and deltas out into the lake (Bookstrom et al., 1999).

Numerous human-caused factors have also influenced sediment supply to the watersheds. Hard-rock mining upstream on the South Fork of the Coeur d'Alene River has added about 57 million tons of mine wastes to the system (Bookstrom et al., 1999), so that existing sediments in and along the rivers and lakes in the Project area are a mixture of metal-enriched mine deposits and natural sediments. High river flows and wave action in near-shore areas continue to redistribute these sediments (Earth Systems and Parametrix, 2004).

The construction of artificial levees and dikes for roads, railroads, farm drainage, and flood control have affected the shoreline topography as well as the energy effects of high-flow events. These activities reduce the effectiveness of the natural floodplain to store water and retain sediment and, in diked reaches, increase the energy of flows in the main channel during higher flows. Smaller effects have occurred from direct construction activities along shorelines, especially the construction of bulkheads or other shoreline protection efforts that can displace the effects of erosion to other areas.

Sediment transport in the Coeur d'Alene and St. Joe rivers generally occurs during bankfull (or greater) flows, and Coeur d'Alene Lake acts as a sink for sediments under both pre-Project and current Project conditions (Golder, 2004b).

Downstream of Spokane, Hangman Creek and the Little Spokane River contribute substantial amounts of fine sediments to the Spokane River, especially during high-flow periods. Channel alterations to Hangman Creek combined with intensive agricultural practices in the watershed have increased sediment discharge from this watershed into the Spokane River (NPPC, 2000b). Nine Mile Development passes, on average, approximately 75 percent of sediment entering the reservoir but is still accumulating sediment each year (Golder, 2004b). Sediment transport past Long Lake Development is restricted to fine materials that remain suspended, and Lake Spokane is also accumulating sediment (Golder, 2004b).

Erosion of the Lake Spokane shoreline was greater when the Project was first built than it is today, and both wind-driven waves and powerboat wakes have had a continuing erosional effect on the shoreline since Long Lake Development inundated the river valley (Earth Systems and Parametrix, 2004).

Based on the distribution of natural and human-caused factors that cumulatively affect sediment supply and transport in the Project area, the geographic scope of the cumulative effects analysis for this issue includes the entire Project boundary.

3.2.1.4 Aquatic Resources

Past actions from a variety of sources have cumulatively affected aquatic species and habitats in the Coeur d'Alene Lake-Spokane River Watershed. These actions include mining, agriculture, urban and suburban development, recreation, Project and reservoir operations, habitat modifications, fish propagation and enhancement programs, other resource management efforts, and human activities.

Anadromous salmon and steelhead are no longer present in the Project area because upstream fish passage into the Spokane River is currently precluded by the Chief Joseph and Grand Coulee dams, which lack fish passage facilities and block anadromous fish from the upper Columbia River Basin (NPCC, 2003). However, Coeur d'Alene Lake and its tributaries provide important rearing and spawning habitat for other native salmonid species that occupy Project waters, such as westslope cutthroat trout (*Oncorhynchus clarki lewisi*) and bull trout (*Salvelinus confluentus*). These tributaries also affect aquatic species in the Project area by transporting metal-enriched sediments from upstream mining areas, nutrient-enriched sediments from agricultural areas, and other sediments produced by upstream activities such as timber harvesting, road building, and residential/commercial development. Project operations that regulate reservoir water levels and downstream flows affect fish spawning and rearing habitat potential. Resource agency management programs throughout the Project area affect aquatic species through the protection and management of native salmonids and the introduction and management of native and non-native game fish populations. The intensity of sport fishing occurring throughout the Project area also influences game fish populations. Other resource agency actions affect aquatic resources through implementation of water quality improvement measures and invasive plant control programs.

Considering these potential sources of cumulative effects on aquatic resources, the geographic scope of our cumulative effects analysis for aquatic species and habitat focuses on the Coeur d'Alene Lake-Spokane River Watershed from the Idaho tributaries to Coeur d'Alene Lake downstream to the Little Falls Project Pool in Washington.

3.2.1.5 Terrestrial Resources

Plant communities and wildlife habitats in the Coeur d'Alene Lake-Spokane River Watershed have been affected by past actions from a variety of sources, including mining, agriculture, urban and suburban development, recreation, Project construction and operation, and other human activities (Parametrix, 2004a, 2003a).

Riparian habitats and wetlands associated with Coeur d'Alene Lake and its tributaries have been particularly affected. Large camas meadows that were historically present in the Coeur d'Alene, St. Joe, and St. Maries river valleys have been drastically reduced by agriculture, grazing, diking, and drainage of wet meadows. Project operation has increased the period of inundation of lower river shallow water habitats, converting pre-Project forested, scrub-shrub, and/or emergent wetlands and riparian habitats to open water and aquatic bed habitats. Downstream of the Post Falls Project, agriculture, residences, and other development on both sides of the Spokane River have modified or eliminated much of the wetland and riparian habitat. A variety of land uses and recreational boating have introduced non-native invasive aquatic species to both Coeur d'Alene Lake and Lake Spokane.

The loss of habitat due to development for residential and recreational purposes reduced the availability of habitat for many wildlife species. Exposure to metal-enriched sediments in wetlands and lakes, particularly in the lower Coeur d'Alene River area, have affected wildlife species (Parametrix, 2003a). Continued operation of the Project facilities will continue to affect the distribution of sediment within the Project area because the dams form barriers to downstream sediment transport and Project operations alter the natural river flows. Therefore, sediment will continue to be deposited in Nine Mile Reservoir and Lake Spokane instead of being transported farther downstream. Wetland and wildlife resources are affected by the change in sediment transport and deposition, and the changes in sediment distribution and accumulation may facilitate the establishment and spread of non-native aquatic plants.

The geographic scope of the cumulative effects analysis for terrestrial resources focuses on the Coeur d'Alene Lake-Spokane River Watershed (including tributaries to Coeur d'Alene Lake) downstream to Long Lake Dam, including a short length of transmission-line corridor associated with Long Lake Development.

3.2.1.6 Recreational Resources

In the last several decades, recreational activities have increased in the Project area as well as at other parts of the Coeur d'Alene-Spokane River Basin.

Coeur d’Alene Lake is a popular recreation destination. Tourism and recreation-related industries of the area continue to grow, thereby contributing to the local economy. Data from the Statewide Comprehensive Outdoor Recreation Plans for the States of Washington and Idaho indicate an increase in populations; as a result, there is a need for improving and developing recreation facilities. Post Falls Project operations maintain Coeur d’Alene Lake at a stable lake level during the recreation season (July 1 to September 15). At other times of the year, Project operations could affect downstream flows and the associated aquatic resources; the potential impacts are discussed herein.

3.2.1.7 Cultural Resources

Past actions from a variety of sources, including mining, agriculture, railroad construction, urban development, recreation, Project construction and operation, and other human activities in the Coeur d’Alene Lake-Spokane River Watershed, have cumulatively affected prehistoric and historic archaeological resources and culturally sensitive areas associated with the Coeur d’Alene Tribe, the Spokane Tribe, and the Confederated Tribes of the Colville Reservation, as well as historic structures and buildings associated with hydroelectric development in the basin (Entrix and Western Historical Services, 2004). Key cumulatively affected resources include the cultural materials associated with sites used by the tribes (including plants, animals, and archaeological sites) and the historic components associated with the period of exploration and settlement and with railway and hydroelectric facility development. The geographic scope of the cumulative effects analysis for cultural resources is the Coeur d’Alene Lake-Spokane River Watershed.

3.2.2 Temporal Scope

The temporal scope of our cumulative analysis in the EIS includes past, present, and future actions and their possible cumulative effects on each resource. Based on the terms of the licenses for the Spokane River Project and the Post Falls Project, the temporal scope will look 30 to 50 years into the future, concentrating on the effects on the resources from reasonably foreseeable future actions. The historical discussion will, by necessity, be limited to the amount of available information for each resource.

3.3 PROPOSED ACTION AND ACTION ALTERNATIVES

3.3.1 Geology and Soils

3.3.1.1 Affected Environment

3.3.1.1.1 Geology

The Coeur d'Alene Lake-Spokane River Watershed spans two distinct geologic provinces: the older North American Continent to the east and the younger Columbia Plateau to the west (NPPC, 2000b). To the west along the Spokane River, the older continental rocks disappear beneath the younger basalt of the Columbia Plateau. Atop this basalt, the wide pre-glacial Spokane River Valley is filled in with late-Pleistocene glacial deposits. Rivers and great floods flowing from the Cordilleran Ice Sheet filled the valley with glacial outwash, lake, and outburst flood deposits that are as thick as 650 feet and constitute the Spokane Valley-Rathdrum Prairie Aquifer (SAJB, 2004; Molenaar, 1988; as cited in Box and Wallis, 2002). These glacial-age valley fill deposits blocked all the tributary valleys to form lakes, including Coeur d'Alene Lake, the largest in the area. Drainage from the Coeur d'Alene River and St. Joe River valleys was forced up against the high bedrock uplands on the south side of the valley, locking the Spokane River into its current location. The Spokane River eroded into the unconsolidated valley fill forming the present valley, in places encountering bedrock and forming the falls and canyon sections (including Post Falls, Spokane Falls, Nine Mile Falls, and much of the river canyon along Long Lake Development) (Earth Systems and Parametrix, 2004).

Coeur d'Alene Lake Area

An extensive, natural sill at the outlet of Coeur d'Alene Lake controls the flow rate of the river out of the lake. Dams in the Post Falls area added additional structural controls to the river's flow rate out of the lake (Box and Wallis, 2002).

The rock notches and valley fill elevations along the lower Coeur d'Alene and St. Joe rivers indicate that current lake surface elevations have been roughly similar for at least several thousand years (Earth Systems and Parametrix, 2004). Each creek and river entering the lake has been slowly filling the inundated valley bottom at the mouth of each tributary to the lake. Through time, the tributary streams have built deltas out into Coeur d'Alene Lake or the lateral lakes along the rivers. Larger tributaries such as the Coeur d'Alene and St. Joe rivers have built deltas typically with a single main channel and natural levees that build out into Coeur d'Alene Lake, forming extensive back lakes and marshes (Bookstrom et al., 1999).

St. Joe and St. Maries River Deltas—Valley walls of the ancient St. Joe River Valley confine the St. Joe River delta so that it does not have a classic delta shape. The St. Joe River delta builds and gradually fills Coeur d'Alene Lake (and the lateral lakes) by construction of lobes at the delta front, at occasional breaks in the levee, and by overbank deposition on the levee tops. The end of the main river channel is currently at Beadle Point, but an older delta lobe and main channel are also visible in aerial photographs.

The delta plain starts at about river mile 22 on the St. Joe River and at about river mile 7.2 on the St. Maries River (Figure 3.3.1.1-1). The upper delta areas on the St. Joe and St. Maries rivers typically consist of a single main channel, levees along the channel, and lateral marsh areas. The overbank areas of the upper delta are primarily shallow marshes on the back side of natural levees. During most flows, the main channel is isolated from the floodplain by natural levees that formed through deposition of suspended sediment during overbank floods.

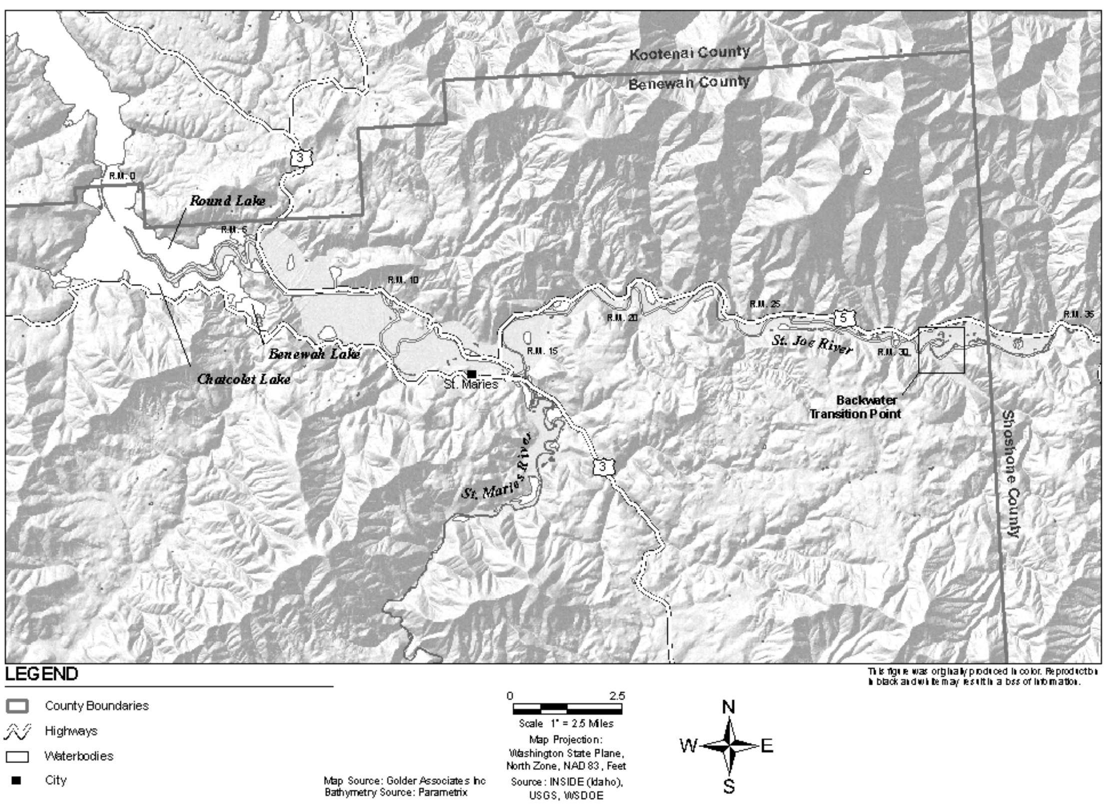


Figure 3.3.1.1-1. St. Joe River features

During the past 125 years, human development has modified the natural levees, leading to further isolation of the main channel from the floodplain. This has concentrated flood flows within the main channel, increased erosion and sediment transport through this reach, and reduced deposition in the overbank lakes and marshes. At river mile 5 of the St. Joe River, the overbank areas on the back side of the levees are less confined and the river channel has more lake characteristics. Here, velocities in the channel are lower and the bed consists of sand, silt, and clay. This downstream portion of the levees has limited historical shore development and is the least-modified portion of the river. Downstream of river mile 2, where the natural levees are youngest and therefore lower and narrower, grazing, erosion, and soil saturation have eliminated much of the vegetation and increased the potential for erosion. The result is that the exposed portion of the levees has been narrowed or eliminated.

Coeur d'Alene River Delta—The valley-bottom river and delta depositional processes and landforms for the Coeur d'Alene River are generally similar to those previously described for the St. Joe River. However, during the mining era, about 57 million tons (dry weight) of mine wastes were put into Coeur d'Alene River tributaries and distributed downstream by the stream currents, especially the finer fractions that remained suspended (Bookstrom et al., 1999). The existing sediments in and along the river and associated lakes are a mixture of metal-enriched mine deposits and natural sediments, and each flood and boating season continues to redistribute this sediment. In addition, flood events upstream can continue to deliver fresh sediments to the system.

The Coeur d'Alene River from the upper watershed to Cataldo Flats is a high-gradient, cobble- and gravel-bedded river. Downstream of Cataldo Flats, the backwater influence of the lake both pre- and post-Project development has formed a long compound delta that is relatively confined by the bedrock valley walls and, at the wider portions, by ancient lake and river deposits. The lower Coeur d'Alene River typically has low velocities and a sand, silt, and clay bottom, similar to the St. Joe River downstream of river mile 22 and the St. Maries River downstream of river mile 7 (Figure 3.3.1.1-2).

The Coeur d'Alene River delta front runs from Harrison to Harlow Point. Natural levees extend upstream, forming lakes and marshes behind them and providing a high area that was often increased and used for building roads, dikes, and buildings. The natural levees have steep riverside banks of sand, silt, and clay, with mining-related metal-enriched silty mud mixed in (Bookstrom et al., 1999). The metal-enriched deposits are typically 1 to 6 feet thick along the banks and 1 to 5 feet thick on the levee tops. Metal-enriched deposits are present across the entire

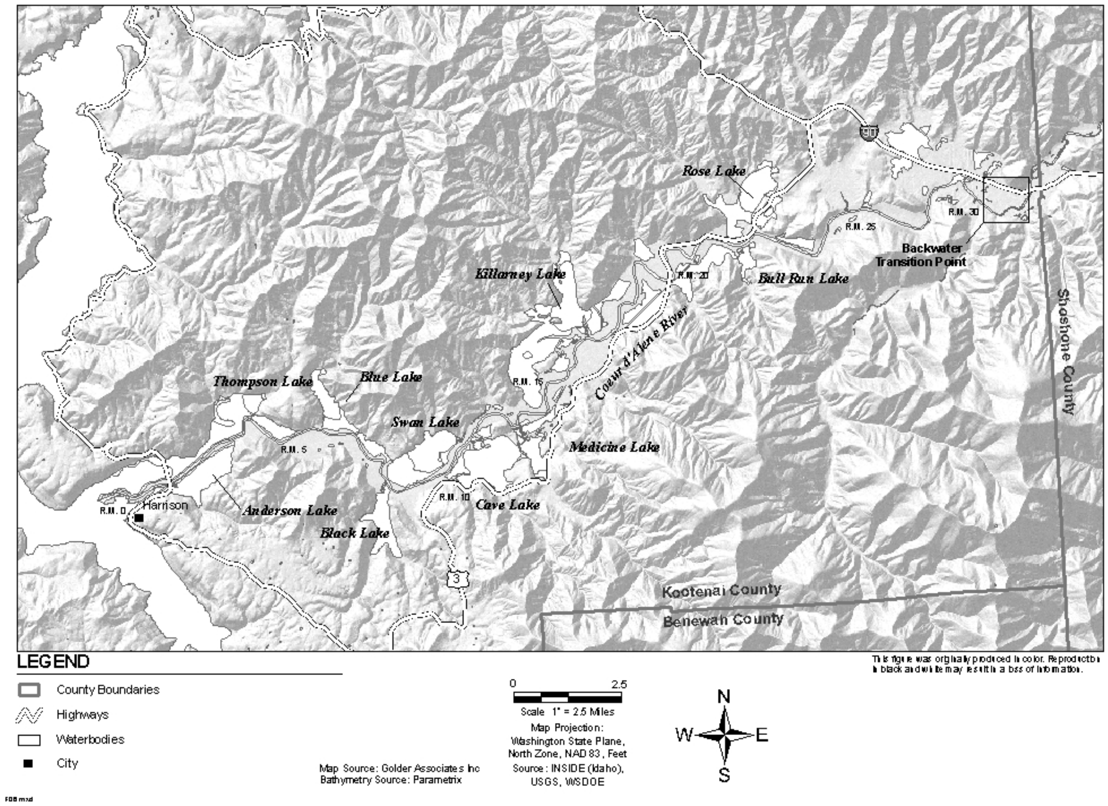


Figure 3.3.1.1-2. Coeur d'Alene River features

floodplain, with lower concentrations and thinner deposits of metals farther down the back sides of the levees and in the lateral marshes and lakes (Bookstrom et al., 1999).

The upper air-exposed layers of the metal-rich sediment along much of the Coeur d'Alene River banks are harder and relatively resistant to impact or seepage erosion because of the oxidation products of the metals and greater percentage of fines. Metal-rich bank layers are typically hard, more blocky and brittle, and less erosive than the natural alluvium. Overall, bank slumps along the Coeur d'Alene River show more brittle edges and tend to be blockier than the St. Joe bank slumps, but basically form a relatively unstable and steep bank of similar proportion.

Spokane River Area

Downstream of Coeur d'Alene Lake, the Spokane River enters a wide, flat valley formed by a series of enormous glacial floods and associated sediment deposition (Box and Wallis, 2002). In this fluvial valley, the topography includes rolling hills and subtle gradient changes. Between Post Falls, Idaho, and the City of Spokane's Upriver Dam, the Spokane River has a moderate gradient (a drop of about 140 feet over 18 miles) and is characterized by a wide valley and marginal channel entrenchment (NPPC, 2000b; FERC, 1997). Other channel characteristics include unembedded cobble and boulder substrates, relatively stable banks, and direct hydrologic connections that are flowing into and out of the Spokane Valley-Rathdrum Prairie Aquifer, depending on the reach and time of year (Avista, 2002).

Farther downstream, Spokane Falls marks a noticeable shift in river channel characteristics and underlying geology (NPPC, 2000b). Spokane Falls is a geologic knickpoint comprising Miocene basalt flows. Here, the channel is highly entrenched and bedrock is the dominant substrate. Downstream of Spokane Falls, the channel remains deeply entrenched for a short distance, with a relatively narrow valley floor, and is dominated by unembedded cobble-to-boulder substrate in areas that are not affected by reservoir conditions (Box and Wallis, 2002). Outside the immediate river corridor, the gently rolling terrain generally continues to Long Lake Development and beyond.

Spokane River Tributaries—Within the Project area, there are only two perennial tributaries to the Spokane River downstream of Coeur d'Alene Lake: Hangman Creek and the Little Spokane River. Hangman Creek enters the Spokane River on the left bank from the south in the city of Spokane, downstream of Upper Falls and Monroe Street Developments (NHC, 1999).

Hangman Creek Watershed includes the rolling, fine-grained, and erosive Palouse Hills and the uplands lying to the east. Large areas of agriculture, combined with the development of roads and other infrastructure, have increased the watershed's sediment supply. In addition, stream gradients are relatively low, and channelization and road construction have eliminated the natural meander patterns along much of the stream. These factors have increased the downstream transport of sediment and led to increased delivery of sand and fine sediment into the Spokane River (NPPC, 2000b).

The Little Spokane River enters the Spokane River from the northeast on the right bank, downstream of Nine Mile Development, within the upper reaches of Lake Spokane. The Little Spokane River drains a diverse watershed that includes forested uplands and mountains as well as lowlands that have been historically farmed or ranched (NPPC, 2000b). The watershed has become increasingly developed with residential and commercial projects. The little Spokane River supplies sand and fines to the delta forming in the upper end of Lake Spokane (NPPC, 2000b).

3.3.1.1.2 Soils

Project area soils are dominated by valley bottom and wetland soils. Some edges of the Project area include portions of the typically steep Spokane River

Valley walls. Around Coeur d'Alene Lake, the slopes consist primarily of fairly steep valley walls with relatively shallow colluvium over bedrock. Downstream of Coeur d'Alene Lake, the rest of the Project area is generally located in the glacial-age valley and glacial-fill deposits of the Spokane River Valley. Here, a narrow zone of recent alluvial valley bottom soils bounds the river, with older alluvial soils perched on terraces at various levels above the valley bottom. The steep valley walls comprise shallow, loose colluvium over the thick, older sequence of glacial fill units. The valley walls also include steep bedrock slopes and cliffs where sections of bedrock are exposed.

Soils along the St. Joe and St. Maries rivers are a mix of deposits laid down on the delta surface during each flood. The flood deposits form fine sand and silt levees near the main channel and deposit finer silt and clay across the lateral lakes and marshes. Four levee soil units were typically identifiable along the banks of the St. Joe and St. Maries rivers. Erosion ledges from boat waves are eroded into one or more of these four soil units along most of the river. These soil units vary from fine sand to fine sandy silt, generally are soft to very soft at the water level and up to 1.5 feet above the water, and are firm to stiff when 1.5 feet or more above the water level. The lowest soil unit along the banks is always wet, with a soft to firm texture (Earth Systems and Parametrix, 2004).

Surface soil conditions along the Coeur d'Alene River channel and floodplain would be similar to the St. Joe River, except they include metal-enriched sediments derived from upstream mining, milling, and smelting (Bookstrom et al., 1999; Earth Systems and Parametrix, 2004). Relative to uncontaminated sediments of the region, metal-enriched sediments are highly enriched in silver, lead, zinc, arsenic, antimony, and mercury; and enriched to a lesser degree in copper, cadmium, manganese, and iron (Fousek, 1996, as cited in Bookstrom et al., 1999). Widespread distribution of metal-enriched sediments has resulted from over a century of mining in the upstream Coeur d'Alene Mining District, direct mine-waste discharge into the river during the first 80 years of mining, and regular overbank floods that redistribute this sediment along the channel and floodplain (Bookstrom et al., 1999). Various weathering oxides in these deposits may turn the alluvial deposits various reddish and orange tones with a medium-dense to dense consistency near the waterline and above.

The shoreline of Coeur d'Alene Lake is dominated by bedrock and slope deposits derived from rocky upland soils and sandy beaches in and around tributary creeks, rivers, and unconsolidated shore areas (Earth Systems and Parametrix, 2004). The Coeur d'Alene Lake shoreline elevation has naturally varied between 2,118 and 2,140 feet during the past several thousand years, and the existing lake shoreline and beaches have been formed by the wind-caused wave erosion and associated influences and conditions within this relatively large elevation zone (Earth Systems and Parametrix, 2004). The summer lake level maintained by the Post Falls Project during the past 50+ years shifted the vegetation line and upper extent of the summer beaches to the 2,128-foot elevation and has shifted the shallow aquatic and wetland zones.

Downstream of Post Falls, the Spokane River flows over a cobble-to-boulder bed for most of its course downstream to Hangman Creek, except for a 0.5-mile-long reach through downtown Spokane, where bedrock forms Spokane Falls (Box and Wallis, 2002). Upstream and downstream of the falls area, the floodplain consists of recent alluvium deposits filling the bottom of the valley, which is cut into the thick sequence of Pleistocene outburst flood deposits. The coarse gravel-cobble-boulder riverbed is derived from erosion by the river into these coarse-grained valley fill deposits. The glacial-age flood deposits and the modern alluvium derived from them consist predominantly of well-rounded boulders, cobbles, gravel, and sand, with blocks that range to 10-foot-diameter. Silt and finer grain-sized material are scarce in the Pleistocene flood channel deposits and recent alluvium because much of the fine sediment remains suspended and moves farther down the valley or is deposited in thin layers in the limited overbank areas along the Spokane River.

Because of their geologic characteristics and land-use influences, Hangman Creek and the Little Spokane River tributaries contribute substantial amounts of sediment to the Spokane River downstream of Spokane, particularly during high-flow periods (NPPC, 2000b). In particular, the Hangman Creek Watershed has been subjected to intensive farming practices in the upper and middle reaches. Channelization of the creek, combined with steep slopes, fine silt and clay loess soils, and large runoff events have made the watershed susceptible to streambed and upland agricultural erosion (Edelen and Allen, 1998, as cited in NPPC, 2000b).

Nine Mile Reservoir is relatively small compared to the upstream sediment supply, so it has been filled with sediment for a long time. In addition to the continuing sediment input, some of the stored sediment is reworked during floods. Flow through this reach is more riverine in nature than lake-like, and point bars and lateral bars, some of substantial length, form along the inside of the river bends. Historical photographs indicate that prior to construction of Nine Mile Development, the channel through this reach had a well-defined, bedrock-controlled channel with bed and banks dominated by large rocks, boulders and bedrock outcrops (Golder, 2005a). Upper valley walls and cliffs still reflect this morphology.

Around Lake Spokane, there are three main types of shoreline soil materials. The most common material is sandy, gravelly, glacial-flood deposits that make up the shoreline’s steep valley walls, forming about 66 percent of the shoreline (Earth Systems and Parametrix, 2004). The second most common shore material is river alluvium deposited by the ancient and recent Spokane River bedload movement, which accounts for about 25 percent of the shoreline (Earth Systems and Parametrix, 2004). The third most common shore material is bedrock or colluvium derived from bedrock, accounting for about 7 percent of the shoreline. Roughly 2 percent of the shoreline consists of glacial-age lake deposits and gravelly sands at the alluvial fans and small deltas of tributary creeks (Earth Systems and Parametrix, 2004).

3.3.1.1.3 Existing Geologic Hazards

The applicant's preliminary draft environmental assessment (PDEA) reports no seismic hazards related to the Project and there are no geologic hazards of significance (Avista, 2005). The Project is periodically assessed for seismic and other geologic hazards through the required Part 12 inspections under the Commission's authority.

Shallow translational landslides occur on the steep valley walls surrounding Lake Spokane. The active landslides are primarily located in the downstream end of the reservoir (particularly the downstream 5 miles), where the reservoir water levels intersect the steeper valley walls at an elevation above the previous natural river shoreline. At the upstream end of Lake Spokane, the valley is broader with gentle slopes, and the shoreline is composed of rock and old river terraces along with engineered road prisms (Earth Systems and Parametrix, 2004). The naturally steep valley wall slopes in the downstream end of the reservoir are made up of erosive materials (gravelly sands) that generally do not completely stabilize even with dense vegetation. Along the Lake Spokane full pool shoreline, there are 26 acres with slopes greater than 30 degrees. This is where most of the shallow slides occur. Many of these sandy, unconsolidated slopes are near or at their limits of stability and would experience some erosion regardless of any Project-related influence. This is evident by the areas of visible slope erosion that are located away from and upslope of the reservoir shoreline. Typically, these slides have bare areas of soil loss; include down, tilted, or exposed roots of trees or brush; and have sharp edges to scarps, headwalls, sidewalls, or toe deposits. Less-active slides or ancient non-active slides have stable vegetation and more rounded edges and slopes (Earth Systems and Parametrix, 2004).

The potential for drawdown-induced shoreline seepage leading to bank slumping does exist on portions of Lake Spokane because of the steep valley walls around the downstream shoreline and the presence of loose- to medium-compact unconsolidated sandy-layered slope materials. However, Earth Systems and Parametrix (2004) found no direct evidence of drawdown-induced slumping following a recent 12-foot drawdown of Lake Spokane. Earth Systems and Parametrix (2004) note that drawdown-induced slumping may have been a factor during the early history of the reservoir when more of the shore slopes were less adjusted to the new lakeshore, but the limited extent of large drawdowns and the fairly long history of the reservoir limit the current likelihood of drawdown-induced slumping.

3.3.1.1.4 Sediment Supply and Transport

Under natural conditions, sediment is first supplied to the Coeur d'Alene Lake-Spokane River system by hillslope erosion processes. Once mobilized by erosion on the land surface, sediment is generally transported to the stream system by colluvial and/or fluvial processes. Within the riverine environment, sediment may be actively transported downstream or stored indefinitely in the channel or on the floodplain. Variability in stream discharge, changes in upstream sediment supply, natural channel migration and evolution of its morphology, landslides, alluvial fans, and human-induced effects on the channel and entire river basin, such as land use practices and road density, all influence the supply and transport rate of sediment. In addition, larger-scale geologic processes—such as the deposition of glacial flood sediments on what has become the floodplain of the Spokane River—can function as a supplemental sediment source for a river or creek. In the Coeur d'Alene River Basin, fluvial erosion of mine tailings piles also contributes sediment to the system.

Sediment Supply and Transport in the Coeur d'Alene, St. Joe, and St. Maries Rivers

Coeur d'Alene River—Golder (2004b) has identified several sediment sources for the Coeur d'Alene River above Coeur d'Alene Lake. These sources include sediment supplied from the North and South forks (including substantial quantities of contaminated mine waste), local bank erosion, and channel bed remobilization. Mining and milling in the Coeur d'Alene mining area have produced approximately 109 million tons of tailings since approximately the late 1800s (Long, 1998, as cited in Bookstrom et al., 1999). Approximately 51 percent of the tailings generated in the Coeur d'Alene Mining District were discarded directly into creeks that are tributaries to the Coeur d'Alene River (Long, 1998, as cited in Box et al., 2001). Local bank erosion is caused by wind-generated waves, boat wakes, and flood events.

Sediment from the mainstem Coeur d'Alene River is generally transported to Coeur d'Alene Lake, with widespread deposition on the levees, back marshes, and lakes during overbank floods. The Coeur d'Alene River inundates large portions of its floodplain during high-flows, depositing sediment in the process.

Several agencies have monitored and analyzed sediment transport at the Rose Lake and Harrison gages on the river (Clark and Woods, 2001; U.S.

Environmental Protection Agency [EPA], 2001a, as cited in Golder, 2004b). EPA (2001a, as cited in Golder, 2004b) estimates that an average 27,207 tons of sediment is transported past the USGS Coeur d'Alene-River-at–Rose-Lake gage by the river each year. In 1999, approximately 29,700 tons of suspended sediment were estimated to be transported past the gage. Of that, about 23,000 tons were fines and 6,700 tons were sand. In general, most of the sediment transport observed at the gage occurs between March and June during the peak stream discharges (EPA, 2001a, as cited in Golder, 2004b).

An average 81,338 tons of sediment is estimated to be transported by the river past the Coeur d'Alene-River-near-Harrison gage (USGS gage no. 12413860) each year (EPA, 2001a, as cited in Golder, 2004b), again generally occurring during the large stream discharges between March and June.

From Cataldo to Harrison, the floodplain of the Coeur d'Alene River generally slopes away from the tops of the natural levees that flank the river. Therefore, if floodwater overtops the levees or flows through low passes in the levees, it tends to cover most of the floodplain and sediment deposition occurs (Bookstrom et al., 1999). At this localized scale, sediment is being both transported and deposited. Figure 3.3.1.1-3 illustrates a conceptual diagram of the cycle of transport and deposition of fine-grained sediment in the lower Coeur d'Alene River (i.e., from the river mouth to approximately 30 miles upstream), with sediment moving through the system via a series of interconnected physical processes.

Sediment movement is not uniform or continuous. Although sediment may be moving at the full range of low flows to peak flows, the majority of sediment transport in the river is driven by higher flow velocities (Golder, 2004b) and is therefore closely related to larger flow events, occurring typically between November and June. Since mining began in 1886, 13 major floods have inundated the floodplain of the Coeur d'Alene River Valley, and 26 lesser floods have flooded much of the valley floor (Box, 1994 [unpublished data], as cited in Bookstrom et al., 1999). For the purpose of discussing the frequency of movement of the sediment, two general types of floods must be distinguished—spring floods and winter floods.

The rise in the hydrograph for the annual spring runoff floods is typically relatively gradual, with consistent stage and flow velocities maintained over a prolonged period. Annual spring floods commonly inundate the lower end of the river valley, and major spring floods inundate most of the floodplain (Bookstrom et al., 1999). During these spring floods, fine-grained, metals-rich sediment is mobilized from the channel bottom and banks and deposited on the floodplain (as

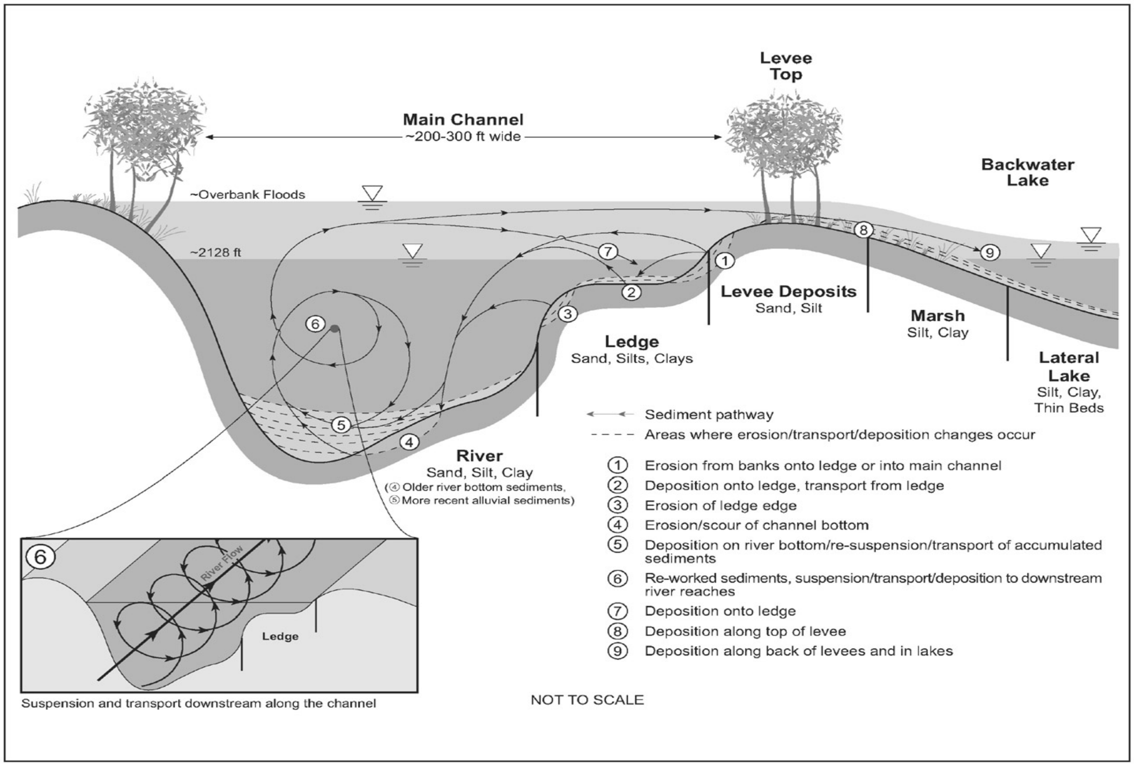


Figure 3.3.1.1-3. Conceptual model of sediment erosion, transport, and deposition in the lower Coeur d'Alene River
Source: Adapted from Golder (2004b)

described above) and carried into and across Coeur d'Alene Lake (as observed in the spring runoff of 1999) (Box et al., 1998 [unpublished data]; Woods, 1999 [unpublished data]; both as cited in Bookstrom et al., 1999).

Winter rain-on-snow floods are less frequent but more aggressively erosive, typically with higher flow velocities but of shorter duration. Winter floods commonly begin when the lake level is down and the hydraulic differential between the upper basin and the lower reaches of the river is greatest. The relationship between peak flows on the Coeur d'Alene River as recorded at the Cataldo gage and lake levels for the period from 1911 through 2003 is depicted in the PDEA (Avista, 2005, Figure 5-4). During these winter floods, sediment is often delivered from the upper watershed through surface runoff and is transported and deposited as described above.

St. Joe River and St. Maries River—Because these rivers have not supported any major mining, sediment transported by the rivers and/or delivered to Coeur d'Alene Lake is likely to be relatively uncontaminated by metal-enriched sediment (Horowitz et al., 1992, as cited in Golder, 2004b). Further, the overall sediment load of these rivers is expected to be less than that of the Coeur d'Alene

River because, without the effects of mining waste inputs, sediment yields should be less on a volume-per-unit-area basis. Based on existing information and the U.S. Army Corps of Engineers' Hydrologic Engineering Center-River Analysis System (HEC-RAS) modeling performed for relicensing (Golder, 2004b), sediment transport processes on the St. Joe River are expected to be similar to that of the Coeur d'Alene River, as discussed in previous sections. The conceptual model of sediment loading, transport, and deposition in the lower Coeur d'Alene River (see Figure 3.3.1.1-3) also applies to the lower St. Joe River and the lower St. Maries River.

Sediment Transport-Related Interactions between Coeur d'Alene Lake and Tributary Rivers

Coeur d'Alene Lake levels and the naturally low gradient nature of the lower reaches of the tributary rivers affect sediment transport through their influence on water velocities in the affected reaches. According to the intercept method used on bathymetry data by Golder (2004b), the backwater transition zone on the Coeur d'Alene River is located at about river mile 32, or near where Interstate 90 crosses the river about 2 miles downstream of the town of Cataldo; at approximately river mile 34 on the St. Joe River, roughly 11 miles downstream of the town of Calder; and on the St. Maries River approximately 9 miles upstream of the town of St. Maries (which lies near the confluence with the St. Joe River) (see Figures 3.3.1.1-1 and 3.3.1.1-2). These areas are considered transition zones rather than distinct breaks because, even with a relatively static lake water level of 2,128 feet, the change from a "free-flowing" riverine character to a "slack-water" lake-influenced condition is a gradual change and varies depending on river flows and lake levels.

The lateral lakes bounding the Coeur d'Alene and St. Joe rivers receive sediment via deposition from river floodwaters spilling over the natural levees and from tributary streams entering the lateral lakes themselves. Golder (2004b) modeled water velocities within these lateral lakes for natural and regulated (Post Falls Project operations) conditions. Modeled horizontal water velocities within the small bays and lateral lake areas are relatively low, typically within the order of 295 feet per day (Golder, 2004b). Settling velocities for the sediments seen in the small bays (i.e., medium silts, fine sands, and clay-silts) range from 295 feet per day to 3.3 feet per day. The settling velocities are therefore approximately 1 to 2 orders of magnitude less than the predicted horizontal velocities. The higher horizontal velocities relative to the lower settling velocities for the sediments allow for movement of sediments in the lateral lakes and in the bays. This conceptual model is consistent with the substrate mapping results completed by Parametrix (2004b), showing that fine-grained sediments are typically present throughout the length of the bays (as opposed to a large mass of sediment settling out near the initial sediment sources).

Sediment Supply and Transport in Coeur d'Alene Lake

The results of bathymetric mapping for Coeur d'Alene Lake are included in the Avista PDEA as Figure 5-5 of Appendix A, *Maps*, with color schemes depicting varying water depths (Avista, 2005). Owing largely to the lake's legacy as a flooded river valley, the bathymetry depicts a generally flat-bottomed lake that becomes relatively deep (exceeding approximately 200 feet) in its center, just south of the constriction at Driftwood Point. This depth, as well as the substantial distance between the main sediment sources (the Coeur d'Alene and St. Joe rivers) at the southern end of the lake and the lake outlet at the far northern end, results in the lake functioning as a very effective sediment trap.

Sediment transport and deposition within the lake is largely governed by water velocities and their relationship to the settling velocities for suspended sediments. Therefore, given the types of sediment being input to the lake, sediment deposition throughout the lake is occurring only at relatively slow water velocities—ranging from 295 feet per day for medium silts to 3.3 feet per day for clay-silts (Golder, 2004b). Golder's modeling of velocities in the lake indicates that lake dynamics are very complicated (Golder, 2004b). Water velocities are most likely governed by a combination of topography, wind patterns, bathymetry, and hydrologic inputs. Surficial lake flow patterns are assumed to be largely governed by the wind (Golder, 2004b), although during high flows on the Coeur d'Alene and St. Joe rivers, hydraulic head-generated currents are also likely a strong factor in at least the southern half of the lake.

Despite the complicated lake dynamics, Coeur d'Alene Lake is understood to have long acted as an effective sediment trap (Golder, 2004b). The sediment trapping capability of the lake is largely related to its configuration and the fact that the dominant source of sediment is located in the southern portion of the lake (i.e., from the St. Joe, St. Maries and Coeur d'Alene river systems). Golder (2004b) found the majority to be fine-grained in texture. Many of the samples from the main part of Coeur d'Alene Lake contained a thin layer of reddish material with black flecks. This material is believed to be either derived from mining waste in the floodplains and banks of the Coeur d'Alene River or composed of mineral grains coated with iron and manganese oxides formed in the anoxic conditions in the lake (Golder, 2004b). Many of the samples collected in the lake south of Rockford Bay up to the mouth of the St. Joe River contained a layer believed to be deposition of ash from the Mount St. Helen's eruption in 1980 (Golder, 2004b). Based on this layer, recent sedimentation rates in the lower part of the lake are believed to be on the order of 0.3 to 0.5 centimeters per year (Horowitz et al., 1992, as cited in Golder, 2004b).

Golder (2004b) developed a series of maps illustrating the concentration of various lakebed sediment metal contaminants to provide additional insight on sediment supply and transport in the lake. Maps for 16 different contaminants are provided in Appendix D of Golder's report (2004b). The majority of lakebed sediments north of Conkling Point are highly enriched in silver, copper, lead, zinc, cadmium, mercury, arsenic, and antimony relative to uncontaminated sediments. Observations of elevated metals concentrations have been found in the sediments of many of the shallower bays such as Mica Bay, Wolf Lodge Bay, and Squaw Bay (Golder, 2004b), all located far from the mouth of the Coeur d'Alene River. Transport to these locations is from at least two mechanisms: transport of metals on particulates (fine sediment) and transport within the water column as dissolved load. The presence, distribution, and concentration of metals indicate that the vast majority of the sediments in the lake originated from the Coeur d'Alene River, where mining operations have occurred for longer than a century (Golder, 2004b). The lower concentrations or even absence of metals in lakebed sediments south of the Coeur d'Alene River delta further supports this conclusion.

In summary, sediment delivered to Coeur d'Alene Lake is generally deposited within the lake. Any transport through the lake is expected to consist of very fine suspended silts and clays and to occur only in very high-flow water years (for example, 1996 and 1999) (Box et al., 1998 [unpublished data]; Woods, 1999 [unpublished data]; both as cited in Bookstrom et al., 1999). This phenomenon is complex, and little research has addressed metals transport within the lake. Definitive data are not available to determine the degree to which each transport process may operate.

Sediment Supply and Transport in the Spokane River

Historically and currently, Coeur d'Alene Lake has intercepted essentially all of the bedload sediment originating within the upper watershed (i.e., the Coeur d'Alene and St. Joe rivers and other smaller lake tributaries [NPPC, 2000b]). Some suspended sediment enters the Spokane River from Coeur d'Alene Lake, typically during high flow conditions in the winter and spring. The channel between the lake and the Post Falls Project has a relatively flat cross-section, is low gradient, and maintains a single-thread morphology (Golder, 2004b). The channel bed consists of bedrock controls with sand, gravel, cobble, and small-boulder substrate. There are no significant gravel bars in this reach and generally it can be considered a sediment transport reach. This reach also includes the natural channel constriction/sill that controls lake outflows absent any control at the Post Falls Project.

The 17-mile-long reach of the Spokane River between the Post Falls Project downstream to a point roughly 4.5 miles upstream of the City of Spokane's Upriver Dam is a single-thread channel with occasional lateral and point gravel bars associated with channel bends or human-made structures that reach into the river. Sediment sources within this reach include normal bank erosion and bed scour during relatively high flows (Golder, 2004b). Beginning roughly 4.5 miles upstream of Upriver Dam, the Spokane River becomes a depositional reach (Golder, 2004b). Sediment sampling within the Upriver Dam impoundment (Johnson, 1999; Johnson and Norton, 2001, both as cited in Golder, 2004b) indicates that the majority of the substrate is cobble, gravel, and sands. These data suggest that much of the fine-grained sediment is moving through this reach (Golder, 2004b). The sediments in the Upriver Dam impoundment were found to have higher concentrations of polychlorinated biphenyls (PCBs) and metals than other areas of the Spokane River (Golder, 2004b), reflecting the fact that this reach is the first significant depositional reach downstream of Coeur d'Alene Lake.

From Upriver Dam through Upper Falls Development and on downstream past Monroe Street Development, the Spokane River is again a transport reach (Golder, 2004b). Both Upper Falls Development and Monroe Street Development, located just downstream, were constructed on geologic knickpoints within a bedrock-controlled reach of river. Conceptual hydraulic modeling through this reach indicates an increased potential for sediment transport due to the steeper gradient and corresponding increase in stream power (Golder, 2004b). The Upper Falls impoundment is relatively small and shallow, and the north channel spillway gates generally match the bottom of the channel (Golder, 2004b). These factors are thought to facilitate sediment passage through this impoundment (personal communication, A. Kammereck, Golder, Redmond, WA, with E. Ginney, Geomorphologist, Louis Berger Group, Chico, CA, dated December 15, 2004). Monroe Street Development (located 0.2 mile downstream) has a single concrete gravity dam spanning the width of the river that creates a very small and shallow operating pool. Modeling undertaken in 2000 (Papanicolaou, 2000, as cited in Golder, 2004b) indicates that the bedrock channel in this reach allows for high water velocities and likely transports all sediment through this reach, except for large bedload material such as cobbles.

Downstream of Monroe Street Development, the river is also classified as a transport reach until it reaches the backwater from Nine Mile Development (located 47.5 miles downstream of Coeur d'Alene Lake) (Golder, 2004b). Hangman Creek enters the Spokane River on its south, or left bank, a short distance downstream of Monroe Street Development and approximately 38.5 miles downstream of Coeur d'Alene Lake. Hangman Creek is the single largest source of sediment in the Spokane River within the Project area, with 97 percent of the sediment being sand-sized or finer material (Golder, 2004b). The creek's estimated annual sediment discharge in the 4 years from 1998 to 2001 ranged from 4,750 tons in 2001 to 189,000 tons in 1999, with an estimated annual average of 82,334 tons (SCCD, 2002). These estimates are based on average annual flows of 209.4 cfs during the same period (SCCD, 2002).

Sediment Supply and Transport in Nine Mile Reservoir

The Nine Mile Reservoir is a depositional reach that extends more than 4 miles downstream to Nine Mile Development. Downstream of this dam, the Spokane River is free-flowing for approximately 1 mile, in a reach classified as a transport reach. At that point, and near the confluence of the Little Spokane and Spokane rivers, the river is characterized by the reservoir conditions created by Long Lake Development.

Within Nine Mile Reservoir, point and lateral bars are evident along the inside of bends in the relatively narrow reservoir; in some cases, these bars extend for considerable distances within the reservoir (Golder, 2004b). Northwest Hydraulic Consultants (NHC) estimated that approximately 2.2 million cubic yards of sediment have been deposited within Nine Mile Reservoir during its life span. The majority of deposition within the reservoir is coarse sand and gravel, with fine sand, silt, and clay being mostly transported through the reservoir. The ongoing and increasing sediment passage through the turbine generating units led to increased operating expense and development downtime (NHC, 1999). In 1997 and 1998, a diversion tunnel was installed at Nine Mile Development to help transport the coarser sediment downstream of the dam by bypassing turbines. This construction required initial excavation of the area leading up to the intake to remove accumulated sediment from the immediate area surrounding the intake (Golder, 2004b). The sediment bypass tunnel has proven to be an effective measure at protecting the turbines from the effects of coarse sediment. The tunnel does not affect the ultimate transport of sediments through the development.

In the approximately 1-mile-long reach downstream of Nine Mile Development, the river is again largely a transport reach until the backwater from Lake Spokane is encountered (Golder, 2004b). This short reach of channel is confined and relatively stable, with a bed of predominantly bedrock and cobbles (Golder, 2004b). Farther downstream, pocket beaches begin to occur. These pocket beaches tend to occur in the lee of boulders and other topographic features and are suspected to be formed of coarser sediments that passed through the Nine Mile Development turbines and bypass tunnel (NHC, 1999). Approximately 2.5 miles downstream of Nine Mile Development, the river channel widens to roughly 2,000 feet, coinciding with a large sediment deposition zone along the southern shoreline (Golder, 2004b). This deposition zone has been in place for many years and appears to be a deposition area for the fine sediment that has passed downstream, (NHC, 1999).

Sediment Supply and Transport in Lake Spokane

In Lake Spokane, sediment deposition has been dominated by fine sand, silt, and clay carried mostly as suspended load (NHC, 1999). NHC (1999) determined that the amount of coarser sediment (coarse sand and larger) passing

Nine Mile Dam during the mid- to late-1990s was increasing and would continue to increase—despite the construction of the sediment bypass tunnel—as the reservoir pool approached equilibrium. Despite the continued increase in coarse sediment entering Lake Spokane, the dominant sediment deposition in the reservoir is fine-grained (by volume over 90 percent finer than 1.0 millimeter [NHC, 1999]). Golder (2004b) estimates sediment delivery to Lake Spokane averages roughly 83,000 cubic yards per year.

No detailed historical bathymetric surveys have been conducted for Lake Spokane, so the reservoir's long-term aggradation rate has not been estimated; however, NHC (1999) addressed this in an alternative fashion by estimating the reservoir's sediment trapping efficiency. This analysis estimated that 35 to 50 percent of fine suspended sediments passing Nine Mile Development is deposited in the deeper portions of Lake Spokane, and virtually all of the sand load is deposited near the head of the reservoir where the channel begins to deepen and water velocities slow (NHC, 1999). From these estimates, NHC (1999) projected that during the next 50 years, silt and sand deposition could reduce the storage volume in Lake Spokane by as much as 20 percent.

Sediment transport past Long Lake Development is negligible and is limited almost entirely to fully suspended load that passes through the entire reservoir. Flow conditions downstream of Long Lake Development are largely governed by existing hydroelectric projects. As such, sediment transport and deposition downstream of Long Lake Development are dictated by the downstream channel characteristics (i.e., a deeply incised bedrock channel) and the existence of hydroelectric projects. Any reduction in sediment load would likely have insignificant effects on this downstream reach.

3.3.1.1.5 Erosion

Natural and modified erosion processes in the Project area include wind- and boat-generated waves, stream current bank and bed erosion, freeze/thaw, rain splash, rill, and seepage erosion. Of these, the wind- and boat-generated wave erosion and stream current bank erosion are the primary shoreline erosion processes.

On the Coeur d'Alene, St. Joe, and St. Maries rivers, streambank erosion occurs naturally on the inside of the levees from stream currents during higher flow periods and is greatly increased by boat-generated waves. The summer lake level sets the elevation at which wind- and boat-generated waves influence shoreline erosion during that portion of the year. The Post Falls Project regulates the lake level about 6 to 7 months of the year, depending on inflow, weather conditions, snowpack, and other factors. The lake level is typically held at the 2,128-foot elevation (the normal summer full-pool elevation) after the peak runoff period and is then maintained at that level through summer. Beginning sometime after Labor Day, The Post Falls Project gradually releases the stored water over several months, typically resulting in a 1- to 1.5-foot drop per month. By early winter, the lake achieves a level that depends on the natural outlet rather than hydroelectric development operations. Mature trees and, to a lesser extent, dense brush help protect the banks from erosion and literally hold the soft St. Joe River stream banks together. Dense vegetation grows along the rivers and lakeshore because of moisture conditions and forms a pronounced tree line at the 2,128-foot elevation (the normal summer full-pool elevation). Trees, brush, and grass form a dense web of roots and trunks that buttress and hold the loose levee soils together. The dense vegetation also acts to slow near-shore water velocity, allowing more deposition of fine sand on the levee top. Trees growing along the St. Joe and Coeur d'Alene rivers are dominated by cottonwoods along with a mix of aspens, alders, pines, and cedars. The original forests along the stream banks were cut during the late 1800s and early part of the 1900s. Only one area in the lower 7 miles of the St. Joe River, located northwest of the swing bridge, is labeled as uncut on the 1908 map (Avista, 1909). Cedars and other conifers were cut during the late 1800s and very few remain along the riverbanks today. The cottonwoods were probably cleared later as the farms and towns developed along the rivers.

St. Joe River

The natural St. Joe River banks have a steep and eroding face on the inside (river side) levee banks. Erosion is primarily occurring along the inside of the levees where boat waves are the main erosion factor along with stream current bank erosion and, to a lesser degree, freeze/thaw, rain splash, and rill erosion during lower lake level periods. On the backside, the levees are wide and gently slope into the back marshes and lakes where overbank flood waters annually deposit sediment. On the downstream-most 2 to 3 miles of the river, the natural St. Joe River levees were only 1 to 2 feet higher than the 2,128-foot summer lake level. Boat-caused waves erode wave-cut ledges along the full length of the affected reaches of the St. Joe and St. Maries rivers. These ledges are an average of 46 feet wide from river mile 7 to river mile 1.9. From the Swing Bridge downstream to river mile 0, the right bank ledge width averages 86 feet, and the width of the left bank ledge averages about 216 feet, with most of the original levee top eroded on this side of the river. Stream currents also erode the channel banks, but only during floods and not in a continuous line along the entire river as the boat-caused waves do. The ledge shape, elevation, and in-place stumps indicate the ledge width has been eroded primarily by boat-caused waves. These waves cut a prominent notch at the 2,126-foot level that is still present. The main notch has now moved up to the 2,126- to 2,128-foot elevation as a result of the summer lake levels since 1942.

Erosion on the St. Joe River has been assessed in three ways: through erosion pin monitoring during the boating season; through analysis of historic aerial photographs, where available; and through analysis of the erosion ledge found on the inside of the natural levees. Because stream flow erosion is at a minimum during the summer and wind is not a significant factor in erosion along the insides of the levees, the erosion pin monitoring estimated erosion on the inside of the levees primarily from boat traffic, which is at its peak during the summer. The monitoring demonstrated that bank recession caused primarily by boat waves along the inside of the lower St. Joe River levees ranges between 0.1 and 0.7 foot per boating season and averages about 0.4 feet per boating season.

Historical aerial photograph erosion analysis assesses erosion from all causes on both sides of the levees and yields a long-term estimate of the changes in the width of the levee tops on a multi-decade scale. Aerial photograph analysis indicates that an average of 1.3 acres per year of levee top erosion and loss occurred along the lower St. Joe River from 1933 to 2003. This estimate includes both river banks and both sides of the levee tops. This is equivalent to an average of 1.5 feet per year. However, the erosion is not evenly distributed along the length of the river; there is more erosion on the river side of the levee banks and the downstream and lower-elevation portions of the levees (i.e., the lower 7 miles of the levee system). The lower 7 miles of the St. Joe River have far less land-use modifications compared to upstream locations, where dikes, roads, railroads, industrial, agricultural, recreation, and urban land-use modifications are the dominant influences on streambank conditions. However, these upstream conditions have aggravated erosion effects in the lower St. Joe River. For the lower 7 miles of the St. Joe River, estimates of future erosion losses, based on the historical aerial photographs assessment, would be approximately 39 to 65 acres during the next 30 to 50 years.

The ledge approach to quantifying levee top erosion measures the amount of erosion that has occurred on the inside of the levees from all causes, averaged over many decades. The ledge analysis for the St. Joe River indicates an average erosion rate of about 1.3 feet per year of erosion (total, for both banks) of the inside face of the levees. This indicates that on the lower 7 miles of the St. Joe River, approximately 1.3 acres erode each year, or approximately 39 to 65 acres would be lost to erosion over the next 30 to 50 years. From river mile 7 to river mile 24, the ledge analysis indicates only about 0.2 foot per year of erosion on each river bank. This is equivalent to approximately 27 to 45 acres during the next 30 to 50 years.

Wind-wave erosion of the back side of the St. Joe River levees occurs where there is open water and the levees are exposed to prevailing winds and significant wind fetch. The summer pool elevation increases fetch for portions of the Chatcolet Lake, Round Lake, and Coeur d'Alene River mouth portions of the levees. This increased fetch influences erosion mostly on the back sides of the levees and adds to the rate that the narrow portions of the levee tops recede. Boat-wave-related erosion on the inside banks of the levees is much greater, however, because summer wind–wave-related erosion potential is relatively limited compared to that of the boat-wake waves.

Wave modeling and field observations indicate that winds exceeding 15 miles per hour typically produce wave heights of 0.5 foot or greater, which are large enough to erode the shoreline banks. The raised summer lake levels have placed the wind waves on Round and Chatcolet lakes near the levee tops. The wind waves erode undercuts and a ledge on the exposed outside levee segments, similar to the action of the boat waves on the inside banks. The wind erosion on the outside and ends of the levees is not as continuous or as wide as the inside levee boat-wave erosion because of levee orientation, the gradual backslope that spreads the wave energy out on the back side, and the presence of dense emergent wetland plants.

The condition of the levees varies with distance upstream. At the most downstream reach, the levees have experienced the greatest loss due to erosion and vegetation loss. From river mile 2 upstream to about river mile 3, the height and width of a portion of the levees provide adequate non-eroding and unsaturated soil for colonization by trees; yet in several reaches, the levees are quite narrow. The levees between river mile 2 and river mile 3 are a transition from the lower reach, where the nearly lost levee tops transition to the wider, higher, upstream levees that long-term boat-caused wave erosion will not be able to completely remove. Upstream of river mile 3, boat-wave erosion is estimated to continue to widen the erosion ledge but not erode the entire levee top away.

Coeur d'Alene River

The Coeur d'Alene River has levee and boat traffic conditions similar to the St. Joe River, but its levee banks are eroding more slowly, largely because of the metal-enriched mine wastes mixed in with the natural alluvium that make the surface soil units denser. On the Coeur d'Alene River, the boat-wave-cut ledges are narrower than on the St. Joe River, typically ranging from 20 to 30 feet wide. The lower mile of the Coeur d'Alene River has had fewer land-use modifications compared to upstream; based on the ledge method, the estimated rate of bank erosion is about 0.6 foot per year (total, including both banks). The ledge analysis for the lower 4 miles of the Coeur d'Alene River indicates about 0.3 acre per year, or approximately 9 to 14 acres, will be lost to erosion over the next 30 to 50 years. From river mile 4 to river mile 27, about 1.4 acres will be lost to erosion per year, or approximately 42 to 69 acres will erode during the next 30 to 50 years. Erosion along the river banks is related to multiple influences, including boat waves, stream currents, freeze/thaw, rain splash, riling, and land use.

Coeur d'Alene Lake

Because lake fluctuations still occur within their natural range of variability (between the 2,118- and 2,140-foot elevations over the past several thousand years), much of the shore is already scoured to bedrock or is rocky in nature; therefore, shore erosion has been fairly limited. The existing lake shoreline and beaches have been formed by wind-wave erosion and associated influences and conditions within this relatively large elevation zone. In addition, most road, railroad, building, and yard areas were armored decades ago (Earth Systems and Parametrix, 2004). Current summer lake levels are maintained by the Post Falls Project and have shifted the upper extent of the summer beaches and associated vegetation line to the 2,128-foot elevation. A combination of wind- and boat-caused waves creates and maintains the beach and shore conditions around the lake. Summer lake level regulation has inundated a front row of trees that may have existed in some areas of the lakeshore prior to Post's or Avista's dams. This regulation, combined with early logging, clearing, and other activities, reduced the shoreline vegetation in many areas. During the past 95 years, the beaches have been forming, and humans have added various types of shore armor in some areas. Much of the shore now has redeveloped significant vegetative cover and is either rocky or armored, and erosion appears minimal.

Spokane River

The Spokane River banks above the Post Falls Project have been highly modified by over 100 years of industrial, commercial, residential, and recreation development along and near the river. The greatest potential erosion energy along the upper Spokane River is from heavy summer boat traffic and winter floods. Much of the eroding shore has been armored with various combinations of rock, wood, and concrete bulkheads.

Downstream of the Post Falls Project to Lake Spokane, the Spokane River is free-flowing for more than 25 miles, except for Upriver Dam Reservoir (operated by the City of Spokane), Upper Falls Reservoir, and Nine Mile Reservoir. River reaches upstream of those reservoirs are dominated either by the unsorted valley alluvial fill or bedrock morphology. In addition, a number of areas, especially areas upstream of Upper Falls, have experienced extensive channelization and fill associated with the development of the City of Spokane. Because higher flows in the Spokane River (those that are expected to be capable of causing erosion) are largely unaltered by Project operations, there appears to be minimal connection between the Project and erosion on the river.

Lake Spokane

Shoreline erosion around Lake Spokane is typical of natural lakes and reservoirs with erosive shore materials. During the early history of Long Lake Development, erosion of shoreline areas was greater than it is today because the vegetation and shore were not adjusted to the new water levels. Some of the natural steeper, sandy, unconsolidated slopes along the lakeshore of Lake Spokane are near or at the limits of stability. The type and amount of vegetation in these areas is a key factor in the continuing stability of slopes, along with slope aspect, slope position, moisture conditions, and land use history. Vegetated shorelines slowly erode during wind storms and heavy boat traffic, allowing trees and brush to lean and fall into the lakeshore, which provides additional shoreline protection by buffering waves. Historical photographs indicate that the valley slopes had sparse vegetation and far fewer trees in the 1950s. The pines are now larger and denser along many of the valley walls, and Lake Spokane has large areas with well-vegetated shoreline.

Studies at various other reservoirs and field observations around Lake Spokane indicate that wind- and boat-generated waves are the predominant force eroding the reservoir banks. These waves erode the toe of the steep valley wall slopes, and localized areas have experienced shallow translational slides, some of which remain active today, while others have largely stabilized. Vegetation has taken hold on portions of these slides since about the 1950s and should continue to gradually provide more slope and shore structure and stability, thereby reducing slope erosion.

Erosion of the toe of steep slopes causes and maintains the slides around the shore. The steep valley wall slopes with shallow translational slides are typically located in the lower reservoir on slopes greater than 20 degrees. Based on USGS topographic maps, about 200 acres of the reservoir shoreline have steeper slopes within 0.3 mile of the shore (Earth Systems and Parametrix, 2004). This is the zone that is most influenced by shoreline erosion processes. Slopes greater than about 28 degrees are near the edge of stability, and vegetation begins to play an important part in holding the surface together.

3.3.1.1.6 Turbidity

Reservoir wind- and boat-wave action, naturally high flows, rapid water-level fluctuations, rain splash and rill bank erosion, chronic erosion sites, and human-caused disturbances can affect water quality by increasing bank erosion and resuspending fine sediments along river, lake, and reservoir shorelines.

Wind- and boat-generated waves and high runoff flows are the main factors that raise turbidity in the Project system. Introduction of sediment from basin erosion from roads, farms, and construction areas also changes turbidity in the system. Water level fluctuation rates are not considered an erosion factor causing water turbidity because of the relatively slower rates of level changes used for the Project reservoirs.

On Coeur d'Alene Lake, field observations and wave modeling indicate that winds of 1 to 15 miles per hour would typically result in small waves on the shores that would not create turbidity or noticeable erosion (Earth Systems and Parametrix, 2004). Winds above 15 miles per hour result in wave heights of 0.5 foot or greater. Wind- or boat-generated waves that are greater than 0.5 foot are large enough to create turbidity and begin to erode unarmored shoreline banks.

Water samples were taken to measure turbidity and total suspended solids at three sites along the lower St. Joe River before and during the 2003 Fourth of July holiday weekend to evaluate the influence of boat-wave erosion on the main river channel (Earth Systems and Parametrix, 2004). Water quality sampling indicates that fine-grained sediment is being washed from the banks by boat waves. Eroded clay and fine silt remain suspended for hours or days as the stream current slowly moves it downstream, while fine and medium sand quickly settles on the erosion ledge, where it is temporarily stored until resuspended during natural low water periods by wave erosion, freeze/thaw, seepage, and rain splash erosion. At the Big Bend Site, turbidity at the right bank ranged from 1 to 12 nephelometric turbidity units (NTUs) before boat traffic began and from 23 to 1,176 NTUs during periods of boat traffic. Total suspended solids ranged from 2 to 5 milligrams per liter before boat traffic and from 49 to 6,300 milligrams per liter during boat traffic. The water was turbid near both the right bank (where the monitoring occurred) and the left bank but was visibly worse at the inside of the sharp right bank turn. The plume of turbid water was observed along the entire shoreline with boat traffic (Earth Systems and Parametrix, 2004).

3.3.1.1.7 Hazardous Materials

The Coeur d'Alene River Basin is one of the largest areas of historical mining operations in the world, with mining activities in the upper basin having contributed an estimated 100 million of tons of mine waste to the river system since the late 1880s. Until as recently as 1968, tailings were deposited directly in the river. Over time, these wastes have been distributed throughout more than 150 miles of the Coeur d'Alene and Spokane rivers, lakes, and floodplains.

The Bunker Hill Mining and Metallurgical Complex National Priorities List (Superfund) Site is located in the Coeur d'Alene River Basin. It was listed on EPA's National Priorities List in 1983. Contaminants from mining operations spread harmful levels of heavy metals down the South Fork of the Coeur d'Alene River and into the floodplain. It is in this area (Operable Unit [OU] 3) that mining contamination overlaps with a portion of the Project area. In September 2002, EPA issued its plan to clean up mining contamination in OU 3 over a 30-year period (EPA, 2002). The Record of Decision (ROD) describes the proposed cleanup work.

Three environmental priorities were identified in the ROD: dissolved metals in surface water (particularly zinc and cadmium), lead in floodplain soil and sediment, and particulate lead in surface water (EPA, 2002). The selected remedy does not include remedial actions for Coeur d'Alene Lake. Instead, EPA (2002) notes that federal, state, tribal, and local governments are in the process of implementing a lake management plan outside the Superfund process using separate regulatory authorities.

The pre-mining-era bed of the Coeur d'Alene River, along with its banks and floodplain, is mostly covered by deposits of metal-enriched sediments. Relative to median concentrations of metals in sediments of the region, the metal-bearing sediments are highly enriched in lead, zinc, silver, arsenic, antimony, and mercury; and enriched to a lesser degree in copper, cadmium, iron, and manganese (Fousek, 1996, as cited in Bookstrom et al., 1999). Compared to the regional background metal contents of sediments from the St. Joe River Valley, Abraham (1994, as cited in Bookstrom, et al., 1999) determined the following metal-enrichment factors for mining-derived sediments of the Coeur d'Alene River Valley: lead (211, indicating that there is 211 times more lead in the metal-enriched sediments than in the regional background sediments), silver (200), antimony (75), cadmium (41), zinc (39), arsenic (26), manganese (25), iron (3.5), and copper (3.0).

Mine wastes have been distributed throughout more than 150 miles of the Coeur d'Alene/Spokane River Basin, including rivers and floodplains. EPA, in cooperation with WDOE and USGS, sampled sediments on beaches and banks of the Spokane River in the fall of 2000 (EPA, 2001a). The study report indicates that a health advisory was issued by the Spokane Regional Health District for the area between the Idaho-Washington state line and Upriver Dam, encompassing two locations where reported lead concentrations were greater than 700 milligrams per kilogram.

3.3.1.2 Environmental Consequences

3.3.1.2.1 Effects of Lake Level Management

Currently, erosion of sediment occurs along portions of the shoreline of the lateral lakes and lower river levees and within the drawdown zone of Coeur d'Alene Lake and Lake Spokane (Earth Systems and Parametrix, 2004). The extent of shoreline erosion is influenced both by natural factors (soil type, bank configuration, and wind direction) and factors controlled by humans (creation of Project reservoirs, land-use activities, and recreational use such as the operation of motor boats). In addition, Project regulation of reservoir pool levels and flow releases affect sediment transport within the Project's lakes and rivers.

Post Falls Project

The Post Falls Project currently regulates the upper Spokane River and Coeur d'Alene Lake level about 6 to 7 months of the year, depending on inflow, weather conditions, snowpack, and other factors. Because the lake backs up into the Coeur d'Alene, St. Joe, and St. Maries rivers, Project operations also influence lower portions of these rivers. The summer lake level sets the elevation at which wind and boat waves influence shorelines during the Project-regulated periods (Earth Systems and Parametrix, 2004). Additionally, boat numbers, types, and sizes have increased significantly during the last 40 years on Coeur d'Alene Lake, with the lake currently receiving more than 1 million recreational visits per year, primarily for recreational and angler boating (Louis Berger Group, 2004a). Based on these recreation visitation trends, it is clear that boat-generated wave erosion on the lake and its tributaries would continue and could increase under current or proposed Project operations. The areas most affected by the erosion caused by boat wakes on the Coeur d'Alene and St. Joe rivers also have few, if any, boating restrictions.

On the St. Joe River levees, the Project's maintenance of a summer lake level has resulted in inundation of the low, downstream ends and the front inside edge of the levees. This has resulted in narrowing of the levees and a change in vegetation, ultimately resulting in loss of the levee tops. Project-related inundation since construction has resulted in vegetation loss between the 2,122- and 2,128-foot elevations in these areas; however, many other factors are responsible for erosion, such as boat- and wind-generated waves and natural erosion mechanisms such as vegetation removal, freeze/thaw, rain splash, rill erosion, and stream currents.

On the Coeur d'Alene River, a similar loss of vegetation in the 2,122- to 2,128-foot elevation zone has resulted, to a large degree, from the existence of Post's dams and the Post Falls Project and the current summer pool. Erosion on the inside of the levees is more related to the loss of vegetation from agriculture, dike construction and maintenance, industrial sites, logging, and boat-wave erosion.

Recent evaluation of shoreline erosion associated with the natural levees on the lower Coeur d'Alene and St. Joe rivers and Coeur d'Alene Lake (Earth Systems and Parametrix, 2004) indicates the following:

- Loss of vegetation in the 2,122- to 2,128-foot elevation zone is largely a result of inundation due to the existence of Post’s dams and the Project operations for nearly 100 years.
- Bank erosion on the inside of the levees along the St. Joe River below river mile 2 is primarily due to boat-generated wave erosion and inundation associated with the Project’s high summer lake levels; other erosion processes are relatively less important factors. From about river mile 2 and downstream, the natural levee was low and narrow, so inundation of the 2,122- to 2,128-foot elevation zone was the main change that resulted in the loss of upland vegetation. However, here the narrow remaining upland is limited and continuously eroded by boat-generated waves, so cottonwood survival is low and the rate of erosion is high.
- Overall, bank erosion on the outside of the levees downstream of river mile 2 is caused by a combination of wind- and boat-generated wave erosion.
- Along the St. Joe River levees between river mile 0 and river mile 7, erosion of the inside of the levees (from all causes) is occurring at a rate of about 1.3 acres per year (Earth Systems and Parametrix, 2004, Appendix C, Table C-1).
- Because of the metal-enriched mine wastes mixed in with the natural alluvium (making the surface soil units denser), the Coeur d’Alene River levee banks are eroding more slowly than the St. Joe River levees, with the boat-wave-cut ledges narrower along the Coeur d’Alene River. The inside of the Coeur d’Alene River levees (river mile 0 to river mile 4) are eroding at the rate of about 0.3 acre per year (Earth Systems and Parametrix, 2004, Appendix C, Table C-1).
- Around Coeur d’Alene Lake, recent hydroelectric development-related shoreline erosion has been fairly limited because the lake is operated within its natural range, much of the shore is bedrock or is rocky in nature, and most road, railroad, building, and yard areas were armored decades ago. A combination of wind- and boat-generated waves creates the beach and shore conditions around the lake.

Recent evaluation of sediment transport in the Coeur d’Alene River (Golder, 2004b) indicates that:

- The vast majority of sediment moving in the Coeur d’Alene River occurs during bankfull or greater flows. Bankfull flows in the lower reaches of the Coeur d’Alene River can transport approximately 3,000 to 7,000 metric tons per day of sediment. One-hundred-year flows in the lower reaches of the Coeur d’Alene River can transport approximately 150,000 to 250,000 metric tons per day of sediment.

- The river channel's bottom profile shows a definitive change in slope at a river bottom elevation of approximately 2,105 feet, corresponding to approximately river mile 29. This transition point is significantly lower than the 2,128-foot managed level and the level of the lake outlet sill (Avista, 2005, Figure 5-6).
- A small, localized change (i.e., a bump) in the river channel profile exists about 30 miles upstream of the lake on the Coeur d'Alene River (Avista, 2005, Figure 5-6). The small change in channel profile corresponds to a lake level elevation range of approximately 2,126 to 2,128 feet. There does not appear to be a significant upstream or downstream progression of the change in channel profile. This profile change may be a localized response to lake level management, resulting in deposition of sediments at this location. The source of sediment may be from less-frequent, lower-magnitude peak flows in the early fall season.
- Regulation of lake levels by the Post Falls Project is not anticipated to significantly change or affect the transport and deposition of sediments in the Coeur d'Alene River because regulation typically does not occur when the majority of sediments are moving in the river system.

Recent evaluation of sediment transport in the St. Joe River (Golder, 2004b) indicates that:

- Sediment transport and deposition characteristics in the St. Joe River are anticipated to be similar to the Coeur d'Alene River. The contribution of sediment from boat-wake erosion that occurs between June and September, when Post Falls Project operation controls lake levels, is minimal compared to the suspended sediment contribution resulting from naturally occurring peak flows.

- Regulation of lake levels by the Post Falls Project is not anticipated to significantly change or affect the transport and deposition of sediments in the St. Joe River because regulation typically does not occur when the majority of sediments are moving in the river system.

- The channel bottom profile shows a definitive change in slope at a river bottom elevation of approximately 2,105 feet, corresponding to river mile 26 (Avista, 2005, Figure 5-7). This transition point is significantly lower than both the 2,128-foot managed level and the 2,120-foot level of the lake outlet sill.

- A small, localized change (i.e., a bump) in the river channel profile exists about 32 miles upstream of the lake on the St. Joe River (Avista, 2005, Figure 5-7). The small change in channel profile corresponds to a lake level elevation range of 2,126 to 2,128 feet. There does not appear to be a significant upstream or downstream progression of the change in channel profile. This profile change may be a localized response to lake level management, resulting in deposition of sediments at this location. The source of sediment may be from less-frequent, lower-magnitude peak flows in the early fall season.

Under current Project operations, most of the lateral lakes along the two rivers also exhibit some erosion on shores exposed to wind waves. This erosion is on a scale similar to natural erosion; however, effects are at a higher elevation due to the raised summer lake level. On the backside and downstream ends of the levees, wind- and boat-generated waves and flood deposition have annually changed the upland and emergent wetland plant zones as deposition during high flows builds them out; these waves then modify and redistribute the sediment.

It is difficult to identify erosion in the Spokane River upstream of the Post Falls dams that is directly related to hydroelectric development operations because of the large number of development-related streambank modifications. The main Project-related change is the shift of the summer boat-wave erosion energy to a higher elevation. With the Project, this energy is focused above the lower, unconsolidated river bars and up onto the lower portion of the vegetated "flood stage banks" at the 2,128-foot elevation.

Our Analysis

Under the Proposed Action, lake levels would be controlled by operating the Project to satisfy proposed reservoir water level targets and several development flow-discharge-related requirements. Target water levels would be set to balance support of current recreational uses on Coeur d'Alene Lake with downstream flow concerns by maintaining the lake elevation near 2,128 feet from as early as practicable each summer until September 15, but subject to several flow discharge requirements (i.e., trout spawning flows and minimum flow criteria). The extra 1 to 2 weeks the lake is held at 2,128 feet beyond Labor Day appears to be broadly supported by the stakeholders and is not a significant difference from the current operating conditions.

Managing Project reservoir levels under the Proposed Action would not substantially change the current hydrologic characteristics or morphologic trends of Coeur d'Alene Lake, Nine Mile Reservoir, and Lake Spokane, or in the two smaller Project development reservoirs. Wave action and flood flows are the principal causes of reservoir shoreline and levee erosion. Maintaining a reservoir water level at any one specific elevation, either naturally or through hydroelectric operations, results in repeated wave action along the reservoir shoreline, thereby increasing the potential for erosion at that elevation.

In the Coeur d'Alene, St. Joe, and St. Maries rivers, the majority of sediment transport occurs during periods of high flows that do not coincide with the time that the development influences water levels. Therefore, the Proposed Action would not have any effect on sediment transport and deposition as compared to the current conditions.

On the St. Joe River, any erosion-related effects from the Proposed Action would also be essentially the same as under current Project operations. Between river mile 0 and river mile 7, approximately 39 to 65 acres would erode during the next 30 to 50 years (Earth Systems and Parametrix, 2004) due primarily to boat-wave-generated erosion. These estimates would apply in the absence of the Proposed Action measure PF-TR-1 but could be reduced by implementing the Erosion Control Program included in that measure.

On the Coeur d'Alene River, any erosion-related effects from the Proposed Action would continue at about the same rate as under current Project operations. Erosion along the lower 4 miles of the river during the next 30 to 50 years would total about 9 to 14 acres (Earth Systems and Parametrix, 2004, Appendix C, Table C-1). Between river mile 4 and river mile 27, erosion would total about 42 to 69 acres during the next 30 to 50 years (Earth Systems and Parametrix, 2004). These estimates would apply in the absence of Proposed Action PME measure PF-TR-1 but could be reduced by implementing the Erosion Control Program included in that measure. In addition, erosion may be further reduced as EPA implements its Coeur d'Alene Basin ROD, which calls for extensive bank stabilization efforts along the lower Coeur d'Alene River.

No data are available specific to the role of metals leaching from the stream banks or remobilizing from deposited sediments and the interaction between these processes and Project lake level management. However, the issues of metals contamination and the potential influence of lake level management on the transport of sediment and metals are discussed in detail in Golder (2005b) and are addressed in the water-quality-related sections of this document. Given the minimal changes in Project operations related to Coeur d'Alene Lake water levels and the associated processes affecting metals transport and mobilization, the effects of the Proposed Action would be largely the same as under current Project operations.

Spokane River Developments

Upper Falls Development is operated as a run-of-river facility, with little fluctuation in reservoir level. The shorelines around the reservoir for this development are highly developed and greatly altered, typically characterized by large rock and boulder fill, other constructed materials, and/or are well vegetated with a shrub and deciduous tree riparian fringe. Reservoir level management associated with operation of Upper Falls Development has no significant effect on erosion, and little if any erosion is evident.

Monroe Street Development creates a very small reservoir and is operated as a run-of-river facility, with very minimal reservoir fluctuations. The reservoir is located within the incised bedrock ledges that form the Spokane Falls, and its operation has no effect on erosion.

Since Nine Mile Reservoir is aggrading in response to sediment inputs from Hangman Creek, bank erosion is generally minimal. Based on available sediment data, there is a net annual accumulation of between approximately 25,000 and 75,000 cubic yards of predominantly coarse-grained sediments (gravel and finer) in Nine Mile Reservoir. The sediment bypass tube installed in the 1990s allows much of the coarse- and fine-grained sediments to move downstream without passing through the turbines. Nine Mile Development is expected to pass, on average, approximately 75 percent of the sediment entering the reservoir (Golder, 2004b).

The surface elevation of Lake Spokane is such that wind- and boat-waves have eroded some small, localized areas along the toe of the steep valley wall that were at the edge of stability prior to construction of the impoundment. Many of the steep slopes that were initially prone to erosion have since stabilized due to the natural creation of benches and/or beaches at their toes or intersections with the reservoir. Additionally, changes in land use (i.e., reduction of livestock grazing) since the 1950s have allowed for revegetation and toe-slope healing along many of the steep slopes. The few areas still prone to erosion have not been able to support vegetation due to their slope, soil, and aspect. Portions of these steep slope areas, estimated to cover a total of about 24 acres along the approximately 40 miles of lake shoreline, could continue to experience shallow translational slides and wave-related erosion over the next 30 to 50 years, with some areas healing and others failing again. Overall, the area subject to these slides is expected to stay relatively constant (Earth Systems and Parametrix, 2004).

Sediment deposition within Lake Spokane is anticipated to continue under current Project operations (Golder, 2004b). Deposition of sediments would be predominantly finer-grained clays, silts, and sands. Coarse materials that have passed Nine Mile Dam would most likely accumulate within the first 1 to 3 miles downstream of Nine Mile Development. Finer-grained materials would most likely deposit within 1 to 8 miles downstream of the development. During the next 50 years, Golder (2004b) estimated that the elevation of the thalweg (deepest point in the channel) in the upper portions of Lake Spokane could fill in by approximately 2 feet about 2.5 miles downstream of Nine Mile Development, by approximately 4 to 5 feet about 3.5 miles downstream of the development, and by approximately 4 feet about 6.5 miles downstream of the development. Sediment accumulation in other areas outside the thalweg would also likely continue, but at lower rates than that within the thalweg (Golder, 2004b).

Sediment transport past Long Lake Development is negligible and limited almost entirely to fully suspended load that passes through the entire reservoir (Golder, 2004b). Sediment transport/deposition and flow conditions downstream of Long Lake Development are governed by the downstream channel characteristics (i.e., deeply incised bedrock channel) and other downstream hydroelectric projects (i.e., Little Falls Development and Grand Coulee Dam). As such, effects from a relative reduction in sediment loading to downstream reaches as compared to natural river conditions are likely to be insignificant (Golder, 2004b).

Future operation of the reservoirs under current Project operations has the potential for minor erosion along reservoir shorelines, sediment deposition within the reservoirs, and reduced sediment supply to reaches of the Spokane River downstream of Long Lake Development.

Our Analysis

Managing Project reservoir levels under the Proposed Action would not substantially change the current hydrologic characteristics or morphologic trends of Nine Mile Reservoir, and Lake Spokane, or in the two smaller Project development reservoirs. Wave action and flood flows are the principal causes of reservoir shoreline and levee erosion. Maintaining a reservoir water level at any one specific elevation, either naturally or through hydro operations, results in repeated wave action along the reservoir shoreline, thereby increasing the potential for erosion at that elevation.

Erosion, sediment deposition, and sediment transport related to operation of Upper Falls, Monroe Street, and Nine Mile Developments would continue unchanged under the Proposed Action.

In Lake Spokane, the Proposed Action would make the current voluntary practice of a 14-foot maximum drawdown a requirement. Since the Proposed Action would change only the license language (not the way the Project is currently operated), the effects of the Proposed Action would be the same as under current Project operations. Erosion, sediment transport, and deposition would therefore be unaffected by the proposed Long Lake Development operations under the Proposed Action.

3.3.1.2.2 Project Flow Releases

Post Falls Project

The Post Falls Project affects flows in the upper Spokane River about 6 to 7 months of the year, depending on inflow, weather conditions, snowpack, and other factors (Earth Systems and Parametrix, 2004). The larger, sediment-competent flows that occur during winter and spring runoff events are unaltered by Project operations. The Proposed Action would set a minimum Post Falls Project discharge flow of 600 cfs, which would drop to 500 cfs during drier summers, per criteria in PF-AR-1—an increase of at least 300 cfs over the current minimum flow requirement during normal-water years. In addition, the Proposed Action includes other flow-related items, including a rainbow trout spawning and emergence flow target, downramping restrictions, aesthetic flows, and potential whitewater boating flows, which would represent changes in various Project Development flow release requirements and targets.

Our Analysis

Under the Proposed Action, naturally occurring peak flows would continue to occur on the Spokane River. Minimum discharge flows out of the Post Falls Project would increase from 300 cfs or less to a minimum of 600 cfs, with a trigger to 500 cfs during drier summers; however, flows of this size (i.e., 500 or 600 cfs) are still much lower than the dominant sediment transport flows. Under the Proposed Action, the Spokane River would continue to receive the same amount of sediment supply from Coeur d'Alene Lake and other sources, and sediment transport past and downstream of the Post Falls Project would be similar to current conditions. All bedload and most suspended load traveling down the Spokane River would continue to be intercepted by the lower Project reservoirs, primarily Nine Mile Reservoir, Lake Spokane, and other hydroelectric facilities on or affecting the river.

Because the timing and nature of peak flows would be unaltered, as compared to the current operation, the net flow-related effects of the Proposed Action on sediment transport and erosion would be negligible. The increase in minimum flows from 300 to 600 cfs would not affect sediment transport in the lower Spokane River due to the low sediment carrying capacity at those low flows. Erosion on the Spokane River would remain similar to that found under current Project operations.

Spokane River Developments

The developments affect flows in the upper Spokane River about 6 to 7 months of the year, depending on inflow, weather conditions, snowpack, and other factors (Earth Systems and Parametrix, 2004). The larger, sediment-competent flows that occur during winter and spring runoff events are unaltered by Project operations.

Our Analysis

Under the Proposed Action, the Spokane River would continue to receive the same amount of sediment supply from Coeur d'Alene Lake and other sources, and sediment transport past and downstream of the Post Falls Project would be similar to current conditions. All bedload and most suspended load traveling down the Spokane River would continue to be intercepted by the lower Project reservoirs, primarily Nine Mile Reservoir, Lake Spokane, and other hydroelectric facilities on or affecting the river.

Because the timing and nature of peak flows would be unaltered, as compared to the current operation, the net effects of the Proposed Action on sediment transport and erosion would be negligible. Erosion on the Spokane River would remain similar to that found under current Project operations.

3.3.1.2.3 Effects of Sediment Transport

<u>*Post Falls Project*</u>

Sediment Transport in the Coeur d'Alene and St. Joe Rivers—The majority of sediment moving in the Coeur d'Alene and St. Joe rivers occurs during bankfull or greater flows, which typically occur between November and June. Peak flows typically occur between March and June, and peak flows are rarely seen in the historical record during the period when the Post Falls Project is regulating lake levels (between June and November). Since 1913, flows exceeded the bankfull flow during Post Falls Project control of the lake levels only three times, and there was one bankfull flow in the St. Joe River during the 86-year period of record that coincided with the time when the Post Falls Project controls lake levels. Mobilization of sediments occurs at almost all flows, but Golder (2004b) modeling results indicate that the most significant percentage of sediment movement occurs when limiting velocities for source materials are overcome, corresponding approximately to the bankfull flow events.

Coeur d'Alene Lake levels relate to sediment transport by affecting tributary river velocities, a principal factor influencing the transport of the fine sediment in these rivers. Golder (2004b) conducted hydraulic modeling to examine the effects of altering lake levels on instream velocities—and hence sediment transport—in the Coeur d'Alene and St. Joe rivers. Two scenarios were run for each river: a constant lake level at a 2,124-foot elevation and a constant lake level near a 2,128-foot elevation. The lower lake level of 2,124 feet was selected because it represents approximately the mean daily lake level for an unregulated hydrograph over the period of record (i.e., 1913 to current). It also represents the typical lake level during peak flows in the Coeur d'Alene and St. Joe rivers between 1911 and 2003. The lake level of 2,128 feet represents current Project operations.

The results at river mile 10 (shown in the Avista PDEA [Avista, 2005, Table 5-1]) for both the Coeur d'Alene and St. Joe rivers indicate that velocities decrease as lake levels increase. The decrease in velocity is consistent with the anticipated decrease in gradient that would result from an elevated lake level. However, the change in velocity is very small, and even the lowest velocities are within the range of limiting velocities for transporting fine-grained sediment.

Finer-grained sediments such as silts and sands have a limiting velocity of approximately 2.5 to 3.0 feet per second (fps). Based on these criteria, the decrease in flow velocity because of a higher lake level would not significantly affect the potential for sediment to move at the varied lake levels evaluated.

Current and proposed Project operations result in increased lake levels on Coeur d'Alene Lake. This results in decreased water velocities in the Coeur d'Alene and St. Joe rivers; however, the change in velocity is very small, and even the lowest velocities are within the range of limiting velocities for fine-grained sediment. In addition, bankfull and larger flows almost always occur when the lake is not regulated by the Post Falls Project, resulting in little Project effect on sediment transport. Therefore, current Project operations are not believed to have a significant effect on the movement of sediment.

Our Analysis

The Proposed Action lake levels would be essentially the same as under current Project operations, which do not appreciably affect sediment transport in the Coeur d'Alene and St. Joe rivers. Therefore, the Proposed Action would have little, if any, effect on sediment transport in these rivers.

Sediment Transport in the Lateral Lakes of the Coeur d'Alene and St. Joe Rivers—Golder (2004b) modeled water velocities within the lateral lakes for unregulated and regulated conditions. Horizontal water velocities were examined and compared to the settling velocities for suspended sediments. Modeled water velocities within the lateral lakes were relatively small, typically falling within the order of magnitude of 1×10^{-3} meters per second, which equates to about 295 feet per day. The settling velocities are therefore 1 to 2 orders of magnitude less than the predicted horizontal velocities. Changes in velocity that occur for the modeled scenarios (i.e., unregulated versus regulated conditions) are typically relatively small and typically within the same order of magnitude, indicating that lake level has little effect on sediment transport in the lateral lakes.

Our Analysis

Project operation establishing a steady summer elevation has decreased water velocities in the Coeur d'Alene and St. Joe rivers and altered the lake levels and velocities in the lateral lakes of these two rivers. The change in velocity is very small, and even the lowest velocities are within the range of limiting velocities for fine-grained sediment.

The Proposed Action would not be much different than current Project operations. As such, the Proposed Action would have little, if any, effect on sediment transport within the lateral lakes of the Coeur d'Alene and St. Joe rivers.

Sediment Supply and Transport in Coeur d'Alene Lake—Sediment supply and deposition in Coeur d'Alene Lake is related to the lake's tributary streams. Sediment supply and transport in the two largest tributaries, the Coeur d'Alene and St. Joe rivers, is mostly unaffected under current Project operations and would remain so under the Proposed Action. Sediment supply to the lake from other tributaries is unaffected by the Project. Sediment transport to the lake is typically through the bays into which these tributaries discharge. Sediment transport through these bays was analyzed by Golder (2004b) using the same methods as for the lateral lakes. Results were the same as for the lateral lakes: modeled horizontal water velocities within the small bays were found to be relatively small, with settling velocities approximately 1 to 2 orders of magnitude less than the predicted horizontal velocities. Changes in velocity that occur for the modeled scenarios (i.e., regulated versus unregulated conditions) are typically relatively small and typically within the same order of magnitude, indicating that lake level has little effect on sediment transport in the bays. Hence, the Project has little, if any, effect on sediment supply and transport to the lake.

Our Analysis

The Project currently causes no change in the net sediment flux in Coeur d'Alene Lake. The supply of sediment and its transport to the lake from its tributaries/bays does not appreciably change with the Project in place, and ultimately the same amount of sediment enters the lake through the course of a season. Deposition of coarse sediment may be at a higher elevation along the lakeshores and deltas if coarse sediment transport occurs during a time when lake levels are elevated by the Project, but winter and spring high flows subsequently transport this sediment to a lower elevation. The Proposed Action would not appreciably change sediment supply and transport in Coeur d'Alene Lake as compared to current Project operations.

The Sierra Club and Lands Council filings of July 17, 2006, proposed that Avista fund a sediment transport and monitoring effort in Coeur d'Alene Lake (including tributaries) based on actual field data and modeling methods such as those used by the USGS.

The staff agrees that data collection and sediment monitoring would be useful towards the water quality effort; however, the staff does not feel that the minor change in proposed operation warrants sediment transport modeling in Coeur d'Alene Lake. The proposed change in operation deals only with low flows, whereas sediment transport is mobilized by high flows.

Spokane River Developments

The Spokane River both upstream and downstream of the Post Falls Project is largely a sediment transport reach until it reaches the upstream end of the City of Spokane's Upriver Project. The Project hydroelectric developments located downstream of the Upriver Project then have various effects on sediment transport, depending on the hydroelectric development's specific location and configuration.

The Upper Falls diversion dam structure is located in line with the main river channel. The bottom elevation of the control gates generally match the river bottom level, and the impounded reservoir pool behind the dam is relatively small and operated in a run-of-river fashion. As a result, flows entering the hydroelectric development reservoir pass through and exit without decreasing in magnitude. Operation of Upper Falls Development therefore allows virtually all sediments to pass the hydroelectric development during flows when materials are moving in the channel.

Monroe Street Development is constructed within a bedrock-controlled reach on the lower Spokane Falls. This portion of the river has always had a steep gradient and increased sediment transport potential. There is no evidence to suggest that Monroe Street Development's operations have significantly changed the pre-existing sediment transport or deposition conditions at this river location. All sediment supplied from upstream, aside from highly localized deposition of larger bedload material, is transported through this reach.

Hangman Creek Watershed is a substantial source of sediment to the Spokane River, and substantial sediment deposition in Nine Mile Reservoir is expected to continue, although Proposed Action measure SRP-TR-1 is intended to help reduce sediment inflow from Hangman Creek. No change in sediment transport through the reservoir associated with Post Falls Project minimum discharge flow increases under the Proposed Action is expected because it is the larger flow conditions that drive sediment transport through Nine Mile Development.

Under current Project operations, sediment deposition within Lake Spokane is predominantly finer-grained clays, silts, and sands. Under the Proposed Action, drawdowns would be limited to 14 feet, which is not physically different from current Project operations. During drawdowns under the Proposed Action, sediment deposited in areas previously inundated by the reservoir backwater but still within the wetted river channel may become remobilized. This sediment is expected to be transported and deposited a short distance farther downstream, being redeposited once it again reaches the reservoir influence.

Sediment transport past Long Lake Development is currently negligible and limited almost entirely to fully suspended load that passes through the entire reservoir as would be the case under the Proposed Action.

Our Analysis

The Upper Falls and Monroe Street Developments currently pass all sediment, aside from localized deposition of larger bedload material at Monroe Street. There is no evidence to suggest that the occasional increase in base flow during the summer months, or other proposed flow adjustments under the Proposed Action, would change the way these hydroelectric developments influence sediment transport. The current sediment supply and transport rates in Nine Mile Reservoir and Lake Spokane would continue to be similar to current conditions under the Proposed Action. PME SRP-TR-1 is intended to support regional efforts to reduce erosion and sediment inflow from Hangman Creek. Since this is intended to address the predominant sediment input, it will help reduce sediments in the river system downstream of this confluence.

The Sierra Club and Lands Council filings of July 17, 2006, proposed that Avista fully study sedimentation and perform aggressive sediment management in the Spokane River reservoirs. The WDOE July 17, 2006, filing and WDFW July 17, 2006, filing also urge more study and planning for this issue. Avista recommended in its August 1, 2006, filing that the Commission reject these proposals.

In SRP-TR-1, Avista focuses on Hangman Creek as the source of new sediments to the system. That proposed measure would contribute to reducing the new sediment load; however, the resources allocated to sediment reduction in Hangman Creek is a small fraction of the resources associated with that PME.

Nine Mile Reservoir and Lake Spokane have been capturing sediment from upstream since their construction. In 1994, two turbines at Nine Mile were replaced due to excessive damage from sediment. In 1996, a sediment bypass tube was installed in an effort to extend the life of the turbines (NHC, 1999). In 1999, it was estimated that approximately 5 years of available sediment storage remained, before the area upstream of the spillway is filled (NHC, 1999). This will increase sediment being passed through to Lake Spokane and the rate of accumulation in Lake Spokane. Therefore, changes in the downstream environment could accelerate. Significant sediment accumulation can alter the Project environment in several ways: channel changes and erosion; an increase in Eurasian watermilfoil habitat; increased nutrient loading and cycling; increased shallow water habitat leading to warmer temperatures; and an aquatic environment more favorable to non-native fish species.

The proposal to replace the wooden flashboards at Nine Mile Dam with a more permanent rubber dam has the potential to change the sediment transport and deposition in the upper reach of the Nine Mile pool. Currently, sediment is deposited in the upper reach of the Nine Mile pool up to Seven Mile Bridge. When the 10 feet of flashboards are removed or blown out (to elevation 1,596.6 feet), gradient and velocities in the upper reach increase, reducing sediment deposition. If the pool is maintained 10 feet higher during this period (at elevation 1,606.6 feet), it is possible that the area of deposition will increase.

Near the Nine Mile Dam site, sediment buildup on the inside bar is pushing the thalweg to the opposite (west) side of the bend (NHC, 1999), causing some undercutting of the bank. Downstream of Nine Mile Development, future sediment deposition is expected to occur mainly within 1 to 8 miles from the dam (Golder, 2005a). In the next 30 to 50 years of operation, bed level changes in the upper portions of Lake Spokane could increase.

The WDOE July 17, 2006, filing claims the PDEA discussion on sediment does not lead to concise statements of effects. It estimates that during the next 50 years, the deepest point of the river channel downstream of the Nine Mile Development will decrease in depth by 2 to 4 feet due to sediment deposition and that sediments trapped by the developments have the potential to impact water quality.

In the staff's opinion, Project operations store, transport, and control new sediments supplied to the system (and also years of sediments stored within the system). Sediment transport and deposition within the system also has implications for water quality, fish, and benthic organisms. The staff agrees with the need for additional measures and a Sediment Management Plan for the Nine Mile and Long Lake Reservoirs (including the two related Project developments). This plan should address sediment transport (or the lack thereof) and the impacts to the river system, sediment characterization, a process for regular monitoring of sediments trapped by the developments, and a plan for final disposition of sediments. The plan should document current deposition and transport rates and patterns in the reservoirs, including the effect of the dams on how sediment is stored in the reach.

3.3.1.2.4 Effects of Erosion

Post Falls Project

Available studies and analysis specific to erosion and the geomorphic processes associated with the Project indicate that operation of the Post Falls Project is contributing to ongoing erosion by holding the summer lake level at or very near a constant elevation. However, boat- and wind-related wave action are the primary causes of erosion and are concentrated at the approximately 2,128-foot water-surface/shoreline interface, as determined by the prevailing summer lake level. In the absence of the nearly constant summer lake level, the effects of boat- and wind-related wave action would still occur, but at lower shoreline elevations (Earth Systems and Parametrix, 2004).

The Commission has said that Project-induced erosion is caused primarily by daily flow fluctuations. Erosion that is not Project-induced is caused by natural phenomena, flood flows, boat- or wind-driven wave action, runoff from steep terrain during storms, loss of vegetation due to fire, or other natural causes (*34 FERC ¶ 61,254*).

Operation of the Post Falls Project affects the summer water level and thereby contributes in part to erosion along 34 miles of the St. Joe River, 32 miles of the Coeur d'Alene River, and 9 miles of the St. Maries River (Earth Systems and Parametrix, 2004). Extensive field work and analysis undertaken through the ALP (Earth Systems and Parametrix, 2004) indicates that erosion along the lower 24 miles of the St. Joe River, the lower 27 miles of the Coeur d'Alene River, and 9 miles of the St. Maries River is of most concern because of the link between erosion and its effect on habitat and archaeological sites. If current Project operations continue (i.e., stable summer lake levels at or near 2,128 feet and unrestricted boat traffic on the rivers), future erosion losses along the lower 7 miles of the St. Joe River are estimated to be about 1 to 1.3 acres per year, or about 39 to 65 acres during the next 30 to 50 years; and for the upper 17 miles of river, about 28 to 47 acres during the next 30 to 50 years. On the lower 4 miles of the Coeur d'Alene River, about 9 to 14 acres should erode during the next 30 to 50 years. Erosion along the lower 9 miles of the St. Maries River is estimated at 14 to 23 acres over the next 30 to 50 years. These estimates are based on the best available information concerning past erosion losses and rates, which reflects all influences and causes of erosion, both Project and non-Project, with boat and wind waves identified as the most significant, current, and future direct causes of this erosion.

As mitigation for erosion to Coeur d'Alene Lake by continued operation of the Post Falls Project, Avista proposes measure PF-TR-1, Coeur d'Alene Lake and Tributary Erosion Control and Wetland and Riparian Habitat Protection and Enhancement. This PME measure has two components: an Erosion Control Program and a Wetlands and Riparian Habitat Protection and Enhancement Program. Under the Proposed Action, Avista, in consultation with relevant cooperating parties, would implement the Erosion Control Program for the specific purpose of addressing the effects of continued operation of the Post Falls Project on erosion processes. The Wetlands and Riparian Habitat Protection and Enhancement Program of PME measure PF-TR-1 is discussed in section 3.3.5.

The Erosion Control Program would:

- identify and prioritize areas of particular interest for protection needs and specific erosion-control activities and projects. Potential sites and erosion control measures that may be included in the initial plan are discussed in the *Final Spokane River Hydroelectric Project Phase 2 Erosion Assessment* (Earth Systems and Parametrix, 2004);

- likely to be prioritized based on the presence and condition of the National Register-eligible archeological sites;

- include appropriate monitoring and evaluation of biological and physical effectiveness of the specific erosion-control measures to be implemented; and

- be implemented within the first 5 years of the license term, with updates on a 5-year cycle.

The DOI recommended in its July 17, 2006, BIA 4(e) filing condition no. 2 that Avista develop and submit for review and approval a Coeur d'Alene Indian Reservation Shoreline Erosion Control Plan (Erosion Control Plan) to "address erosion occurring on trust lands within the Coeur d'Alene Indian Reservation up to and including the 2128 ft. elevation and any uplands contiguous thereto." The provisions of the Erosion Control Plan included:

- identifying and prioritizing all existing erosion sites, completely describing these sites, mapping them, preparing designs of erosion control measures for each site, and preparing and implementing monitoring and maintenance procedures;

- filing the plan in two parts with implementation schedules;

- contracting with an independent third-party erosion control expert;

- obtaining tribal approval; and

- providing annual reports.

The Sierra Club and Lands Council filings of July 17, 2006, proposed that Avista, along with implementing site-specific control measures on all sites mentioned in the 2004 erosion study and including monitoring and evaluation, include funding for sediment transport and monitoring based on actual field data and modeling methods.

The IDFG, in its July 17, 2006, filing, stated that holding the pool to 2,128 feet until September 15 each year would increase the length of time banks are exposed to erosion.

Our Analysis

The Erosion Control Program proposed by Avista would provide resources for protecting the most actively eroding portions of the shorelines associated with the Post Falls Project. The exact nature and specific location of all the erosion control measures that would be implemented during the next 30 to 50 years have not been determined at this time; however, priority or “target” sites have been identified for protection during the initial years following issuance of the new license, as identified in the Erosion Control Program. Additional sites could and would be determined based on the current conditions and resource needs every 5 years over the term of the new license. This approach is consistent with the fact that erosion would also occur and vary over the term of the new license, and that other erosion control efforts are underway or planned in the basin. Measures in the Erosion Control Program would provide resources to reduce erosion and otherwise protect habitat along several miles of shoreline, significant cultural sites, and other sensitive and high-value sites. The temporary increase of erosion and sedimentation during installation of erosion control measures is expected to be minimal and would be offset by future benefits.

In its July 17, 2006, BIA 4(e) filing condition no. 2, DOI request that Avista “address erosion occurring on trust lands within the Coeur d’Alene Indian Reservation up to and including the 2128 ft. elevation and any uplands contiguous thereto.” This condition assumes that all erosion on the lake is caused by the Post Falls Project, obligating Avista to remedy all erosion. Analysis shows that erosion from boat waves is the greatest source of erosive energy on reservation shorelines within the Project boundary and is the primary cause of erosion, including to cultural sites, on the reservation within the Project boundary, particularly on the St. Joe River. Maintaining the summer lake level above natural conditions merely changes the elevation at which erosion occurs. It does not cause the erosion, which is primarily due to boat waves. Due to the frequency and intensity of boat waves, erosion would continue even in the absence of the Project.

Avista filed reply comments on August 17, 2006, and September 1, 2006, and agreed to limit its responsibility to that necessary to ameliorate the Project-caused shoreline erosion on the tribe’s reservation *within* the Project boundary as identified in the expert report (Earth Systems and Parametrix, 2004) regarding the impacts of the Project on shoreline erosion.

Staff believes that Avista’s Erosion Control Program needs to be modified to include a compromise measure for erosion on tribal lands. The Erosion Control

Program shall include a plan to ameliorate Project-caused shoreline erosion on lands of the Coeur d'Alene Indian Reservation located within the boundary of the Post Falls Project, as identified in and consistent with the *Post Falls Hydroelectric Project Erosion Report in Response to Preliminary Conditions of the Department of the Interior* (Earth Systems, 2006) and the *Spokane Project Erosion Control Review, Terrestrial Resources Work Group* (Earth Systems, 2004).

The staff notes that the Coeur d'Alene Lake level naturally fluctuates between elevation 2,120 and 2,140 feet, shaping the shoreline with wind and boat waves. Much of the shore is bedrock or rocky or was armored along roads, docks, railroads, buildings, and lawns decades ago. Project-related Coeur d'Alene Lake shore erosion is limited because the lake is still within its natural range. Therefore, with regard to the northern two-thirds of the lake that is outside the reservation, and outside the backwater zone, additional erosion measures are not appropriate.

Intervenor filings claim the Project is directly or indirectly responsible for much of the erosion, making little distinction between erosion attributable to the Project and erosion attributable to other natural and human-made causes; therefore, in the staff's opinion, the proposals with more extensive measures are not necessary to mitigate for Project-related adverse impacts. Avista's proposed Erosion Control Program includes measures to prevent and/or reduce erosion of the lake (including main tributaries), as well as monitoring and evaluating the effectiveness of the measures. Additionally, the implementation would be planned and coordinated with the tribe and the relevant natural resource agencies.

Staff believes IDFG's concern that erosion would occur by holding the pool to 2,128 feet until September 15 is speculative, since the extra 1 to 2 weeks held at 2,128 feet is not a significant difference from the current operating conditions and, as we have stated, lake level is not a primary cause of erosion. Therefore, the staff believes that additional PMEs would not be necessary to mitigate for the proposed date change.

Spokane River Developments

The *Final Spokane River Hydroelectric Project Phase 2 Erosion Assessment* (Earth Systems and Parametrix, 2004) referenced by WDFW identified 15 miles of shoreline suitable for stabilization; however, the study did not identify any areas where Project operations were causing erosion. At Lake Spokane, the shoreline includes steep slopes with inherent instability (predating construction of the Project). The steep shorelines subject to slides are now expected to stay relatively constant, according to the erosion assessment.

Reservoir level fluctuations can be a significant factor in causing slope failure. The current license allows for 24 feet of drawdown in Lake Spokane.

Drawdown typically occurs in winter and has been limited to about 14 feet over the last 15 years. Little is known about the degree to which Lake Spokane drawdowns have contributed to slope failure.

The studies conducted for the relicensing effort relative to erosion and sedimentation did not identify any areas of shoreline erosion in Nine Mile Reservoir. Instead, deposition of sediment (originating in the non-Project Hangman Creek watershed), rather than erosion, is occurring in that reservoir.

As part of its Lake Spokane/Nine Mile Terrestrial, Riparian and Wetland Habitat Protection and Enhancement PME (SRP-TR-1), Avista is proposing to support additional habitat management and enhancement activities on new Project lands as well as on existing Project land that may include erosion control. Avista would also continue to support regional efforts to reduce erosion (and downstream sedimentation) in the Hangman Creek Watershed.

The Sierra Club and Lands Council filing of July 17, 2006, proposed that Avista prepare, fund, and implement an Erosion Control, Prevention, and Restoration Program for Lake Spokane.

The WDFW July 17, 2006, 10 (j) filing proposed that Avista prepare, fund, and implement an Erosion Control, Prevention, and Restoration Program for Lake Spokane and Nine Mile Reservoir.

Avista responded on August 1, 2006, recommending that the Commission reject the WDFW's proposed Erosion Control, Prevention and Restoration Program because it believes that the Project is not causing erosion in these areas and that the measure would not effectively protect any Project resources.

Our Analysis

As previously stated, there is little connection between Project operations and erosion at Lake Spokane or Nine Mile Reservoirs.. Avista is not proposing to change the drawdown limits (at Lake Spokane) of 14 feet in the winter. We agree with the studies concluding that sedimentation, rather than erosion, is occurring at Nine Mile Reservoir. Therefore, Erosion Control, Prevention, and Restoration Programs for Lake Spokane and Nine Mile Reservoirs do not need to be prepared, implemented, or funded.

3.3.1.2.5 Effects of Turbidity

<u>*Post Falls Project*</u>

Reservoir water-level fluctuations, wind- and boat-wave action, and human-caused disturbances can affect water quality by increasing bank erosion and resuspending fine sediments that have accumulated in reservoirs. Water quality sampling, erosion monitoring, and direct observations on the St. Joe River indicate that fine-grained sediment is being washed from the banks by boat-waves. Turbid water was observed during erosion studies along virtually the entire shoreline during periods of boating activity, especially along the inside of sharp river bends (Earth Systems and Parametrix, 2004).

Under the Proposed Action, Avista, in consultation with relevant cooperating parties, would implement the Coeur d'Alene Lake and Tributary Erosion Control and Wetlands and Riparian Habitat Protection and Enhancement measure (PF-TR-1) to address the effects of erosion associated with the continued operation of the Post Falls Project.

Our Analysis

Under the proposed operation, fine-grained sediment would continue to wash from the banks by boat waves, producing periods of turbid water, as it does under the current operation. Eroded clay and fine silt would remain suspended for hours or days as the stream current slowly moved it downstream, while fine and medium sand would quickly settle on the erosion ledge and be temporarily stored until resuspended during natural low water periods by wave erosion, freeze/thaw, seepage, or rain splash erosion.

The actions under measure PF-TR-1 have not been specified in detail and are not specific to addressing water turbidity; however, implementation of this measure would likely assist in reducing turbidity in the rivers and the lower levees. It is expected to protect and restore vegetation or otherwise stabilize the shorelines along portions of the levee and riverbanks. This would result in levees and riverbanks that are less erodible and therefore less likely to contribute to suspended sediments and turbidity.

Spokane River Developments

See the turbidity discussion in section 3.3.3.2.6.

3.3.1.2.6 Secondary Effects of Environmental Measures

Post Falls Project

The Proposed Action includes several measures that are designed to protect or enhance fishery and recreation resources but which may have minor secondary effects on soil erosion and/or turbidity.

In the Spokane River, Lake Spokane, or other waters near the Project, fishery enhancement, supported as a part of Proposed Action measure SRP-AR-1, may cause secondary effects such as short-term, localized increases in erosion, similar to the effects of measure PF-TR-1 discussed above. The Post Falls Project

Fish Protection, Mitigation, and Enhancement Program (PF-AR-1) would provide assistance and financial support for the development and implementation of bull trout and westslope cutthroat trout habitat enhancement activities in the Coeur d'Alene River Basin and could also cause secondary effects similar to measure PF-TR-1.

Proposed Action measures SRP-REC-1, SRP-REC-4, PF-REC-1, and PF-REC-2 together involve abandoned dock/debris removal, shoreline stabilization measures, and the construction and/or improvement of trails, beaches, breakwaters, campsites, boat ramps, and access areas. These actions have the potential to result in minor, short-term, localized increases in erosion and/or turbidity.

Our Analysis

All of the actions noted above have the potential to cause undesirable secondary effects on soil erosion and sediment supply. These effects would likely be minimized, however, through the use of best management practices.

Spokane River Developments

The Proposed Action includes several measures that are designed to protect or enhance fishery and recreation resources but which may have minor secondary effects on soil erosion and/or turbidity.

In the Spokane River, Lake Spokane, or other waters near the Project, fishery enhancement, supported as a part of Proposed Action measure SRP-AR-1, may cause secondary effects such as short-term, localized increases in erosion, similar to the effects of measure PF-TR-1 discussed above.

Proposed Action measure SRP-AR-2 would provide site-specific and general weed control through the installation, maintenance, and/or replacement of bottom or physical barriers in Lake Spokane. These activities could result in short-term turbidity and disturbance of the lakebed.

Proposed Action measures SRP-REC-1, SRP-REC-4, PF-REC-1, and PF-REC-2 together involve abandoned dock/debris removal, shoreline stabilization measures, and the construction and/or improvement of trails, beaches, breakwaters, campsites, boat ramps, and access areas. These actions have the potential to result in minor, short-term, localized increases in erosion and/or turbidity.

Our Analysis

All of the actions noted above have the potential to cause undesirable secondary effects on soil erosion and sediment supply. These effects would likely be minimized, however, through the use of best management practices.

3.3.1.3 Unavoidable Adverse Effects

Holding the lake level up through September 15 each year exposes the 2,128-foot shoreline to 1 or 2 more weeks of waves. The removal of abandoned docks and debris, shoreline stabilization measures, habitat enhancement activities, and the construction and/or improvement of trails, beaches, breakwaters, campsites, boat ramps, access areas, which are all elements of the Proposed Action, have the potential to result in minor, unavoidable, short-term, localized increases in the potential for erosion and sediment input.

3.3.1.4 Cumulative Effects

Implementing the Proposed Action would not noticeably alter the cumulative effects already in evidence under current Project operations. Boat-generated waves, combined with Project operations (which maintain Coeur d'Alene Lake levels higher in the summer than they would be under unregulated conditions), would have an adverse cumulative effect on river levee bank erosion. The same proportional distribution of the causes of erosion occurring under current Project operations would likely continue under the Proposed Action.

Contaminated sediment from mine waste generated in the upper Coeur d'Alene River Basin would continue to be routed through and deposited within Project impoundments. Project facilities and operations contribute to this effect in a small way as contaminated sediment would continue to deposit within Coeur d'Alene Lake and portions of the Spokane River, even in the absence of the Project. Sediment inputs from Hangman Creek (a tributary with substantial sediment supply resulting from a variety of land uses) combines with the reduction in stream gradient and increased depth in the Nine Mile and Long Lake reservoirs, resulting in substantial areas of aggradation, a condition inherent to the existence of the reservoirs.

3.3.2 Water Quantity

3.3.2.1 Affected Environment

3.3.2.1.1 Surface Water

The Spokane River drains a 6,640-square-mile area at its confluence with the Columbia River at Lake Franklin D. Roosevelt (WDOE, 2004a), representing about 2.6 percent of the total drainage area of the Columbia River at Beaver Army Terminal near Quincy, Oregon (USGS gage no. 14246900). The Spokane River traverses 111 miles from Coeur d'Alene Lake, which is about 15 miles east of the Washington-Idaho state line, to the Columbia River, which is about 42 miles upstream of Grand Coulee Dam near Fort Spokane (Ebasco, 1987). The USGS indicates that about 122 square miles of drainage area near Hayden Lake, Idaho, do not contribute to surface water runoff in the Spokane River (USGS, 2003a). Eventually, some of this water may reach the Spokane River as groundwater, but the lake itself is a closed system with respect to surface water. As such, Avista's drainage area estimates cited below in the reach-by-reach descriptions differ slightly from those of the USGS.

There is a long period of USGS-gaged flow records for the Spokane River, beginning in 1913 at Post Falls and 1891 in the City of Spokane. Since 1977, Long Lake storage contents and elevations have been recorded daily; therefore, a complete data set for the Project exists for 1978 through the present. Data from August 1978 through July 2002 are used to describe flow conditions for the Project.

Avista and the consultants selected by the Water Resources Work Group (WRWG) developed a water budget model for the Spokane River based on USGS data that has been adjusted for storage changes in Coeur d'Alene Lake and Lake Spokane and adjusted for evaporation in Coeur d'Alene Lake, plus other modeling efforts and published research (NHC, 2003). As a result of this effort, there is a record of calculated inflow to most of the developments in the Spokane River Project. Several changes in the Project design, configurations, efficiencies, and regulated outflows of the Post Falls Project have made it desirable to use modeled water budget data rather than USGS data to characterize flow conditions. Therefore, tables in the following sections present minimum, mean, and maximum flows based on modeled conditions.

Several USGS gages are located on the Spokane River and its tributaries. Additional gages measure stream flows and elevations at Coeur d'Alene Lake and its major tributaries. Table 3.3.2.1-1 summarizes key USGS gage information for the Spokane River Project. Information in Table 3.3.2.1-1 is useful for understanding the approximate relative contribution of various tributaries within the Spokane River and Coeur d'Alene Lake subbasins. Information about smaller and more remote streams in the basin is available in USGS water data reports (USGS, 2003a,b).

Table 3.3.2.1-1 Streamflow surface water and reservoir station information near the Spokane River Project

USGS Gage Name (No.)	Period of Record[a]	Latitude	Longitude	Drainage Area (square miles)	Mean Annual Flow (cfs)	Annual Runoff (inches)
Coeur d'Alene River near Harrison, ID (12413860)	1991–present	47 28'43"	116 43'56"	1,475	Stages only	Stages only
Coeur d'Alene River at Cataldo, ID 12413500	1911–1912 1920–1972 1986–present	47 33'17"	116 19'26"	1,223	2,536	28.17
St. Joe River at Calder, ID (12414500)	1911–1912 1920–present	47 16'29"	116 11'17"	1,030	2,344	30.92
St. Maries River near Santa, ID (12414900)	1965–present	47 10'35"	116 29'30"	275	354.5	17.51
Coeur d'Alene Lake at Coeur d'Alene, ID (12415500)	1903–present	47 39'55"	116 46'13"	3,700	Stages only	Stages only
Spokane River near Post Falls, ID (12419000)	1912–present	47 42'11"	116 58'37"	3,840[b]	6,224	22.01
Spokane River above Liberty Bridge, near Otis Orchards, WA (12419500)	1930–1936 1938–1940, 1942 1944–1946 1951–1983 2000–present	47 40'56"	117 05'05"	3,880	6,097	21.38
Spokane River at Greenacres, WA (12420500)	1948–1952 1999–present	47 40'39"	117 09'04"	4,150	6,508	21.31

Table 3.3.2.1-1 Streamflow surface water and reservoir station information near the Spokane River Project (continued)

USGS Gage Name (No.)	Period of Record[a]	Latitude	Longitude	Drainage Area (square miles)	Mean Annual Flow (cfs)	Annual Runoff (inches)
Spokane River at Spokane, WA (12422500)	1891–present	47 39'34"	117 26'53"	4,290[b]	6,742	21.35
Hangman Creek at Spokane, WA (12424000)	1948–present	47 39'10"	117 26'55"	689	235	4.64
Little Spokane River at Dartford, WA (12431000)	1929–1932 1946–present	47 47'05"	117 24'12"	665	304	6.21
Little Spokane River near Dartford, WA (12431500)	1948–1952, 1997–present	47 46'52"	117 29'43"	698	599	11.66
Long Lake at Long Lake, WA (12432500)	1913–present[c]	47 50'12"	117 50'20"	6,020[b]	Stages only	Stages only
Spokane River at Long Lake, WA12433000	1939–present	47 50'12"	117 50'25"	6,020[b]	7,777	17.50
Chamokane Creek below Long Lake, WA (12433200)	1971–1978 1984–1987 1987–present	47 51'42"	117 51'28"	179	64.6	4.90

a. Years are water years (August through July) unless otherwise noted.
b. USGS estimate including non-contributing areas.
c. Prior to 1950: month-end contents only; October 1950 to September 1977: month-end stage and contents only.

Source: USGS, 2003a

Basin Planning Efforts

Several basin planning initiatives relevant to the Spokane River Basin are underway at the state and regional level. At the state level, increasing concerns regarding water use and planning led to the passage of a watershed planning law in Washington in 1998. Through grants, Washington State supports the implementation of local watershed planning and requires that, at a minimum, local groups consider water quantity in their planning. The Watershed Planning Act (Revised Code of Washington [RCW] 90.82) provides a framework for comprehensive planning and execution of local solutions to watershed issues on a watershed level (WDOE, 2003a). The WDOE designated four water resources inventory areas (WRIAs) in the basin:

1. WRIA 54, Lower Spokane;
2. WRIA 55, Little Spokane;
3. WRIA 56, Hangman; and
4. WRIA 57, Middle Spokane.

The watershed planning process is split into four phases: (1) organization, (2) technical assessment, (3) plan development and approval, and (4) plan implementation. WRIAs 55, 56, and 57 are in Phase 3 of the process, and Phase 1 work for WRIA 54 began in 2003. WRIA plans may include proposals for the construction of water storage facilities (for flow augmentation), development of water conservation strategies, and approaches to ensure that instream flows are maintained at healthy levels for fish (WDOE, 2004a).

At the regional level, the Northwest Power and Conservation Council (NPCC) also developed a subbasin planning process. Subbasin plans were introduced to implement the NPCC’s fish and wildlife program and to develop action strategies to implement the NPCC’s basin-wide vision for fish and wildlife that have been adversely affected by the development and operation of the Columbia River hydropower system (GEI, 2004). Two of the subbasins overlap with the Spokane River Project: the Spokane subbasin (downstream of the Post Falls Project) and the Coeur d’Alene subbasin (upstream of the Post Falls Project). These are two of the six subbasins defined by the Northwest Power Planning Council (NPPC) as the Intermountain Province. Figures 5-8 and 5-9 of the PDEA (Avista, 2005, Appendix A) illustrate the Coeur d’Alene River and the Spokane River subbasins, respectively.

Flood Management

The Spokane River Project plays an annual role in managing upstream flood potential. This role is limited by the Project's storage capacity (confined to the 7.5-foot depth between the low pool elevation of 2,120.5 feet and the full-pool elevation of 2,128 feet) and by the outflow capacity of the natural outlet restriction of Coeur d'Alene Lake relative to flood flows in the Spokane River Basin. This same feature, the lake's natural outlet restriction, provides downstream flood protection, as described below.

Several flood control structures and projects, unrelated to the Spokane River Project, have been undertaken to reduce the incidence and effects of flooding along the Coeur d'Alene Lake tributaries. Approximately 10 miles of constructed levees protect residents from floods along the Coeur d'Alene River, although protection is below the 100-year flood recurrence interval (Kootenai County, 1998). Improvements to the Cataldo flood-protection works were completed in 1997. The St. Joe River also has levee protection, and the city of St. Maries, at the confluence of the St. Maries River with the St. Joe River, is protected by constructed levees up to a 200-year flood event (Corps, 2001). These levees are under the regulatory jurisdiction of the U.S. Army Corps of Engineers (the Corps).

Coeur d'Alene Lake's natural outlet provides downstream flood attenuation, as demonstrated by the flood of December 1933, when flows peaked at 53,000 cfs in the St. Joe River at Calder, Idaho (USGS, 2003b), and 67,000 cfs in the Coeur d'Alene River at Cataldo, Idaho (USGS, 2004). These two inflows, representing slightly more than 60 percent of the drainage area contributing to the lake, are more than double the recorded outflow from Coeur d'Alene Lake during the flood (50,100 cfs, the highest recorded flow from the Post Falls Project). During the same flood event, the peak water surface elevation in Coeur d'Alene Lake reached elevation 2,139.05 feet (Kootenai County, 1998). High lake levels were also reported in conjunction with the floods of 1894 (elevation 2,137.6 feet), 1974 (elevation 2,136.54 feet), and 1997 (elevation 2,136.14 feet) (Kootenai County, 1998).

The USGS does not publish flood frequency data for the downstream Spokane River Project hydroelectric developments or the associated gaging stations. The historical record, however, shows major floods in the 50,000-cfs range for both the City of Spokane and downstream of Long Lake Development in 1894 and 1933.

Water Quantity Description

Upstream of Post Falls Project—The Spokane River drainage area is approximately 3,780 square miles at the Post Falls Project (Ebasco, 1987). Most of the drainage area is above Coeur d'Alene Lake. The natural outlet of Coeur d'Alene Lake is 9 miles upstream of the Post Falls Project. Prior to construction of the dams that preceded the Post Falls Project, Coeur d'Alene Lake's rise and fall depended on natural inflow, with a discharge determined by lake elevation and shaped only by the natural outlet. Lake elevations would approach elevation 2,120 feet in late summer. Today, the Post Falls Project maintains a relatively constant summer lake level near elevation 2,128 feet for recreational purposes and energy production, and the lake is drawn down beginning in early September. During the summer, the Project reduces flow relative to natural conditions, creating a flow that is from 15.1 percent lower than natural conditions in June to 47.1 percent lower in August (Golder, 2004c). Drawdown of the lake increases flow in the Spokane River (ranging from 16 percent higher than natural conditions in December to 87 percent higher in October) and allows for additional storage capacity in the lake for fall and winter precipitation.

Once the lake has been drawn down to the degree that inflow, precipitation, and the natural lake outlet channel restriction will allow (typically by the end of December), the Post Falls Project no longer controls upstream water levels, and nearly all flows reaching the dam are allowed to pass. At that time and extending through the spring runoff period, the facility does not significantly influence either lake levels or river flows downstream of the Post Falls Project. The lake is subsequently restored to summer recreation levels, usually during June, to maintain a summer pool level near elevation 2,128 feet. Overall, the average annual effect of the Post Falls Project is a slight flow reduction of about 0.4 percent (Golder, 2004c), primarily due to higher estimated evaporation quantities associated with higher lake elevations during the summer.

The primary tributaries to Coeur d'Alene Lake include the Coeur d'Alene and St. Joe rivers. Together, these two rivers account for about 90 percent of the inflow to the lake (Woods and Beckwith, 1997, as cited in Woods, 2001). The lake is approximately 30.9 miles long from the southern tip to the natural lake outlet and varies from 1 to 6 miles wide. The average depth is 72 feet. Within the proposed Project boundary, at normal summer full pool (elevation 2,128 feet), the lake itself covers about 31,618 acres; at minimum pool (elevation 2,120.5 feet), it covers about 27,302 acres. Adding the area between the natural lake outlet and the Post Falls dams, the lateral lakes, and the affected portions of the St. Joe, St. Maries, and Coeur d'Alene rivers yields a total area of 40,580 acres at full pool and 31,587 acres at minimum pool. This represents an increase in area between minimum pool and full pool of about 28.5 percent.

In addition to affecting flows in the Spokane River, the Spokane River Project also affects water levels in Coeur d'Alene Lake and the associated chain lakes. The majority of water in Coeur d'Alene Lake originates as precipitation in the Bitterroot Mountain Range and reaches Coeur d'Alene Lake via the Coeur d'Alene, St. Joe, and St. Maries rivers. All three major rivers were free-flowing tributaries prior to construction of dams in the Post Falls area, except when affected by Coeur d'Alene Lake levels that naturally produced a backwater effect during high river flows. The current Coeur d'Alene Lake backwater transition (maximum extent of backwater under normal conditions) on the Coeur d'Alene River is located at approximately river mile 32, or approximately where Interstate 90 crosses the river about 2 miles downstream of the town of Cataldo; at approximately river mile 34 on the St. Joe River, roughly 11 miles downstream of the town of Calder, and approximately 8.8 miles upstream of St. Maries (near the confluence with the St. Joe River) on the St. Maries River.

Numerous smaller tributaries flow into Coeur d'Alene Lake. Wolf Lodge Creek has a drainage area of 62 square miles, but the USGS does not actively monitor the creek. Cougar, Kidd, Mica, and Latour creeks are also minor tributaries to Coeur d'Alene Lake (IDHW/DEQ, 1999). Several additional creeks feeding into the lake include Fernan, Turner, Carlin, Lake, and Rockford creeks. Smaller lake tributaries are also subject to the backwater effects of the lake.

Minimum, mean, and maximum Coeur d'Alene Lake elevations are summarized in Table 3.3.2.1-2. Table 3.3.2.1-3 presents the monthly average surface area of the lake at daily mean elevations. The monthly average surface area is approximately 17 percent greater in May (40,598 acres) than in January (34,806 acres).

Downstream of Post Falls Project to Monroe Street Development— Monthly and annual flow characteristics, including daily, 3-day maximum, and 7-day minimum flows for Post Falls Project outflows, are summarized in Tables 3.3.2.1-4, 3.3.2.1-5, and 3.3.2.1-6, respectively.

The Spokane River drainage is approximately 4,225 square miles at Upper Falls and Monroe Street Developments (Ebasco, 1987). The 28-mile-long reach of the river between the Post Falls Project and Monroe Street Development, which includes the City of Spokane's Upriver Project (FERC No. 3074), encompasses a mix of free-flowing reaches and reservoir reaches. The free-flowing reaches include 17.8 miles between the Post Falls Project and the upper end of the Upriver Reservoir and 2 miles between the Upriver Project dams and the upper end of Upper Falls Reservoir. The reservoir reaches include 4 miles behind Upriver Dam, 4 miles behind the Upper Falls south channel dam, and 0.2 mile behind Monroe Street Dam.

Table 3.3.2.1-2 Daily mean lake level elevation statistics (feet) for Coeur d'Alene Lake (August 1978 through July 2002) [a]

Month	Minimum	Mean	Maximum [b]
August	2,127.7	2,127.9	2,128.0
September	2,127.0	2,127.5	2,128.0
October	2,125.0	2,126.0	2,127.0
November	2,123.5	2,124.5	2,129.9
December	2,122.0	2,123.7	2,133.0
January	2,120.6	2,123.4	2,130.3
February	2,120.6	2,124.2	2,135.1
March	2,120.6	2,125.8	2,131.7
April	2,123.5	2,127.5	2,134.4
May	2,125.6	2,128.3	2,136.6
June	2,126.5	2,127.7	2,132.9
July	2,127.8	2,127.9	2,128.0
Year	2,120.6	2,126.2	2,136.6

a. Values are based on modeled flows.

b. Maximum values above elevation 2,128 feet are due to high water and flooding effects and not the Post Falls Project.

Source: E-mail from L. Karpack, Principal, NHC, Seattle, WA, to M. Killgore, Project Engineer, Louis Berger Group, Bellevue, WA, dated December 1, 2004. Modeled results are based on historical water resource data from USGS and Avista.

Table 3.3.2.1-3 Daily mean elevation and corresponding surface area of Coeur d'Alene Lake (August 1978 through July 2002)

Month	Coeur d'Alene Lake Elevation (feet)	Total Area (acres)	Coeur d'Alene River Area (acres)	Coeur d'Alene Lake Area (acres)	Spokane River Area (acres)	St. Joe River Area (acres)	St. Maries River Area (acres)	Lateral Lakes (acres)
August	2,127.9	40,310	831	31,603	819	738	168	6,150
September	2,127.5	39,579	820	31,477	811	727	153	5,592
October	2,126.0	37,771	784	31,088	787	690	130	4,292
November	2,124.5	36,391	742	30,135	751	656	119	3,987
December	2,123.7	35,310	723	29,581	732	640	113	3,522
January	2,123.4	34,806	718	29,382	725	636	111	3,234
February	2,124.2	36,182	736	29,990	746	651	117	3,942
March	2,125.8	37,607	778	30,975	782	686	129	4,256
April	2,127.5	39,642	821	31,487	811	728	154	5,640
May	2,128.3	40,598	837	31,772	824	743	171	6,251
June	2,127.7	39,986	826	31,547	815	733	161	5,903
July	2,127.9	40,209	830	31,585	818	737	166	6,074
Year	2,126.2	38,006	789	31,146	790	696	132	4,453

Source: E-mail from L. Karpack, Principal, NHC, Seattle, WA, to M. Killgore, Project Engineer, Louis Berger Group, Bellevue, WA, dated December 23, 2004 combined with "Lake Surface Area (Golder 12-04).XLS" spreadsheet. The Golder spreadsheet uses a static pool approach to estimating inundated area under various pool elevations within Coeur d'Alene Lake. Intermediate values are linearly interpolated and values above elevation 2,128 feet are linearly extrapolated.

Table 3.3.2.1-4. Daily mean flow statistics (cfs) for Spokane River near Post Falls, Idaho (August 1978 through July 2002)

Month	Minimum [a]	Mean [a]	Maximum [a]
August	300	837	2,858
September	300	1,323	2,568
October	776	2,155	3,999
November	1,035	3,430	18,526
December	1,050	4,689	30,182
January	934	4,659	21,988
February	724	6,873	37,659
March	368	9,725	26,301
April	1,406	13,486	34,770
May	2,142	15,236	42,677
June	350	8,413	29,810
July	308	2,197	8,426
Year	300	6,073	42,677

Note: cfs – cubic feet per second

a. Minimum, mean, and maximum values are based on modeled flows.

Source: E-mail from L. Karpack, Principal, NHC, Seattle, WA, to M. Killgore, Project Engineer, Louis Berger Group, Bellevue, WA, dated December 1, 2004. Modeled results are based on historical water resource data from USGS and Avista.

Table 3.3.2.1-5. Spokane River near Post Falls, Idaho, regulated 3-day maximum flow (cfs) [a]

Month	Minimum	Mean	Maximum
August	390	1,473	2,603
September	1,102	2,018	4,078
October	1,835	3,113	5,403
November	2,219	5,686	18,996
December	2,257	7,127	29,686
January	1,979	7,211	21,899
February	1,284	11,016	36,782
March	4,966	13,899	26,526
April	7,121	18,950	34,490
May	8,717	19,631	42,261
June	2,717	14,156	29,722
July	1,203	4,065	7,799
Year[b,c]	10,177	23,425	42,261

Note: cfs – cubic feet per second

a. Based on modeled flow values for August 1978 through July 2002.

b. The average yearly value for mean 3-day maximum flow values is the average of all years of record, and not the average of the 12 months above.

c. Minimum yearly values do not necessarily match monthly values because the minimum 3-day maximum flow may occur during a different year than the monthly minimum 3-day maximum flows.

Source: E-mail from L. Karpack, Principal, NHC, Seattle, WA, to M. Killgore, Project Engineer, Louis Berger Group, Bellevue, WA, dated December 1, 2004. Modeled results are based on historical water resource data from USGS and Avista.

Table 3.3.2.1-6. Spokane River near Post Falls, Washington, regulated 7-day minimum flow (cfs) [a]

Month	Minimum	Mean	Maximum
August	300	552	1,043
September	300	943	1,603
October	1,041	1,740	2,766
November	1,354	2,220	4,730
December	1,266	3,166	9,815
January	1,239	3,176	7,816
February	908	4,118	10,429
March	599	6,398	14,404
April	2,131	8,946	15,640
May	2,496	11,593	30,113
June	459	3,622	8,833
July	318	1,050	2,225
Year[b,c]	300	1,181	16,668

Note: cfs – cubic feet per second

a. Based on modeled flow values for August 1978 through July 2002.

b. The average yearly value for average 7-day minimum flow values is the average of all years of record, and not the average of the 12 months above.

c. Maximum yearly values do not necessarily match monthly values because the maximum 7-day minimum flow may occur during a different year than the maximum monthly minimum.

Source: E-mail from L. Karpack, Principal, NHC, Seattle, WA, to M. Killgore, Project Engineer, Louis Berger Group, Bellevue, WA, dated December 1, 2004. Modeled results are based on historical water resource data from USGS and Avista.

Avista's Upper Falls Development is located in downtown Spokane near river mile 74.2. The Upper Falls Development creates a small reservoir and includes two dams located on either side of a natural island, Havermale Island. The reservoir's normal full-pool elevation is 1,870.5 feet, and at this elevation, the impounded surface area is 150 acres. The reservoir provides storage of 800 acre-feet with a maximum 6-foot drawdown but is operated as a run-of-river facility. Typically, when inflow is below 2,500 cfs, all the flow is routed into the south channel and through the powerhouse. Under such conditions, flow in the north channel around Havermale Island consists of leakage of about 32 cfs through the control works and a small amount of groundwater flow contribution.

Monroe Street Development is also located in downtown Spokane (at river mile 74), about 1,000 feet downstream of Upper Falls Development. Monroe Street Development creates a very small reservoir and, like Upper Falls Development, is operated as a run-of-river facility. The reservoir extends approximately 0.2 mile upstream and has a normal full-pool elevation of 1,806 to 1,806.3 feet. The dam creates an impounded surface area of 5 acres and provides 30 acre-feet of storage. The minimum pool corresponding to 30 acre-feet of storage (Ebasco, 1987) is elevation 1,800 feet. In accordance with the existing license, Avista maintains an aesthetic flow of 200 cfs over Monroe Street Dam and its downstream ledges during daily viewing hours that extend from 10 a.m. until one-half hour after sunset. Monthly and annual flow characteristics for the period of record (August 1978 through July 2002), including daily, 3-day maximum, and 7-day minimum flows for Upper Falls/Monroe Street Developments, are summarized in Tables 3.3.2.1-7, 3.3.2.1-8 and 3.3.2.1-9, respectively.

Downstream of Monroe Street Development to Nine Mile Development—The Spokane River drainage area is approximately 4,998 square miles at Nine Mile Development. The 16-mile-long reach between Monroe Street Development and Nine Mile Development includes about 10 miles of free-flowing river; the remaining 6 miles are affected by Nine Mile Development. The most significant tributary in this reach is Hangman Creek, with a drainage area of 689 square miles at the Hangman Creek gage (USGS gage no. 12424000) and 705 square miles at the confluence with the Spokane River. Hangman Creek enters the Spokane River at river mile 72.4 in the free-flowing reach between Monroe Street powerhouse and Nine Mile Reservoir (NPPC, 2000b). Hangman Creek is flashy in nature, averaging close to only 200 cfs annually but peaking at nearly 20,000 cfs during extreme runoff conditions.

Table 3.3.2.1-7. Daily mean flow statistics (cfs) for Spokane River at Upper Falls/Monroe Street (August 1978 through July 2002)

Month	Minimum[a]	Mean[a]	Maximum[a]
August	347	1,235	2,825
September	430	1,570	2,633
October	649	2,405	3,909
November	1,099	3,597	16,386
December	1,222	4,748	27,082
January	1,259	4,870	22,188
February	1,250	6,899	35,953
March	770	9,610	26,301
April	1,576	13,205	33,070
May	2,502	15,197	41,677
June	720	8,744	30,310
July	352	2,660	9,006
Year	347	6,217	41,677

Note: cfs – cubic feet per second

a. Minimum, mean, and maximum values are based on modeled flows.

Source: E-mail from L. Karpack, Principal, NHC, Seattle, WA, to M. Killgore, Project Engineer, Louis Berger Group, Bellevue, WA, dated December 1, 2004. Modeled results are based on historical water resource data from USGS and Avista.

Table 3.3.2.1-8. Spokane River at Upper Falls/Monroe Street regulated 3-day maximum flow (cfs) (August 1978 through July 2002)

Month	Minimum [a]	Mean [a]	Maximum [a]
August	590	1,812	2,734
September	1,314	2,289	4,208
October	2,148	3,359	5,576
November	2,591	5,656	16,098
December	2,627	7,031	26,579
January	2,376	7,182	22,099
February	1,837	10,828	35,345
March	5,076	13,572	26,459
April	6,017	18,564	32,723
May	8,771	19,476	41,328
June	2,765	14,245	30,122
July	1,554	4,483	8,318
Year[b,c]	9,733	23,069	41,328

Note: cfs – cubic feet per second

a. Minimum, mean, and maximum values are based on modeled flows.

b. The average yearly value for mean 3-day maximum flow values is the average of all years of record, and not the average of the 12 months above.

c. Minimum yearly values do not necessarily match monthly values since the minimum 3-day maximum flow may occur during a different year than the monthly minimum 3-day maximum flows.

Source: E-mail from L. Karpack, Principal, NHC, Seattle, WA, to M. Killgore, Project Engineer, Louis Berger Group, Bellevue, WA, dated December 1, 2004. Modeled results are based on historical water resource data from USGS and Avista.

Table 3.3.2.1-9 Spokane River at Upper Falls/Monroe Street, Washington, regulated 7-day minimum flow (cfs)

Month	Minimum[a]	Mean[a]	Maximum[a]
August	477	942	1,680
September	506	1,269	1,932
October	1,036	1,958	2,984
November	1,568	2,496	4,667
December	1,434	3,338	9,992
January	1,592	3,535	8,164
February	1,391	4,370	9,749
March	999	6,567	14,433
April	2,258	8,813	14,805
May	2,793	11,715	30,642
June	887	4,103	9,164
July	544	1,496	2,855
Year[b,c]	477	1,532	16,522

Note: cfs – cubic feet per second

a. Minimum, mean, and maximum values are based on modeled flows.

b. The average yearly value for average 7-day minimum flow values is the average of all years of record, and not the average of the 12 months above.

c. Maximum yearly values do not necessarily match monthly values since the maximum 7-day minimum flow may occur during a different year than the maximum monthly minimum.

Source: E-mail from L. Karpack, Principal, NHC, Seattle, WA, to M. Killgore, Project Engineer, Louis Berger Group, Bellevue, WA, dated December 1, 2004. Modeled results are based on historical water resource data from USGS and Avista.

Nine Mile Development, located at river mile 58, has 3,130 acre-feet of storage and an area of 440 acres at the normal maximum pool elevation of 1,606.6 feet. The total maximum drawdown is 16 feet, resulting in a minimum normal pool elevation of 1,590.6 feet. Storage above the spillway crest at elevation 1,596.6 feet is augmented by two-tiered sections of removable flashboards with crests at elevations 1,601.6 and 1,606.6 feet (Findlay Engineering Inc., 1999a). These flashboards are further subdivided into two subsections so that during high flow conditions, sections of the flashboards can be released in stages as needed (Ebasco, 1990). The effect of these releases is to create a small temporary pulsed flow in the Spokane River downstream of Nine Mile Dam until the flow and water surface elevation readjust to the lower setting. Because the flashboards are released under higher flow and stage conditions in the Spokane River and removed in stages, any effect is of limited duration and impact.

Given the high variability in Spokane River flows, flashboard removal also varies greatly, making generalizations regarding reservoir elevation difficult. Flashboard removal does not occur each year; in some years, only the top section of flashboards is removed. With flashboards in place, as described above, the Nine Mile pool is maintained at 1,606.6 feet. As flows increase above plant capacity, often by February, the top 5-foot section of flashboards is removed. In very high flow conditions, the lower section of flashboards is removed. Removal of the upper and lower flashboard sections can occur within the same week, or months apart, depending on flow conditions.

As long as flows continue to exceed plant capacity, the reservoir elevation is determined by a combination of the spillway crest elevation (1,601.6 feet with the top section removed, 1,596.6 feet with both sections removed) and river flow. Throughout these events, outflows from Nine Mile Development are equal to inflow. Once flows stabilize below plant capacity, flashboards are reinstalled (typically near the second week of July), and the Nine Mile pool is re-established and maintained at the 1606.6-foot level. Statistics on monthly and annual flow characteristics, including daily, 3-day maximum, and 7-day maximum, for flows downstream of Nine Mile Development are summarized in Tables 3.3.2.1-10, 3.3.2.1-11, and 3.3.2.1-12, respectively. Reservoir elevations for 3 recent years are depicted in the PDEA (Avista, 2005, Figure 5-10).

Table 3.3.2.1-10. Daily mean flow statistics (cfs) for Spokane River at Nine Mile

Month	Minimum[a]	Mean[a]	Maximum[a]
August	643	1,566	3,181
September	683	1,907	3,148
October	917	2,763	3,500
November	1,461	3,993	17,125
December	1,555	5,256	29,080
January	1,572	5,576	22,476
February	1,599	7,790	36,796
March	1,277	10,569	26,937
April	2,146	13,963	34,992
May	2,892	15,821	42,993
June	795	9,312	31,385
July	635	3,056	9,590
Year	635	6,785	42,993

Note: cfs – cubic feet per second

a. Minimum, mean, and maximum values are based on modeled flows from August 1978 through July 2002.

Source: E-mail from L. Karpack, Principal, NHC, Seattle, WA, to M. Killgore, Project Engineer, Louis Berger Group, Bellevue, WA, dated December 1, 2004. Modeled results are based on historical water resource data from USGS and Avista.

Table 3.3.2.1-11 Spokane River at Nine Mile regulated 3-day maximum flow (cfs) (August 1978 through July 2002)

Month	Minimum [a]	Mean [a]	Maximum [a]
August	874	2,160	3,182
September	1,649	2,648	4,580
October	2,499	3,739	5,990
November	2,979	6,097	16,963
December	3,104	7,522	27,782
January	2,837	7,959	22,449
February	2,393	11,731	36,105
March	5,430	14,491	27,366
April	6,410	19,297	34,671
May	9,110	20,025	42,203
June	3,170	14,837	31,243
July	1,885	4,931	8,925
Year [b,c]	10,159	23,656	42,203

Note: cfs – cubic feet per second

a. Minimum, mean, and maximum values are based on modeled flows from August 1978 through July 2002.

b. The average yearly value for mean 3-day maximum flow values is the average of all years of record, and not the average of the 12 months above.

c. Minimum yearly values do not necessarily match monthly values because the minimum 3-day maximum flow may occur during a different year than the monthly minimum 3-day maximum flows.

Source: E-mail from L. Karpack, Principal, NHC, Seattle, WA, to M. Killgore, Project Engineer, Louis Berger Group, Bellevue, WA, dated December 1, 2004. Modeled results are based on historical water resource data from USGS and Avista.

Table 3.3.2.1-12 Spokane River at Nine Mile regulated 7-day minimum flow (cfs)

Month	Minimum[a]	Mean[a]	Maximum[a]
August	752	1,259	2,099
September	806	1,582	2,360
October	1,320	2,302	3,353
November	1,880	2,859	5,099
December	1,884	3,794	10,918
January	2,052	4,183	9,310
February	1,885	5,143	11,209
March	1,572	7,424	15,617
April	2,835	9,589	15,587
May	3,180	12,322	31,738
June	1,077	4,563	9,670
July	843	1,829	3,338
Year[b,c]	752	1,857	17,231

Note: cfs – cubic feet per second

a. Minimum, mean, and maximum values are based on modeled flows for August 1978 through July 2002

b. The average yearly for average 7-day minimum flow values is the average of all years of record, and not the average of the 12 months above.

c. Maximum yearly values do not necessarily match monthly values because the maximum 7-day minimum flow may occur during a different year than the maximum monthly minimum.

Source: E-mail from L. Karpack, Principal, NHC, Seattle, WA, to M. Killgore, Project Engineer, Louis Berger Group, Bellevue, WA, dated December 1, 2004. Modeled results are based on historical water resource data from USGS and Avista.

Downstream of Nine Mile Development to Long Lake Development— The Spokane River drainage area is approximately 5,844 square miles at Long Lake Development (Ebasco, 1987). Between Nine Mile Development and Long Lake Development, the river traverses a distance of 24 miles, of which up to 23.5 miles are inundated by Lake Spokane under normal operating conditions. The Little Spokane River is the largest tributary in this reach, with a drainage area of 665 square miles at the Dartford gage (USGS gage no. 12431000) and 710 square miles at the confluence with the Spokane River. It enters the Spokane River at river mile 56.5, downstream of Nine Mile Dam (river mile 58) (NPPC, 2000b). The Little Spokane River has an average annual mean flow of about 300 cfs (at the USGS Dartford gage). The Little Spokane gains approximately an additional 300 cfs from the Spokane aquifer between Dartford and its confluence with the

Spokane River. As a result, average annual inflows are close to 600 cfs from the Little Spokane River. Peak flows have ranged as high as over 4,000 cfs at the Dartford gage.

Long Lake Development, located near river mile 34, impounds 105,080 acre-feet of storage and an area of 5,060 acres at the normal maximum pool of 1,536 feet (Findlay Engineering, 1999b). The total licensed drawdown is 24 feet, resulting in a minimum pool elevation of 1,512 feet. Since the late 1980s, Avista has voluntarily limited drawdown to approximately 14 feet (elevation 1,522 feet), effectively reducing the active storage to 66,270 acre-feet. Monthly and annual flow characteristics, including daily, 3-day maximum, and 7-day minimum flows, are summarized in Tables 3.3.2.1-13, 3.3.2.1-14, and 3.3.2.1-15, respectively. Minimum, mean, and maximum Lake Spokane elevations are summarized in Table 3.3.2.1-16.

Downstream of Long Lake Development—The Spokane River drainage area is approximately 6,096 square miles at the non-licensed Little Falls Project, located 5 miles downstream of Long Lake Dam. Under normal maximum pool conditions at Little Falls, the entire 5-mile reach between Little Falls Dam and Long Lake Dam is inundated, and Long Lake discharges almost directly into the Little Falls pool. Downstream of Little Falls Dam, the last 29 miles of the Spokane River constitute the Spokane River arm of Lake Roosevelt. This area is typically affected by the backwater from Grand Coulee Dam and can vary from riverine to lacustrine, depending on the Grand Coulee Pool level (WDOE, 2004b).

3.3.2.1.2 Groundwater

Groundwater conditions in the main stem of the Coeur d'Alene River are not well known, although the aquifer is described as comprising mostly silts and clays (EPA, 2001b). Groundwater gradients are low and groundwater flows very slowly. Coeur d'Alene Lake is described as a regional groundwater discharge zone, although the northern end is characterized as a primary source of recharge into the Spokane Valley-Rathdrum Prairie Aquifer (EPA, 2001b).

Groundwater/surface-water interaction plays an important role in Spokane River flows. The unconfined Spokane Valley-Rathdrum Prairie Aquifer lies under a 325-square-mile area of the Idaho panhandle and eastern Washington and is the sole source of drinking water for more than 450,000 people. The aquifer is described as extremely permeable and high in groundwater velocity (1 to 50 feet per day). The aquifer was formed during the last ice age between 12,000 and 20,000 years ago during periods of massive flooding in northern Idaho and eastern Washington. Significant recharge to the river from the aquifer occurs in the form of springs in reaches of the river in Washington, as well as along the Little Spokane River (Panhandle Health District, 2004; EWU, 2004).

Table 3.3.2.1-13 Daily mean flow statistics (cfs) for the Spokane River downstream of Long Lake Development

Month	Minimum[a]	Mean[a]	Maximum[a]
August	432	1,896	4,210
September	859	2,245	3,798
October	1,184	3,120	4,317
November	1,702	4,389	17,864
December	1,853	5,764	31,325
January	2,176	6,862	22,763
February	1,944	8,478	38,433
March	1,756	11,313	28,279
April	1,506	14,530	36,914
May	3,282	16,446	44,429
June	870	9,885	32,485
July	530	3,454	10,175
Year	432	7,352	44,429

Note: cfs – cubic feet per second

a. Minimum, mean, and maximum values are based on modeled flows from August 1978 through July 2002.

Source: E-mail from L. Karpack, Principal, NHC, Seattle, WA, to M. Killgore, Project Engineer, Louis Berger Group, Bellevue, WA, dated December 1, 2004. Modeled results are based on historical water resource data from USGS and Avista.

Table 3.3.2.1-14 Spokane River downstream of Long Lake regulated 3-day maximum flow (cfs)

Month	Minimum [a]	Mean [a]	Maximum [a]
August	1,224	2,522	3,631
September	1,986	3,011	4,952
October	2,849	4,141	6,403
November	3,367	6,573	17,996
December	3,610	8,230	29,079
January	4,379	9,077	22,799
February	3,209	12,548	37,663
March	5,986	15,315	28,273
April	6,001	20,019	36,619
May	9,448	20,605	43,158
June	3,560	15,438	32,364
July	2,220	5,396	9,575
Year[b,c]	10,601	24,288	43,158

Note: cfs – cubic feet per second

a. Minimum, mean, and maximum values are based on modeled flows from August 1978 through July 2002.

b. The average yearly value for mean 3-day maximum flow values is the average of all years of record, and not the average of the 12 months above.

c. Minimum yearly values do not necessarily match monthly values since the minimum 3-day maximum flow may occur during a different year than the monthly minimum 3-day maximum flows.

Source: E-mail from L. Karpack, Principal, NHC, Seattle, WA, to M. Killgore, Project Engineer, Louis Berger Group, Bellevue, WA, dated December 1, 2004. Modeled results are based on historical water resource data from USGS and Avista.

Table 3.3.2.1-15 Spokane River downstream of Long Lake Development regulated 7-day minimum flow (cfs)

Month	Minimum[a]	Mean[a]	Maximum[a]
August	1,024	1,565	2,515
September	1,099	1,892	2,787
October	1,580	2,642	3,721
November	2,193	3,220	5,530
December	2,334	4,259	11,844
January	3,076	5,363	9,854
February	2,340	5,890	11,749
March	2,134	8,240	16,801
April	2,319	10,153	16,369
May	3,567	12,930	32,834
June	1,268	5,022	10,175
July	1,142	2,160	3,820
Year[b,c]	1,024	2,172	17,940

Note: cfs – cubic feet per second

a. Minimum, mean, and maximum values are based on modeled flows for August 1978 through July 2002.

b. The average yearly for average 7-day minimum flow values is the average of all years of record, and not the average of the 12 months above.

c. Maximum yearly values do not necessarily match monthly values because the maximum 7-day minimum flow may occur during a different year than the maximum monthly minimum.

Source: E-mail from L. Karpack, Principal, NHC, Seattle, WA, to M. Killgore, Project Engineer, Louis Berger Group, Bellevue, WA, dated December 1, 2004. Modeled results are based on historical water resource data from USGS and Avista.

Table 3.3.2.1-16 Daily mean simulated lake level elevation statistics (feet) for Lake Spokane (August 1978 through July 2002)

Month	Minimum[a]	Mean[a]	Maximum[a]
August	1,535.9	1,535.9	1,535.9
September	1,535.9	1,535.9	1,535.9
October	1,535.9	1,535.9	1,535.9
November	1,535.9	1,535.9	1,536.0
December	1,535.9	1,535.9	1,536.0
January	1,522.2	1,531.8	1,536.0
February	1,522.0	1,529.3	1,536.0
March	1,522.0	1,532.2	1,536.0
April	1,522.2	1,535.0	1,536.0
May	1,535.9	1,536.0	1,536.0
June	1,535.9	1,536.0	1,536.0
July	1,535.9	1,535.9	1,536.0
Year	1,522.0	1,534.7	1,536.0

a. Minimum, mean, and maximum values are based on modeled flows for August 1978 through July 2002.

Source: E-mail from L. Karpack, Principal, NHC, Seattle, WA, to M. Killgore, Project Engineer, Louis Berger Group, Bellevue, WA, dated December 1, 2004. Modeled results are based on historical water resource data from USGS and Avista.

Numerous studies have established a direct hydraulic connection between the Spokane River and the Spokane Valley-Rathdrum Prairie Aquifer (Gibbons et al., 1984; WDOE, 1999; Gearhardt, 2001; Golder, 2001). In broad terms, the river generally loses water to the aquifer upstream of Barker Road (river mile 90) near Greenacres, Washington, but gains water from the aquifer in the more downstream reaches. Summer low flows in the Spokane River have declined over the period of record (1891 to present), although less so in recent years and although the overall mean annual flow has been steady (NHC, 2003). Causes for the summer low-flow declines could include aquifer and surface water withdrawals as well as urbanization and other land-use influences. Post Falls Project operations also have affected the timing and shape of summer low flows. The 7-day low flow with a recurrence interval of 10 years (7Q10) is 161 cfs at the USGS gage at Post Falls and 847 cfs at the USGS gage in the City of Spokane (Golder, 2001).

Johnson (1992), who describes the groundwater in the Lake Spokane vicinity extensively, reported piezometer readings that establish that nearby shallow groundwater levels are very responsive to changes in reservoir stage at Long Lake Development. At the upstream end of Lake Spokane, gradients are directed toward the lake, while, at the downstream end, gradients are directed away from the lake. These differential gradients suggest that Lake Spokane is a flow-through lake in terms of the groundwater contribution. Groundwater therefore plays a relatively minor role in the overall water budget of the lake, providing approximately 1 to 3 percent of the inflow to the Lake Spokane reach.

3.3.2.1.3 Water Rights

Operation of the Project requires non-consumptive water rights for power generation. In Idaho, the water right for the Post Falls Project is 5,410 cfs. In Washington, non-consumptive water rights exist for Upper Falls (2,600 cfs), Monroe Street (2,900 cfs), Nine Mile (6,500 cfs), and Long Lake (6,300 cfs) Developments. Most of the area's consumptive water withdrawals for municipal, domestic, agricultural, and industrial uses occur from the aquifer, although some also occur from the river, upstream tributaries, and Coeur d'Alene Lake. Both consumptive and non-consumptive water rights are regulated by the Idaho Department of Water Resources (IDWR) and WDOE. The Coeur d'Alene Tribe and Spokane Tribe of Indians also have water codes relevant to withdrawal on their respective reservations.

The Spokane Valley-Rathdrum Prairie Aquifer lies under the Spokane River Valley. The aquifer is an exceptionally transmissive, unconfined aquifer formed in the predominantly coarse sand, gravel, cobbles, and boulders deposited by the Great Missoulian floods. The Spokane River loses water to the aquifer from the outlet of Coeur d'Alene Lake to the area near the Idaho-Washington state line. Farther west, the river alternately loses water to and gains water from the aquifer.

Management of the aquifer affects flows in the Spokane River and, in turn, the availability of water for Avista's projects and natural resource concerns.

3.3.2.2 Environmental Consequences

3.3.2.2.1 Lake Level Management and Flow Releases

Post Falls Project

Avista currently controls the Coeur d'Alene Lake level for about 6 months of the year, establishing full-pool elevation of 2,128 feet as early as practicable and typically beginning the fall drawdown of Coeur d'Alene Lake the week after Labor Day. Also under current Project operations, Avista is required to maintain a year-round minimum flow downstream of Post Falls of 300 cfs or an amount equal to Coeur d'Alene Lake inflow, whichever is less. Although flows lower than 300 cfs have occurred historically, Avista attempts to meet a 300-cfs minimum flow downstream of Post Falls Dam at all times.

Under the Proposed Action, outflow from Coeur d'Alene Lake would continue to be managed so that the lake would reach a summer full-pool elevation of 2,128 feet as early as practicable each year. The lake elevation would be maintained near 2,128 feet until September 15, when the fall lake drawdown to an elevation as low as 2,120.5 feet would begin, providing room to accommodate winter precipitation and spring runoff and to generate power. This operation would be similar to the current drawdown regime, with the exception of providing a specific target date for initiation of the fall drawdown and slightly longer duration the lake is held at full pool.

Under the Proposed Action, Avista would ensure a minimum discharge of 600 cfs, as measured at USGS gage no. 12419000 just downstream of the Post Falls Dam. Avista also proposes to reduce minimum flows further (from 600 cfs to 500 cfs) when Coeur d'Alene Lake falls below elevation 2,127.75 feet in August or early September due to the new proposed minimum flow. These flows are the most reasonable starting point. There is not universal agreement among the stakeholders that these flows are optimal; however, they were arrived at through working group discussions as they attempted to balance minimum instream flows, resulting temperatures, and resulting habitat area.

Under the Proposed Action, operations at the Post Falls Project would be managed to comply with the discharge approaches outlined in the *Upper Spokane River Rainbow Trout Spawning and Fry Emergence Protection Plan* (Avista, 2004).

Under the Proposed Action, operations at the Post Falls Project would follow a downramping rate that corresponds to no more than a 4-inch drop per hour in downstream water levels at the USGS gage no. 12419000 (Spokane River near Post Falls). This would constitute a change from current license conditions, which specify no maximum ramping rate.

Under the Proposed Action (PME PF-REC-3), flows from the Post Falls Project would be adjusted when possible in late spring and in the fall to maintain preferred whitewater paddling flows for an extended time, and, when possible, increased flows for open-water boating would be scheduled for one or more weekends in August.

Under the Proposed Action, Avista would provide aesthetic flows at the Post Falls Project through the north channel spill gates (approximately 46 cfs) on Saturdays and Sundays from 12 noon until 6 p.m., Memorial Day weekend through Labor Day (PF-AES-1).

Our Analysis

Implementation of the Proposed Action, including establishing September 15 as the date when drawdown begins and implementing the 600-cfs minimum discharge at the Post Falls Project, would have a relatively minor effect on Coeur d'Alene Lake levels as compared to the present operations. The changes resulting from implementing the Proposed Action were simulated and compared to the results under current Project operations. For the 24 years modeled (August 1978 through July 2002), implementation of the Proposed Action would have affected the elevation of Coeur d'Alene Lake primarily in August and September. Table 3.3.2.2-1 indicates that the average mean August lake level would drop 0.06 foot (0.7 inch), from 2,127.94 feet under current Project operations to 2,127.88 feet under the Proposed Action. The modeled average September mean lake level would rise 0.15 foot (1.8 inches), from 2,127.46 to 2,127.61 feet.

The Proposed Action would not appreciably change the area inundated by Coeur d'Alene Lake under current Project operations. Because of the increased minimum discharge at the Post Falls Project, some shallow areas would experience a slightly earlier drawdown; this would typically vary from current conditions by a few inches at most. The Proposed Action would not cause any significant change in the location (i.e., river mile) where static pool levels in Coeur d'Alene Lake intersect the major tributaries (Coeur d'Alene, St. Joe, and St. Maries rivers).

A water budget was prepared for the current and proposed operation (NHC, 2003). In the model, Avista's consultant estimated the small fraction of lake seepage and evaporation, which are not expected to significantly change under the Proposed Action.

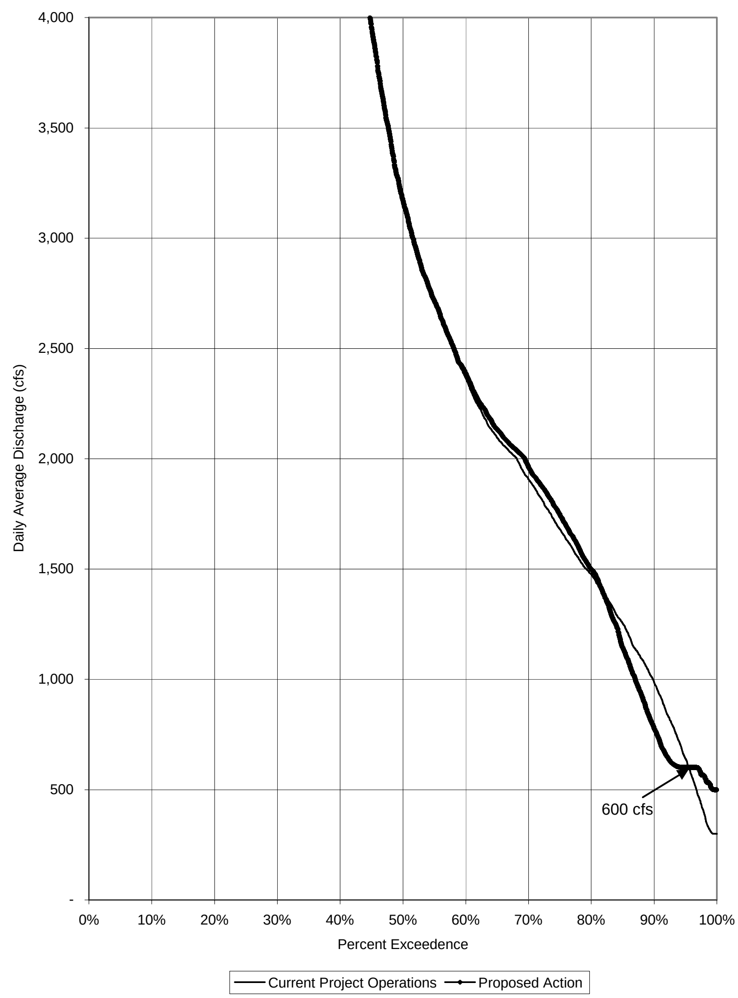
Table 3.3.2.2-1 Change in daily mean elevation statistics (feet) (Proposed Action minus current Project operations) for Coeur d'Alene Lake (August 1978 through July 2002)

Month	Minimum[a]	Mean[a]	Maximum[a]
August	–0.42	–0.06	0.00
September	0.01	0.15	0.05
October	0.00	0.02	0.36
November	0.00	0.01	0.00
December	0.00	–0.01	0.00
January	0.00	0.00	0.00
February	0.00	0.00	0.00
March	0.00	0.00	0.00
April	0.00	0.00	0.00
May	0.00	0.00	0.00
June	0.00	0.00	0.00
July	–0.08	–0.01	0.00
Year	0.00	0.01	0.00

a. Minimum, mean, and maximum values are based on modeled flows.

Source: E-mail from L. Karpack, Principal, NHC, Seattle, WA, to M. Killgore, Project Engineer, Louis Berger Group, Bellevue, WA, dated December 1, 2004. Modeled results are based on historical water resource data from USGS and Avista.

With respect to Spokane River flows downstream of the Post Falls Project, Figure 3.3.2.2-1 shows that the flow currently exceeds 600 cfs approximately 95.5 percent of the time. Under the Proposed Action, flow would exceed 600 cfs about 96.9 percent of the time, a gain of 1.4 percent. Figure 3.3.2.2-1 also shows that the flow currently exceeds 500 cfs approximately 96.7 percent of the time. Under the Proposed Action, flow would exceed 500 cfs all the time, increasing downstream flows at that level 3.3 percent of the time. The improvement is significant because it would come at a critical time during low summer flows. Seven-day minimum low flows would also be higher under the Proposed Action. This proposed increase in stream flows downstream of the Post Falls Project between July and mid-September would be offset by a slight decrease in late fall or early winter.



Note: At daily average discharges greater than 4,000 cfs, current Project operations and the Proposed Action are nearly identical. The graph is truncated at that point to improve readability.

Figure 3.3.2.2-1. Flow duration curve for Spokane River near Post Falls, Idaho (August 1978 through July 2002)

Source: E-mails from L. Karpack, Principal, NHC, Seattle, WA, to M. Killgore, Project Engineer, Louis Berger Group, Bellevue, WA, dated December 1, 2004

In the 24 years that were modeled (August 1978 through July 2002), each day during which flow was less than or equal to 600 cfs was evaluated under current Project operations to assess how often improvements in flow would be evident under the Proposed Action. The improved effect on flow downstream of the Post Falls Project was most evident during July through September. Flows downstream of the Post Falls Project would be at least 100 cfs higher on at least one July day in 8 out of 24 years, at least one August day in 22 out of 24 years, and at least one September day in 7 out of 24 years. Flows downstream of the Post Falls Project would be at least 300 cfs higher for at least one July day in 1 out of 24 years, at least one August day in 1 out of 24 years, and at least one September day in 2 out of 24 years. There would be little or no effect the remainder of the year.

The WDOE July 17, 2006, 10(a) filing proposed 600 cfs year-round minimum instream flow for Post Falls discharges and a 5-year adaptive management approach with monitoring of effects.

The WDFW July 17, 2006, 10(j) filing proposed 600 cfs minimum instream flow at Post Falls, with allowance for 500 cfs minimum flows during a 5-year adaptive management period. WDFW also proposed spring flows for incubation and emergence of trout in the Spokane River from April 15 through June 7 of each year at Post Falls Dam. Flow was proposed to be at a level of 60 percent of the highest 7-day running average (consecutive days) of daily discharge flows from the Post Falls Project for the period of April 1-15 each year, or natural flow, whichever is less.

The IDEQ 10(a) and IDFG 10(j) filings of July 17, 2006, recommend, as proposed by Avista, that the minimum discharge flow from the Post Falls Project be set at 600 cfs year round, as measured at USGS gage no. 12419000 (Spokane River near Post Falls). They also support reducing the minimum discharge flow to 500 cfs if Coeur d'Alene Lake is drafted more than 3 inches below full pool of 2,128 feet. The objective in making this recommendation is the protection of instream beneficial uses. The proposed 600/500-cfs flows provide the volume of water needed to protect Spokane River's cold-water aquatic life at the Idaho/Washington state line and downstream, without causing the temperatures to rise to levels that would limit fish distribution.

The Sierra Club July 17, 2006, filing and the CELP July 17, 2006, filing proposed release of approximately 770 cfs minimum instream flow from Post Falls to provide 500 cfs at Barker Road, including monitoring and adaptive management.

The Lands Council July 17, 2006, filing proposed the release of sufficient water from Post Falls dam to achieve a flow of 500 cfs at Barker Road, the collection and comparison of real-time flow data at Barker Road for flows below 800 cfs during summer months to identify the loss of flow and calculate the minimum instream flow for Post Falls to protect fish habitat, and 5-year monitoring.

The Northwest Whitewater Association July 17, 2006, filing proposed not having a 500 cfs minimum instream flow at Post Falls when Coeur d'Alene Lake drops 0.25 feet. It recommends generally higher releases of 700 to 800 cfs to achieve a minimum flow of 500 cfs at Barker Road.

Avista's minimum flow proposal described in the PDEA significantly improves minimum instream flows over the current operation, because flows would exceed 500 cfs all the time. Although the flow duration curves indicate there is a minor reduction in the frequency of flows between ~850 cfs and ~1,500 cfs, it is offset by a minor increase in the frequency of flows between ~1,500 cfs and ~2,500 cfs. In this range of medium flow, the minor redistribution of flows is not significant.

The Spokane River-Rathdrum Prairie Aquifer is a sole-source aquifer used for substantial drinking water supplies. As more water is pumped from the aquifer, gradients recharge the aquifer by depleting more surface water from the river system. This has been detected in trends of decreasing summer streamflows in the Spokane River (USGS, 2005). These streamflow losses are especially important in the upper Spokane River downstream of Post Falls Dam. Many of the tradeoffs on setting minimum instream flow center around the reach of river downstream from Post Falls near Barker Road (river mile 90.4) and Sullivan Road (river mile 87.5). There is no real-time streamflow gaging station at the Barker Road site; however, an inactive USGS gage (no. 12420500) that exists at the Barker Road site was reactivated for the period of 2000 to 2005. Avista used streamflow data from the 2000 to 2005 period to prepare a regression curve that correlates flows at the USGS Post Falls gage no. 12419000 to the reactivated gage at the Barker Road site. The regression analysis predicts that flows of 600 and 500 cfs at the Post Falls gage would provide flows of approximately 344 cfs and 256 cfs, respectively, at the Barker Road site (Avista, 2006b).

We expect that actual flow at the Barker Road site could vary slightly from this prediction because a number of dynamic variables can affect streamflow in this reach. Examples of these variables include surface water diversions, groundwater pumping, precipitation, and ambient temperature. Nevertheless, the results of the regression analysis indicate that streamflow losses do occur at the Barker Road site, but these losses can be quantified and streamflows can be estimated. Downstream of the Barker Road site, streamflows are generally restored at the Sullivan Road site (river mile 87.5) where groundwater inflow returns to the river.

Currently, USGS's gage no. 12419000 below Post Falls Dam is not a real-time gage. PME PF-REC-3 proposes to provide funds to USGS to upgrade and maintain the gage so that it provides real-time information to USGS's system on the Internet. The WDFW July 17, 2006, 10(j) filing proposes ramping rate flows from Post Falls of no more than 2 inches per hour as measured at the USGS gage no. 12415500.

The USFWS 10(j) July 17, 2006, filing proposes ramping rate flows from Post Falls of no more than 4 inches per hour, citing it as the best balance of resource interests in a cost-effective manner.

The IDFG 10(j) July 17, 2006, filing proposes ramping rate flows from Post Falls of no more than 4 inches per hour.

The CELP July 17, 2006, filing proposes no more than a 2-inch-per-hour ramping rate at Post Falls, or ramping rates suggested by WDOE and WDFW.

The Sierra Club July 17, 2006, filing and The Lands Council July 17, 2006, filing proposes a ramping rate of no more than 1 inch per hour at Post Falls Dam from June 16 to October 31 and 2 inches per hour from November 1 to February 15.

Under current Project operations, no maximum downramping rate is specified for the Post Falls Project. Under the Proposed Action, Avista would maintain a maximum allowable downramping rate of 4 inches per hour, as determined from rating tables for USGS gage no. 12419000 (Spokane River near Post Falls). Compared to current Project operations, this ramping-rate restriction would result in a slightly more gradual change in downstream flow when the hydrograph is receding and Avista transitions to storing water in Coeur d'Alene Lake. The selection of a 2-inch or 4-inch maximum downramping rate would have no effect on water quantity.

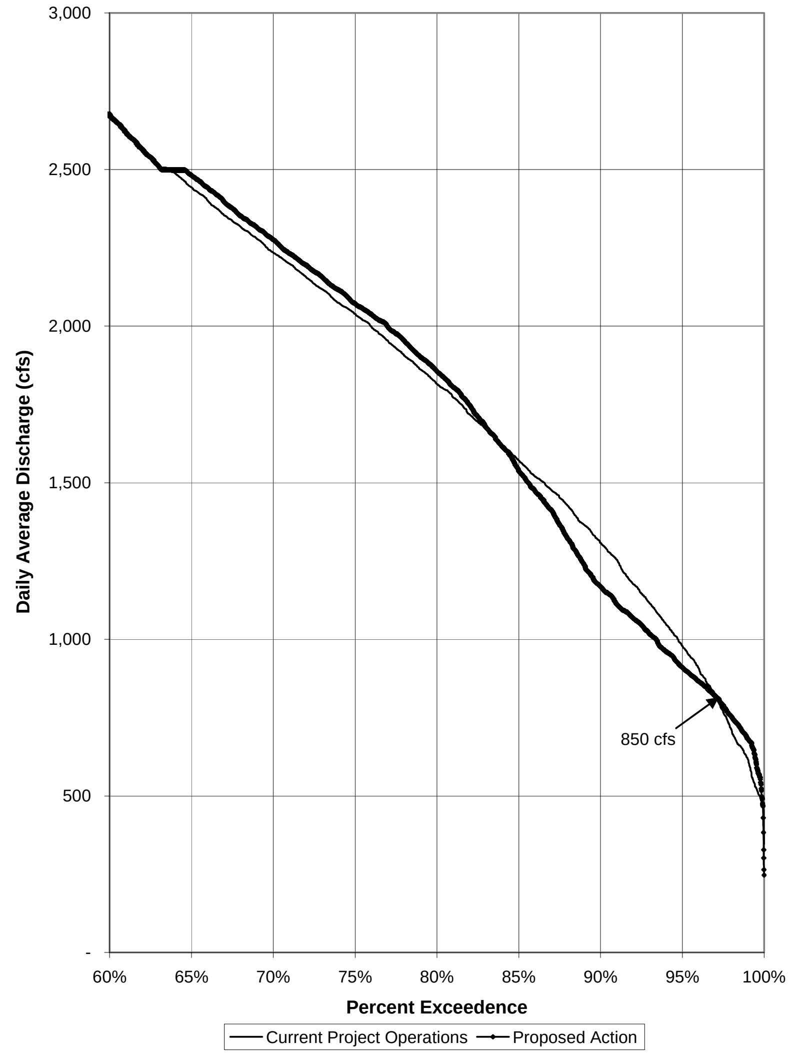
The 4-inch maximum ramping is an improvement over the current situation; therefore, the staff recommends adopting this rate rather than the more restrictive recommendation because limited data are available at this time to determine whether benefits to the aquatic environment in the Spokane River would be significantly improved by limiting the ramping rate to 2 inches per hour or less. The current Project cannot accurately ensure a downramping rate of less than 4 inches per hour without significant upgrades. Avista's PME proposal, as presented in PF-AR-1 (Part 3) of the PDEA, would provide enhanced protection for important fish populations and represents a balance of resource interests in a cost-effective manner.

Under the Proposed Action (PME PF-REC-3), flows from the Post Falls Project would be adjusted when possible in late spring and in the fall to maintain preferred whitewater paddling flows for an extended time. In addition, when possible, increased flows for open-water boating would be scheduled for one or more weekends in August. This would entail providing flows of ~1,250 cfs for no more than two weekends. Since this would only be done when average and projected river flows at Post Falls exceeded 800 cfs, and would be coordinated with other fisheries/water resources flow releases, the staff expects it would have almost no effect on water quantity; therefore, the staff agrees with the PME.

Currently, no aesthetic flows are required at the Post Falls Project. Under the Proposed Action (PME PF-AES-1), Avista would use the north channel to allow for an aesthetic spill through the gates for certain weekend hours throughout the summer. The aesthetic flow releases would have no effect on the total water quantity downstream of Post Falls (only very slightly altering the timing). It would provide flow in a channel that would otherwise be dry under non-spill conditions, and the 46 cfs for brief periods (12 hours per week during the summer) represents a very small fraction of the average flow; therefore, the staff agrees with the PME.

At downtown Spokane, under the Proposed Action, mean annual flows would not be affected. Seven-day minimum low flows would also be higher under the Proposed Action, increasing in July from 544 to 739 cfs (an increase of 195 cfs) and increasing in August from 477 to 665 cfs (an increase of 188 cfs). Three-day high flows would be affected primarily in the months of August (7 cfs lower on average), September (154 cfs higher on average), October (12 cfs higher), and December (28 cfs lower). Overall, under the Proposed Action, mean daily flows would be higher in July and August, and slightly lower in late fall or early winter.

The effects of the combined 500/600-cfs minimum flow release at the Post Falls Project would continue downstream to the vicinity of Upper Falls and Monroe Street Developments. Flows less than 850 cfs at downtown Spokane occur approximately 3.4 percent of the time (Figure 3.3.2.2-2). The benefit of the 500/600-cfs minimum flow at the Post Falls Project would be to increase the magnitude of flow in the range below 850 cfs. Flows through downtown Spokane can be affected by channel losses as well as by Post Falls Project discharges. Overall, an increase in the minimum Post Falls Project discharge would increase the 7-day average low flows through downtown Spokane.



Note: There is very little difference between current Project operations and the Proposed Action at flows higher than the 60 percent exceedance flow. The graph is truncated at that point to improve readability.

Figure 3.3.2.2-2. Flow duration curve for Spokane River at Upper Falls/Monroe Street Developments (August 1978 through July 2002)

Source: E-mails from L. Karpack, Principal, NHC, Seattle, WA, to M. Killgore, Project Engineer, Louis Berger Group, Bellevue, WA, dated December 1, 2004

The effects of the Proposed Action's 500-/600-cfs minimum-flow release downstream of the Post Falls Project would continue downstream to the Nine Mile Development vicinity. Overall, under the Proposed Action, mean daily flows would be higher in July and August and slightly lower in late fall or early winter. Mean annual flows would not be affected. This would have no effect on the elevation of Nine Mile Reservoir.

The effects of the Proposed Action's 500-/600-cfs minimum-flow release at the Post Falls Project would continue downstream to the Long Lake Development vicinity, where the mean daily flows would be higher in July and August, and slightly lower in late fall or early winter. Mean annual flows would not be affected. There would be no effect on the elevation of Lake Spokane.

Spokane River Developments

Under the Proposed Action, Avista would provide a 200-cfs minimum daily aesthetic flow through Upper Falls Development bypass reach (north and middle channels) from 10 a.m. to one-half hour after sunset, Memorial Day weekend through September 30, and implement channel restoration as feasible to enhance visual conditions (SRP-AES-1).

Under the Proposed Action, Avista would continue to provide the current 200-cfs minimum daily aesthetic flow from 10 a.m. to one-half hour after sunset daily, year-round, at Monroe Street Development (SRP-AES-1).

The applicant also proposed to replace the wooden flashboards at Nine Mile Dam with a more permanent rubber dam to maintain the pool at elevation 1,606.6 feet.

Under the Proposed Action, Avista would limit the drawdown of Lake Spokane to 14 feet (except under certain emergency conditions). This would constitute a change from current license conditions, which allow for a 24-foot maximum drawdown, but would not be a change from the way the Project has been operated in recent years.

At downtown Spokane, under the Proposed Action, mean annual flows would not be affected. Seven-day minimum low flows would also be higher under the Proposed Action, increasing in July from 544 to 739 cfs (an increase of 195 cfs) and increasing in August from 477 to 665 cfs (an increase of 188 cfs). Three-day high flows would be affected primarily in the months of August (7 cfs lower on average), September (154 cfs higher on average), October (12 cfs higher), and December (28 cfs lower). Overall, under the Proposed Action, mean daily flows would be higher in July and August, and slightly lower in late fall or early winter.

The effects of the Proposed Action’s 500-/600-cfs minimum-flow release downstream of the Post Falls Project would continue downstream to the Nine Mile Development vicinity. Overall, under the Proposed Action, mean daily flows would be higher in July and August and slightly lower in late fall or early winter. Mean annual flows would not be affected. This would have no effect on the elevation of Nine Mile Reservoir.

The effects of the Proposed Action’s 500-/600-cfs minimum-flow release at the Post Falls Project would continue downstream to the Long Lake Development vicinity, where the mean daily flows would be higher in July and August, and slightly lower in late fall or early winter. Mean annual flows would not be affected. There would be no effect on the elevation of Lake Spokane.

Our Analysis

Under current Project operations, aesthetic flows are not released at Upper Falls Development, although there is an existing release at Monroe Street Development. Under the Proposed Action, Avista would provide a 200-cfs minimum daily aesthetic flow through Upper Falls Development bypass reach (north and middle channels) from 10 a.m. to one-half hour after sunset, Memorial Day weekend through September 30, and would implement channel restoration as feasible to enhance visual conditions (SRP-AES-1). Aesthetic flows would have no effect on total water quantity downstream of the developments, but would provide surface water flow where none currently exists.

The proposal to replace the wooden flashboards at Nine Mile Dam with a more permanent rubber dam would allow Avista to more accurately control the pool level, has the potential maintain full pool level for a longer period of time, and alters the drawdown duration. The pool level would not change (it would continue to range between 1,596.6 feet and 1,606.6 feet); however, refilling the pool soon after peak flow subsides is a change from current operations. Depending on how much longer Avista plans to hold the lake at full pool (a timeframe has not been specified), this has the potential to alter the local hydrology, which could influence riparian vegetation, aquatic habitat, sediment dynamics, aquatic invertebrate production, macrophyte production, and fish population.

Under the Proposed Action, Avista would limit the drawdown of Lake Spokane to 14 feet (except under certain emergency conditions). This would constitute a change from current license conditions, which allows for a 24-foot maximum drawdown, but would not be a change from the way the Project has been operated in recent years. This change does not impact water quantity.

3.3.2.2.2 Groundwater

Post Falls Project

Surface waters are considered hydraulic boundaries to groundwater systems, and the elevation of a lake or river contributes to the determination of the rate that groundwater flows into or out of the lake or river. The rate of groundwater discharge to the major inundated tributaries and lateral lakes of Coeur d'Alene Lake and the Spokane River is proportional to local hydraulic gradients. Avista's operation of the Post Falls Project causes the Coeur d'Alene Lake level to stabilize near an elevation of 2,128 feet as early as practicable each year, depending on inflows, and to remain there until September. Beginning in September, the lake level is drawn down.

During the summer, the current operations result in higher lake levels than would occur under unimpounded conditions. This results in less groundwater discharge into the lake as a result of a lower hydraulic gradient into the lake, compared to unimpounded conditions. This also results in more groundwater flow to the Spokane River during the summer as a result of a higher hydraulic gradient out of the lake, compared to unimpounded conditions. During the fall, drawdown of Coeur d'Alene Lake reduces the rate at which the level of Coeur d'Alene Lake recedes compared to the rate of lake level drop under unimpounded conditions. Therefore, the current conditions result in a more gradual decrease in hydraulic gradient than would occur without impoundment of the lake.

Our Analysis

The Proposed Action would hold the level of Coeur d'Alene Lake a week or two more than the current operation. That change, which is broadly supported by stakeholders, would not significantly alter the magnitude and pattern of lake level fluctuations. The staff believes the Proposed Action would not significantly change groundwater dynamics compared to current conditions; however, a federally funded interstate aquifer study being jointly conducted by the USGS and the states of Washington and Idaho is designed to better characterize the complicated aquifer and river interchange relationship.

Spokane River Developments

Within these developments, the applicant has proposed only very minor changes to aesthetic flows and drawdown at Lake Spokane.

Our Analysis

While there is a great deal of interaction between the Spokane River and the Spokane Valley-Rathdrum Prairie Aquifer, the changes and measures proposed for the Spokane River Developments would have a very minor effect on groundwater.

The effects of Post Falls Project operations on the common aquifer are evaluated above.

3.3.2.2.3 Water Rights

<u>*Post Falls Project*</u>

Operation of the Project requires non-consumptive water rights for power generation. In Idaho, the water right for the Post Falls Project is 5,410 cfs. In Washington, non-consumptive water rights exist for Upper Falls (2,600 cfs), Monroe Street (2,900 cfs), Nine Mile (6,500 cfs), and Long Lake (6,300 cfs) Developments. Most of the area's consumptive water withdrawals for municipal, domestic, agricultural, and industrial uses occur from the aquifer, although some also occur from the river, upstream tributaries, and Coeur d'Alene Lake.

Our Analysis

Both consumptive and non-consumptive water rights are regulated by the IDWR and WDOE. The Coeur d'Alene Tribe and Spokane Tribe of Indians also have water codes relevant to withdrawal on their respective reservations.

Under the Proposed Action, Avista would begin drawdown of Coeur d'Alene Lake on September 15. This date, which is consistent with the historical range of the initiation of drawdown (although may result in a period of full pool lasting 1 to 2 weeks longer), would provide a specific date for the initiation of drawdown. Avista also proposes to increase the Post Falls Project minimum flow to 600 cfs during non-droughts conditions and 500 cfs during drier summer conditions. Compared to current operations, implementing these proposed operations would have a very minor effect on annual (or average) non-consumptive water use through the Project developments, and therefore little effect on water rights.

The Sierra Club July 17, 2006, filing calls for Avista to develop a Water Rights Protection Program to fully assess its water rights in Idaho and Washington and take appropriate action to defend water rights against threats from junior water right holders and new water right appropriations, including participation in the North Idaho Water Right Adjudication. Avista's water rights are identified and quantified in the PDEA, and its non-consumptive water use is not substantially changing.

<u>*Spokane River Developments*</u>

Due to the movement of surface water downstream and the strong interaction of surface water with the Spokane Valley-Rathdrum Prairie Aquifer, the discussion above for the Post Falls Project is relevant to the downstream developments because they would be subject to the same physical and administrative limitations.

3.3.2.3 Unavoidable Adverse Effects

The Proposed Action would have no unavoidable adverse effects on water quantity compared to current Project operations.

3.3.2.4 Cumulative Effects

The Spokane River drains a 6,640-square mile area at its confluence with the Columbia River at Lake Franklin D. Roosevelt (WDOE, 2004a) and represents about 2.6 percent of the total drainage area of the Columbia River at Beaver Army Terminal near Quincy, Oregon (USGS gage no. 14246900). The Spokane River Project is one of 250 hydroelectric developments in the Columbia River Basin. In addition to the Spokane River Project, other dams on the river (Upriver and Little Falls, as well as Grand Coulee Dam) contribute to cumulative effects by changing riverine reaches to reservoir reaches.

Levees at various locations along the Spokane River and tributaries to Coeur d'Alene Lake also have a cumulative effect on the behavior of river stages. Extensive development in the greater Spokane area and bridges associated with transportation infrastructure represent an additional cumulative effect that has changed the behavior of the river, particularly under higher flow conditions. Local stream hydrographs also have been affected by land use, including transportation infrastructure, forest practices, mining, agriculture and extensive urbanization, in the region. Regulation of the Spokane River by the Project may seasonally affect interaction of surface and groundwater when river stages are affected by hydropower operations. The Proposed Action would not have any significant additional cumulative impact on water quantity compared to current Project operations.

3.3.3 Water Quality

3.3.3.1 Affected Environment

The presence, operation, and maintenance of the Project alters lake levels and Spokane River flows. These alterations have the potential to influence a range of water quality parameters, including water temperatures, DO concentrations and biological productivity (and associated parameters such as nutrient cycling and pH [potential hydrogen]), mobilization and transport of trace metals through the system, and TDG. The alterations to the natural system, along with natural processes themselves, also affect water quality via suspended sediments and turbidity as has been discussed in section 3.3.1.

Water quality conditions in the Project area are addressed in this section following a discussion of water quality standards. Characterization of current water quality conditions in the Project area is based on existing information from a variety of sources, including state and tribal Water Quality Monitoring Programs, EPA and USGS monitoring and reports, and data and water quality modeling developed as part of the Project relicensing process (WDOE, 2004a; EPA, 2003; Woods and Beckwith, 1997; Golder, 2003, 2004a,d,e,f; Golder and HDR, 2004).

The discussion of current conditions includes general statements characterizing certain conditions as exceedances of specific numeric water quality criteria. These characterizations do not necessarily equate to violations of water quality standards, as some standards involve relative comparisons to natural conditions (not simply numeric targets contained in the standards). It can not be assumed that such exceedances are automatically the result of Project-related effects.

3.3.3.1.1 Water Quality Standards

WDOE and IDEQ have water quality standards that address state surface waters within the Project area. The Coeur d'Alene Tribe has proposed water quality standards that will apply within their reservation at the lower one-third of Coeur d'Alene Lake, and the Spokane Tribe of Indians has water quality standards that apply downstream of the Project boundary.

The beneficial uses designated in each of the existing and proposed state and Tribal water quality standards are presented in Table 3.3.3.1-1. Washington's current water quality standards follow a class system that describes characteristic uses for each class. In contrast, the other water quality standards (including Washington's proposed revised standards that are currently under review by EPA) designate beneficial uses for surface water-body reaches. Numeric water quality criteria for each of the existing and proposed water quality standards are presented in Table 3.3.3.1-2.

Table 3.3.3.1-1 Designated beneficial uses of surface waters

Reach	Existing Standards[a]		Proposed Standards[b]	
	Beneficial Uses	**Source**	**Beneficial Uses**	**Source**
Coeur d'Alene Lake	Coldwater communities; salmonid spawning; primary contact recreation; domestic, agricultural, and industrial water supply; wildlife habitat; aesthetics; and special resource water	IDAPA 58.01.02.100 and 58.01.02.110.10		
Coeur d'Alene Lake within Coeur d'Alene Indian Reservation		Coeur d'Alene Tribe (2000)[c]	Domestic and industrial water supply; recreational and cultural use; bull trout; aesthetics; and wildlife habitat	
Spokane River from Coeur d'Alene Lake to Idaho/Washington state line (river mile 96.5)	Coldwater communities; salmonid spawning; primary contact recreation; and domestic, agricultural, and industrial water supply; wildlife habitat; and aesthetics	IDAPA 58.01.02.100 and 58.01.02.110.12		
Spokane River from Idaho/Washington state line (river mile 96.5) to Nine Mile Bridge (river mile 58.0)	Class A—Characteristic uses of water supply, stock watering, fish and shellfish, wildlife habitat, recreation, commerce, and navigation	WAC 173-201A-130(108)	Non-core salmon/trout; primary contact recreation; domestic, industrial, agricultural, and stock water supply; wildlife habitat; harvesting, commerce and navigation; boating; and aesthetics	WAC 173-201a-602
Spokane River from Nine Mile Bridge (river mile 58.0) to Long Lake Dam (river mile 33.9)	Lake Class—Characteristic uses of water supply, stock watering, fish and shellfish, wildlife habitat, recreation, commerce and navigation	WAC 173-201A-130(107)	Core salmon/trout; extraordinary primary contact recreation; domestic, industrial, agricultural, and stock water supply; wildlife habitat; harvesting; commerce/navigation; boating; and aesthetics	WAC 173-201a-602
Spokane River from Long Lake Dam (river mile 33.9) to mouth	Class A—Characteristic uses of water supply, stock watering, fish and shellfish, wildlife habitat, recreation, commerce and navigation	WAC 173-201A-130(106)	Non-core salmon/trout; primary contact recreation; domestic, industrial, agricultural, and stock water supply; wildlife habitat; harvesting, commerce and navigation; boating; and aesthetics	WAC 173-201a-602

Table 3.3.3.1-1 Designated beneficial uses of surface waters (continued)

Reach	Existing Standards[a]		Proposed Standards[b]	
	Beneficial Uses	**Source**	**Beneficial Uses**	**Source**
Spokane River on the Spokane Indian Reservation (approximately river mile 32.7 to river mile 0.0)	Class A—Designated uses of primary contact ceremonial and spiritual; cultural; domestic, industrial, and agricultural water supply; stock watering; fish and shellfish; primary contact recreation; and commerce and navigation	Spokane Tribe of Indians (2003)		

Notes: EPA – U.S. Environmental Protection Agency
IDAPA – Idaho Administrative Procedures Act
WAC – Washington Administrative Code

a. Standards that are currently applicable.
b. WDOE's proposed revision of the WAC 173-201A, which was adopted on June 24, 2003, and submitted to EPA on July 1, 2003.
c. EPA has not yet approved the Coeur d'Alene Tribe's water quality standards.

Table 3.3.3.1-2 Existing and proposed water quality criteria for surface waters in the Project area

Parameter	Idaho (IDAPA 58.01.02)	Washington (WAC 173-201A)	Coeur d'Alene Tribe (2000)	Spokane Tribe of Indians (2003)
Temperature	Cold: ≤22°C with a maximum daily average of ≤19ºC. No measurable change in lakes Salmonid spawning:[a] ≤13ºC with maximum daily average of ≤9ºC Bull trout: maximum weekly average of ≤13ºC during June–August and maximum daily average of ≤9ºC during September–October	Existing: ≤20.0°C due to human activities; no increase of >0.3°C when natural conditions >20.0°C; nor increase at any time of >34ºC (background temperature + 9ºC) Proposed: same as existing	Bull trout: daily maximum of ≤10ºC from June 1 to September 30 Cold: 7-day maximum of ≤14ºC and instantaneous maximum of <18ºC from February 1 to June 30, and 7-day maximum of ≤18ºC and instantaneous maximum of <21ºC from July 1 to January 31	Salmon/trout spawning and rearing: 7-day average of daily maximum temperatures of ≤16.5ºC from June 1 to September 1 and 7-day average of daily maximum temperatures of ≤13.5ºC between September 1 and October 1 and between April 1 and June 1, and ≤11ºC from October 1 to April 1 with no daily maximum of >18.5ºC[b]
TDG	≤110% of saturation	Existing: ≤110% of saturation[c] Proposed: ≤110% of saturation[c,d]	--	≤110% of saturation
DO	Cold:[e] >6 mg/l Salmonid spawning:[a] minimum of 6.0 mg/l or 90% of saturation, whichever is greater Below existing facilities:[f] 30-day mean of ≥6.0 mg/l, 7-day mean minimum of ≥4.7 mg/l, and instantaneous minimum of ≥3.5 mg/l	Existing: Class A: >8.0 mg/l Lake Class: no measurable decrease from natural conditions Proposed: Core salmon/trout: 1-day minimum of ≥9.5 mg/l Non-core salmon/trout: 1-day minimum of ≥8.0 mg/l	Bull trout:[g] 7-day average of >9.5 mg/l and >8.0 at all times	≥8.0 mg/l

Table 3.3.3.1-2 Existing and proposed water quality criteria for surface waters in the Project area (continued)

Parameter	Idaho (IDAPA 58.01.02)	Washington (WAC 173-201A)	Coeur d'Alene Tribe (2000)	Spokane Tribe of Indians (2003)
pH	Within 6.5–9.0	Existing: Class A: within 6.5–8.5 Lake class: no measurable decrease from natural conditions. Proposed: Core salmon/trout: within 6.5–8.5, with a human-caused variation of <0.2 units Non-core salmon/trout: within 6.5–8.5, with a human-caused variation of <0.5 units	Domestic water supply and bull trout: within 6.5–8.5 with a human-caused variation of <0.5 unit over any 24-hour period	Within 6.5–8.5 with a human-caused variation of <0.5 unit
Turbidity	Cold: maximum instantaneous of ≤50 NTU over background, and maintain ≤25 NTU over background for 10-consecutive days	Existing: Class A: ≤5 NTU over background turbidity of ≤50 NTU, or ≤10% over background turbidity of >50 NTU Lake class: ≤5 NTU over background Proposed**:** ≤5 NTU over background turbidity of ≤50 NTU, or ≤10% over background turbidity of >50 NTU	Domestic water supply: ≤1 NTU over background turbidity of ≤10 NTU, or ≤10% over background turbidity of >10 NTU Bull trout: ≤5 NTU over background turbidity of ≤50 NTU, or ≤10% over background turbidity of >50 NTU	--

Table 3.3.3.1-2 Existing and proposed water quality criteria for surface waters in the Project area (continued)

Parameter	Idaho (IDAPA 58.01.02)	Washington (WAC 173-201A)	Coeur d'Alene Tribe (2000)	Spokane Tribe of Indians (2003)
Total phosphorus	--[h]	Existing: Long Lake:[i] average euphotic zone concentration of ≤25μg phosphorus per liter during the period of June 1 to October 31 Proposed: Long Lake:[i] Same as existing	--	--
Coliform	*E. coli* levels with geometric mean[j] of ≤126/100 ml and maximum instantaneous value of ≤406/100 ml. In specified public swimming beaches, maximum instantaneous *E. coli* concentrations of ≤235/100 ml.	Existing: Class A: Fecal coliform levels shall not exceed a geometric mean of 100 colonies/100 ml or 200 colonies/100 ml for more than 10 percent of samples Lake class: Fecal coliform levels shall not exceed a geometric mean of 50 colonies/100 ml or 100 colonies/100 ml for more than 10 percent of samples Proposed: Extraordinary primary contact: fecal coliform geometric mean of ≤50/100 ml and no more than 10% of all samples (or any single sample when less than 10 samples exist) with ≥100/100 ml Primary contact: Fecal coliform geometric mean of ≤100/100 ml and no more than 10% of all samples (or any single sample when less than 10 samples exist) with ≥200/100 ml	Recreational and cultural: *E. coli* levels with 30-day geometric mean of ≤126/100 ml, based on a minimum of five samples	*E. coli* levels with geometric mean of ≤126/100 ml and no more than 10% of all samples (or any single sample when less than 10 samples exist) with ≥406/100 ml

Table 3.3.3.1-2 Existing and proposed water quality criteria for surface waters in the Project area (continued)

Parameter	Idaho (IDAPA 58.01.02)	Washington (WAC 173-201A)	Coeur d'Alene Tribe (2000)	Spokane Tribe of Indians (2003)

Notes:
-- – no applicable criterion
% – percent
ºC – degrees Celsius
DO – dissolved oxygen
EPA – U.S. Environmental Protection Agency
Exherichia coli – *E. coli*
IDAPA – Idaho Administrative Procedures Act
ml – milliliter
mg/l – milligrams per liter
NTU – nephelometric turbidity unit
pH – potential hydrogen
Proposed – WDOE's proposed revision of the WAC 173-201A, which was adopted by WDOE on June 24, 2003, and submitted to EPA on July 1, 2003
TDG – total dissolved gas
μg – microgram
WAC – Washington Administrative Code
WDOE – Washington Department of Ecology

a. Criteria that are applicable to waters designated for salmonid spawning during the spawning and incubation periods for the particular species present.
b. In waters where the only salmonid present is non-anadromous form of naturalized rainbow or redband trout, the 7-day average of the daily maximum temperature may be allowed to reach 18.5ºC.
c. Criterion does not apply when the stream flow exceeds the 7-day, 10-year frequency flood.
d. TDG criteria may be adjusted to aid fish passage over hydroelectric dams when consistent with a department-approved gas abatement plan.
e. In lakes and reservoirs, does not apply to bottom 20 percent of water depth where depths are 35 meters or less, the bottom 7 meters of water depth where depths are greater than 35 meters, or hypolimnetic waters where stratification occurs.
f. Applicable below dams, reservoirs, and hydroelectric facilities.
g. In thermally stratified lakes, the hypolimnetic DO content shall be determined by natural conditions. This applies to the bottom 20 percent of the water column in lakes deeper than 35 meters, and the bottom 1 meter of the water column in lakes less than 35 meters deep.
h. Narrative standard, IDAPA 58.01.02.200.06: Excess Nutrients. Surface waters of the state shall be free of excess nutrients that can cause visible slime growths or nuisance aquatic growths impairing designated beneficial uses.
i. Spokane River from Nine Mile Bridge (river mile 58.0) to Long Lake Dam (river mile 33.9).
j. Based on a minimum of 5 samples taken every 3 to 5 days over a 30-day period.

Numerous water quality concerns have been under investigation for years in the Spokane River Basin. Much of the concern results from human activities, including mining in the upper basin (EPA, 2003; Golder, 2004d) and nutrient-rich discharges from wastewater treatment systems (WDOE, 2003b). Section 303(d) of the CWA requires states to prepare a list of water-body segments that are not expected to meet applicable state surface water quality standards within the next 2 years. The states are then required to complete a total maximum daily load (TMDL) for water-body segments on the 303(d) list that is approved by EPA. Table 3.3.3.1-3 presents the most recent EPA-approved 303(d) listings for surface waters in the Project area, along with the status of corresponding TMDLs. Although TDG was not on the 1998 EPA-approved 303(d) list, WDOE proposed to list the Spokane River downstream of the Long Lake Development on the 2004 303(d) list (Pickett, 2003).

3.3.3.1.2 Temperature

Upstream of Post Falls Project—WRWG consultants reviewed available water temperature data sources and monitored water temperatures in Coeur d'Alene Lake (including several of its tributaries) during the summer of 2003 and developed a water quality modeling plan using the CE-QUAL-W2 model. CE-QUAL-W2 is a two-dimensional hydrodynamic water quality model developed by the Corps commonly used for such evaluations. The 2003 water temperature effort included continuously monitoring temperatures between June 3 and October 22, 2003, at 42 stations located at representative locations throughout the lake and its major tributaries (including different depths at the same location). Temperature instruments continuously record temperatures at 1- or 2-hour intervals. Results of the 2003 continuous-monitoring program are summarized in the PDEA (Avista, 2005, Table 5-22). CE-QUAL-W2 modeled water quality conditions in the lake and its major tributaries under current regulated conditions as well as unregulated (i.e., unimpounded, natural hydrograph) conditions; the results of the modeling effort were reported by Golder (2004g). These models provide useful information for evaluating factors that influence water quality but have limitations for comparisons to numeric criteria or specific water quality standards.

Results of the 2003 monitoring indicate that water temperatures in the Coeur d'Alene and St. Joe rivers generally peak between mid-July and mid-August (Golder, 2004a). Seasonal and daily temperature patterns in the Coeur d'Alene and St. Joe rivers were similar as they entered the slack water of the lake, although the St. Joe River was warmer than the Coeur d'Alene River. Within the 2-mile-long reaches centered on the transition zone as the rivers enter the lake, both rivers exhibit little thermal stratification and experience little warming (+0.2 to 0.3ºC [0.4 to 0.5ºF]), based on differences in the average daily mean

Table 3.3.3.1-3. EPA-approved 1998 303(d) listings and status of corresponding TMDLs

Parameter	Location	TMDL Status
Temperature	Spokane River from Coeur d'Alene Lake to Idaho/ Washington state line	No status reported
Temperature	Spokane River within Washington	No status reported
DO	Spokane River within Washington	In process
Total phosphorus	Spokane River within Washington	In process
pH	Spokane River within Washington	No status reported
Metals (unspecified)	Coeur d'Alene Lake and Spokane River from Coeur d'Alene Lake to Idaho/ Washington state line	Approved
Metals (arsenic, cadmium, chromium,[a] lead, and zinc)	Spokane River within Washington	Approved
PCBs	Spokane River within Washington and Lake Spokane	In process
Sediments	Spokane River within Washington and Lake Spokane	No status reported

Notes: DO – dissolved oxygen
PCB – polychlorinated biphenyls
pH – potential hydrogen
TMDL – total maximum daily load

a. Johnson and Golding (2002) recommend removing Spokane River chromium from the 303(d) listing because the listing is based on questionable data and because six samples collected between July 2001 and May 2002 were in compliance with water quality standards.

Sources: IDEQ, 2003; WDOE, 2003c,d

temperatures. At the transition points, Coeur d'Alene and St. Joe river temperatures exceeded Idaho's and the Coeur d'Alene Tribe's bull trout criteria for the entire applicable period (Golder, 2004h). They also exceeded IDEQ's coldwater criterion during most of the period from mid-July to late August, and exceeded the Coeur d'Alene Tribe's coldwater criterion from mid-June through mid-September. In addition, both rivers frequently exceeded the Coeur d'Alene Tribe's coldwater criteria through mid-August.

Temperature data for the Coeur d'Alene River upstream of Coeur d'Alene Lake (between Cataldo and Harrison) between 1972 and 2003 indicate frequent exceedances of Idaho’s salmonid spawning criterion between June and September, and less frequent exceedances of Idaho’s coldwater criteria in July and August (Golder, 2004h). Temperature data for the St. Joe River upstream of Coeur d’Alene Lake at St. Maries between 1973 and 1992 indicate frequent exceedances of Idaho’s salmonid spawning criterion between June and October, and regular exceedances of Idaho’s coldwater criteria in July and August (Golder, 2004h).

During 2003, all of the monitored smaller tributaries to the lake (Benewah, Carlin, Cougar, Fighting, Kid, Mica, Plummer, Turner, and Wolf Lodge creeks) had water temperatures greater than Idaho’s and the Coeur d’Alene Tribe’s bull trout criteria for the entire applicable period (Golder, 2004h). Daily average tributary temperatures also exceeded Idaho’s salmonid spawning criterion during the entire monitoring period. Between mid-July and mid-August 2003, three tributaries (i.e., Benewah, Fighting, and Mica creeks) also exceeded Idaho’s coldwater instantaneous criterion. Golder (2004h) reported that Idaho’s salmonid spawning criterion was exceeded in Cougar, Mica, and Wolf Lodge creeks during other years, but the reported values did not exceed the cold-water criteria.

Continuous seasonal temperature measurements made in four Coeur d’Alene Lake bays (i.e., Beauty, Carlin, Cougar, and Windy) during 2003 indicate that each bay thermally stratifies throughout the summer. Results indicate that Idaho’s salmonid spawning criteria were met continuously at the deepest location measured in each of the four bays. In the three bays with maximum depths of about 67 to 74 feet (i.e., Cougar, Windy, and Beauty), surface temperatures in excess of 20ºC (68°F) were observed much of the summer, and near-bottom temperatures remained at 7 to 9ºC (45 to 48°F) through at least August. In contrast, near-bottom temperatures in Carlin Bay, which has a maximum depth of about 54 feet, began warming as early as June. Temperatures in the tributaries to the four monitored bays were generally cooler than in their corresponding bay as they enter the bays, first as interflow at depths of 29 to 42 feet during June through mid-October and then along the bottom after mid-October (Golder, 2004a). Near-surface 7-day averages of daily maximum temperature in the bays generally varied from about 18ºC (64°F) in June to a peak of 24 to 25ºC (75 to 77°F) in early August and then decreased to 13 to 14ºC (55 to 57°F) by mid-October. Idaho’s bull trout criteria and the Coeur d’Alene Tribe’s proposed bull trout criteria were exceeded throughout the majority of the water column during their applicable periods. In addition, Idaho’s 22ºC (71.6°F) coldwater criterion was exceeded in the upper layers of each of the bays during the warmest summer months.

Numerous small lakes and wetlands adjacent to the Coeur d’Alene River are hydraulically linked to the river and likely were before construction of the Project. These water bodies, referred to as lateral lakes, generally receive most of their inflow from the river during high flows that overtop the levee along the river

(Golder, 2004h). Lateral lakes are generally hydraulically linked with the river through a narrow channel connecting them with the adjacent river. The rate and direction of flow through each of these channels depend on water elevations in the two water bodies and are not well understood. The Coeur d'Alene Tribe monitored water temperatures in Black Lake, which is approximately 21.3 feet deep, during August 2002 and September 2001 and 2002. The results of this monitoring indicate that Black Lake exceeded the Coeur d'Alene Tribe's proposed salmonid spawning criteria, but satisfied the coldwater aquatic life criteria (Golder, 2004a). Because the hydraulic characteristics of the lateral lakes are not well understood, these results cannot be generalized to the other lateral lakes.

The 2003 monitoring effort, along with other water temperature study data, shows that Coeur d'Alene Lake follows a dimictic pattern of thermally stratifying in the summer and fully mixing throughout the water column during spring and fall. When the lake is stratified, it has a warm upper layer (epilimnion), cooler middle layer that has a large rate of temperature reduction associated with depth (metalimnion), and an even cooler layer with stable temperatures below (hypolimnion). The lake becomes thermally stratified by June or July and remains stratified into October (Golder, 2004h). EPA (2001a) reported that the depth of the epilimnion averaged about 33 feet and the upper depth of the hypolimnion averaged about 49 feet from July through September of 7 recent years (1991, 1992, 1995–1999) (Figure 5-13 of the PDEA [Avista, 2005]). Under these conditions, the approximate distribution of the total lake volume into these layers was 38 percent in the epilimnion, 12 percent in the metalimnion, and 50 percent in the hypolimnion. The depth of the maximum rate of temperature change in the water column (thermocline) varies spatially within the lake. In 1992, the thermocline was deepest at the north end of the lake (71 feet) and shallowest in the south end of the lake (15 to 29 feet) (Golder, 2004e). Based on measurements made in Coeur d'Alene Lake, including bays and shallow southern lake locations during 1992 and 1995 through 2002, annual maximum surface temperatures varied from 19.5 to 26.6ºC (67 to 80°F) (e-mail from S. Marxen, Project Engineer, Golder, Redmond, WA, to B. Mattax, Senior Aquatic Scientist, Louis Berger Group, Bellevue, WA, dated June 23, 2004). USGS monitoring in 1991 and 1992 indicated that minimum lake water temperatures were as low as 0ºC (32°F) in the shallow south end of the lake, but were 2 to 4ºC (36 to 39°F) throughout the rest of the lake (Golder, 2004h).

The PDEA reports that water temperatures at the USGS Tubbs Hill station in Coeur d'Alene Lake, which is the closest monitoring station to the outlet of the lake, were used to represent the thermal conditions of outflow from the lake. Water temperatures measured by USGS and IDEQ at this location during 7 years in the 1990s ranged from about 2 to 24ºC (36 to 75°F), and indicate that summer outflow from the lake generally tends to range in the mid– to high 20sºC (73 to

81°F) (Golder, 2004a; e-mail from S. Marxen, Project Engineer, Golder, Redmond, WA, to B. Mattax, Senior Aquatic Scientist, Louis Berger Group, Bellevue, WA, dated June 13, 2004). Temperatures at this location vary from year to year but tend to follow the same seasonal thermal stratification patterns seen elsewhere in the lake. Temperatures are very similar throughout the water column in early spring and begin to thermally stratify during later spring (Avista, 2005, Figure 5-13). By early August, the epilimnion approaches 24ºC (75°F) to a depth of approximately 23 feet over a layer that becomes steadily cooler with depth. Near-bottom temperatures are generally about 7ºC (45°F) in August and slowly increase to near 8ºC (at a depth of 26 feet) by October. In the fall, near-surface water temperatures cool, eventually resulting in turnover, and similar temperatures throughout the water column.

The 9-mile-long Spokane River reach from the outlet of Coeur d'Alene Lake to the Post Falls Project is an impounded reach for the portion of the year that includes the warmest summer months. This river reach receives Coeur d'Alene Lake outflow that is controlled by the natural outlet sill that starts at an elevation of 2,112 feet and rises to an elevation of 2,118 feet farther downstream. As a result of this natural sill, water entering the Spokane River comes from the top 16 feet of the lake when it is at its summer elevation of 2,128 feet. Therefore, only the epilimnion of Coeur d'Alene Lake supplies the inflow to the Spokane River.

The seasonal progression of water temperatures monitored in 1998 at elevation 2,112 feet near the lake outlet (at Tubbs Hill) is displayed in the PDEA (Avista, 2005, Figure 5-14). At these depths, water temperatures higher than Idaho's instantaneous maximum criterion of 22ºC (71.6°F) were reported for mid-August, and temperatures higher than Idaho's maximum daily average temperature of 19ºC (66.2°F) were common in July, August, and September. Results of monitoring conducted during August 1992, an extremely dry period, also indicate that the Spokane River reach upstream of the Post Falls Project experienced only small (about 0.3ºC [0.5°F]) daily fluctuations and that little temperature change occurs throughout the water column (Cochrane, 1994).

Downstream of Post Falls Project to Monroe Street Development—Water temperatures for the Spokane River immediately downstream of the Post Falls Project since 1973 are similar to temperatures in the upper 20 feet of Coeur d'Alene Lake and the river reach from the lake outflow to the Post Falls Project. Water temperatures in the reach between the Post Falls Project and the Idaho/Washington state line, monitored during July through mid-September in 2001 (an extremely dry period used to assess near worst-case conditions), exceeded Idaho's coldwater criteria (i.e., instantaneous maximum of 22ºC [71.6°F] and daily average of 19ºC [66.2°F]) throughout the monitoring period (HDR, 2005).

HDR (2005) reports that water temperature data collected by WDOE at the Idaho/Washington state line between 1959 and 2001 follow a consistent seasonal pattern, generally with minimum values of about 2ºC (36°F) and maximum values of about 22 to 25ºC (72 to 77°F). Washington's 20ºC (68°F) criterion is generally exceeded from July through early September for the first 11.5 river miles on the Spokane River in Washington. Water temperatures are highly influenced by interchange of surface and groundwater in the reach between the Sullivan River Bridge (river mile 87.5) and the Monroe Street diversion dam. Data collected during the drought conditions in 2001 indicate that temperatures of less than 20ºC (68ºF) occurred from near the Sullivan River Bridge to the Monroe Street diversion dam, with the exception of areas within the Upriver Dam pool (WDOE, 2003b; Golder and HDR, 2004).

Downstream of Monroe Street Development to Nine Mile Development—Based on WDOE spot measurements of water temperature collected at five locations between Monroe Street Development and Nine Mile Development in 1991, 2000, and 2001, temperatures are generally less than 20ºC (68°F) (Golder and HDR, 2004). Relatively cool temperatures in this reach during the summer appear to be largely due to the cool groundwater entering the river upstream as well as within this reach (WDOE, 2003b; Golder and HDR, 2004).

Downstream of Nine Mile Development to Long Lake Development—Temperature measurements made during 1991 and 2000 indicate that Lake Spokane thermally stratifies during a portion of the year. Water temperatures in the spring are relatively similar throughout the water column (Avista, 2005, Figure 5-15), largely because of high spring flows that move rapidly through Lake Spokane (WDOE, 2004a). During the summer months, hydraulic retention times in the lake are much longer, which promotes thermal stratification. In 1991, Lake Spokane hydraulic retention times averaged 7 days in May and increased to as high as 56 days in August. The average retention time for July through September was 44 days (WDOE, 2004b). During the summer, relatively cool, dense inflows remain near the bed in the upper end of the reservoir and proceed through most of the reservoir as interflow (HDR, 2005). In the forebay, the thermocline typically develops at a depth well above where the Long Lake Development power plant intake withdraws water; hence, cool water is routed through the lake during the summer. Lake surface temperatures have been reported to reach as high as 24 to 25°C (73 to 77ºF) in August 1991 and 2002. Starting in September, the flow entering the lake increases with the drawdown of Coeur d'Alene Lake. Also, the river cools more rapidly than Lake Spokane as days shorten and temperatures decrease.

Downstream of Long Lake Development—Water routed through the Long Lake Development penstocks is withdrawn from Lake Spokane through intake structures that are located between elevations 1,491 and 1,507 feet (i.e., a depth of about 30 to 45 feet when the reservoir is at its normal full-pool elevation of 1,536 feet). At the level of the intakes, Lake Spokane temperatures are approximately 18 to 19°C (64 to 66°F) during the summer; hence, summer discharges from Long Lake Development are substantially cooler than surface waters of Lake Spokane. Results of a long-term investigation of water temperatures measured approximately 0.6 mile downstream of Long Lake Development indicate that the river generally complies with Washington's 20ºC (68°F) criterion (HDR, 2005). At Little Falls Development (river mile 29.3), located approximately 4.6 miles downstream of the Long Lake Development tailrace, water temperatures during 2001 and 2002 remained below Washington's 20ºC (68°F) criterion; however, the Spokane Tribe of Indians' water temperature criteria of 11 to 18.5°C (52 to 65°F), depending on time of year, were exceeded between September and mid-October, even with the favorable influence of cooler water provided by the mid-level intake of Long Lake Development (HDR, 2005).

3.3.3.1.3 Biological Productivity and Related Water Quality Parameters

Upstream of Post Falls Project—Coeur d'Alene Lake's trophic status transitioned from mesotrophic (moderate primary productivity) in 1975 to oligotrophic (low primary productivity) by the early 1990s, representing improving water quality conditions. Woods (1997) credits this change to a 50 percent reduction in nutrient loads, caused in part by elimination of direct discharges of mining and smelting wastes to the South Fork of the Coeur d'Alene River, diversion of untreated sewage to municipal wastewater treatment plants (WWTPs), and implementation of best management practices by timber harvest and agricultural industries. Results of an investigation of nutrient loading to the lake in the early 1990s indicate that the St. Joe River is currently the primary source of phosphorus. Harvey and Aparicio (2003a,b) indicate that the sources of nutrients in the St. Joe and St. Maries rivers subbasins are not readily apparent, although the City of St. Maries' WWTP and the Potlatch Corporation both discharge into the river downstream of the confluence with the St. Maries River and substantial areas of the lower St. Joe Basin are under agricultural use. Estimated loadings of phosphorus from the St. Joe and Coeur d'Alene rivers for 1991 were 72,100 kilograms and 22,000 kilograms (approximately 159,000 pounds and 48,500 pounds), respectively (Woods, 2001). For the drier year of 1992, estimated phosphorus loadings from the St. Joe and Coeur d'Alene rivers were 18,300 and 9,980 kilograms (approximately 40,300 and 22,000 pounds), respectively (Woods and Beckwith, 1997). Nitrogen loadings followed the same pattern, with the St. Joe River being the single largest source, although the relative difference of nitrogen loadings between the St. Joe and Coeur d'Alene rivers was not as large as for phosphorus (Golder, 2004e). The lake acts as a sink for both phosphorus and nitrogen, although the lake retains a much greater percentage of inflowing phosphorus (Golder, 2004a). Ratios of inorganic nitrogen to inorganic phosphorus suggest that there is a strong tendency for phytoplankton to be limited by phosphorus availability throughout the lake (Woods and Beckwith, 1997).

Woods and Beckwith (1997) reported that Secchi depths ranged between 2.3 and 31.2 feet in 1991 and 5.6 and 36.4 feet in 1992. The smallest Secchi depths occurred during late winter and spring when snowmelt runoff had increased turbidity in the lake, whereas the highest values occurred in late summer and fall well after the high runoff season. Values were consistently lower in the southern end of the lake due to the proximity of the two major inflows (i.e., the St. Joe and Coeur d'Alene rivers); the shallow depths, which permit resuspension of bed sediments by wind-induced turbulence; and increased biological production (Woods and Beckwith, 1997).

Golder (2004h) compiled and summarized water quality data obtained from IDEQ, USGS, and the Coeur d'Alene Tribe. PDEA Figure 5-5 (Avista, 2005, Appendix A, *Maps*) displays the bathymetry of the lake and denotes various landmarks that are useful in interpreting the summary of water quality data. The PDEA (Avista, 2005, Table 5-23) summarizes the data and frequency of discrete measurements that did not meet the corresponding numeric water quality criteria.

DO concentrations and pH exhibit a seasonal pattern in Coeur d'Alene Lake. In the spring, the density of the water becomes fairly uniform throughout the water column (the spring turnover), and DO concentrations are similar from the surface to the bottom. As thermal stratification is established in early summer, biological and chemical oxygen demand in the deeper hypolimnion lowers DO substantially in portions of the lake and its associated lateral lakes (Woods and Beckwith, 1997). In 1991 and 1992, hypolimnetic DO concentrations were lowered to less than 0.5 milligram per liter (anoxic) in Chatcolet Lake during parts of August and September. Very low DO concentrations also occurred in the lower portion of the water column of the shallow southern portion of Coeur d'Alene end of the lake, where submerged aquatic plants are common (Avista, 2005, Table 5-23). Decomposition of aquatic plants in this region of the lake is a contributing factor to these low DO concentrations. During fall turnover, mixing of the thermally stratified layers increases DO concentrations in the hypolimnion, eventually leading to complete mixing of the entire water column.

During spring turnover, the pH is near 7.5 units throughout the water column. As thermal stratification is established, hypolimnetic pH decreases to just below 7.0 units, and epilimnetic pH increases to greater than 8.0 units. Greater pH differences occur in shallow areas, as exhibited by reported values of 6.0 to

10.0 units (Golder, 2004h). Surface measurements from the lake generally meet Idaho's criteria, but pH levels outside the allowable limits sometimes occur in deeper water. These exceedances are generally pH values of less than the 6.5-unit lower limit and typically occur during late May and mid-September (Golder, 2004h). Deeper lake waters also experience infrequent exceedances of the 9.0-unit upper limit. Inflows from the Coeur d'Alene and St. Joe rivers are infrequently below the lower limit of 6.5 units.

Downstream of Post Falls Project to Long Lake Development Tailrace—The Spokane River receives nutrients from a number of substantial point sources as well as non-point sources. Excessive nutrient loading of the Spokane River in the State of Washington has resulted in its being included on Washington's 303(d) list as being threatened due to total phosphorus, DO, and pH levels (WDOE, 2003c,d). The river is currently the subject of a proceeding to develop a TMDL for DO. The WDOE (2004a) identified the following sources of nutrients in its draft TMDL for DO; however, it is difficult to isolate discrete effects of particular point and non-point source loads relative to the various gaining and losing reaches of the river and other influences on water quality:

- City of Coeur d'Alene Advanced Wastewater Treatment Plant (AWTP) at river mile 111.0.
- Hayden Area Regional Sewer Board Publicly Owned Treatment Works (POTW) at river mile 108.7.
- City of Post Falls POTW at river mile 100.5.
- Liberty Lake POTW at river mile 92.7.
- Kaiser Aluminum Industrial Wastewater Treatment Plant (IWTP) at Trentwood, river mile 86.0.
- Inland Empire Paper Company IWTP at river mile 82.6.
- City of Spokane AWTP at river mile 67.4.
- Hangman Creek (river mile 72.5), which receives small seasonal discharges from the communities of Cheney, Spangle, Rockford, Tekoa, and Fairfield POTWs.
- Little Spokane River (river mile 56.5), which receives discharges from Kaiser-Mead IWTP (currently not in operation), WDFW Spokane Fish Hatchery, and the Colbert Landfill Superfund Site groundwater pump and treatment system operated by Spokane County.

- Coulee/Deep Creek (river mile 59*)*, which indirectly receive a portion of the effluent discharges of the city of Medical Lake. Knight (1998, as cited in WDOE, 2004a) states "At current proposed design flows, the discharge will probably not affect the Spokane River. However, as the system is expanded there may be some winter hydraulic capacity issues in Deep Creek and a potential for a new growing-season phosphorus load to the Spokane River."

- The Spokane Valley-Rathdrum Prairie Aquifer, which ultimately discharges to the Spokane River.

WDOE (2005a) recently proposed listing the Spokane River on its 2004 303(d) list for low DO concentrations as far upstream as the Stateline gage. Between the Post Falls Project and the Spokane AWTP, the Spokane River is very oligotrophic (i.e., it has an abundance of DO and a deficiency of nutrients in plants) (Kadlec, 2000). Although the City of Coeur d'Alene AWTP discharges nutrients to the river, it does not appear to substantially increase primary productivity due to high metal concentrations that inhibit growth of algae (Kadlec, 2000). Woods (2001) estimated the primary nutrient loads of the Spokane River at three locations for water year 1999 (Avista, 2005, Table 5-24). These results indicate that the load of dissolved nitrate plus nitrite increases substantially between Post Falls and Spokane, and substantial loading of various forms of nitrogen and phosphorus occurs between Spokane and discharges from Lake Spokane. An evaluation of historical loadings of total phosphorus to Lake Spokane indicates that the Spokane AWTP currently supplies about 30 percent of the total phosphorus, in contrast to nearly 55 percent of the load accounted for by the city's treatment facilities prior to construction and initiation of operation of the AWTP in December 1977 (Soltero et al., 1992, as cited in WDOE, 2004a). Results of this evaluation by Soltero et al. (1992) also indicate that the Little Spokane River contributes about 12 to 13 percent of the total phosphorus load, and Hangman Creek contributes about 2 to 4 percent of the load. As part of the process for developing a TMDL for DO, WDOE monitored nutrient concentrations in the Spokane River at several locations between the Idaho/Washington state line and river mile 58.1 (WDOE, 2004a). The results of this monitoring program (Avista, 2005, Figures 5-16 and 5-17) also indicate the substantial effects of the City of Spokane's AWTP on concentrations of total phosphorus and total per sulfate nitrogen.

Hallock (2004) summarized water quality data collected year-round by WDOE at its long-term stations in the Spokane River Basin, and WDOE (2004a) summarized historical water quality data collected between June and October of 1977 to 2001. The PDEA (Avista, 2005, Table 5-25) summarizes year-round data collected by WDOE at the Washington/Idaho state line (river mile 96.0), 1.4 miles downstream of the City of Spokane's AWTP (river mile 66.0), and in Hangman

Creek near its mouth, as well as June to October data collected in the Little Spokane River near its mouth.

3.3.3.1.4 Metals

Upstream of Post Falls Project—Historical mining activities in the Coeur d'Alene River Basin have resulted in contamination of soil, sediment, surface water, and groundwater. In 1983, EPA established the 21-square-mile Bunker Hill Superfund Site; this site includes the 365-acre abandoned former Bunker Hill Mining and Metallurgical Complex and five main communities in the Silver Valley, which is located along the South Fork of the Coeur d'Alene River near Kellogg, more than 15 miles from the confluence with the mainstem Coeur d'Alene River. The South Fork of the Coeur d'Alene River joins the mainstem upstream of the Project area. Numerous studies have been conducted to evaluate metal contamination in the Coeur d'Alene Basin; these studies were summarized in the EPA's remedial investigation report (EPA, 2001b). Subsequently, the feasibility of several alternative cleanup approaches was evaluated, and a cleanup program was selected (EPA, 2002). The cleanup is being implemented by the Coeur d'Alene Basin Commission, which was set up under the Basin Environmental Improvement Act in 2001. The program is overseen by EPA and there is significant local involvement in the Basin Commission. EPA plans to issue a draft Five-Year Review report of cleanup activities in June 2005. Streamflow and water velocity are the primary factors controlling sediment transport and, therefore, trace metal transport and deposition into the lake (Clark, 2003).

It is estimated that 75 million metric tons of trace-element-rich sediments have been deposited in Coeur d'Alene Lake, based on a sediment-deposition layer 17 to 119 centimeters thick (Horowitz et al., 1993). Results of sampling surface sediments of Coeur d'Alene Lake in 1989 and 1991 as reported by Horowitz et al. (1992) are presented in the PDEA (Avista, 2005, Table 5-26). The results of this study indicate that most of the surface sediments in the main body of Coeur d'Alene Lake (generally downstream of the mouth of the Coeur d'Alene River) have substantially higher concentrations of antimony, arsenic, cadmium, lead, mercury, silver, and zinc than in the more southern portion of the lake and St. Joe River (Horowitz et al., 1992). In addition, concentrations of copper, iron, and manganese are somewhat higher in the main body of Coeur d'Alene Lake than in the southern portion of the lake and St. Joe River. Results of a subsequent investigation of the location of sediments with elevated concentrations of trace elements in the lake and its tributaries indicate that 85 percent of Coeur d'Alene Lake is covered by trace metal-enriched sediments, primarily from mining-related activity in the Coeur d'Alene River Basin (Golder, 2005b). Elevated trace metal concentrations were widespread in the lake sediments and occurred in some areas that were not anticipated, including Wolf Lodge Bay and the main body of the lake between the Coeur d'Alene River inflow and Blue Point.

The PDEA (Avista, 2005, Table 5-27) presents estimates of annual metal loads of cadmium, lead, and zinc entering Coeur d'Alene Lake and discharged from the Post Falls Project. Clark (2003) reported that the Coeur d'Alene River supplied more than 99 percent of the lake's total load of cadmium, lead, and zinc during water years 1999–2000. As expected, loadings of each of these metals increase proportionately with inflow and outflow discharges (Golder, 2004d). The amount of sediment and trace metals retained in the lake is also highly dependent on inflow and outflow to the lake.

The percent of whole-water recoverable (total) cadmium loadings retained in Coeur d'Alene Lake was fairly constant, with a median of 51 percent. Retention of the dissolved cadmium loads were much more variable, ranging from –39 percent in 1997 to 57 percent in 1999, and having a median of –3 percent. The estimates indicate that more dissolved cadmium was discharged from Post Falls than entered the lake in 4 of the 7 years, and that the highest percent exported occurred in the 2 wettest years (1996 and 1997). Percent retention of total and dissolved lead loads was fairly constant, with median values of 91 and 71 percent, respectively. Percent retention of the total and dissolved fractions of zinc were generally fairly similar to one another, with median values of 35 percent retention for total zinc loads and 32 percent for dissolved loads. However, the inter-annual variability of retention of dissolved zinc ranged from 17 to 50 percent compared to 31 to 52 percent for total zinc. The cause of differences among the variable retention rates of cadmium, lead, and zinc has not been determined.

Metal concentrations reported for Coeur d'Alene Lake studies conducted between 1989 and 2002 indicate higher metals concentrations in the hypolimnion than in the euphotic zone (the near-surface zone corresponding to light penetration depth), suggesting that lake sediments may act as one of the sources for dissolved metals. However, lake sediments are not believed to be the primary source of metals to the lake water column (Balistrieri, 1998, as cited in Golder, 2004d). The PDEA (Avista, 2005, Table 5-28) presents a summary of metal concentrations reported for five different Coeur d'Alene Lake monitoring programs conducted since 1989. Golder (2004d) compared the summary values to applicable water quality criteria, based on the Idaho Administrative Procedures Act (IDAPA) statutory minimum hardness of 25 milligrams per liter (as $CaCO_3$). Golder (2004a) indicated that the vast majority of hardness values reported for the lake were less than the 25-milligram-per-liter (as $CaCO_3$) statutory value. These data indicate that dissolved zinc concentrations in the lake frequently exceed Idaho's ambient freshwater Criterion Maximum Concentration and Criterion Continuous Concentration. Results for dissolved lead and cadmium suggest that their corresponding Idaho criteria are exceeded less frequently, although concentrations greater than Idaho's Criterion Continuous Concentration do occur for both metals. The Criterion Maximum Concentration for dissolved cadmium was exceeded in the results from both a 1989 USGS study and various IDEQ studies.

Several of the metals that are found in Coeur d'Alene Lake have the potential to accumulate in aquatic organisms (including fish) and in some cases increase in concentration as they move up the food chain (biomagnify). Consumption of fish from the contaminated areas can be a risk to human health. The Agency for Toxic Substances and Disease Registry (ATSDR) and the Idaho Department of Health and Welfare, Idaho Division of Health (IDOH) worked jointly to develop and implement an evaluation of the potential risk to human health associated with the metals found in Coeur d'Alene Lake. The IDOH and ATSDR (2003) reported that 14 of the metals evaluated (antimony, barium, beryllium, chromium III, cobalt, copper, manganese, molybdenum, nickel, silver, selenium, thallium, vanadium, and zinc) are not a risk to human health, based on an evaluation of worst-case exposures. Four of the metals (arsenic, cadmium, lead, and mercury) were associated with some level of risk. Based on the results of this investigation, the State of Idaho and Coeur d'Alene Tribe issued a fish consumption advisory in June 2003 (IDOH and ATSDR, 2003).

Downstream of Post Falls Project to Long Lake Development Tailrace—Elevated concentrations of metals in the Spokane River resulted in the river being listed on the 1998 303(d) list of water-quality-limited water bodies for both Idaho and Washington. In Idaho, the listing is for "metals" (IDEQ, 2003). The listing for Washington is specific to arsenic, cadmium, chromium, lead, and zinc (WDOE, 2003c), although Johnson and Golding (2002) recommended removing chromium from the 303(d) list based on results of a study conducted in 2001 and 2002. The WDOE (2005a) did not propose listing the Spokane River for metals in its proposed 2004 303(d) list since EPA has approved TMDLs addressing metals for both Idaho and Washington. The TMDLs establish a "pollution budget" for the Coeur d'Alene River Basin, including waters of the South Fork of the Coeur d'Alene River and tributaries, mainstem Coeur d'Alene River, Coeur d'Alene Lake, and Spokane River upstream of the Idaho-Washington state line. The pollution budget determines the amount of a pollutant that can be introduced into basin waters without exceeding applicable water quality standards. It also allocates a portion of this budget to sources of pollution. Notably, contaminant sources within the Project area (i.e., Coeur d'Alene Lake itself) were not assigned pollutant loads because it is expected that the load allocations for sources upstream of the Project area would achieve compliance with water quality standards. Due to the scale of the contamination problem, the cleanup is expected to take many years. EPA, IDEQ, and other governmental agencies continue to evaluate the effectiveness of cleanup projects in light of the TMDL goals.

Dissolved zinc concentrations generally exceed Washington water quality criteria throughout most of the year in the upper portion of the Spokane River between the Idaho/Washington state line and the Trent Road Bridge (Golder, 2004g). Dissolved lead and cadmium concentrations also exceed Washington water quality criteria in the upper portion of the Spokane River between the Idaho/Washington state line and the Trent Road Bridge, but seasonal or long-term trends are less evident due, in part, to variability in the method detection limits used in analyzing the water samples over the period of record (Golder, 2004d).

In Lake Spokane, the concentration of dissolved zinc has significantly reduced over time. The samples containing the highest zinc concentrations were measured in the 1960s and 1970s and are therefore not representative of current conditions (Golder, 2004d). These samples were measured before the source control regulations requiring the use of mine tailings dams on the Coeur d'Alene River were enacted in 1968. Prior to 1968, most mine tailings were deposited on the banks or discharged directly into the Coeur d'Alene River. This illustrates the significance of source control in managing metals water quality in the Spokane River system. USGS sampling in 1999 and 2000 shows mean flow-weighted concentrations for zinc that are generally below Washington water quality criteria in Lake Spokane (Clark, 2003).

Sediments with elevated concentrations of lead are deposited in slack water areas in the Spokane River (EPA, 2001b). The primary areas where this deposition occurs are in the slack water reaches upstream of dams. In addition, fine-grained sediments are deposited in pockets behind boulders and on small beaches throughout the Spokane River.

Woods (2001) conducted an analysis of concentrations and loadings of whole-water recoverable (total) and dissolved cadmium, lead, and zinc samples in the Spokane River during water year 1999 (October 1998–September 1999), which had a mean annual flow 20 percent greater than the long-term average. Results of this analysis are presented in the PDEA (Avista, 2005, Table 5-29). The annual load of cadmium, lead, and zinc generally decreased between the Post Falls Project discharge and 0.5 mile upstream of the confluence with Hangman Creek (USGS gage no. 12422500). However, the annual load of dissolved lead increased in this reach. For water years 1999–2000, Clark (2003) reported similar results showing reductions in cadmium and zinc loads and variable response in lead loads for this reach. Discharges from Long Lake Development (USGS no. 12433000) had much smaller loadings of cadmium, lead, and zinc for both whole-water and the dissolved fraction, indicating that the reservoir acts as a sink for these metals, which is consistent with the pattern for sediments (Clark, 2003). Overall during 1999–2000, metals loads were significantly reduced between the source areas entering Coeur d'Alene Lake and the outlet from Lake Spokane. Clark (2003) reports that 76 percent of the cadmium load, 95 percent of the lead load, and 48 percent of the zinc load delivered to Coeur d'Alene Lake during 1999–2000 was lost to Coeur d'Alene Lake, the Spokane River, and Long Lake.

WDOE recently conducted two evaluations of contaminant levels in Lake Spokane fish-tissue samples. The results of these studies suggest that Lake Spokane is not impaired by cadmium, lead, mercury, or zinc (Jack and Roose, 2002). In a review of the data reported for the statewide evaluation of mercury levels in bass (Fischnaller et al., 2003), the Washington State Department of Health concluded that it was not appropriate to issue a fish consumption advisory for largemouth bass from Lake Spokane (WDOH, 2003).

3.3.3.1.5 Total Dissolved Gas

Elevated levels of TDG have the potential to adversely affect aquatic organisms, and both Idaho and Washington have adopted a numeric TDG criterion of 110 percent of saturation. Elevated levels of TDG (above 100 percent saturation, commonly referred to as supersaturation) can result when water plunges into a pool, forcing entrained gases into saturation under elevated pressure. Supersaturation can occur at both natural falls or as a result of spill at dams. TDG levels can also be influenced by other chemical and biological processes.

Contractors selected by the WRWG investigated TDG levels in Project waters and the effect of the Project on TDG by monitoring conditions at several locations in the Project area. They deployed and regularly maintained continuously recording instruments at selected monitoring locations and also made spot measurements of TDG levels to supplement the continuous data collection programs and better understand overall TDG conditions (CH2M HILL, 2002; Golder, 2003, 2004f). Continuous measurements generally were made at 1-hour intervals prior to 2003 and at 10-minute intervals in 2003 and 2004. In addition, Avista had conducted earlier TDG monitoring prior to the start of the relicensing process. To fill in data needed for development of a TDG TMDL, WDOE conducted seasonal monitoring of TDG upstream of Upriver Dam and provided support to the Spokane Tribe of Indians for TDG monitoring downstream of Little Falls Development. Results of monitoring conducted by the contractors selected by the WRWG between April 2001 and early July 2004 are summarized by calendar year in the PDEA (Avista, 2005, Table 5-30). Results of WDOE's and the Spokane Tribe's monitoring effort are not in a format that facilitated incorporating them into this analysis, although preliminary results of WDOE's 2003 monitoring effort are available on the Internet (WDOE, 2005b). The WDOE results are discussed below.

Post Falls Project

TDG measurements obtained in the Post Falls Project forebay ranged from 97 to 111 percent of saturation during the 2003 and 2004 monitoring periods. TDG levels generally remained below the 110-percent criterion, although levels exceeded 110 percent for brief periods in May 2003. Golder (2004f) reported that TDG values followed a daily cyclical pattern and attributed this pattern to variation in water temperatures (with gas saturation proportional to temperature) and photosynthesis.

Avista and contractors monitored TDG levels in the river downstream of the Post Falls Project through both continuous and spot measurements during 2001, 2002, 2003, and 2004. TDG levels measured in the Post Falls Project tailrace at the USGS gage 1.2 miles downstream of the dam ranged from 92 to 120 percent and had values greater than 110 percent at various times from March to June. Results of continuous TDG monitoring in 2003 and 2004 suggest that spill at the south channel of the Post Falls Project produces less downstream TDG than passing water through the north channel (Golder, 2003, 2004f).

Downstream of Post Falls Project to Monroe Street—Spot measurements of TDG indicate that elevated TDG levels dissipate approximately 5 percent between the Post Falls Project and the reservoir of the City of Spokane's Upriver Development, and that approximately half of this dissipation occurs upstream of the Washington/Idaho state line (Golder, 2004f). A preliminary evaluation of continuous measurements of TDG upstream of Upriver Dam indicates that TDG remained below 110 percent during the spill season of 2003 (WDOE, 2005a). All TDG measurements for the Upper Falls Development forebay, tailrace, and immediately downstream of the spillway were below the 110-percent criterion. Overall, TDG was approximately 3 percent higher immediately below the Upper Falls spill control structure than upstream of it (Golder, 2003). Water flowing over the natural upper falls tended to increase TDG in the north channel by about 3 to 4 percent, and resulted in exceedances of the 110-percent criterion during two monitoring events. At the Monroe Street Development forebay, spot TDG measurements ranged from 103 to 114 percent. Because routing water through the power plants typically does not result in gas entrainment, the elevated TDG levels in the Monroe Street Development forebay are likely the result of water with naturally high TDG levels caused by the upper falls being mixed with water routed through the Upper Falls Development power plant (Golder, 2003).

Downstream of Monroe Street Development to Nine Mile Reservoir—TDG measurements in the Monroe Street Development tailrace were nearly the same as in its forebay, indicating that Monroe Street Development has little influence on Spokane River TDG levels. Spot measurements made at five locations downstream of the development and lower falls provide insight into the effect of the naturally occurring lower falls on TDG levels and the rate of the downstream dissipation of the elevated TDG. TDG measurements at a station 0.7 mile downstream of the lower falls ranged from 104 to 128 percent of saturation and were typically greater than the corresponding levels recorded in the Monroe Street Development forebay or tailrace. This indicates that flow over the lower falls resulted in elevated TDG levels. During peak flows in late March to early April 2003, TDG levels were reduced by nearly 10 percent in the 10.3-mile-long reach below this station (Golder, 2003). Golder (2004f) reported a similar decrease in TDG levels within this 10.3-mile-long reach in 2004. Measurements made 2 miles farther downstream indicate that little further dissipation occurs in this reach, and TDG levels of up to approximately 117 to 118 percent of saturation occurred. This reduced dissipation rate was attributed to increased river depth and the already-reduced TDG levels.

Nine Mile Development—TDG levels measured in the Nine Mile Development forebay ranged from 93 to 121 percent of saturation. This forebay experiences daily fluctuations in TDG (commonly 3 to 7 percent), with the highest values occurring in late afternoon and the lowest values occurring in the morning. Golder (2003) suggests that large daily fluctuations in TDG could be a result of high levels of photosynthetic activity due in part from nutrient supply from the Spokane sewage treatment plant and daily temperature fluctuations in the forebay.

Downstream of Nine Mile Development to Long Lake Reservoir—TDG measurements obtained 0.4 mile downstream of the dam ranged from 96 to 123 percent and typically had smaller daily fluctuations than in the Nine Mile Development forebay. These downstream TDG levels tended to be similar or below corresponding levels recorded in the forebay, indicating little, if any TDG production at the development, and that the development's spillway may reduce gas levels at times.

Long Lake Development—TDG measurements in the Long Lake Development forebay ranged from 101 to 123 percent, and typically had daily fluctuations of less than 5 percent before mid-spring and during summer. During mid-spring, daily fluctuations in TDG of 5 to 10 percent occurred. Golder (2003) also indicated that spot measurements made in the forebay and power plant tailrace during 2003 were not consistent with measurements recorded by the continuous measurement in the forebay. These observations suggest that the continuous forebay measurements are not always representative of TDG levels in the water actually being passed through the turbines. To better monitor TDG conditions of water being drafted into the intake and to avoid damaging the equipment used for monitoring, the TDG sensor was moved to other locations during 2004. Results of this monitoring indicate that large daily fluctuations in forebay TDG occurred erratically from spring to early summer. Golder (2003, 2004f) reported that the variation in TDG levels corresponds with fluctuations in water temperatures and appears to be related to disruption of thermal stratification in Lake Spokane.

Downstream of Long Lake Development—TDG measurements obtained 0.6 mile downstream of Long Lake Development ranged from 90 to 129 percent. These downstream levels were generally higher than the upstream forebay levels, substantially so during spill periods. During the 2003 and 2004 monitoring period, nearly half of the measured values exceeded 110 percent. Avista also tested various spill gate configurations during monitoring. These tests indicated the potential for reducing TDG super-saturation by preferential use of certain spill gates.

3.3.3.2 Environmental Consequences

3.3.3.2.1 Effects of Lake Level Management on Water Quality

The effects of Avista's hydroelectric developments on water quality were examined via a series of water quality models developed using CE-QUAL-W2. The selection and application of these models proceeded at the direction of the WRWG, and the modeling was carried out by consultants (Golder Associates and HDR Engineering), with technical review by one of the developers of the CE-QUAL-W2 model (Dr. Scott Wells). Two CE-QUAL-W2 models of the Spokane River had been developed previously by others (Berger et al., 2001a,b; Wells et al., 2003). WDOE used these models to assess Spokane River water quality. The exact model setups from these models were the basis for the modeling requested by the WRWG. The CE-QUAL-W2 model for Coeur d'Alene Lake is a completely new model developed during this process that simulated water quality throughout the Coeur d'Alene Lake system, including the inundated reaches of the St. Joe River, Coeur d'Alene River, and lateral lakes. The objectives of the modeling were to develop a baseline water quality simulation of current conditions and to then compare a regulated and uninundated model scenario to better understand the relative effects of the presence and operations of hydroelectric developments.

The use of the model to predict relative effects is consistent with standard modeling practice, while the absolute accuracy of the parameters and modeling coefficients used in the model is always subject to some uncertainty. However, the absolute accuracy of the model is not as important because the models were used to compare scenarios (regulated versus unregulated), and any error in the model results would be similar between scenarios. Most modeling protocols acknowledge this approach as a valid use of models. Although the models are representative of water quality conditions in the river, lake, and inundated areas, the primary use of the modeling was not to forecast absolute water quality conditions, and doing so would introduce additional uncertainty into conclusions reached. For this reason, model-based exceedances and numeric predictions have some uncertainty associated with them. Both modeling analyses (Golder, 2004g; HDR, 2005) describe the uncertainties, use, and limitations associated with these models.

Post Falls Project

Current Post Falls Project operation maintains an elevated Coeur d'Alene Lake water level on average from late June into December compared to what might occur under unimpounded conditions, or a natural hydrograph (it is worth noting that "pre-Project" conditions would have also experienced operations of Frederick Post's dams). Golder and HDR used the CE-QUAL-W2 model to evaluate Project effects on water temperature and water quality in Coeur d'Alene Lake. Modeling results indicate that the Project has resulted in slightly higher water temperatures in the shallow areas of the southern portion of the lake during June to November compared to what might occur under unimpounded conditions (Golder, 2004g). At Benewah Lake, temperatures may be as much as 2.4ºC (4.3ºF) warmer for periods of up to 15 days during August and September. The model predicts that the Spokane River at the Post Falls Project experiences a warming effect, compared to an unimpounded condition, of about 1.1ºC (2.0ºF) during October and between 0.4 and 0.8ºC (0.7 and 1.4ºF) between June and September. However, modeled temperatures for bottom layers at Post Falls were often cooler between June and September under current conditions than the unimpounded condition.

Comparisons of the frequency that model results exceed the applicable temperature criteria were also made using the CE-QUAL-W2 modeled values by Golder (2004g). Again, Benewah Lake was predicted to have the greatest change in the frequency of exceedances (compared to an unimpounded condition) causing a 5 percent increase in the frequency of exceedance of Idaho's 19°C (66°F) chronic coldwater criteria and a 17 percent increase in the frequency of exceedance of Idaho's 9ºC (48°F) chronic salmonid spawning criteria. However, the applicability of these criteria to shallow water areas may be limited because, for example, salmonid spawning may not occur in shallow-water environments like Benewah Lake, which would experience exceedances under unimpounded conditions as well. The Spokane River at the Post Falls Project forebay was predicted to have no change (compared to an unimpounded condition) in the frequency of exceeding Idaho's 19ºC (66°F) chronic coldwater criteria.

The model results were also used to compare the total volume of water in shallow and deep lake areas that exceed the temperature criteria. The model predicted that, under current conditions, the volume of water in shallow areas that satisfy Idaho's 19ºC (66°F) chronic coldwater criteria is reduced by 16 percent during August in comparison to unimpounded conditions. The relative differences in volumes of water meeting this temperature criteria are lower during all other months of the year. The model predicted that current conditions, compared to an unimpounded condition, *increase* the volume of water in deep areas that satisfy Idaho's 19ºC (66°F) chronic coldwater criteria by about 11 percent during August. Impoundment was predicted to result in a reduction of approximately 1,540 acre-feet of shallow water and an increase of approximately 211,600 acre-feet of deep water that satisfy Idaho's 19ºC (66°F) chronic coldwater criteria.

Model results indicate that operation of the Post Falls Project has slightly reduced DO concentrations in Coeur d'Alene Lake compared to unimpounded or natural hydrograph conditions (Golder, 2004g). This appears to be primarily due to the corresponding reduction in oxygen saturation capacity caused by increasing water temperatures. At Benewah Lake, DO concentrations were predicted to be as much as 0.6 milligram per liter lower for current conditions than the unimpounded condition, although predicted DO concentrations were above Idaho's 6-milligrams-per-liter criterion. In deep lake segments, such as Driftwood Point, DO concentrations were predicted to be less than 0.1 milligram per liter lower for current conditions than unimpounded conditions.

The model predicted periods of anoxic conditions at the bottom of Chatcolet Lake that have been observed during the summer. The model indicated that these conditions would also occur under an unimpounded condition. Therefore, development operations do not appear to be the cause of observed anoxia in Chatcolet Lake. However, the model predicted that the length of time that anoxic conditions persist at the bottom of Chatcolet Lake under current conditions is longer than would occur under unimpounded conditions.

The model was also used to compare the total volume of water in shallow and deep lake areas that satisfy Idaho's 6-milligrams-per-liter DO criterion. The model predicted that current conditions, compared to an unimpounded condition, reduce the total volume of water in shallow areas that satisfy the 6-milligrams-per-liter criterion by about 22 percent during August and 15 percent in July. Relative differences in shallow water satisfying the DO criterion are smaller during all other months of the year. For deep lake areas, the model predicted that current conditions, compared to an unimpounded condition, increase the volume of water that satisfies the 6-milligrams-per-liter criterion by about 9 percent during August and September. The current condition in comparison to an unimpounded condition reduces the volume of shallow water satisfying the 6-milligrams-per-liter criterion by approximately 4,540 acre-feet and increases the volume of deep water satisfying this criterion by about 194,570 acre-feet.

Model results suggest that current Project operations have negligible effect on pH and nitrate concentrations within deep areas of Coeur d'Alene Lake

(Golder, 2004g). Shallow areas are also very similar for pH and nitrate concentrations. The model predicted that Chatcolet Lake and the Spokane River upstream of the Post Falls Project sometimes have moderately lower pH in mid-summer to fall than would occur under unimpounded conditions. This has resulted in a slight improvement in satisfying the pH criteria in these areas.

The model predicted total phosphorus concentrations for current conditions that were both higher and lower that under unimpounded conditions. Benewah Lake was predicted to have the greatest increase in frequency (10 percent) of satisfying EPA's 6.25-micrograms-per-liter guidance levels for total phosphorus. Differences in the frequency of satisfying this criterion were less than 3 percent at all other locations. The model predicted that several locations satisfy the 6.25-micrograms-per-liter guidance levels for total phosphorus more frequently under the current condition than under an unimpounded condition.

Large quantities of trace metals (primarily cadmium, lead, and zinc) that were introduced into the lake as a consequence of more than 100 years of mining and ore-processing activities occurring in the Coeur d'Alene River Basin have affected water quality in Coeur d'Alene Lake. The main mining district, often referred to as the "Silver Valley," began operation in 1880 and was one of the major commercial sources of silver, lead, and zinc in the United States. As late as 1964, estimates indicated approximately 2,200 tons of mining and processing wastes were entering the river per day (Reece et al., 1978). These materials were highly enriched with silver, arsenic, cadmium, lead, manganese, lead, antimony, and zinc (Horowitz et al., 1992). Until 1968, most of the mining and ore-processing wastes were deposited either on the banks or directly into the South Fork of the Coeur d'Alene River. Since 1968, tailings ponds have been used to contain mining waste thereby limiting these sediment sources. This has resulted in a significant and measurable reduction in metals concentrations in Coeur d'Alene Lake and Spokane River.

Golder (2005b) examined the processes that affect metals concentrations in water and sediment for primary metals of concern, including sediment load, mixing, adsorption/desorption, diffusion, sulfide oxidation, and reductive dissolution. The results of the water quality model (CE-QUAL-W2) were used to specifically simulate possible geochemical releases from sediment using a mass balance approach that included the use of a geochemical model (PHREEQC). The objective of the modeling was to assess whether variations in lake level related to hydroelectric development operations would have a significant effect on the mobilization of metals from the lakebed sediments. The modeling analysis included an assessment of sediment pore water data, modeling of spatial and temporal changes (relative to uninundated conditions) for parameters controlling metals release (CE-QUAL-W2 model), and geochemical modeling (PHREEQC) to changes in the benthic flux of metals.

Modeling results indicate that, to cause a significant change in metal concentrations, hydroelectric development operations would need to impose a significant long-term change in geochemical conditions (DO, pH, and redox potential) at the sediment-water interface that is sustained over an extended period. The CE-QUAL-W2 model predicted that these types of changes have not occurred as a result of past hydroelectric development operations (Golder, 2004g).

Our Analysis

The CE-QUAL-W2 water quality model, created during the relicensing process (Golder, 2005a), is the most comprehensive water quality model of the lake. It includes new bathymetry data and extends to the inundated portions of the Coeur d'Alene, St. Joe and Spokane rivers, plus 10 lateral lakes along the Coeur d'Alene River Valley. This lake model was used to examine the influence of the Post Falls Project on Coeur d'Alene Lake, including portions of the Coeur d'Alene and St. Joe Rivers.

The model was run using two scenarios: one a hydrograph representing current hydroelectric development operations and flows (i.e., an "impounded scenario," reflecting the "regulated" conditions of the current hydrograph), and the other using a hydrograph representing conditions as if the Post Falls Project did not impound water in Coeur d'Alene Lake (i.e., an "unimpounded scenario" reflecting an "unregulated" condition or "natural hydrograph"). It simulated water quality conditions from 1991 to 2003.

Using standard techniques, and subject to the uncertainties and variability inherent in any model, the modeling indicates that ongoing Project operations to maintain the lake level at elevation 2,128 feet do not have a significant effect on water quality in Coeur d'Alene Lake. The model indicates that elevated temperatures and low DO in the lake would persist at similar magnitudes and frequencies without the Project. The lake's effect on individual water quality parameters is discussed in subsequent sections, along with intervenor filings related to those specific water quality parameters.

Under the Proposed Action, Avista would begin drawdown of Coeur d'Alene Lake on September 15. This date, which is consistent with the historical range of the initiation of drawdown (although it may result in a period of full pool lasting 1 to 2 weeks longer), would provide a specific date for the initiation of drawdown. Avista also proposes to increase the Post Falls Project minimum flow to 600 cfs during non-droughts conditions and 500 cfs during drier summer conditions. As compared to current operation, implementing these proposed operations would have a very minor effect on Coeur d'Alene Lake levels, and therefore little effect on water quality upstream of Post Falls.

Under the Proposed Action, Avista would implement PME PF-WQ-2 to meet water quality standards and support existing beneficial uses of the Spokane River and Coeur d'Alene Lake. Specifically, this PME measure is designed to monitor and evaluate the effects on water quality of a new minimum discharge flow from the Post Falls Project, to support expansion of current water quality monitoring efforts on Coeur d'Alene Lake (as a part of ongoing water quality management by IDEQ and the Coeur d'Alene Tribe), and to enhance the predictive qualities of the CE-QUAL model (and other models) for use as a lake management tool by IDEQ and the Coeur d'Alene Tribe. There is broad support for this measure. It would provide long-term monitoring of water quality conditions in the Spokane River and Coeur d'Alene Lake, including parameters affected by Project operations.

The DOI BIA 4(e) filing of July 17, 2006, condition 3, called for Post Falls to be operated at all times so that "it does not contribute to exceedance of applicable numeric criteria and narrative Federal, State, and Tribal water quality standards." In addition, Avista would be required by this condition to implement a monitoring, sampling, and modeling program on water quality within the Reservation. As proposed, this is an extensive and comprehensive program encompassing a full range of water quality parameters, including temperature.

Modeling indicates that water temperature increases and DO level decreases may occur in some areas of the lake due to Avista operating the Project so as to maintain the summer lake level at elevation 2,128 feet. The comprehensive monitoring recommended by DOI BIA would provide information regarding water temperature and DO; however, it also would include monitoring of multiple parameters, including benthos and phytoplankton, that the model suggests are unaffected by Project operations.

Avista's September 1, 2006, filing stated the DOI BIA 4(e) condition 3 would require an extraordinarily burdensome and costly monitoring, sampling, and modeling program on water quality within the Reservation, which would involve the study of many water quality parameters that are not affected by the Project. Avista's August 17, 2006, filing proposed an alternative condition that would require Avista to conduct a limited water quality plan and to maintain the elevation of the lake in accordance with the requirements specified by DOI BIA in its modified conditions.

DOI BIA's modified conditions are expected to be filed with the Commission subsequent to the ongoing EPAct proceeding. Therefore, because these conditions are not currently available, we are unable to evaluate the environmental and economic effects of Avista's proposed alternative operation of the Post Falls Project.

Avista's alternative monitoring program proposes that Avista monitor water temperature and DO in areas within the Project boundary that occupy the Coeur d'Alene Indian Reservation. This monitoring program was proposed by Avista as a separate and additional proposal to PF-WQ-2. Under Avista's proposed operation of the Post Falls Project, the Project would continue to affect water temperature and DO within Coeur d'Alene Lake. Under this scenario, Avista's alternative Water Quality Monitoring Program would be useful for monitoring Project effects on water temperature and DO in the portion of the lake that lies within the Coeur d'Alene Indian Reservation. However, if the Project were operated as specified in DOI BIA's condition 3, there would be no Project effects on water quality within the lake and, therefore, no benefit to implementing Avista's proposed alternative Water Quality Monitoring Program.

Spokane River Developments

At Lake Spokane, Avista would continue to limit drawdown of Lake Spokane to 14 feet, as it has voluntarily done since the 1980s.

Our Analysis

Model results indicate that impounding water in Lake Spokane and operating the Project increase surface temperatures in this lake reach from mid-spring through summer compared to what temperatures would be without the Project impoundments. Average increases in summer (July through September) 2001 surface lake temperatures were in the 3.6-to-6.8ºC (6.5-to-12.2ºF) range compared to free-flowing river conditions (HDR, 2005). Water in the hypolimnion of Lake Spokane was predicted to be cooler than corresponding modeled temperatures for unimpounded conditions. Based on modeled temperatures for Lake Spokane outflow, Project operations, which draw cooler water into the development from well below the thermocline, have generally avoided exceedances of Washington's 20°C (68°F) criterion that might otherwise occur in an unimpounded river below the location of the development. In addition, Project operations substantially reduce the frequency that the Spokane Tribe's temperature criteria would be exceeded, compared to unimpounded conditions (HDR, 2005).

3.3.3.2.2 Effect of Project Flow Releases on Temperature

Post Falls Project

Above Post Falls, Benewah Lake was predicted to have the greatest change in the frequency of exceedances (compared to an unimpounded condition) causing a 5 percent increase in the frequency of exceedance of Idaho's 19°C (66°F) chronic coldwater criteria and a 17 percent increase in the frequency of exceedance of Idaho's 9ºC (48°F) chronic salmonid spawning criteria. However, the applicability of these criteria to shallow water areas may be limited because, for example, salmonid spawning may not occur in shallow-water environments like Benewah Lake, which would experience exceedances under unimpounded conditions as well. The Spokane River at the Post Falls Project forebay was predicted to have no change (compared to an unimpounded condition) in the frequency of exceeding Idaho's 19ºC (66°F) chronic coldwater criteria.

At Benewah Lake, temperatures may be as much as 2.4ºC (4.3ºF) warmer for periods of up to 15 days during August and September. The model predicts that the Spokane River at the Post Falls Project experiences a warming effect, compared to an unimpounded condition, of about 1.1ºC (2.0ºF) during October and between 0.4 and 0.8ºC (0.7 and 1.4ºF) between June and September. However, modeled temperatures for bottom layers at Post Falls were often cooler between June and September under current conditions than the unimpounded condition.

Water temperatures in the Spokane River from immediately downstream of Coeur d'Alene Lake to the Idaho/Washington state line currently exceed Idaho's applicable water temperature criteria during much of the summer. Comparison of CE-QUAL-W2 modeling results for current and unimpounded conditions indicate that current Project operations reduce (by 35 percent) the frequency of daily maximum temperature exceedances of Idaho's 22°C (71.6°F) criterion that would otherwise occur immediately downstream of the Post Falls Project (HDR, 2005). However, the development has had little effect on the frequency of daily average temperature exceedances of Idaho's 19°C (66.2°F) criterion. Modeling also indicates that Project operations have little effect on the frequency of exceedances of Idaho's daily maximum and daily average temperature criteria farther downstream at the Idaho/Washington state line.

Under current Project operations, water temperatures frequently exceed Washington's 20°C (68°F) criterion in the reach between the Idaho state line and the upper end of the Upriver Reservoir from July through early September. The model predicts that Project operations have little effect on the frequency of these exceedances. Operation of the Project has slightly increased the frequency that the criterion is exceeded at Sullivan Road as compared to an unregulated condition, but has substantially reduced the frequency of exceedance of this criterion from the upper end of the Upriver Reservoir down to the upper end of the Upper Falls Reservoir. Current Project operations have almost no effect on exceedance of the 20ºC (68ºF) criterion at the Upper Falls forebay and tailrace.

Based on CE-QUAL-W2 modeling, current Project operations somewhat reduce the frequency that daily maximum temperatures exceed Washington's 20°C (68°F) criterion in the area of the Nine Mile Reservoir and its tailwater compared to unregulated conditions (HDR, 2005).

Our Analysis

The Proposed Action includes measures for minimum instream flow releases for aquatic and aesthetic resources (measures PF-AR-1 and PF-AES-1). Avista would release at least 600 cfs as measured at the gage just downstream of the Post Falls Dam year-round, with the exception of periods in August or early September when it would reduce minimum flows to as low as 500 cfs if the minimum instream flow releases caused Coeur d'Alene Lake water levels to fall to an elevation of less than 2,127.75 feet. New aesthetic flow releases would be provided seasonally at the Post Falls Project. In addition, Avista would manage flows at the Post Falls Project to protect downstream trout spawning and fry emergence.

The Proposed Action includes PF-WQ-2 to meet water quality standards and support existing beneficial uses of the Spokane River. It is designed to monitor and evaluate the effects of a new minimum discharge flow from the Post Falls Project on water quality in the Spokane River. The monitoring would be beneficial to water temperature by helping to explain the relationship of flows and temperatures.

Providing aesthetic flows into the north channel at the Post Falls Project by opening two gates approximately 0.5 inch (providing a flow of approximately 46 cfs) could have minor short-term localized effects on flows and water temperature in this channel. Increasing flow here would somewhat reduce the limited warming from solar input and ambient conditions that currently occur in the reach. Because current operations result in spill into this channel during many years, cooling effects would be most noticeable during below-normal river flows. However, these effects would result in negligible effects downstream of the confluence of this channel with the rest of the river.

Golder and HDR evaluated potential effects of different Project operations on water quality in the Spokane River between the Post Falls Project and Long Lake Development using the CE-QUAL-W2 model. Various model runs were conducted, including one for current conditions and runs with 700-cfs and 800-cfs minimum flows at the Post Falls Project. The modeled water quality conditions for a 700-cfs minimum flow release at the Post Falls Project as compared to current operations were used to evaluate the effects of 600-cfs and 500-cfs minimum flow releases (Koreny, 2004; Koreny and Oppenheimer, 2004).

The model results indicated that a 700-cfs minimum discharge at the Post Falls Project would have no influence on water temperatures upstream of the Post Falls Project and similar temperatures downstream of the development in the losing reaches of the Spokane River (Koreny and Oppenheimer, 2004). Where groundwater inflow begins to influence river water temperatures, the relatively warm lake outflow would result in warmer temperatures than under current low-flow conditions due to the increased volume of surface water compared to cooler groundwater.

To evaluate worst-case conditions under an increased minimum discharge at the Post Falls Project, Avista used the characteristics of daily maximum temperatures modeled for August 2001 (Avista, 2005, Figure 5-18). These modeling results show that the effects of increasing the flow release from the Post Falls Project would vary by reach, depending on the interaction of surface water and groundwater. In the reach that loses water to the aquifer between the Post Falls Project and Barker Road (river mile 90.4), increasing the flow release would somewhat lower daily maximum temperatures. In the reach downstream of Barker Road, the river receives substantial cool-water inflow from the aquifer. Increasing the flow release from the Post Falls Project would substantially reduce the cooling effect of this inflow and consequently increase daily maximum temperatures. Model results indicate that the largest increases in daily maximum temperatures would occur at the upper end of the Upriver Reservoir (river mile 84.6). A more moderate temperature increase of 1.5°C (2.7ºF) with a 700-cfs flow release would generally occur at Sullivan Road (river mile 87.5), although current temperatures at this site already exceed Washington's 20°C (68°F) criterion at times and would likely do so more frequently with an increased hydroelectric development discharge. Increasing the flow release to 700 cfs would have lesser effects downstream of the Upriver Project and the Upper Falls and Monroe Street Developments as additional groundwater entered the river; modeling results indicate negligible effects on daily maximum temperatures from the upper end of the Nine Mile Reservoir (river mile 63.4) downstream.

Avista suggests that the effects of the Proposed Action's 600-cfs and 500-cfs flow releases on downstream water temperatures are expected to be similar to those for a 700-cfs flow release; however, no models have been run for 500 or 600 cfs. Avista also gathered field data in August 2004 at a time when air temperatures were greater than 32°C (90°F) and flows of between approximately 500 and 700 cfs were released at the Post Falls Project. Results of this evaluation corresponded with modeling results (Golder, 2004i). Releases of 700 cfs from the Post Falls Project resulted in water temperature fluctuations of between 20 and 22.5°C (68 and 72.5°F) at Sullivan Road.

Based on these results, Horner (2004) estimated that a 600-cfs release would result in temperatures of 19 to 21°C (66.2 to 69.8°F). These results indicate that water temperatures higher than Washington State's 20°C (68°F) criterion would likely still occur with a 600-cfs minimum discharge at the Post Falls Project. At a 500-cfs minimum discharge, it is likely that less frequent exceedances of the 20°C (68°F) criterion would occur at Sullivan Road when compared to slightly higher flows. However, overall habitat suitability for rainbow trout was close to optimal when flows were close to 600 cfs, particularly when considered in conjunction with these temperature results. Based on this reasoning, the IDFG and the IDEQ recommend Avista's proposed minimum flows specifically because these flows resulted in beneficial temperatures as compared to the current operation.

The Sierra Club July 17, 2006, filing proposed that Avista perform additional temperature monitoring and provide for mitigation. The CELP filing of July 17, 2006, proposed monitoring, adaptive management, and upgrading to real-time flow gages.

The WDFW July 17, 2006, filing indicated a preference for 770 cfs at Post Falls (to provide 600 cfs at Barker Road); however, it agreed to support Avista's 600/500 cfs proposal only within the context of a 5-year Adaptive Management Monitoring Program, due to its concern for high temperatures in the vicinity of Barker Road. WDFW pointed out that "modeled data showed an increase in daily average river temperatures in the Sullivan Road area to unacceptable levels - around 23°C. Some field measurements were collected by Avista in August of 2004: two days of flow at 700 cfs recorded maximum water temperatures of 22.5°C, and two days of flow at 500 cfs recorded temperatures of 19.5°C. Other than this, little data demonstrates or substantiates the relationship between Post Falls discharge and temperature response in the upper Spokane River."

Avista's September 1, 2006, filing called for rejection of CELP and WDFW's adaptive monitoring, claiming them to be unnecessary, unreasonable, and onerous.

The WDOE May 23, 2005, comments on the PDEA also indicated temperature concerns, leading it to endorse the 5-year adaptive management approach. The WDOE July 17, 2006, filing did not propose additional conditions related to temperature (other than its continuing support for adaptive management).

Considering the available data on habitat, flows, and temperature, WDFW revised its minimum discharge recommendation for the Post Falls Project to that of 600 cfs, with a recommendation for additional monitoring to better understand how the Project affects trout and trout habitat downstream. Because flows have a strong effect on water temperature, an additional 5 years of monitoring would provide necessary data to better understand the Project's effect on temperature and the affected resources in the Spokane River. Data collected would provide resource managers and decision-makers with additional information to refine Project operations if appropriate.

Spokane River Developments

Under current Project operations, water temperatures frequently exceed Washington's 20°C (68°F) criterion in the reach between the Idaho state line and the upper end of the Upriver Reservoir from July through early September. The model predicts that Project operations have little effect on the frequency of these exceedances. Operation of the Project has slightly increased the frequency that the criterion is exceeded at Sullivan Road as compared to an unregulated condition, but has substantially reduced the frequency of exceedance of this criterion from the upper end of the Upriver Reservoir down to the upper end of the Upper Falls Reservoir. Current Project operations have almost no effect on exceedance of the 20ºC (68ºF) criterion at the Upper Falls forebay and tailrace.

Based on CE-QUAL-W2 modeling, current Project operations somewhat reduce the frequency that daily maximum temperatures exceed Washington's 20°C (68°F) criterion in the area of the Nine Mile Reservoir and its tailwater compared to unregulated conditions (HDR, 2005).

Model results indicate that impounding water in Lake Spokane and operating the Project increase surface temperatures in this lake reach from mid-spring through summer compared to what temperatures would be without the Project impoundments. Average increases in summer (July through September) 2001 surface lake temperatures were in the 3.6-to-6.8ºC (6.5-to-12.2ºF) range compared to free-flowing river conditions (HDR, 2005). Water in the hypolimnion of Lake Spokane was predicted to be cooler than corresponding modeled temperatures for unimpounded conditions. Based on modeled temperatures for Lake Spokane outflow, Project operations, which draw cooler water into the development from well below the thermocline, have generally avoided exceedances of Washington's 20°C (68°F) criterion that might otherwise occur in an unimpounded river below the location of the development. In addition, Project operations substantially reduce the frequency that the Spokane Tribe's temperature criteria would be exceeded, compared to unimpounded conditions (HDR, 2005).

Our Analysis

The Proposed Action includes PME SRP-WQ-2 to meet water quality standards and support existing beneficial uses of the Spokane River. It is designed to monitor and evaluate the effects on water quality of a new minimum discharge flow from the Post Falls Project in the Spokane River and to and improve the DO levels at the discharge of Long Lake Development. The monitoring would be beneficial to water temperature by helping to explain the relationship of flows and temperatures.

3.3.3.2.3 Effect of Flows on Biological Productivity, DO, and Other Water Quality Parameters

Post Falls Project

Monitoring data for the Idaho reach of the Spokane River indicate that the 6-milligrams-per-liter DO criterion and the 6.5-to-9.0 pH criteria are generally satisfied. HDR (2005) evaluated the effect that the Project currently has on DO concentrations and pH levels by comparing CE-QUAL-W2 model results for current Project operations to modeled values for unimpounded flows for 2001. The model indicates that current Project operations have little effect on minimum DO concentrations in the Idaho portion of the Spokane River. Model results also suggest that current Project operations reduce diurnal pH shifts during the spring and thereby reduce the frequency at which pH exceeds the 9.0-criterion compared to unimpounded conditions.

Monitoring data for the Spokane River between the Idaho/Washington state line and Lake Spokane indicate that Washington's 8.0-milligrams-per-liter DO criterion and its 6.5-to-8.5 pH criteria are usually satisfied. However, the data indicate that DO concentrations of less than the 8.0-milligrams-per-liter criterion sometimes occur in the summer between the Idaho/Washington state line and the Upriver Dam, and pH values fall outside the 6.5-to 8.5-pH criteria in this reach in August (HDR, 2005). Model results indicate that the frequency of days with DO concentrations of less than the 8.0-milligrams-per-liter criterion under the current operations is virtually the same as unimpounded/free-flowing conditions in the Spokane River between the Idaho-Washington state line and the upper end of the City of Spokane's Upriver Reservoir (HDR, 2005). For most of the reach between the Upriver forebay and Nine Mile tailrace, model results suggest that the impoundments contribute to DO concentrations falling below the 8.0-milligrams-per-liter criterion during about 2 to 3 months of the summer. The model results suggest that the Project also has different effects on pH, depending on the reach of the river. Between Barker Road and Sullivan Road, current Project operations appear to increase summer diurnal pH fluctuations and daily maximum pH. However, current Project operations appear to have reduced diurnal pH fluctuations and daily maximum pH in the Upper Falls Reservoir and the Nine Mile Reservoir. Because of potential model limitations in simulating periphyton, it is not practical to compare discrete modeled values to the applicable pH criteria.

Our Analysis

The effects of the Proposed Action to increase the minimum discharge at Post Falls were evaluated through the use of the CE-QUAL-W2 model. Results indicate that increasing the Post Falls Project flow release to 700 cfs (used to evaluate the effects of the 600-cfs minimum flow under the Proposed Action) would have little effect on DO and algae concentrations in the Spokane River and

Lake Spokane (Koreny, 2004). The PDEA (Avista, 2005, Figure 5-19) displays the average daily minimum DO concentrations along with the average difference in daily minimum DO concentrations between current Project operations and a 700-cfs minimum discharge for August 2001. In the Spokane River, the average difference in daily minimum DO concentrations was within ± 0.5 milligram per liter at all sites other than Barker Road (river mile 90.4), where an increase of 0.9 milligram per liter was predicted (Avista, 2005, Figure 5-19). The change in DO concentrations at Barker Road is partially due to a corresponding cooling effect in the river in that reach which increases the water's capacity to retain oxygen. DO concentrations predicted for the surface of Lake Spokane are virtually the same for the 700-cfs release as for current Project operations. Modeled values for deeper layers generally indicated only negligible differences in DO concentrations, although minor differences of less than 1 milligram per liter were indicated for some water column profiles (Koreny, 2004). The effects of more than doubling the minimum flow releases from the Post Falls Project (from 300 cfs or less to 700 cfs) resulted in small differences in modeled daily minimum DO concentrations from the outflow of Lake Spokane—on average, approximately 0.1 milligram per liter. The model predicts minimal effects for a 700-cfs Post Falls Project minimum discharge.

The CE-QUAL-W2-modeled chlorophyll-*a* concentrations serve to reflect the presence of algae in Lake Spokane. Results of modeling indicate that increasing the minimum discharge at the Post Falls Project to 700 cfs would result in negligible effects on chlorophyll-*a* concentrations in Lake Spokane (Koreny, 2004). The average difference between Lake Spokane surface chlorophyll-*a* concentrations modeled for the 700-cfs release were within 6 micrograms per liter of the levels for current Project operations.

Under the Proposed Action, the provision of an aesthetic flow of approximately 46 cfs in the north channel of the Post Falls Project could result in minor increases in DO concentrations in the affected channels. As with temperature, effects of the aesthetic flows on DO concentrations and pH would be negligible downstream of the confluences of these channels with the remainder of the river.

The WDOE comments of May 23, 2005, on the PDEA also indicated DO concerns in the Spokane River. The WDOE July 17, 2006, filing did not propose additional conditions related to DO.

WDOE is currently drafting a TMDL to increase DO levels in the Spokane River and Lake Spokane. The development of the TMDL is guided by a Managed Implementation Plan, developed through a collaborative effort led by local governments and WDOE, in which Avista is referenced. Avista submitted a request for section 401 certification on July 12, 2006, and would continue to consult with WDOE on all relevant water quality measures. WDOE's certification review process, in turn, would provide additional opportunities for public review.

The DO levels predicted by modeling are dependent on predicted temperatures and predicted flow relationships which are not well known. This includes the uncertainties of using Post Falls flows as a surrogate for Barker flows and the use of 700 cfs flows to represent 600 cfs/500 cfs flows (and the resulting groundwater interaction at those flows). However, DO depletion is a natural symptom of a nutrient-loading problem in eutrophic lakes and reservoirs. Nutrients carried from the land from point and non-point sources (including tributaries such as the Little Spokane River and Latah Creek) are conveyed by the Spokane River to Long Lake Reservoir. Once there, the physical, chemical, and biological processes common to natural lakes and reservoirs take over, and the nutrients in their varied forms are metabolized by the biota. The result is depletion of DO in the hypolimnion of the reservoir during the low flow times of the year. While construction and operation of Long Lake Dam results in some changes in water quality, Avista's operation of the Post Falls Project does not influence the nutrient inputs, which are the predominant factor affecting DO levels within Long Lake Reservoir.

Spokane River Developments

Lake Spokane thermally stratifies from June through September, and stagnation of deep water results in low DO concentrations near the bottom of the lower portion of the reservoir in the summer and early fall. The primary effects of current Project operations on DO concentrations are that concentrations are increased in the upper end of the lake during most of the spring and summer and decreased in the hypolimnion of the lower portion of the lake in comparison to free-flowing conditions. The model indicates that 8.0-milligrams-per-liter concentrations would be met under unimpounded conditions, whereas the current impoundment of water behind Long Lake Dam and current Project operations, collectively, contribute to not satisfying the 8.0-milligrams-per-liter criterion between 3 to 5 months per year in the interflow and hypolimnion of the lower portion of the lake under current conditions (HDR, 2005). Monitoring data indicate that pH levels are generally within the acceptable limits of 6.5 to 8.5 units, although pH exceeds the 8.5-unit criterion on occasion (HDR, 2005). The model predicted that, during August through October, pH levels exceed the upper limit of 8.5 units near the surface for both current Project operations and free-flowing conditions; however, higher pH values were predicted for current Project operations (HDR, 2005).

Monitored power plant discharges from Long Lake Development have DO concentrations of less than the 8.0-milligrams-per-liter criterion established for the Spokane River by Washington State and the Spokane Tribe of Indians for a period of about 120 to 130 days during the summer and fall (HDR, 2005). The model predicted that DO concentrations under unimpounded conditions would not drop below the 8.0-milligrams-per-liter criterion, whereas current conditions result in DO concentrations of less than 8.0 milligrams per liter for more than 108 days (HDR, 2005). HDR (2005) did not evaluate the relationship between pH values for current operations and unregulated conditions at this location.

Our Analysis

The Sierra Club July 17, 2006, filing and The Lands Council July 17, 2006, filing proposed that Avista undertake projects to improve DO in Long Lake Reservoir and downstream.

The CELP July 17, 2006, filing proposed that a Dissolved Oxygen Enhancement Plan for Long Lake Dam should continue for 10 years instead of 5 and should be submitted for approval within 5 years of license issuance. It also proposed that $50,000 is insufficient to provide adequate funding for a feasibility study to improve DO levels downstream of Long Lake Development.

Avista's September 1, 2006, filing called for rejection of the Sierra Club's and CELP's measures related to DO because they are not supported by substantial evidence, lack a nexus with Project operations, are inconsistent with established Commission policy, and are flawed because they rely on comparison of current conditions with pre-Project conditions.

The WDOE comments of May 23, 2005, on the PDEA also indicated DO concerns in the Spokane River. The WDOE July 17, 2006, filing did not propose additional conditions related to DO.

WDOE is currently drafting a TMDL to increase DO levels in the Spokane River and Lake Spokane. The development of the TMDL is guided by a Managed Implementation Plan, developed through a collaborative effort led by local governments and WDOE, in which Avista is referenced. Avista submitted a request for section 401 certification on July 12, 2006, and would continue to consult with WDOE on all relevant water quality measures. WDOE's certification review process, in turn, would provide additional opportunities for public review.

Avista has proposed SRP-WQ-2 to conduct a feasibility study to identify potential mechanisms for increasing DO in Long Lake Development discharge and implementing reasonable and feasible measures identified in the Dissolved Oxygen Enhancement Plan. As part of this program, Avista would monitor DO levels at Long Lake Dam and explore approaches for improving DO levels downstream of the dam. Implementation of measures to increase DO in discharge from Long Lake Dam would improve water quality in the lower Spokane River and improve conditions for fish and other aquatic resources.

In the previous section, we address the effects of Post Falls Project operations on DO levels in the Spokane River and Long Lake Reservoir.

3.3.3.2.4 Metals

Post Falls Project

Trace metal concentrations can be substantially influenced by high flows that mobilize and transport sediments, such as those during spring runoff and flooding events, and by changes in oxidation and reduction (redox) potentials and nutrient availability near the sediment-water interface (Elder, 1988; La Force et al., 1998, as cited in Kuwabara et al., 2003).

Our Analysis

The Proposed Action includes an increase in the minimum discharge from the Post Falls Project, as well as new aesthetic flow releases at the Post Falls Project and Upper Falls Development, and continued aesthetic releases at Monroe Street Development. Implementation of these proposed measures would not alter the DO regime or redox potential of water in Coeur d'Alene Lake or its tributaries, or change any relevant redox conditions downstream. Therefore, providing the minimum flow releases as proposed in the Proposed Action is not expected to result in noticeable changes of trace metal concentrations in Coeur d'Alene Lake or the Spokane River (including Lake Spokane).

Spokane River Developments

Within these developments, the applicant has proposed only very minor changes to aesthetic flows and drawdown at Lake Spokane.

Our Analysis

The staff believes the minor changes to low flows proposed at these developments would not alter the hydrologic regime or affect trace metals in the system.

3.3.3.2.5 Total Dissolved Gas

Post Falls Project

Under current conditions, various exceedances of the applicable 110-percent TDG criterion occur at the Project developments. These TDG levels are linked to various causes, including high flows, spill over dams, natural waterfalls, increases in water temperature, and photosynthetic activity. In addition, impoundment of previously free-flowing river reaches by the construction of Project and non-Project dams has likely reduced the potential for the river to dissipate elevated TDG.

Evaluations of TDG characteristics and historical channel conditions have shown or suggested varied influences of the Project developments on TDG (Golder, 2003, 2004f). At the Post Falls Project, available historical information on the characteristics of the middle channel is not sufficient to determine the influence of the development on TDG levels in that channel. It is possible that the Post Falls Project has reduced TDG production in this channel by routing water through the power plant rather than over the natural ledge or falls which existed before. Available information indicates that TDG production in the north and south channels at the Post Falls Project is largely unchanged as a result of the development (Golder, 2004f). Overall, hydraulic conditions that influence TDG production are unchanged or improved due to construction of the development, and approximately 5,000 cfs are routed through the powerhouse rather than spilled during high flows.

Our Analysis

Under the Proposed Action, Avista would implement water quality measures included in PF-WQ-1. These measures would address the Project's effect on TDG by implementing spill gate operating protocols at the Post Falls Project designed to minimize TDG production while conducting additional TDG monitoring and evaluation.

At Post Falls, the Proposed Action would include maximizing the use of the south channel for anticipated long-term spill events. Because spilling water through the south channel results in less TDG production than using the north channel (Golder, 2003, 2004f), this would reduce overall TDG production at the hydroelectric development and result in lower TDG levels downstream. Development of interim protocols would facilitate selection of appropriate preferential uses of spill gates to be implemented in the near term, while preventing excessive erosion near the dam. Under current Project operations, Avista prefers to use gates 3 through 6, which were found to produce more TDG than gates 1, 2, 7, and 8 (Golder, 2003, 2004f). By avoiding use of gates 5 and 6 whenever possible and splitting flows among other gates, available data suggest that TDG production would be reduced at moderate spill levels. However, while use of gates 1, 2, 7, and 8 would produce the least TDG at moderate spills, the use of these "outer gates" may need to be limited to avoid excessive erosion near the dam.

By developing and implementing TDG monitoring plans, Avista and the other parties would be better able to understand the relationship between flows, spill gate usage, and downstream TDG levels at higher flows than occurred in 2003 and 2004. Results would indicate the different spill gate operating protocols that should be implemented. The adaptive nature of the Proposed Action with respect to TDG monitoring, spill gate use, and TDG abatement would facilitate making appropriate adjustments through the term of any new license.

In letters filed on July 17, 2006, the Sierra Club and the Lands Council recommended that Avista monitor TDG and implement operational measures to minimize TDG increases downstream of Post Falls Dam. Avista's proposal includes monitoring and operational measures to limit TDG increases downstream of the dam.

Avista's program provides for monitoring, control, and/or mitigation of dissolved gas supersaturation associated with operations. This PME was developed and approved by the WRWG during the ALP process; further evaluation and implementation is expected to occur in the context of the CWA section 401 certification process.

The WDOE July 17, 2006, filing concurred, indicating it would address terms and conditions regarding temperature, DO, and TDG in its certification issued under its authority under section 401 of the CWA.

Avista submitted a request for section 401 certification on July 12, 2006, and would continue to consult with WDOE on all relevant water quality measures. WDOE's certification review process would provide additional opportunities for public review.

Spokane River Developments

Under current conditions, various exceedances of the applicable 110-percent TDG criterion occur at the Spokane River Developments. These TDG levels are linked to various causes, including high flows, spill over dams, natural waterfalls, increases in water temperature, and photosynthetic activity. In addition, impoundment of previously free-flowing river reaches by the construction of Project and non-Project dams has likely reduced the potential for the river to dissipate elevated TDG.

Evaluations of TDG characteristics and historical channel conditions have shown or suggested varied influences of the Spokane River Developments on TDG (Golder, 2003, 2004f).

At the Upper Falls and Monroe Street Developments, evaluation of the facilities and the downstream channel morphology indicates that TDG production at the Spokane Falls is primarily driven by flows passing over natural falls and into the downstream pool rather than by any influence of the two developments. However, routing up to 2,500 cfs through the Upper Falls power plant and up to 2,850 cfs through the Monroe Street power plant instead of over the lower falls reduces the production of elevated TDG levels that would occur without the presence of these developments (Golder, 2004f).

Downstream of Monroe Street Development, TDG levels dissipate as water moves through the free-flowing reach upstream of the Nine Mile Reservoir. Data collected within this reach indicate that TDG dissipation is greatest in the upper portions of the reach and diminishes downstream as TDG levels decrease and river depth increases. It is unknown what degree of TDG dissipation may have occurred in these reaches prior to the construction of Nine Mile Development, or to what degree the natural falls at Nine Mile Falls may have affected TDG levels.

Peak flow and spill events at the Nine Mile Development in 2004 reflected TDG levels that were typically 2 to 4 percent lower in the tailrace than in the forebay. This indicates that spills of up to approximately 9,000 cfs coinciding with full generation may reduce TDG levels (Golder, 2004f). Although the available data for Nine Mile Development indicate that spills of up to 9,000 cfs do not increase TDG, higher flow conditions have not been available for evaluation.

The available data indicate that current conditions at Long Lake Development contribute to TDG production during spills and in downstream TDG levels greater than 110 percent of saturation. Available data also suggest that selective use of the eight spill gates at Long Lake Development can influence TDG production. The highest TDG levels measured in the tailrace coincide with spill discharge being split evenly between gates 4 and 5. In contrast, use of gates 1 and 2 tend to produce the least TDG of any of the gates. Spot monitoring of downstream TDG levels in the Little Falls Reservoir indicates that little TDG dissipation occurs within this reach; thus, elevated TDG levels experienced in the Long Lake Development tailrace can extend to the Little Falls Development forebay and into the Spokane arm of Lake Roosevelt. Continuation of current operations would result in similar spatial and temporal characteristics of TDG, including levels greater than the 110-percent criterion as described above.

Our Analysis

Under the Proposed Action, Avista would implement water quality measures included in SRP-WQ-1. These measures would address the effect of the Spokane River Developments on TDG by implementing spill gate operating protocols at Long Lake Development designed to minimize TDG production, conducting additional TDG monitoring/evaluation, and developing/implementing a comprehensive Long Lake Development TDG abatement plan.

For the purposes of this analysis, we assume that some selective use of the existing spill gates at Long Lake Development would be possible and would improved TDG conditions over current operations.

By developing and implementing TDG monitoring plans for Nine Mile Development, and Long Lake Development, Avista and the other parties would be better able to understand the relationship between flows, spill gate usage, and downstream TDG levels at higher flows than occurred in 2003 and 2004. Results would indicate the different spill gate operating protocols that should be implemented at Long Lake Development, or if development of TDG abatement measures for Nine Mile Development would be warranted by conditions at higher flows. The adaptive nature of the Proposed Action with respect to TDG monitoring, spill gate use, and TDG abatement would facilitate making appropriate adjustments through the term of any new license.

Even with implementation of interim spill gate operating protocols at Long Lake Development, TDG would likely exceed the 110-percent criterion during high-flow periods. Under the Proposed Action, Avista would evaluate other alternatives for reducing TDG production by developing a TDG abatement plan for the development in consultation with WDOE and the Spokane Tribe. Following selection of an appropriate abatement strategy, Avista would finalize and implement the strategy to further reduce or abate TDG production by the Development.

Under the Proposed Action, Avista would not alter its operations of Upper Falls or Monroe Street Developments to address elevated TDG levels downstream of these developments because these developments make little, if any, contribution to TDG production. TDG levels greater than Washington State's 110-percent criterion would continue to occur at about the same frequency as under current operations at these developments.

In letters filed on July 17, 2006, the Sierra Club and the Lands Council recommended that Avista monitor TDG and implement operational measures to minimize TDG increases downstream of the Spokane River Developments. Avista's proposal includes monitoring and operational measures to limit TDG increases downstream of the developments.

The Sierra Club and the Lands Council also recommended that Avista install deflectors (flip-lip-like devices) or make other modifications to Long Lake Dam to minimize the deep plunge of water immediately downstream of the dam. Modifying Long Lake Dam to reduce the plunge depth of spilled flows may reduce TDG increases at this facility; however, because the Sierra Club and the Lands Council did not provide specific recommendations or designs for modifications, we are unable to quantify the potential benefit of this measure.

Avista's program provides for monitoring, control, and/or mitigation of dissolved gas supersaturation associated with operation of the Spokane River Developments. This PME was developed and approved by the WRWG during the

ALP process; further evaluation and implementation is expected to occur in the context of the CWA section 401 certification process.

The WDOE July 17, 2006, filing concurred, indicating it would address terms and conditions regarding temperature, DO, and TDG in its certification issued under its authority under section 401 of the CWA.

Avista submitted a request for section 401 certification on July 12, 2006, and would continue to consult with WDOE on all relevant water quality measures. WDOE's certification review process would provide additional opportunities for public review.

3.3.3.2.6 Water Quality Monitoring

Post Falls Project

Changing Project operations and implementing other various measures during the term of a new license would influence water quality in Coeur d'Alene Lake and the Spokane River. Avista has used CE-QUAL-W2 to simulate the effects that changing current Project operations would have on water quality and has evaluated the use of spill gates to reduce the Project's effects on TDG. Although these studies provide insight into likely changes in water quality, they may not accurately represent the actual effects that could occur once these changes are implemented.

Our Analysis

The Proposed Action also includes monitoring for TDG, as described above, and measures PF-WQ-2 and SRP-WQ-2 to develop and implement separate Water Quality Monitoring Plans for the states of Idaho and Washington.

For the Idaho Water Quality Monitoring Plan (PF-WQ-2), Avista would consult with IDEQ and the Coeur d'Alene Tribe. This plan would have three goals: (1) evaluate the effects of the new Post Falls minimum discharge on water temperatures in the Spokane River, (2) support expansion of current Coeur d'Alene Lake water quality monitoring efforts, and (3) enhance the predictive capabilities of the CE-QUAL-W2 model as a lake management tool. Avista proposes to evaluate the effects of the new minimum flows from the Post Falls Project by developing a study to monitor Spokane River temperature and flow at the Idaho/Washington state line during summer/fall periods for 5 years following implementation of the new minimum flows. Our analysis of Avista's proposed monitoring program and alternative monitoring programs for Coeur d'Alene Lake is presented in section 3.3.3.2.1.

For the Washington Water Quality Monitoring Plan, Avista would consult with WDOE and the Spokane Tribe of Indians about water quality at the Long Lake Development, and with WDOE about the reach between Barker Road (river mile 90.4) and the upper end of the Upriver Reservoir (river mile 84). The primary goal of this plan would be to determine the effect of increased minimum flows from the Post Falls Project on water temperature.

In these plans, Avista would indicate the monitoring protocol(s), reporting format, and schedule. Monitoring would be expected to be completed in 5 years. These plans would be adaptive so that appropriate annual changes could be made to focus on issues of concern and limit unnecessary efforts once compliance is demonstrated or other agreed-upon monitoring goals and objectives are satisfied.

Developing water quality monitoring plans in consultation with IDEQ, WDOE, the Coeur d'Alene Tribe, and the Spokane Tribe of Indians would ensure that the monitoring plans address the concerns of the state agencies and tribes. The plans would address the effects of Post Falls Project minimum flow releases by monitoring downstream flows. Monitoring flows and temperature at the Idaho/Washington state line and in the reach between Barker Road and the upper end of the Upriver Reservoir during multiple years would document conditions for varied hydrological and meteorological conditions and indicate any effects from increasing flow releases from the Post Falls Project. Results of this monitoring effort could be used to suggest operational modifications, if necessary.

The Sierra Club's July 17, 2006, filing proposed that Avista install and operate a water quality monitoring station downstream of Post Falls and Long Lake dams to monitor discharge, temperature, TDG, DO, and turbidity. There currently is only one USGS stream flow monitoring site on the Spokane River, and there are no permanent water quality monitoring stations. As indicated by the Sierra Club, a station downstream of Post Falls could be used to monitor discharge and determine attainment or nonattainment of standards for water temperature, TDG, DO, and turbidity.

The Sierra Club July 17, 2006, filing and The Lands Council July 17, 2006, filing proposed that Avista obtain a National Pollutant Discharge Elimination System (NPDES) permit for Post Falls Dam. We are unable to quantify or estimate the environmental effects of Avista obtaining an NPDES permit because it is unknown if any changes to Project operations or facilities would be necessary to obtain the permit.

Avista's September 1, 2006, filing recommended that the Commission reject the suggested recommendations of Sierra Club and the Lands Council as to CWA section 402 (NPDES) permits, because they incorrectly assume that section 402 applies to the operation of the Post Falls Project. Avista indicates that section 402 applies only to the “discharge of a pollutant” as that term is defined in the CWA.

Spokane River Developments

Changing Project operations and implementing other various measures during the term of a new license would influence water quality in the Spokane River. Avista has used CE-QUAL-W2 to simulate the effects that changing current Project operations would have on water quality and has evaluated the use of spill gates to reduce the Project’s effects on TDG. Although these studies provide insight into likely changes in water quality, they may not accurately represent the actual effects that could occur once these changes are implemented.

Our Analysis

The Proposed Action includes monitoring for TDG as described above. Under measures included in SRP-WQ-2, Avista would:

- develop and implement a water quality monitoring plan from river mile 90.4 to river mile 84;
- conduct a feasibility study for enhancing DO levels in Long Lake Development discharges; and
- develop and implement a DO enhancement plan for the Long Lake Development discharges.

As part of the water quality monitoring measure, Avista would consult with WDOE and the Spokane Tribe of Indians about Long Lake Development, and with WDOE about the reach between Barker Road (river mile 90.4) and the upper end of the Upriver Reservoir (river mile 84). The primary goal of this plan would be to determine the effect of increased minimum flows from the Post Falls Project on water temperature; therefore, we address the effect of these flows and any associated monitoring under Post Falls above.

The Proposed Action would be expected to continue to result in Long Lake Development discharges that frequently have DO concentrations of less than the 8.0-milligrams-per-liter criterion during the summer and fall. These low DO concentrations would result from many factors, including nutrient loading of the river, existence of the impoundment, and Project operations. In order to address this issue, Avista has proposed evaluating the feasibility of increasing DO concentrations in the Long Lake Development discharges and implementing reasonable and feasible measures to accomplish this goal. This has been accomplished at numerous other hydroelectric projects through several different methods, including air injection, oxygen injection, and aerating weirs (TVA, 2005;

Hauser and Morris, 1995; Hopping et al., 1997). Although the feasibility of increasing DO concentrations in Long Lake discharges has not been tested or implemented, it is reasonable to anticipate that at least one of the methods used at other hydropower dams would be successful at increasing DO concentrations at this site. However, it is possible that even after implementation, DO concentrations in Long Lake discharges could fall below the 8.0-milligrams-per-liter criterion.

The Sierra Club July 17, 2006, filing proposed that Avista install and operate water quality monitoring stations upstream and downstream of Long Lake Dam to monitor discharge, temperature, TDG, DO, and turbidity. There currently is only one USGS stream flow monitoring site on the Spokane River and no permanent water quality monitoring stations. As indicated by the Sierra Club, these stations could be used to monitor discharge and determine attainment or nonattainment of standards for water temperature, TDG, DO, and turbidity.

The Sierra Club July 17, 2006, filing and The Lands Council July 17, 2006, filing proposed that Avista obtain an NPDES permit for the Spokane River Developments. We are unable to quantify or estimate the environmental effects of Avista obtaining an NPDES permit because it is unknown if any changes to Project operations or facilities would be necessary to obtain the permit.

Avista's September 1, 2006, filing recommended that the Commission reject the suggested recommendations of Sierra Club and the Lands Council as to CWA section 402 (NPDES) permits, because they incorrectly assume that section 402 applies to the operation of the Spokane River Developments. Avista indicates that section 402 applies only to the "discharge of a pollutant" as that term is defined in the CWA.

3.3.3.2.7 Secondary Effects of Proposed Measures on Water Quality

Post Falls Project

Coeur d'Alene Erosion Control Program— Under the Proposed Action, Avista would provide funding for projects that reduce the effects of shoreline erosion on resources of particular interest (PF-TR-1). The effects that implementing this action would have on water quality are discussed below.

Recreational Measures—Under the Proposed Action, Avista would attempt to provide flow releases to accommodate open-water boating and extend whitewater boating opportunities on the Spokane River (SRP-REC-3). During August, open-water boating flows of 1,250 cfs would be provided on one or two weekends when river flows at Post Falls exceed 800 cfs (this measure would not be applicable if flows were already at 1,250 cfs or higher). Avista would also coordinate flow releases for late spring and fall to enhance whitewater boating opportunities. Target releases would be between the minimum and maximum flow ranges for whitewater boating opportunities at park-and-play spots (Louis Berger Group, 2004f). These flows range from 1,350 to 5,500 cfs.

Our Analysis

Reducing shoreline erosion as proposed in PF-TR-1 would reduce sediment input to the Spokane River system and could indirectly reduce turbidity levels in downstream areas. In relation to the ongoing levels of erosion and sediment transport occurring within the Spokane River system, we would expect that any incremental changes in turbidity levels from these shoreline erosion projects would be small and likely unmeasurable.

The effects of the Proposed Action open-water boating flows on water temperatures were predicted by Golder (2004i). Golder predicted that open-boating flows of 1,250 cfs released during August would increase Spokane River temperatures by less than 1.0°C (1.8°F) compared to flow levels of 800 cfs. Based on the Post Falls flow exceedance curve for August, and because these flows would be released no more than two weekends per year, implementation of the open-water boating flow releases would affect Project operations infrequently and additional exceedances of the temperature standard would seldom occur.

Effects on water temperature from late-spring and early-fall whitewater boating flows of between 1,350 and 5,500 cfs from the Post Falls Project have not been modeled because flow and temperature conditions at these times do not approach critical levels. The late-spring flow releases would have minimal, if any, effect on the thermal regime of the Spokane River, because flows during this period are generally high, and temperatures at the Post Falls Project are not excessive. Similarly, fall boating flows would be in the current range of flows under current operations. No secondary effects on water temperature would be expected from either late spring or early fall releases.

<u>*Spokane River Developments*</u>

No secondary effects of proposed measures are anticipated at the Spokane River Developments.

3.3.3.3 Unavoidable Adverse Effects

Operation of the Post Falls Project would continue to result in some increases in water temperature and decreases in DO within Coeur d’Alene Lake. Releases of the proposed minimum flows would improve habitat conditions for trout, although some exceedances of criteria for water temperature would likely continue to occur. During periods of spill, some increase in TDG would occur at the Post Falls Project.

Under the Proposed Action, on occasion Avista would release water downstream of Long Lake Dam that would be below criteria for DO. Additionally, release of high spill flows would occasionally result in increased TDG levels at the Project.

3.3.3.4 Cumulative Effects

Currently foreseeable actions, in addition to the Project, contribute to the cumulative effects of water quality parameters. Water quality in the Spokane River-Coeur d'Alene River Basin continues to be influenced by a wide range of human activities, including historical mining activities; population growth in the watershed and its related effect on land use patterns and industrial, commercial, and residential development; nutrient-rich discharges from numerous point and non-point sources; recreational boating and other recreational activities; and the presence and operation of the Project and other dams along the river. Numerous public policy and regulatory proceedings and community-initiated efforts have been undertaken to improve the water quality of the Spokane River, Coeur d'Alene Lake, Lake Spokane, and their tributaries. Generally, water quality has been improving since the mid-1970s and is expected to continue to improve in the foreseeable future as a result of these cumulative efforts.

Current Project operations affect the thermal regime of Coeur d'Alene Lake and the Spokane River. Other human activities result in localized effects on water temperatures but have minimal influence on the overall regime; therefore, cumulative effects on water temperature are generally determined by natural processes and the effects of the Project and its operation.

Historically, wastewater treatment facilities in the basin have supplied nutrient-rich discharges to surface waters, which lead to reduced DO levels. Through time, many facilities have been upgraded to more effectively remove nutrients from wastewater prior to discharge; however, increased development in the Project area has increased the processing demand at these facilities, which partially counteracts the benefits provided by upgrading them.

Implementation of new shoreline management regulations is expected to minimize the adverse water quality effects caused by new development along the shoreline. The Spokane County Conservation District has coordinated efforts of numerous Spokane County stakeholders to successfully reduce erosion and sediment transport along Hangman Creek (WRWG meeting on March 7, 2005). Implementing Proposed Action measure SRP-TR-1 would support that effort.

WDOE is finalizing a TMDL and implementation strategy to address nutrient issues in the Spokane River and Lake Spokane (Merrill and Cusimano, 2004). It is also in the process of developing TMDLs for the Spokane River's two primary tributaries, Hangman Creek and the Little Spokane River. Implementing the strategies developed as part of the Spokane River TMDL would improve water quality by 2016, particularly within Lake Spokane. Implementation of the strategies that would be developed for the Hangman Creek and Little Spokane River TMDLs may also improve water quality in the Spokane River and Lake Spokane. Implementation of the Proposed Action would result in negligible effects on nutrient loads and biological productivity, although increases in DO concentrations of the Long Lake Development discharges are expected to occur as a result of implementing reasonable and feasible tailwater enhancements. The cumulative effects of the aforementioned actions would therefore result in long-term improvement of nutrient and associated conditions in Coeur d'Alene Lake, the Spokane River, and Lake Spokane, and long-term improvement of DO concentrations downstream of the Long Lake Development.

As a result of historical mining activities, a considerable quantity of sediments with high metal concentrations has accumulated in Coeur d'Alene Lake. Implementation of EPA's plan to clean up mining contamination in the South Fork of the Coeur d'Alene River (EPA, 2002) is expected to reduce metal loadings to the lake. The Coeur d'Alene Tribe and State of Idaho are working on a Lake Management Plan, which may serve as an alternative to EPA cleanup actions in the lake. In addition, WDOE is developing a TMDL for PCBs for the Spokane River and oversees cleanup of PCB-contaminated sediments and groundwater adjacent to the Spokane River. Implementation of such cleanup efforts would likely improve water quality. Implementation of the Proposed Action is not expected to appreciably affect trace metals or PCBs compared to current Project operations. As a result, the cumulative effects of the above actions would be a long-term improvement in metal and PCB concentrations that would continue through the term of any new license.

TDG levels in the Spokane River are directly affected by water flowing over both natural falls and dams and are indirectly affected by river channel characteristics and routing of water around the falls. Natural waterfalls in the Spokane River produce TDG at levels that sometimes exceed the applicable TDG criteria. Under current Project operations, spill over the Project dams can increase the production of TDG, particularly at Long Lake Development. However, routing water around the falls and through the turbines generally eliminates TDG production in that water and further reduces TDG once this water is mixed with water that has flowed over falls or spillways. Project and non-Project dams reduce velocities and natural dissipation rates in some impounded reaches, which can indirectly cause TDG levels to remain higher than if the impoundments did not exist. Under the Proposed Action, Avista would implement TDG abatement measures to reduce TDG production by spill at Long Lake Development, and possibly Nine Mile Development, if these measures are shown to elevate TDG levels at higher flows. TDG production at natural falls in the Project area (Post Falls and Spokane Falls) would continue similar to current conditions. The cumulative effect of these actions would be a long-term reduction in TDG levels in the Spokane River downstream of the Post Falls Project, Lake Spokane Development, and possibly Nine Mile Development, compared to current conditions, due primarily to PMEs included in the Proposed Action.

3.3.4 Aquatic Resources

The following sections describe the existing aquatic habitat and fish species occurring in the Project vicinity. Additional information on federally listed threatened and endangered species (i.e., bull trout) is provided in section 3.3.6, "Federally Listed Threatened and Endangered Species."

Although historical records indicate that anadromous fish, including chinook salmon (*Oncorhynchus tshawytscha)* and steelhead trout (*O. mykiss*), were found in the lower Spokane River, the Little Spokane River, and Hangman Creek, anadromous fish are no longer present in the Project area (NPCC, 2004, as cited in Avista, 2005). Upstream passage to the mouth of the Spokane River is blocked by the Chief Joseph and Grand Coulee dams on the Columbia River, neither of which have fish passage facilities. Spokane Falls, at the site of the current Upper Falls and Monroe Street dams, generally acted as a natural barrier to anadromous species, preventing further passage up the Spokane River (NPCC, 2004, as cited in Avista, 2005). Fisheries management agencies and Native American tribes have expressed interest in restoring anadromous fish to historical habitat in the Columbia River Basin, including portions of the Spokane River. If fish passage is ultimately provided at Chief Joseph and Grand Coulee dams, the issue of fish passage at Long Lake and Nine Mile dams would likely be revisited. However, there is no present or foreseeable future need for fish passage facilities at the Project developments related to anadromous fish passage. Thus, the bulk of the discussion on aquatic resources will center on resident fish species in the Project area.

State-listed aquatic species found in the Project area include the westslope cutthroat trout (*Oncorhynchus clarki lewisi*), interior redband trout (*O. mykiss gairdneri*), and the burbot (*Lota lota*) (USDA Forest Service, 2004). The cutthroat and burbot are designated S2; these taxa are imperiled because of rarity or because other factors demonstrably make it vulnerable to extinction. The redband trout is an S2/3 species; S3 taxa are rare or uncommon, but not imperiled.

3.3.4.1 Affected Environment

3.3.4.1.1 Coeur d'Alene Lake Basin

Coeur d'Alene Lake is a natural lake approximately 23 miles long. Lake waters cover approximately 34,000 acres at its summer pool level of 2,128 feet and more than 29,000 acres when it is drawn down to its lowest elevation of 2,120.5 feet (Golder, 2004j, as cited in Avista, 2005). At the 2,128-foot elevation, the average depth is 72 feet and the maximum depth is 209 feet (IDEQ, 1996, as cited in Avista, 2002). The southern end of the lake is relatively shallow (typically less than 30 feet deep), and the middle and northern portions of the lake tend to be deeper. The shallow, southern portion of the lake has the most extensive beds of aquatic macrophytes. Cougar Bay, at the northern end of the lake, is also heavily populated with aquatic macrophytes. In general, the majority of bays with sedimentary deltas also contain abundant macrophyte growth (IDEQ, 1996, as cited in Avista, 2002). Aquatic macrophyte beds, in general, represent spawning and nursery habitat for many species of fish, including a number of introduced species such as northern pike (*Esox lucius*), largemouth bass (*Micropterus salmoides*) and smallmouth bass (*M. dolomieui*), yellow perch (*Perca flavescens*), black crappie (*Pomoxis nigromaculatus*), and pumpkinseed (*Lepomis gibbosus*).

Coeur d'Alene Lake serves as the primary storage reservoir for the Spokane River Project, to maximize power generation to meet Avista's electricity demands and to provide maximum room for dampening flood potential. Its primary headwater tributaries drain the Bitterroot Mountains lying to the east of the lake. The Coeur d'Alene and St. Joe Rivers have high-gradient mid- and upper reaches with low-gradient lower reaches and are the primary source of inflow to the lake. The surface elevation of Coeur d'Alene Lake is controlled by a combination of inflow, a natural outlet channel restriction, and operation of the Post Falls Dam. Lake levels naturally vary from high spring runoff to autumn-winter low elevations. Water elevations can be highly variable, rising 3 to 4 feet in less than a week, as a result of rapid increases in inflows during winter and spring high-water events.

Because of their low gradients, the lower portions of the lake's tributaries are inundated to various extents by lake elevations. The natural channel restriction serves as the river flow control during the winter and spring runoff periods. During this time, Coeur d'Alene Lake naturally backwaters the lower 29 miles of the Coeur d'Alene River, the lower 31 miles of the St. Joe River, and about 6.5 miles of the lower St. Maries River.

After spring runoff flows have peaked or largely subsided, the Post Falls Dam is used to achieve or maintain Coeur d'Alene Lake levels at a target summer elevation of 2,128 feet. Achieving the target summer elevation requires Avista to reduce discharge from the dam to a level below that of the inflow to the lake. Once the target lake level is achieved, the dam is operated as a run-of-river facility, with outflow equaling inflow, through early September. This operational mode for Post Falls Dam dates back to the early 1950s (Avista and WDFW, 2004).

At the normal summer elevation, the lake backwater effect extends up the Coeur d'Alene River to river mile 32, approximately 2 miles south of the town of Cataldo. The lake backwater effect extends up the St. Joe River to river mile 34 at summer elevation, roughly 11 miles downstream of the town of Calder. The St. Joe River is joined by the St. Maries River before it discharges into the southern end of Coeur d'Alene Lake. The low-gradient lower reach of the St. Maries River is also affected by the lake backwater effect at summer elevation for about 9 miles upstream from the confluence of the St. Joe River near the town of St. Maries. A gradual drawdown of Coeur d'Alene Lake begins in the autumn, until the natural lake level is once again controlled by the natural channel restriction above the dam (Avista and WDFW, 2004).

Twelve native fish species and 16 introduced species currently are known to inhabit the Coeur d'Alene Lake Basin (Table 3.3.4.1-1). Tributaries to Coeur d'Alene Lake typically support coldwater resident, fluvial, and adfluvial fish assemblages, including some bull trout (*Salvelinus confluentus)*. Important fish species present in the lake are reported to include both native and introduced species. Abundant native species listed in Weitkamp and Euston (2004) include bull trout, cutthroat trout (*Oncorhynchus clarki*), longnose sucker (*Catostomus catostomus*), and Northern pikeminnow (*Ptycocheilus oregonensis*). Important introduced species present in the lake include black crappie, chinook salmon (*O. tshawytscha*), kokanee (*O. nerka*), largemouth bass, Northern pike, pumpkinseed, rainbow trout (*O. mykiss*), smallmouth bass, tench (*Tinca tinca*), and yellow perch. The native fish species are all considered coldwater species, whereas many of the introduced species are typically considered to be warmwater species. Non-native fish like bass, northern pike, yellow perch, Chinook salmon, and kokanee not only provide important recreational fisheries in Coeur d'Alene Lake but can also pose a threat to the remaining native fish assemblages through direct predation, competition for food and space, and hybridization (NPCC, 2004, as cited in Avista, 2005).

Table 3.3.4.1-1. Fish of the Coeur d'Alene Lake Basin

Common Name	Scientific Name	Native?
Longnose sucker	*Catostomus catostomus*	Yes
Bridgelip sucker	*Catostomus columbianus*	Yes
Largescale sucker	*Catostomus macrocheilus*	Yes
Shorthead sculpin	*Cottus confusus*	Yes
Torrent sculpin	*Cottus rhotheus*	Yes
Westslope cutthroat trout	*Oncorhynchus clarki lewisi*	Yes
Mountain whitefish	*Prosopium williamsoni*	Yes
Northern pikeminnow	*Ptychocheilus oregonensis*	Yes
Longnose dace	*Rhinichthys cataractae*	Yes
Speckled dace	*Rhinichthys osculus*	Yes
Redside shiner	*Richardsonius balteatus*	Yes
Bull trout	*Salvelinus confluentus*	Yes
Lake superior whitefish	*Coregonis clupeaformis*	No
Northern pike	*Esox lucius*	No
Tiger muskie	*Esox masquinongy x E. lucius*	No
Black bullhead	*Ictalurus melas*	No
Brown bullhead	*Ictalurus nebulosus*	No
Channel catfish	*Ictalurus punctata*	No
Pumpkinseed	*Lepomis gibbosus*	No
Smallmouth bass	*Micropterus dolomieui*	No
Largemouth bass	*Micropterus salmoides*	No
Rainbow trout	*Oncorhynchus mykiss*	No
Kokanee salmon	*Oncorhynchus nerka*	No
Chinook salmon	*Oncorhynchus tshawytscha*	No
Yellow perch	*Perca flavescens*	No
Black crappie	*Pomoxis nigromaculatus*	No
Brook trout	*Salvelinus fontinalis*	No
Tench	*Tinca tinca*	No

Source: NPCC, 2004, as cited in Avista, 2005

IDFG management goals for the Coeur d'Alene Lake Basin include increasing sport fishing opportunities, maintaining or enhancing quality fish populations and habitat, and maintaining or restoring wild native populations of fish in suitable waters (Kleinschmidt, 2004). The Coeur d'Alene Tribe has management goals for native fish species in Coeur d'Alene Lake that include restoring naturally maintained native fish and providing recreational fishing opportunities for the tribe (Kleinschmidt, 2004).

Native trout were considerably more abundant in the Coeur d'Alene Lake Basin prior to 1990. In 1977, the spawning migration of cutthroat trout into Wolf Lodge Creek was relatively robust, with an estimated run size of 3,000 fish (Lukens, 1978, as cited in Avista, 2005). By 1990, far fewer cutthroat trout were reported and made up less than 1 percent of the catch sampled in Cougar Bay on Coeur d'Alene Lake (Rich, 1992, as cited in Avista, 2005). Predation and competition from these introduced species are considered to have substantial effects on the population of native salmonids in the Coeur d'Alene Lake Basin (Weitkamp, 2003, as cited in Avista, 2005). Northern pike were illegally introduced into Coeur d'Alene Lake in the 1970s, first appearing in catch data during 1980, and in 1982, IDFG introduced chinook salmon (Rich, 1992, as cited in Avista, 2005; Avista, 2002). Recently, smallmouth bass have also been illegally introduced and are seen in increasing numbers in Coeur d'Alene Lake (Bennett and Rich, 1990, as cited in Avista, 2005; Coeur d'Alene Tribe, 2003, as cited in Avista, 2005).

Even so, viable populations of resident, fluvial, and adfluvial stocks of westslope cutthroat trout still exist within the Coeur d'Alene Lake Basin (Kleinschmidt, 2004). Because viable populations of all three forms of westslope cutthroat trout are currently present in the system, researchers believe that recovery can be accomplished by reducing the effects of limiting factors, particularly habitat loss and competitive interactions with non-native species (Lillengreen et al., 1999, as cited in Avista, 2005). Other potential causes of population declines of native salmonids include reduced water quality and habitat conditions from land use practices, over-harvesting, dams, and other blockages (Kleinschmidt, 2004). Concern about the declining range and numbers of westslope cutthroat trout has resulted in this species being identified as a sensitive species in Idaho (USDA Forest Service, 2004). The Coeur d'Alene Tribe has also emphasized the importance of westslope cutthroat trout to its culture (Kleinschmidt, 2004).

Westslope cutthroat trout spawn and rear in tributaries to Coeur d'Alene Lake. Spawning adfluvial adult trout are known to migrate into Lake Creek in early spring (March and April), and then migrate back to the Coeur d'Alene Lake in April (personal communication, D. Chess, Fisheries Biologist, Coeur d'Alene Tribe, Plummer, ID, with T. Vore, Environmental Specialist, Avista, Spokane, WA, on May 13, 2005, as cited in Avista, 2005). Averett (1962, as cited in Avista, 2005) reported that the majority of spawning adfluvial westslope cutthroat trout migrate up the St. Joe River in April and return to the lake by mid-June. Lukens (1978, as cited in Avista, 2005) indicated that adult cutthroat trout migrate into Wolf Lodge Creek from early April through mid-June. Parametrix (2005) found that radio-tagged adult adfluvial westslope cutthroat trout appeared to migrate downstream and upstream through the inundated reach of the Coeur d'Alene and St. Joe Rivers relatively quickly and successfully. Juvenile westslope cutthroat trout are known to outmigrate from natal streams following declining spring flows (Downs and Jakubowski, 2003, as cited in Avista, 2005). The Coeur d'Alene Tribe has reported outmigration of juvenile westslope cutthroat trout in tributaries to Coeur d'Alene Lake in April and May (personal communication, D. Chess, Fisheries Biologist, Coeur d'Alene Tribe, Plummer, ID, with T. Vore, Environmental Specialist, Avista, Spokane, WA, on May 13, 2005, as cited in Avista, 2005). This is similar to a report by Lukens (1978, as cited in Avista, 2005) documenting that juvenile cutthroat trout begin a lakeward migration in early May.

Bull trout are known to migrate up the St. Joe River in early spring, making it to the headwater tributaries by late summer (IDFG, 1999). Adfluvial bull trout typically spawn in September and then complete a relatively quick outmigration to Coeur d'Alene Lake (IDFG, 1999). Some evidence suggests that juvenile bull trout begin migration out of the upper St. Joe River before the middle of June, but it is unclear when juvenile fish would reach the lower St. Joe River (Parametrix, 2003b).

Both westslope cutthroat trout and bull trout would have successfully migrated through inundated lower river habitat under natural conditions (i.e., absent Post Falls Dam regulating summer water levels) because 31 miles of the lower St. Joe River and 29 miles of the lower Coeur d'Alene River are inundated and relatively deep and slow moving, even at the lowest lake elevation (Avista, 2005).

Water temperatures are known to exceed 15^{o}C (59^{o}F) by mid- to late June in the Coeur d'Alene and St. Joe Rivers. Summer water temperatures in the inundated portions of the Coeur d'Alene, St. Joe, and St. Maries rivers routinely exceed 20ºC (68ºF). Historical water temperature data for the St. Joe River upstream of Coeur d'Alene Lake indicate temperatures frequently in excess of 19^{o}C (66^{o}F) in July and August. These temperatures are in the upper range of suitable water temperatures for salmonids but are suitable for other species such as northern pike and smallmouth bass and warmwater species such as largemouth bass, sunfish, catfish, and bullheads. A number of lakes along the Coeur d'Alene River (collectively referred to as the chain lakes or lateral lakes) are hydrologically connected to the river, and variations in the water level of the river also result in variations in the water level of these lakes. Water temperatures in these lakes help support warmwater fish communities and provide an excellent fishery for largemouth and smallmouth bass, northern pike, yellow perch, and crappie (Bennett and Rich, 1990, as cited in Avista, 2005). Fall water temperatures generally are below 15^{o}C (59^{o}F) by the end of September in the Coeur d'Alene and St. Joe Rivers.

Coeur d'Alene Lake typically thermally stratifies in the summer and mixes completely in the spring and fall (CH2M HILL and URS Corp., 2001, as cited in Avista, 2005). Although winter air temperatures are often below freezing, Coeur d'Alene Lake generally has not frozen in recent decades except in its shallow southern end (IDEQ, 1996, as cited in Avista, 2002). Based on data collected in 1991, 1992, and 1995–1999, the depth of the upper stratified layer, or epilimnion, averaged 33 feet from July through September (CH2M HILL and URS Corp., 2001, as cited in Avista, 2005). During the warmest part of the summer, water temperature in the lake epilimnion is typically above 20ºC (68°F), and during particularly warm summers, the water temperature can reach 26ºC (79°F). The upper limit of the hypolimnion averaged 49 feet during the same period. Hypolimnion temperatures are rarely above 18ºC (64°F) and are therefore suitable for most salmonids. Water temperature profiles measured during 1991 and 1992 indicate that thermal stratification can begin as early as May and continue into early November. In keeping with average lake depths, the thermocline is deeper in the northern portion of the lake, sometimes at depths of over 66 feet, compared to the southern, shallow end of the lake, where it is between 15 and 29 feet (IDEQ, 1996, as cited in Avista, 2002).

Because summer dam operations keep the lake level artificially high, there is a larger littoral zone during the summer months along portions of the Coeur d'Alene Lake shoreline and associated water bodies (e.g., lateral lakes) than would otherwise occur without the dam. This results in an increased amount of shallow-water habitat and some warmer localized summer water temperatures. As a result of the naturally wide range of thermal and other habitat conditions available, Coeur d'Alene Lake supports a diverse array of coldwater and warmwater fish communities.

Mining and ore processing activities also affect aquatic habitats in the Coeur d'Alene Basin. Along the South Fork of the Coeur d'Alene River, mining and ore processing have contributed contaminants to downstream aquatic habitat. Metal concentrations measured in upper Beaver Creek, Big Creek, Canyon Creek, Ninemile Creek, Pine Creek, Prichard Creek, the entire South Fork of the Coeur d'Alene River, and the Coeur d'Alene River down to the town of Harrison have been reported to exceed the applicable water quality criteria for aquatic life (CH2M HILL and URS Corp., 2001, as cited in Avista, 2005). Recent studies indicate that as a result of metal enrichment, streams located downstream of hard-rock mining sites in the Coeur d'Alene River Basin contain fewer, and less abundant, native fish species than other areas (Maret and MacCoy, 2002, as cited in Avista, 2005). With the exception of the lower main stem of the Coeur d'Alene River lying between Harrison and Cataldo, all of these tributaries are upstream of the Project-influenced waters.

Very little mining activity has occurred in the St. Joe River Basin, and the metals concentrations in this system are considered to represent background conditions (Golder, 2005b, as cited in Avista, 2005). Metals concentrations are therefore not considered a limiting factor with respect to aquatic habitat conditions in the St. Joe River Basin.

3.3.4.1.2 Post Falls Dam

There are five hydroelectric dams in the Spokane River Project. Farthest upstream is Post Falls Dam. It sits approximately 9 miles downstream from Coeur d'Alene Lake. Between Coeur d'Alene Lake and Post Falls Dam, the Spokane River exhibits lake-like conditions during the summer when stable water levels are being maintained by Post Falls Dam. At other times (i.e., during drawdown), it becomes more riverine, and then free flowing during periods when Post Falls Dam is not influencing upstream water levels. The Spokane River has naturally occurring, highly variable water levels and flows that can occur over a relatively short time (Avista et al., 2004). Seasonal high flows can range between 10,000 cfs and 48,000 cfs, with low flows of just a few hundred cfs. Project-related discharge and subsequent river elevations are strongly influenced by this natural variability.

The Post Falls Dam is used to "regulate" flows into the downstream reaches of the Spokane River at various times. The extent of river flow regulation varies each year and depends on a variety of factors, including weather forecasts, snowpack conditions, runoff predictions, resource interests, and energy demand (Avista and WDFW, 2004). When Avista manages the flows at Post Falls Dam, it currently operates this dam to meet the following needs: (1) meeting minimum flow requirements (currently 300 cfs or an amount equal to the inflow to Coeur d'Alene Lake, whichever is less); (2) meeting customer energy demands; (3) maximizing the amount of storage available in Coeur d'Alene Lake for absorbing runoff flows; (4) maintaining adequate flows through the rainbow trout spawning and fry emergence period each spring; and (5) serving recreational, residential, and commercial interests upstream of Post Falls Dam (Avista et al., 2004).

During the winter and spring runoff periods, the natural channel restriction serves as the river flow control. After spring runoff flows have peaked or largely subsided, the Post Falls Dam is operated to achieve or maintain Coeur d'Alene Lake levels at a target summer elevation of 2,128 feet by reducing discharge from the dam to a level below that of the inflow to the lake. Once the target lake level is achieved, the dam is operated as a run-of-river facility, with outflow equaling inflow, through early September. Without the dam's maintenance of the stable summer lake level, the Spokane River would likely experience higher, and more variable, summer flows. A gradual drawdown of Coeur d'Alene Lake begins in the autumn, until the natural lake level is once again controlled by the natural channel restriction above the dam. A minimum flow of 300 cfs or equal to the inflow to Coeur d'Alene Lake, whichever is less, is required by the current FERC license (Avista and WDFW, 2004).

Downstream of the Post Falls Dam, the free-flowing stretch of the river extends approximately 15 miles to the Upriver Dam reservoir, a hydroelectric project operated by the City of Spokane. The Idaho/Washington state line is within this free-flowing stretch, approximately 5.5 river miles downstream of the Post Falls Dam (Avista and WDFW, 2004).

Channel characteristics in this free-flowing reach include relatively stable banks and direct hydrologic connections to the Spokane Valley-Rathdrum Prairie Aquifer (NPPC, 2000b, as cited in Avista, 2005). Although the dominant substrate is cobble and boulder, several large areas and many smaller pockets with gravel are suitable for salmonid spawning. Large areas of suitable gravel (greater than 100 square meters), some of which are embedded with sand to varying degrees, occur near Corbin Park (river mile 99.8), the Island Complex (river miles 94.8 to 95.1), Starr Road Bar (river mile 94.7), Harvard Road Bridge (river mile 92.6), and Centennial Trail Bridge (river mile 84.0) (Parametrix, 2003c).

Coeur d'Alene Lake and its fish population are somewhat separated from the Spokane River and the Post Falls Dam by a shallow, natural outlet sill approximately 8 feet deep when the lake level is at its normal full pool of 2,128 feet. Although fish species present in the inundated river channel just upstream from Post Falls Dam and their relative abundance have not been clearly identified, it is likely they are essentially the same species that exist in Coeur d'Alene Lake. Some of the more common fish species in the reach between Post Falls and the Upriver Dam include wild and hatchery rainbow trout, brook trout (*S. fontinalis*), longnose sucker, longnose dace (*Rhinichthys cataractae*), yellow perch, pumpkinseed, and bullhead catfish species (*Ictaluridae*) (Weitkamp and Euston, 2004). Several kokanee in poor condition have also been observed and were assumed to have passed Post Falls Dam during high spring flows (Bailey and Saltes, 1982, as cited in Weitkamp and Euston, 2004). In addition, species such as bridgelip sucker (*C. columbianus*), mountain whitefish (*Prosopium williamsoni*), and Northern pikeminnow, along with yellow perch and centrarchids (bass and sunfishes), may inhabit the Upper Falls impoundment (Weitkamp and Euston, 2004). Bennett and Underwood (1988, as cited in Avista, 2005) and Avista (2000) reported a robust population of wild, self-sustaining rainbow trout in the upper Spokane River. Both IDFG and WDFW manage the upper Spokane River (from Post Falls Dam to Upriver Dam) as a wild trout fishery with no supplemental stocking and have identified the self-sustaining rainbow trout population in this reach as a priority for protection.

Avista, in cooperation with the WDFW, currently stocks approximately 4,000 catchable hatchery rainbow trout into the Upper Falls Reservoir each year following the end of peak spring runoff to enhance angling opportunity as part of the current FERC license.

Instream flow loss to groundwater in the Spokane River upstream of Barker Road is expected to be nearly 160 cfs at Post Falls Dam discharges of 500 to

600 cfs (HDI, 2005). At these flows, up to 400 cfs of groundwater can enter the Spokane River between Sullivan Road and Upper Falls Dam. This groundwater inflow to the Spokane River downstream of Sullivan Road provides a substantial influence on water temperatures and habitat availability during low-flow periods and provides important thermal refugia for rainbow trout during warm summer months. Water temperatures in the Spokane River between the outlet of Coeur d'Alene Lake and the Sullivan Road Bridge (near river mile 87) typically exceed 21°C (70ºF) for much of the summer due to the dominant influence of warm surface water from Coeur d'Alene Lake (Avista, 2005). In the spring high runoff period, radio-tagged fish tended to orient along the river margins, out of the main current. During summer, fish tended to occupy shallow riffle habitat away from shore, perhaps finding thermal refuge in deeper waters. Groundwater inflow (typically around 6°C to 8°C [43 to 46°F]) begins to enter the river in substantial quantities near the Sullivan Road Bridge and cools the river water in the downstream portion of this free-flowing reach to below 20ºC (68ºF) (Avista, 2005).

3.3.4.1.3 Upper Falls and Monroe Street Dams

Both the Upper Falls and Monroe Street dams are located in downtown Spokane, Washington, at the location of the natural Spokane Falls. The Upper Falls Dam impounds approximately 4 miles of the Spokane River (150 acres), but the Monroe Street Dam, located immediately downstream of Upper Falls, impounds only a short, 0.2-mile section of the river (5 acres). Neither project has any effective storage capacity, and they are operated as run-of-river facilities. Thus, operation of these projects is largely determined by the volume of natural and regulated outflow from the Post Falls Dam, along with groundwater inflows and losses and the attenuating effects of the intervening river reach and the Upriver Project, operated by the City of Spokane (Avista, 2005).

The river reach associated with the Upper Falls Dam has been heavily modified over more than 100 years as the bank was shaped to stabilize roads and railroads, to provide flood control, and to accommodate other urbanization and development activities. The project is located on a natural island. There is a dam and intake structure across the south channel, a control works structure across the north channel, and a middle channel that splits off from the north channel. Water from these channels flow into the Monroe Street Dam operating pool. The middle and north channels consist of heavily scoured bedrock. When flows exceed the 2,500 cfs turbine capacity of the Upper Falls Dam, water is passed through the north channel control works into the north and middle channels. When water flows decline, generally from sometime in July into the winter months, all water is currently passed into the south channel and through the powerhouse (Avista, 2005).

The Monroe Street Dam sits atop the lower portion of the Spokane Falls. Powerhouse discharges re-enter the river a short distance downstream of the base of the falls. Downstream of the Monroe Street Dam, a free-flowing river reach extends approximately 10 miles before reaching the Nine Mile Reservoir (Avista, 2005).

The Upper Falls and Monroe Street impoundments are essentially isolated from the larger free-flowing portions of the river and have no tributary streams. As such, these areas provide little suitable aquatic for fish species present in the Project area (Avista and WDFW, 2004). However, the Upper Falls Reservoir is currently managed to provide a put-and-take fishery for hatchery rainbow trout. From 1995 through 1997, WDFW stocked 65,000 to 75,000 2- to 3-inch rainbow trout in the lower Spokane River; from 1999 through 2002, WDFW annually stocked between 4,000 and 10,000 rainbow trout in the Spokane River in downtown Spokane. In 2001, WDFW also began stocking approximately 2,500 non-sterile brown trout annually but since 2003 has ceased stocking rainbow trout (WDFW, 2004, as cited in Avista, 2005). Since 1995, Avista has annually stocked several thousand 8- to 9-inch rainbow trout simultaneously with the WDFW releases in the Upper Falls Reservoir in downtown Spokane and at the upper end of the Nine Mile Reservoir. The rainbow trout stocked by Avista since 2003 were sterile triploids, thereby avoiding the potential for hybridization with the self-sustaining rainbow trout population occurring downstream of the Spokane Falls. The catchable-size trout released into the river provide a popular recreational fishery within the City of Spokane and downstream reach of the river. Continuing the stocking of sterile rainbow trout into the Upper Falls Reservoir and the Nine Mile Reservoir is an overall management objective of WDFW for fisheries in the Spokane River (Avista and WDFW, 2004; WDFW, 2004, as cited in Avista, 2005).

The short reach between the Upper Falls Dam and Monroe Street Dam has a maximum reservoir depth of approximately 24 feet (Weitkamp and Euston, 2004). A short stretch of bedrock bypass channel lying downstream of the north channel control works provides minimal fish habitat and dewaters each year following high-water runoff. Although specific fisheries data for this reach are not available, fish species are likely to include suckers and speckled dace (*R. osculus*), yellow perch, wild and hatchery rainbow trout, and mountain whitefish (Weitkamp and Euston, 2004).

Downstream of Spokane Falls and Monroe Street Dam, the free-flowing river remains entrenched within a narrow valley, with instream substrate again dominated by unembedded cobble and boulder (NPPC, 2000b, as cited in Avista, 2005). As with the upper free-flowing reach of the Spokane River, there are several locations between Monroe Street Dam and the Nine Mile Dam impoundment that have gravel beds and pockets that are suitable for salmonid spawning. Large areas of gravel (greater than 100 square meters), some of which are embedded with sand to varying degrees, occur at Peaceful Valley (river mile 73.1 to 73.2), upper San Soucci (river mile 71.4), T.J. Meenach Springs (river mile 70.1), and Riverbend bar (river mile 68.4) (Parametrix, 2003d). A smaller gravel bar (less than 100 square meters) occurs at mid-San Soucci (river mile 71.0). Summer water temperatures from Monroe Street Dam to the Nine Mile Dam tailrace, including Nine Mile Reservoir, are generally less than 20ºC (68ºF), largely due to continued groundwater input along this reach.

3.3.4.1.4 Nine Mile Dam

The Nine Mile Dam has limited storage capacity but is operated to meet short-term changes in energy demand. Associated pool level fluctuations are rarely more than 1 foot. During periods of high flow, however, sections of 5-foot-high flashboards may be removed from the crest of the spillway to pass flows without creating a substantial rise in upstream pool levels. Water elevations in the tailrace can increase 1 to 2 feet over a matter of a few hours as boards are removed. Flashboards are replaced once high flows have subsided. Although the current FERC license does not require a minimum flow from Nine Mile Dam, Avista maintains a moderate level of discharge at all times to maintain flow into the approximately 0.5-mile free-flowing reach of river between Nine Mile Dam and the upper extent of the Long Lake Dam reservoir (Lake Spokane) (Avista and WDFW, 2004).

Overall, fisheries surveys on the lower Spokane River (i.e., from Monroe Street Dam to Lake Spokane) indicate a diverse overall fish species assemblage similar to the upper Spokane River (Pfeiffer, 1985; Kleist, 1987; Avista, 2000; Parametrix, 2004c). Non-game fish species, including suckers and Northern pikeminnow, appear to dominate the biomass of the fish community in the lower Spokane River (Pfeiffer, 1985; Johnson et al., 1992). Salmonids found in this lower reach include rainbow trout, brown trout (*Salmo trutta*), and mountain whitefish, with recent surveys reporting wild, self-sustaining rainbow trout and mountain whitefish being particularly abundant in the free-flowing reach downstream of Monroe Street Dam (Parametrix, 2004c). Limited surveys of fish have been conducted in the Nine Mile Reservoir. Species captured include Northern pikeminnow, sucker species, mountain whitefish, rainbow trout, brown trout, chiselmouth (*Acrocheilus alutaceus*), redside shiner (*Richardsonius balteatus*), longnose dace, and yellow perch (Weitkamp and Euston, 2004). Creel surveys from this reach indicate that few salmonids are likely present in the forebay of Nine Mile Dam, instead preferring the 10-mile free-flowing stretch just downstream from the Monroe Street Dam. Little information is available regarding the fish community and habitat specific to the short, free-flowing river reach downstream of Nine Mile Dam. However, although little suitable salmonid spawning habitat occurs here, any salmonids that might use this reach during part of their life cycle, as well as salmonids occurring in Lake Spokane, have access to the Little Spokane River and its tributaries for spawning, rearing, and thermal refuge (Parametrix, 2003e).

Downstream of the Spokane Falls, Hangman Creek is a major source of sediments and nutrients to the Spokane River, particularly during high-flow periods (NPPC, 2000b, Soltero et al., 1992, as cited in Parametrix, 2003e). Sediment accumulation has occurred in the Nine Mile Reservoir and influences aquatic habitat characteristics there. Downstream of Nine Mile Dam, a short reach of free-flowing river is confined within a well-defined channel that is dominated by largely unembedded cobble and boulder substrate. No areas of suitable salmonid spawning gravels are known to occur here (Avista, 2005).

3.3.4.1.5 Long Lake Dam

Long Lake Dam is the most downstream of the five Spokane River projects. Its reservoir, Lake Spokane, is 23.5 miles long and covers approximately 5,060 acres at full pool. Long Lake Dam has the second largest storage capacity of the five projects, although it has less than half the storage capacity available at Post Falls. Discharge from Long Lake Dam flows directly into the Little Falls Reservoir (Avista and WDFW, 2004).

The dam is operated as a water storage and release facility for power generation purposes. During summer and fall, the lake is maintained near full pool level, with only the top 1 foot of storage generally used to respond to daily fluctuations in energy demand. Typically, the lake elevation is held at or above elevation 1,533 feet, within 3 feet of full pool, throughout most of the year. The lake stratifies during the summer, with surface water reaching temperatures of 22ºC to 25ºC (72°F to 77°F). In winter, stored water is used to respond to increased energy demand from Avista customers. During winter, when water flows decline and energy needs increase, the lake may be drawn down significantly. In fact, the existing Lake Spokane aquatic ecosystem developed through operating conditions that have included a winter drawdown for most of the 90 years since the lake was created in 1915. Under the existing FERC license, 24 feet of drawdown are allowed. However, during most of the past 15 years, Avista has limited the winter drawdown to approximately 14 feet or less. Winter drawdowns may last for several days to more than a month, depending on weather and energy demands. During the summer, Lake Spokane is typically maintained within 1.5 feet of full pool (Avista and WDFW, 2004; Avista, 2005).

The Long Lake Reservoir has a substantial and diverse fish population. An unpublished survey by WDFW in 2003 found the following species present in

Lake Spokane and the lower Spokane River: mountain whitefish, rainbow trout, chinook salmon, kokanee, brown trout, black crappie, brown bullhead (*Ictalurus nebulosus*), yellow bullhead (*I. natalis*), channel catfish, carp (*Cyprinus carpio*), tench, chiselmouth, Northern pikeminnow, largescale sucker, bridgelip sucker, longnose sucker, largemouth bass, smallmouth bass, pumpkinseed, yellow perch, and sculpin (*Cottus* spp.) (Weitkamp and Euston, 2004). In general, native suckers and chiselmouth are reported as more abundant in the upper half of the reservoir, particularly the free-flowing section. Yellow perch abundance is higher in the lower portions of Lake Spokane, and Northern pikeminnow are evenly distributed throughout the reservoir. Game species such as crappie and bass are likely most abundant in the upstream portion of the reservoir where most of the littoral zone habitats are found. Rainbow trout are found primarily in the Nine Mile Dam tailrace and the mouth of the Little Spokane River near the upstream end of the reservoir. Overall, WDFW hydroacoustic surveys have indicated that fish density is substantially lower in the Long Lake forebay (lower reservoir) than in the middle and upstream portions of the reservoir. According to the surveys, fish densities in the forebay were approximately 10 to 20 percent of densities in the middle and upstream areas. Fish populations were highest in off-channel portions of the reservoir, which are primarily located in the upstream section.

In 2001, WDFW conducted a survey of Lake Spokane that assessed the relative abundance of fish collected in nearshore habitats versus those collected or observed (via hydroacoustic survey) in offshore habitats (Osborne et al., 2003, as cited in Avista, 2005). Fish were observed throughout the water column of Lake Spokane, with the highest concentrations between depths of 53 to 66 feet in the lower and middle lake transects, and between depths of 5 to 26 feet at the most upstream transects (Osborne et al., 2003, as cited in Avista, 2005). Based on the vertical distribution in gill net catches, pikeminnow were collected more frequently in the top 16 feet of the water column, while yellow perch were collected more frequently in water from 16 to 33 feet deep. Seven Kokanee were collected at depths of 16 to 89 feet. The most common fish in the nearshore sampling was the largescale sucker, with yellow perch, largemouth bass, and smallmouth bass the most common game fish collected (Table 3.3.4.1-2). Northern pikeminnow was the most abundant offshore species, and yellow perch was the most abundant game species observed offshore (Osborne et al., 2003, as cited in Avista, 2005). Northern pike were collected in Lake Spokane during previous surveys (Bennett and Hatch, 1991, 1989, as cited in Avista, 2002), although Osborne et al. (2003, as cited in Avista, 2005) did not report finding pike in 2001.

Table 3.3.4.1-2. Fish species collected in Lake Spokane in 2001

Common Name	Scientific Name	Native (N) or Introduced (I)	% of Fish Collected	
			Inshore	Offshore
Mountain whitefish	*Prosopium williamsoni*	N	1.3	2.5
Rainbow trout	*Oncorhynchus mykiss*	N	<0.1	0.5
Chinook salmon	*Oncorhynchus tshawytscha*	N	--	0.6
Kokanee	*Oncorhynchus nerka*	N	--	2.5
Brown trout	*Salmo trutta*	I	0.3	1.8
Black crappie	*Pomoxis nigromaculatus*	I	5.3	0.7
Channel catfish	*Ictalurus punctata*	I	<0.1	--
Brown bullhead	*Ictalurus nebulosus*	I	2.1	0.7
Yellow bullhead	*Ictalurus natalis*	I	2.0	--
Carp	*Cyprinus carpio*	I	1.6	--
Tench	*Tinca tinca*	I	4.0	--
Chiselmouth	*Acrocheilus alutaceus*	N	1.8	0.4
Northern pikeminnow	*Mylocheliyus caurinus*	N	13.5	49.3
Largescale sucker	*Catostomus macrocheilus*	N	32.4	2.1
Bridgelip sucker	*Catostomus columbianus*	N	0.7	--
Longnose sucker	*Catostomus catostomus*	N	0.5	--
Largemouth bass	*Micropterus salmoides*	I	2.3	--
Smallmouth bass	*Micropterus dolomieui*	I	8.4	--
Pumpkinseed	*Lepomis gibbosus*	I	0.2	--
Yellow perch	*Perca flavescens*	I	23.4	39.4
Sculpin	*Cottus* spp.	N	0.1	--
Total fish collected			4,733	282

% – percent
-- – no datum
Source: Modified from Osborne et al., 2003, as cited in Avista, 2005

WDFW overall management objectives for fisheries in Lake Spokane include enhancing angling opportunities by stocking rainbow trout and maintaining the current warmwater fishery (Avista and WDFW, 2004). WDFW currently manages Lake Spokane as a mixed-species fishery and has stocked the lake with several species, including rainbow trout, brown trout, and eastern brook trout. Since 1999, WDFW has planted between 6,000 and 7,000 brown trout in the lake (WDFW, 2004, as cited in Avista, 2005).

Implementation of advanced wastewater treatment at the City of Spokane’s upstream WWTP in 1977 significantly improved water quality conditions in Lake Spokane and has reduced the frequency and extent of summer anoxia (Parametrix, 2003e). Since the 1980s, anoxic conditions appear to occur in Lake Spokane only during extremely low-flow years and at depths greater than 75 feet (WDOE, 2004a, as cited in Avista, 2005). High nutrient levels in Lake Spokane still result in high levels of primary productivity associated with planktonic algae. Algal blooms have occurred in small areas of the lake in recent years, especially during warm, low-flow periods. Also, substantial portions of the lake's shallow-water areas experience dense aquatic and emergent plant growth. Submergent and floating aquatic macrophytes currently can cover as much as an estimated 1,100 acres of the 5,060 surface acres of Lake Spokane (Tetra Tech, 2001, as cited in Parametrix, 2003e). Overall, the nutrient and macrophyte conditions influence the aquatic habitat in Lake Spokane, providing substantial areas of suitable habitat for fish species that favor highly productive, vegetated habitat (Parametrix, 2003e). The relatively high suitability of these habitats is reflected in the fact that Lake Spokane supports popular and high-quality fisheries for largemouth bass, smallmouth bass, yellow perch, and crappie (Avista, 2005).

3.3.4.2 Environmental Consequences

During meetings associated with the relicensing process, stakeholders identified wild rainbow trout as the primary fish species of interest in the Spokane River. In this section, we discuss various Project-related effects on rainbow trout and other aquatic resources.

3.3.4.2.1 Project Ramping and Potential Fish Stranding

Post Falls Project

Under natural water flow conditions, changes in river flows often occur over a number of days. In regulated river systems, there is the potential for flows to drop over a much shorter time period. Flow regulation and the rate of change in discharge at hydroelectric projects (i.e., "ramping") have the potential to both beneficially and adversely affect fish resources. Adverse effects to wild rainbow trout occur primarily through dewatering of spawning redds and stranding of juvenile fish when water flows decline rapidly as a result of Project operation. Benefits may be derived from sustaining more stable seasonal flows that maintain water levels over spawning and rearing habitat that could naturally be dewatered.

The main issue associated with ramping for the Spokane River Projects is whether the current rate of reducing dam discharges results in an unacceptable risk to fish inhabiting affected shallow water habitats (Avista et al., 2004). Overall, the particular areas of greatest concern from ramping and Project operation are the two substantial free-flowing reaches of the Spokane River below Post Falls Dam, with operation of the Post Falls Project having the greatest impact. The first reach is between Post Falls Dam and the reservoir created by the Upriver Project (a City of Spokane project), and the second is downstream of the Monroe Street Dam. The reach below Post Falls is termed the upper reach; the reach below Monroe Street is termed the lower reach. The upriver reach is characterized by a relatively uniform channel configuration (steep-sloped banks and frequent run-glide habitat) and substrate composition (predominantly boulder and cobble). The lower reach has extensive riffle habitat and gradually sloped shorelines.

Generally, those fish suffering adverse effects of reduced flow are juveniles that tend to remain in shallow water or embryos that are attached to or buried in shallow-water substrates. In order for rainbow trout fry to emerge successfully, flows must be sufficient during the incubation period so that the eggs and pre-emergent fry in the redds remain wetted. Larger fish move readily to deeper water and are unaffected by reducing flows. Instead, larger fish are affected more by the duration of decreased flow than by the rate at which flows decrease.

Fish are most often stranded where substrates are level or only gently sloping and have numerous voids of a diameter suitable for juvenile life stages, or depressions that retain water and then become isolated and dewatered, or possibly subject to severe temperature increases. Early stages of rainbow trout, which have a strong tendency to inhabit shallow-water gravel bar habitat, are therefore likely to be susceptible to stranding. Because rainbow trout embryos, fry and small juveniles are susceptible to stranding as well as being an important fishery resource, they are considered the primary species and life stage of concern in the Spokane River Project area.

In the Spokane River, spawning of rainbow trout has been observed in the free-flowing reach below Post Falls Dam, with spawning initiated a bit later in the reach below the Monroe Street Dam. Rainbow trout embryos and pre-emergent fry may therefore be present in gravel at the spawning sites from the end of March through early June. Emerged fry are probably present near the spawning areas in June and July, with small juveniles present around any shallow, gravel bar area of the Spokane River year-round. Thus, downramping associated with Post Falls operation has the potential to affect rainbow trout embryos or fry any time between late March and July, and small juveniles throughout the year.

Avista annually monitors rainbow trout spawning activity in the upper Spokane River below Post Falls Dam at three reference sites and also monitors the timing of fry emergence. Based on monitoring results and anticipated streamflows, Avista attempts to regulate the Post Falls Dam discharge to benefit rainbow trout spawning and fry recruitment by maintaining flows sufficient to keep the majority of redds wetted until fry have emerged. These efforts result in reducing the potential adverse effects of current Project operations on rainbow trout spawning and fry emergence, although varying amounts of spawning habitat and trout redds may still be dewatered, depending on variable annual flow conditions.

Parametrix (2003c) performed a study to verify the overall distribution, extent, and timing of naturally spawning rainbow trout, as well as fry emergence timing in the upper and lower free-flowing reaches. In the upper reach, spawning and fry emergence occurred between April and June. The first observation of spawning occurred during the first week of April as the water temperature reached about 5ºC. Spawning was observed through the third week of April. First signs of emergence were documented on May 23. In the lower reach, spawning and fry emergence occurred approximately 1 week later than in the upper reach. The first observations of spawning did not occur until water temperature reached about 7ºC during the second week of April, despite water temperatures reaching 5ºC during the first week of April. First signs of emergence were documented on May 29. In both reaches, water temperature remained below about 12ºC during the spawning and incubation period.

In the upper reach, surveys have reported between 87 percent and 96 percent of redds located between the Island Complex area (river mile 95.1) and the Harvard Road river bend (river mile 92.1), downstream of the Idaho-Washington state line. A total of 232 redds (approximately 13.6 per mile) were counted by Parametrix in 2003. In the lower reach, about 84 percent of the redds were counted between river mile 70 and river mile 74. A total of 130 redds (approximately 11.8 per mile) were counted by Parametrix in 2003.

Radio tracking information has identified additional areas that may be used by spawning rainbow trout, based on fish locations during the spawning season. Some fish in the upper reach may utilize deep-water areas where it is difficult to detect spawning activity. Such deep-water redds would be less likely to be dewatered before fry emerge. In the lower reach, trout may be utilizing small gravel patches, which are difficult to locate and observe during spring high flow conditions. However, there also appears to be a limited amount of suitable spawning habitat in the lower reach, perhaps limiting the rainbow trout population in this reach.

The substrate composition of the spawning habitat used in the two reaches was similar, ranging from a gravel-cobble mix to sand. Otherwise, distinct differences in spawning habitat were noted between the upper and lower reaches. Spawning habitat in the upper reach is shallower and spread more laterally in the river channel, compared to more defined and limited "pockets" of habitat utilized in the lower reach. Spawning in the upper reach generally occurs at relatively large, shallow gravel bars with little or no inundated vegetation. Spawning habitat in the lower reach is frequently associated with inundated shoreline vegetation.

The wetted area available to trout for spawning and incubation depends upon the amount of water flowing in the river. These flows may be a combination of the natural flow conditions and regulation of Post Falls Dam discharge. A study by NHC and HDI (2004) evaluated how the amount of water discharged from Post Falls affected downstream trout spawning, incubation, and rearing habitat. Within the upper reach, data indicate that the steepest declines in spawning and incubation area occur at flows below 5,000 cfs at the Harvard Road site (NHC and HDI, 2004). At the Starr Road Bar site, available spawning area declines below flows of 7,500 cfs and incubation area declines rapidly below 7,000 cfs. Below the Monroe Street Dam at the Peaceful Valley site, there is virtually no spawning habitat available for flows below 7,500 cfs. Even at 12,000 cfs, suitable spawning area covers just 1,950 square feet. Effective incubation area drops sharply below the spawning flow.

Juvenile and adult rearing habitat is also affected by flow levels. Below Post Falls Dam, there is no major loss of rearing habitat at two sites measured in Idaho despite the flow condition (NHC and HDI, 2004). Thus, current minimum flow releases from Post Falls Dam are adequate at those sites in terms of physical habitat for trout. The Barker Road site, also below Post Falls Dam, is a wide, shallow riffle more suitable for juvenile trout habitat and invertebrate production than for adult habitat. Weighted usable area (WUA) for juveniles drops when flows are below 200 cfs. At the Sullivan Road site below Post Falls Dam where most trout were observed during the study conducted by Northwest Hydraulic Consultants (NHC) and Hardin-Davis, Inc., flows of 150 to 200 cfs appear to provide optimum levels of WUA for all three stages of rainbow trout (NHC and HDI, 2004).

The conclusions of NHC and HDI (2004) indicate that the most important considerations for rainbow trout rearing and adult habitat in the Post Falls Reach are to maintain (if possible) sufficient flow in the Sullivan Road area and to avoid dewatering the Barker Road area. Discharges of about 400 cfs at Post Falls Dam provide near-maximum WUA for all three trout rearing stages at the Sullivan Road reach. Flow releases of about this same range also provide good physical habitat potential for juvenile trout at the Barker Road reach. Better physical habitat potential for adult trout at Barker Road occurs with a Post Falls release of about 700 cfs. Fisheries managers have indicated that the mature age classes (those with spawning potential) are a primary consideration for minimum flow needs. IDFG and WDFW further assessed the available information on water temperatures and refuge habitat and concluded that 600 cfs reduced to 500 cfs during low-flow years was protective of rainbow trout and a significant improvement from the existing condition (Horner, 2004, as cited in Avista, 2005).

Only a few observations of fish stranding have been documented in the literature. In late May of 2003, while performing a spawning survey, Parametrix excavated a number of recently dewatered rainbow trout redds. Of 28 redds that were excavated, only one redd contained undeveloped eggs. It was located in the study reach below Monroe Street Dam, at the Upper San Soucci area at river mile 71.4. In addition, 50 to 60 trout fry were observed stranded in several small, isolated pools in the west channel of the San Soucci area at flows of about

6,000 cfs (Parametrix, 2003c). Additional observations of fish stranding were made by Parametrix in 2003 in association with recreation flow release studies. Following a September flow-reduction event of 1,470 cfs over the course of several minutes, observations were made of nine Northern pikeminnow, two dace, and one smallmouth bass stranded in depressions near Harvard Road, in the reach below Post Falls Dam. In a separate November event, flows were reduced by 1,430 cfs over several minutes. In this case, only one stranded Northern pikeminnow was observed in a channel near Stateline. Sites in the reach below Post Falls such as Harvard Road and Starr Road, considered important spawning and incubation sites, may be affected by flows that drop below 5,000 and 6,500 cfs, respectively.

Thus, downramping at the Post Falls Dam does have the potential to adversely affect early life stages of rainbow trout, especially within the 12 miles of free-flowing river below the dam, and to a lesser extent, in the 9 miles of free-flowing river below the Monroe Street Dam. The effects would probably be greatest during late spring and early summer when the greatest number of the early life stages inhabit the nearshore and when the Post Falls Project is most likely to reduce discharge and control water levels.

Several hydroelectric facilities in Washington have published ramping rates considered to be acceptable at their facility. These range from 1.0 to 3.9 inches per hour. Currently, Post Falls Dam spill gates must be operated manually. In addition, the nearest USGS gage downstream from Post Falls does not post real-time data to the Post Falls Dam. Until real-time telemetry of this data is available, it is difficult for dam operators to achieve even a 4-inch-per-hour downramping rate. To comply with more restrictive downramping criteria (e.g., 2 inches per hour) would require more costly improvements to the existing Post Falls Dam. While real-time telemetry of stream gage information is part of the Proposed Action, further upgrades to Post Falls Dam that would enable downramping rates of less than 4 inches per hour are not being considered by Avista at this time.

With regard to potential fish stranding, the long-term presence and viability of a self-sustaining rainbow trout population in the free-flowing reaches of the river downstream of Post Falls Dam indicate that suitable habitat exists even with current low-flow conditions. But, these conditions can be improved while balancing other upstream and downstream water needs. Avista, WDFW, IDFG, and other stakeholders examined three factors that are important in defining appropriate minimum discharge flows for Post Falls Dam: (1) rainbow trout life stages that are important; (2) the description of fish habitat most affected by low, or minimum, instream flow; and (3) water temperature (Horner, 2004, as cited in Avista, 2005). Stakeholders also considered balancing the downstream flow regime with maintaining recreational water levels in Coeur d'Alene Lake.

Rainbow trout are territorial, and more water in a river often supports more fish. Larger, dominant trout develop territories and will exclude smaller fish. As flows are reduced, the habitat's capacity to support a given number of adult trout can be reduced. This is especially true in a shallow, wide reach of habitat. Large trout need a minimum depth of water, and as flows are reduced, habitat suitability for larger fish is generally lost at a greater rate than for smaller trout. A Parametrix study (2004c) found that larger radio-tagged trout in the upper reach tended to occupy nearshore areas downstream of flow obstructions. Radio-tagged fish in the lower reach tended to occupy nearshore habitat similar to the upper reach fish during the spring. They also tended to occur in shallow riffle-run habitat during summer. Smaller trout, especially fry and young-of-the-year juveniles, tend to favor shallow, low-velocity water with a substrate that provides suitable cover. Shallow, low-velocity water and appropriate substrate and cover for small trout are generally sufficient along the margins of the Spokane River under most flows (Horner, 2004, as cited in Avista, 2005).

From a fisheries management standpoint, adult fish support reproduction and, along with older juvenile fish, are the life stages that maintain the fish population that supports the important wild rainbow trout fishery in the Spokane River (WDFW, 2004, as cited in Avista, 2005). Thus, large benefits to the fishery can be gained by protecting the preferred habitat of older age classes along with juvenile rearing habitat through improved instream flow management.

Avista's Proposals

Project Ramping—There is no maximum downramping rate in the current FERC license. Under the Proposed Action, the Post Falls Dam Fish PME Program specifies that normal operations at Post Falls Dam would maintain a maximum allowable per-hour discharge ramping rate that corresponds to no more than a 4-inch drop in downstream water levels as measured at the USGS gage no. 12419000 (Spokane River near Post Falls) (Avista, 2005). This downramping rate reflects the rate that can reasonably be achieved at Post Falls Dam given the current flow control mechanisms at the dam (i.e., spill gate and turbine intake controls).

The primary benefit of this action would be to provide enhanced protection of rainbow trout fry and juvenile fish in the free-flowing reach of the Spokane River downstream of Post Falls Dam. Although the ramping rate at a dam can result in nearly instantaneous water level changes immediately downstream, the change in water elevation farther downstream is dampened by bank storage, resistance of the river channel, and the volume of water in the channel from the previous discharge level (Avista et al., 2004). Thus, the rate of any changes in river flow occurring downstream of Upper Falls and Monroe Street dams as a result of Post Falls Dam operations would be considerably less than the rate of change immediately downstream of Post Falls Dam.

Spawning, Incubation, and Emergence Flows / Minimum Discharge Flow—Also under the Proposed Action, Avista would continue to operate Post Falls Dam to protect and enhance rainbow trout spawning and fry emergence, but would follow the guidelines documented in the *Upper Spokane River Rainbow Trout Spawning and Fry Emergence Protection Plan* (Avista, 2004). The plan was developed and approved by Fisheries Work Group (FWG) stakeholders representing IDFG, WDFW, the Coeur d'Alene Tribe, and USFWS as being protective of rainbow trout. The plan calls for first determining each year the flows that occur at Post Falls Dam during the peak period of rainbow trout spawning, which has been shown to occur in the upper Spokane River between April 1 and April 15. In addition, forecasted streamflows for April through July would be developed from the *Streamflow Forecasts, Idaho Water Supply Outlook Report*, which the Natural Resource Conservation Service (NRCS) issues each year by April 1. The spawning-period flow and forecasted flows for April through July would be used to establish target discharge flows from Post Falls Dam that would be protective of egg incubation and fry emergence. Avista would seek to maintain such discharge flows through June 7 of that year. Target flows would be designed to keep the majority of suitable habitat and redds at the index spawning sites adequately watered, with the specific flow levels varying depending on forecasted flows.

Finally, under the Proposed Action, Avista would maintain a 600-cfs minimum discharge flow at Post Falls Dam under normal operating conditions. If the daily average inflow to Post Falls Dam (calculated at midnight) is, and is projected to continue to be, less than 600 cfs and Coeur d'Alene Lake is below elevation 2,127.75 feet as measured at the USGS gage at Coeur d'Alene Lake (gage no. 12415500) between July 1 and September 15 of any year, Avista would then maintain a 500-cfs interim minimum discharge flow at Post Falls Dam until the start of the annual scheduled September 15 drawdown. Avista proposed this minimum discharge flow of 600/500 cfs because it felt it:

- was scientifically based and provides for substantial usable habitat for rainbow trout in the Spokane River;
- represented a substantial improvement for fisheries habitat compared to the current requirement to provide a 300-cfs minimum discharge or to equal inflows to Coeur d'Alene Lake, whichever is less;
- used Coeur d'Alene Lake levels as an indicator of low flow, and dry and warm conditions in the watershed;
- recognized both upstream and downstream interests; and

- represented substantial stakeholder support.

Other Recommendations

Project Ramping—There were no DOI BIA 4(e) conditions in the July 17, 2006, filing specifically related to Project ramping.

The USFWS submitted its recommendations on July 17, 2006, pursuant to section 10(j) of the FPA. The USFWS recommended that Avista operate the Post Falls Dam to ensure there would be no more than a 4-inch-per-hour drop in downstream water levels at the USGS gaging station (12419000) as described in SRP-AR-1 (Part 3), as this would provide enhanced protection and minimize the stranding and entrapment of fish downstream from the Project.

The IDFG, in its July 17, 2006, submittal, agreed with the USFWS to support the adoption of the maximum 4-inch-per-hour drop in downstream water levels, based in part on the fact that Avista could not meet a more restrictive ramping rate without modifying the existing facility. IDFG recommended, however, that in the event future upgrades to the Post Falls Dam allow a more restrictive downramping rate, the 4-inch-per-hour rate may be revised upon agreement of Avista and cooperating resource agencies, subject to FERC approval.

The WDFW 10(j) July 17, 2006, filing indicated a preference for limiting the downramping rate at Post Falls Dam to no more than a 2-inch-per-hour drop in downstream water levels, as measured at the USGS gage, station 12419000, located on the Spokane River near Post Falls. WDFW also proposed that electronic data transmission/telemetry be set up at the gage site to improve measurement accuracy and to provide Post Falls Dam operators with real-time, downstream water level response. The WDFW points out that this issue is important because stranding studies at other hydroelectric facilities have shown the potential for a single downramping incident to kill thousands of salmonid fry. The agency indicates that the Post Falls facility has several options and types of gates that should be able to be operated in a manner to meet the 2-inch-per-hour downramping rate.

Similarly, the CELP July 17, 2006, filing endorsed a downramping rate of no more than 2 inches per hour at Post Falls, or ramping rates suggested by WDOE and WDFW. They also recommended monitoring instream flow levels using real-time gages.

The Sierra Club filing on July 17, 2006, and the Lands Council filing on July 24, 2006, called for a maximum 1-inch-per-hour downramping rate from June 16 to October 31, and a 2-inch-per-hour rate from November 1 through February 15, based on recommendations in Hunter (1992).

Spawning, Incubation, and Emergence Flows / Minimum Discharge Flow—Pursuant to section 10(a) of the FPA, the IDEQ recommended in its July 17, 2006, submittal that the Commission adopt Avista's proposal to implement a minimum discharge flow of 600 cfs (reduced to 500 cfs in certain periods) as set forth by Avista in PF-AR-1 component (1), and identified exceptions, as part of its environmental and operational measures for the continued operation of the Post Falls Project.

Likewise, the IDFG's July 17, 2006, section 10(j) submittal also recommended that the Commission adopt Avista's proposal to implement a minimum discharge flow as included in PF-AR-1 component (1). IDFG stated that this proposed component enhances the existing Project conditions and provides cost-effective environmental benefits.

The justification presented by IDFG was extensive. In summary, it stated that total usable habitat for rainbow trout is a combination of the physical habitat and water temperature. Total usable habitat in the upper Spokane River is affected by discharge flow because of the WUA provided and the impact of water temperature on the thermal refuge areas used by trout downstream of Sullivan Road. A clear relationship exists that increased discharge flow from the Post Falls Project increases water temperatures below Sullivan Road and reduces the total usable habitat for juvenile and adult rainbow trout in the Spokane River. IDFG felt that this information supported the proposal by Avista, to lower the minimum discharge flow to 500 cfs during low-flow years, as proposed in the PME measure outlined by Avista in PF-AR-1 component (1) (Horner, 2004; Avista, 2005; HDI, 2005; FWG meeting summaries September 9, October 7, and November 4, 2004).

In its July 14, 2006, filing, the WDOE supported setting an interim minimum discharge of 600 cfs from Post Falls Dam throughout the year, as measured by the USGS gage no. 12419000. The WDOE advocated an adaptive management approach, which would measure actual habitat area, specific temperature impacts and downstream flow relationships to determine a final minimum discharge after a 5-year period. It indicated that Avista may reduce Post Falls flow during the 5-year monitoring period to *no lower than* 500 cfs between July 1 and September 15. The WDOE also recommended that Avista prepare a Quality Assurance Project Plan using agreed-upon guidelines to measure water temperatures, flow relationship to temperatures, and flow relationship downstream of the Post Falls Dam. Information intended to be evaluated during validation that is collected by Avista and agencies other than Avista would be reviewed for acceptability and approved or denied by the agency group.

The WDFW 10(j) July 17, 2006, filing indicated that Avista should provide spring flows for the protection of incubation and emergence of trout in the Spokane River. For the period of April 15 through June 7 of each year, Avista should provide 60 percent of the highest 7-day running average (consecutive days) of daily discharge flows from the Post Falls Dam recorded for the period of April 1 through April 15 each year, or natural flow, whichever is less. An annual report of flows and operations for the period of spawning through emergence, including inflows to the river upstream of the dam, dam changes to outflow, and downstream flows, should be provided to the natural resource agencies. The report should include downramping events.

WDFW stated that Project operations are responsible for dewatering redds and for egg mortality. The agency felt that Project operations to maximize egg and pre-emergence fry survival and fry recruitment has been attempted by Avista, but that filling Coeur d'Alene Lake has often been accomplished at the expense of the downstream fishery. The licensee's proposal offers between 30 percent and 50 percent of the spawning flow, which covers 50 percent to 70 percent of the combined Harvard Road and Starr Road spawning sites. WDFW states that data from the Instream Flow and Fish Habitat Assessment (NHC and HDI, 2004) indicates that when 60 percent of the spawning flow is passed at the dam, incubation flow for 70 percent to 80 percent of the spawning area becomes available. This level of protection is more reasonable to WDFW.

The Sierra Club and the CELP July 17, 2006, filings requested that Avista release sufficient water (approximately 770 cfs) from Post Falls Dam to achieve a flow of 550 cfs at the Barker Road spawning site. The Lands Council's July 24, 2006, submittal requested that Avista release sufficient water from Post Falls Dam to achieve a flow of 500 cfs at Barker Road. In addition, it requested that Avista collect and compare real-time flow data at Barker Road for flows below 800 cfs at the Post Falls Project during the summer months to identify the loss of flow (cubic feet per second) at Barker Road and calculate an appropriate minimum flow level for the Post Falls Project to protect fish habitat. This monitoring should occur over the first 5 years of the license and extend further if more additional data is required. Avista and the appropriate agencies (WDOE, IDEQ, WDFW, IDFG, and EPA) should then utilize information obtained through the monitoring to adjust flows as necessary to maximize fish habitat while addressing any adverse impacts associated with increased flows.

Avista's Countermeasures

Project Ramping—Avista acknowledged the USFWS and IDFG recommendations that the Commission adopt Avista's proposal to implement the 4-inch-per-hour downramping requirement as presented in PF-AR-1.

However, Avista felt the WDFW, CELP, Sierra Club, and Lands Council recommendations were unsupported by substantial evidence, were unreasonable and onerous, and did not provide environmental benefits to salmonids in a cost-effective way.

Spawning, Incubation, and Emergence Flows / Minimum Discharge Flow—Avista extended its appreciation of the IDEQ and IDFG's endorsement of Avista's minimum discharge flow proposal. Avista is confident its flow proposal is appropriate and should be adopted as part of the new license for Post Falls.

In its September 1, 2006, filing, Avista indicated that WDOE's request for it to provide specified minimum discharge flows and associated adaptive monitoring were unsupported by substantial evidence, were unreasonable and onerous, and did not provide environmental benefits to salmonids in a cost-effective way. Specifically, Avista indicated that flows of more than 500 cfs at the Post Falls Project can increase water temperatures near Sullivan Road spawning sites above the state water quality standard. To address this concern, the discharge flow proposed by Avista is designed to be reduced during warm summer periods to protect thermal refuge habitat. Avista requested that the Commission adopt the minimum discharge flow as proposed by Avista in PF-AR-1 component (1), and identified exceptions, as part of Avista's environmental and operational measures for the Post Falls Project, and reject the recommendations submitted by WDOE.

In its September 1, 2006, filing, Avista indicated it found the WDFW recommendation to be unsupported by substantial evidence, unreasonable and onerous, and unable to provide environmental benefits to salmonids in a way that was more cost-effective than Avista's proposed measure. Also, because WDFW is not a state fish and wildlife agency for purpose of Post Falls, given that Post Falls is located in Idaho, Avista addressed the WDFW submittal regarding Post Falls flows as section 10(a) recommendations. Avista recommended that the Commission reject the WDFW recommendation in favor of the flow regime proposed by Avista.

Avista's September 1, 2006, filing also rejected the minimum discharge flow and associated adaptive monitoring recommended by the Sierra Club, CELP, and the Lands Council because they "are unnecessary, unreasonable, and onerous." Avista felt their recommendations would not enhance environmental benefits in a cost-effective way above those that are provided in Avista's proposal.

Our Analysis

Project Ramping—Avista's proposed 4-inch-per-hour maximum downramping rate at the Post Falls Dam would be more protective of salmonid spawning, incubation, and rearing habitat than exists under the current FERC license. The slower downramping rate would protect early stages of rainbow trout by providing more time for juveniles to avoid becoming stranded. Limited data are available at this time to determine whether benefits to the aquatic environment in the Spokane River would be significantly improved by limiting the ramping rate to 2 inches per hour or less. The current Project cannot accurately ensure a downramping rate of less than 4 inches per hour without significant costly upgrades. The 4-inch-per-hour maximum rate would provide enhanced protection for important fish populations and represents a balance of resource interests in a cost-effective manner.

Avista's proposal, and the CELP and WDFW's recommendation to implement real-time electronic data transmission/telemetry at the existing USGS gage no. 12419000, would provide real-time flow data for instream flow compliance monitoring purposes and improve the understanding of the relationship between Post Falls Dam operations and downstream flows at important rainbow trout habitat sites.

Spawning, Incubation, and Emergence Flows / Minimum Discharge Flow—During Project relicensing, it became evident that stakeholders were concerned about the effects of Project operations on rainbow trout spawning sites during egg incubation and fry emergence periods. This is especially important given that the flow levels required to maximize the watered areas and the exact timing may vary somewhat from year to year.

While there is a large amount of information available on the potential impacts to the self-sustaining wild rainbow trout population in the free-flowing reach of the Spokane River downstream of the Post Falls and Monroe Street dams, the data were not sufficiently conclusive for the interested parties to reach a joint conclusion on how to define a minimum Post Falls discharge flow or how to operate the Project to optimize the protection of trout redds through fry emergence by establishing spawning and emergence flows.

Under Avista's proposal to continue to operate the Project under the *Upper Spokane River Rainbow Trout Spawning and Fry Emergence Protection Plan* (Avista, 2004), it would monitor rainbow trout spawning activity and fry emergence at three reference sites in the upper Spokane River below Post Falls Dam. Based on monitoring results and anticipated streamflows, Avista would attempt to regulate upper Spokane River discharge to keep the majority of redds wetted until fry have emerged. We estimate that this proposal would maintain adequate flow over 50 to 70 percent of the important Harvard and Starr roads spawning sites each year, which is reasonably protective of rainbow trout given the natural variability that would be expected in an unregulated system and the natural year-class variability typical of trout populations. Providing spawning and emergence flows according to WDFW's recommendation would undoubtedly improve survival of emerging rainbow trout. The WDFW estimates that releasing 60 percent of the April 1 to April 15 spawning flows at the Post Falls Project would provide for continuous watering of 70 to 80 percent of the spawning area in the important 3-mile spawning reach of the upper Spokane River. However, releasing flows according to this schedule would likely adversely affect Post Falls Project power generation and the ability of Avista to rapidly fill Coeur d'Alene Lake for summer recreation needs.

As proposed by Avista and WDFW, an annual report of flows and operations for the period of spawning through emergence would allow the resource agencies and Avista to annually evaluate the effectiveness of the spawning and fry emergence plan and determine the level of protection that would be afforded to these important life stages for this species.

We make our final recommendation for spawning and emergence flows in section 5.1, *Comprehensive Development and Recommended Alternative*.

Minimum Discharge Flow—Avista conducted an instream flow study which indicated that higher instream flow releases would increase the amount of physical habitat that is available to juvenile and adult rainbow trout in the upper Spokane River. However, temperature modeling predicts that flow releases would also increase water temperatures during the summer period in some reaches of the Spokane River to levels that would exceed the optimal temperatures for rainbow trout growth and survival.

Many of the physical habitat availability and temperature tradeoffs on setting minimum instream flows center around the reach of river downstream from Post Falls near Barker Road (river mile 90.4) and Sullivan Road (river mile 87.5). At the Barker Road site, the river loses water to the groundwater aquifer; therefore, streamflows are typically lower during the summer in this reach. Stream habitat is also a concern at the Barker Road site because the Spokane River at this location is wide and shallow, and as flows change, the changes in habitat characteristics and suitability are more pronounced than in deeper, narrower reaches.

At the Sullivan Road site, streamflows are augmented by groundwater inflow. The groundwater inflow is typically 6°C to 8°C, which has a cooling effect on summer water temperatures in the Spokane River from Sullivan Road downstream. The groundwater inflow in the vicinity of the Sullivan Road site dilutes the warmer water originating from the surface of Coeur d'Alene Lake, thereby typically maintaining average daily summer water temperatures below 20°C from this point downstream. The cooler water temperatures provide important summer habitat for rainbow trout seeking refuge from warmer waters upstream.

As discussed in section 3.3.2.2.1, *Lake Level Management and Flow Releases*, we anticipate that a 600-/500-cfs instream flow release at Post Falls Dam would provide flows of approximately 344 and 256 cfs, respectively, at the Barker Road site. These flows would also maintain summer water temperatures downstream of Sullivan Road within the optimal range for rainbow trout survival and growth (see section 3.3.3.2.2, *Effects of Project Flow Releases on Temperature*).

Avista's instream flow study predicts that a Post Falls Dam flow release of 600 cfs would provide 95 percent of maximum juvenile WUA and 84 percent of maximum adult WUA at the Barker Road site. A 500-cfs minimum instream flow would provide 100 percent of maximum juvenile WUA and 69 percent of maximum adult WUA. Therefore, even under the minimum instream flow release, a 500-cfs discharge would provide an increase in percent of maximum juvenile and adult WUA of 20 and 42 percent, respectively, over what is provided under the current 300-cfs minimum instream flow release schedule.

Instream flow releases of 700 to 800 cfs, as recommended by the Sierra Club, CELP, Northwest Whitewater Association, and the Lands Council, would provide an additional 10 to 14 percent of maximum increase in adult WUA at the Barker Road site, as compared to the staff-recommended 600-cfs flow release; however, these flows would also decrease the juvenile WUA by 4 to 9 percent of maximum. In addition, temperature modeling predicts that summer instream flow releases in excess of 700 cfs would likely reduce overall habitat suitability for rainbow trout by increasing water temperatures to greater than 21°C in critical summer refuge areas downstream of the Sullivan Road site. Water temperatures higher than 21°C would likely limit trout growth and survival and would violate state water quality standards. A 700- to 800-cfs instream flow release could also have adverse effects on the recreation resources of Coeur d'Alene Lake by potentially reducing the lake elevations if sufficient inflow to maintain lake elevations and instream flow requirements were lacking.

An adaptive management approach to setting instream flows, as recommended by the WDOE, WDFW, Lands Council, and Northwest Whitewater Association, would be useful to assess actual habitat availability and temperatures effects from implementation of the new minimum instream flow regime. We note, however, that there appears to be sufficient existing information on the effects of minimum instream flows on the aquatic environment downstream of the Post Falls Dam.

We make our final recommendation for instream flows in section 5.1, *Comprehensive Development and Recommended Alternative*.

Spokane River Developments

Changes in discharge related to Post Falls Dam operations are somewhat buffered at Upper Falls by other hydrologic influences, such as groundwater gains and losses and Upriver Project operations (Avista et al., 2004). In addition, the Upper Falls Dam does not ramp up or down outside of responding to any changes in inflow. As a result, setting appropriate ramping criteria at the Post Falls Dam would be likely to address any ramping rate concerns specific to the Upper Falls Project. North channel spill gates that are closed when high spring flows subside do dewater the north channel. This channel is a short, steep bedrock ledge that offers little fish habitat and is therefore not expected to significantly affect fish populations through stranding.

At the Monroe Street Dam, aesthetic flows of at least 200 cfs are maintained during daylight hours under the current FERC license (Avista et al, 2004). When aesthetic flows begin, there is a small reduction in the amount of water entering the powerhouse as it instead flows over the spillway. The reverse is true when aesthetic flows cease. These aesthetic flow-related changes affect an area of steep bedrock and represent relatively minor changes within the tailrace area. There is no overall change in discharge to the downstream river reach. Therefore, ramping rate does not appear to be an issue directly relevant to the operation of the Monroe Street Project.

Primarily, the volume of outflow from Post Falls Dam also drives water flows at the Nine Mile Project. The exception is when high flows require removal of some, or all, of the two 5-foot-high rows of flashboards on top of the spillway (10 feet total flashboard height). Although only a portion of the flashboards is typically removed at any one time, downstream flows do increase over the course of the removal process. Over as little as a half hour, the tailrace elevation may increase 1 to 2 feet (Avista et al., 2004). Over the next several hours, the Nine Mile discharge gradually readjusts to reflect the volume of inflow. The reservoir level remains lowered until the flashboards may safely be replaced. When flashboards are replaced, the tailrace water level may drop approximately 1 foot for about a half hour, until the reservoir is refilled. This creates a potential downstream ramping effect. This reach has no known spawning or rearing habitat for rainbow trout, and the effects of such rapid downramping in the short free-flowing reach below the dam on species of concern are unknown.

During summer, the Long Lake reservoir is normally held within 1 foot of full-pool elevation (Avista et al., 2004). One or two generating units are operated for a few hours a day to meet energy demand, resulting in a potential change in tailrace elevation of up to 2 feet. Discharge from the Long Lake Dam flows directly into the Little Falls reservoir and not into a free-flowing reach. The affected downstream reach consists mostly of steep rock areas that offer only limited habitat for early life stages of rainbow trout. Thus, ramping concerns in the Long Lake tailrace are considered minimal.

Avista's Proposals

Avista proposed no changes to operations of the Spokane River Developments that would result in downramping rate issues. Upper Falls and Monroe Street dams are operated as run-of-river facilities. At Nine Mile and Long Lake dams, the intakes and powerhouses are integral to the dam structures that span the single main river channel at these locations. Both of these hydroelectric developments discharge directly into the main river channel immediately downstream of the dam.

Other Recommendations

There were no DOI BIA 4(e) conditions in the July 17, 2006, filing specifically related to project ramping.

The WDFW 10(j) July 17, 2006, filing proposed that electronic data transmission/telemetry be set up at the gage site to improve measurement accuracy and to provide Post Falls Dam operators with real-time, downstream water level response. The WDFW points out that this issue is important because stranding studies at other hydroelectric facilities have shown the potential for a single downramping incident to kill thousands of salmonid fry.

Overall, after reviewing the available information, the resource agencies and other stakeholders concluded that there is no known spawning and rearing habitat for rainbow trout in the reaches immediately downstream of the Nine Mile and Long Lake facilities, and the effects on aquatic resources of any downramping would be limited (Avista et al., 2004).

Avista's Countermeasures

Avista called for rejection of the WDFW proposal.

Our Analysis

The WDFW's recommendation to implement real-time electronic data transmission/telemetry at the existing USGS gage no. 12419000 would provide real-time flow data for instream flow compliance monitoring purposes and improve the understanding of the relationship between Post Falls Dam operations and downstream flows at important rainbow trout habitat sites.

3.3.4.2.2 Fish Passage and Entrainment

Entrainment past the dams can occur either by passage through the hydroelectric turbines or within the spill of excess water over the spillway.

Entrainment through the turbines poses a danger of collision with various parts of the Project works, exposure to potentially dangerous water pressure shear forces, and potential injury or death. In addition to the potential for direct injury or mortality, fish passing successfully through the turbines may still become disoriented and subject to the risk of increased predation once they reach the tailrace.

Entrainment of fish in the water discharged through the turbines or passage over a spillway is likely to occur to some degree at each of the dams that are part of the Spokane River Hydroelectric Project (Weitkamp and Euston, 2004). The potential for turbine passage entrainment is related primarily to fish distribution in the impoundments immediately upstream from each of the dams, the probability that the fish are in the portion of the water column that travels through the intakes, and the discharge rate of water through the turbines relative to the total river flow and reservoir size.

No studies measuring direct entrainment of fish have been undertaken for any of the Spokane River Projects. However, some recent data related to radiotracking of rainbow trout does document some downstream passage of fish past the Project dams (Parametrix, 2004c). The downstream movement of wild rainbow trout in the upper Spokane River was examined by tracking two radio-tagged fish that passed the Upriver Project and Upper Falls and Monroe Street dams (Parametrix, 2004c).

The entrainment assessment for the Spokane River Project focused on species determined to be numerically abundant by recent field investigations or actively pursued by recreational anglers. Those species apparently present in forebay areas were characterized with respect to potential susceptibility to entrainment at each dam. Species were categorized as “likely”, “unlikely”, or “none” with respect to their potential for entrainment. Table 3.3.4.2-1, taken from Weitkamp and Euston (2004), indicates the findings of the FWG for the Spokane River Project.

Post Falls Project

The Post Falls Dam was assessed with respect to individual characteristics of the dam, intake and powerhouse structural elements, reservoir characteristics, and fish populations. Several comprehensive studies of entrainment mortality data by FERC and the Electric Power Research Institute (EPRI, 1997) were examined, along with studies on fish behavior relative to turbine passage, to round out the assessment of factors that may influence turbine entrainment. Through analysis of these various factors, an entrainment risk and mortality risk was determined for the Post Falls Project (Table 3.3.4.2-2).

Table 3.3.4.2-1. Potential for fish entrainment at Spokane River Projects

Common Name	Post Falls	Upper Falls / Monroe Street	Nine Mile	Long Lake
Mountain whitefish	Likely	Likely	Likely	Likely
Rainbow trout	Likely	Likely	Likely	Likely
Chinook salmon	Unlikely	None	None	Unlikely
Kokanee	Unlikely	None	None	None
Cutthroat trout	Unlikely	Unlikely	Unlikely	Unlikely
Brown trout	Likely	Likely	Likely	Likely
Brook trout	Unlikely	Unlikely	Unlikely	Unlikely
Bull trout	Unlikely	Unlikely	Unlikely	Unlikely
Black crappie	Unlikely	Unlikely	Likely	Likely
Brown bullhead	Unlikely	Unlikely	Unlikely	Unlikely
Yellow bullhead	Unlikely	Unlikely	Unlikely	Unlikely
Carp	Likely	Likely	Likely	Likely
Tench	Unlikely	Unlikely	Unlikely	Likely
Chiselmouth	Likely	Likely	Likely	Likely
Northern pikeminnow	Likely	Likely	Likely	Likely
Largescale sucker	Likely	Likely	Likely	Likely
Bridgelip sucker	Likely	Likely	Likely	Likely
Longnose sucker	Likely	Likely	Likely	Likely
Largemouth bass	Unlikely	Likely	Likely	Likely
Smallmouth bass	Likely	Likely	Likely	Likely
Pumpkinseed	Likely	Likely	Likely	Likely
Yellow perch	Likely	Likely	Likely	Likely
Sculpin	Unlikely	Unlikely	Unlikely	Unlikely

Source: Weitkamp and Euston, 2004

Table 3.3.4.2-2. Entrainment and mortality risk for fish at Post Falls Dam

Influence Factors	Post Falls
Entrainment Rates	
Intake adjacent to shoreline	No
Intake location in littoral zone	No
Abundant littoral zone fishes (no. species)	No
Abundant littoral zone fishes (no. individuals)	No
Obligatory migrants	No
Intake depth-ft (at top, full pond)	14.25
Winter drawdown	No
Normal hydraulic capacity (cfs)	5,400
Approach velocity (fps, normal operation)	1.35
Water quality factor	No
Entrainment Risk	**Moderate**
Survival Rates	
Turbine type	Francis
High turbine speed	No
Survival rates of small fish (<8 inches)	High
Pressurized intake channel	No
Mortality Risk	**Low**

Source: Weitkamp and Euston 2004

The overall estimated risk of entrainment to important game fish populations at the Post Falls Dam is moderate, due in part to the apparent preferred fish utilization of the lake or its tributaries, rather than the impounded river, together with the dam characteristics (Weitkamp and Euston, 2004). Most fish passing through Post Falls Dam turbines would be expected to experience high survival (low mortality) due to the expected small size of most entrained fish, moderately sized turbine units, and slow turbine speeds. The survival of fish passing through the spillway is likely to be similar to that of fish passing over the falls under historic conditions. Also, entrainment of fish at Post Falls is estimated to be similar to or less than during historic conditions, in part because the dam provides a lower maximum discharge over a longer period than during historic conditions. Thus, the overall estimated impact to fish populations due to entrainment and spillway passage at Post Falls is estimated to be low (Weitkamp and Euston, 2004).

Avista's Proposal

The Proposed Action includes no operational or structural measures that would directly influence fish entrainment at the Post Falls powerhouses.

Other Recommendations

None.

Our Analysis

In Coeur d'Alene Lake, the populations of bull trout and westslope cutthroat trout, the native species of concern, are not anticipated to be entrained because their preference for deeper habitat in the lake and upstream tributaries for spawning and rearing spatially isolates these populations of fish from the Post Falls Dam powerhouse. Other fish that are more likely to be entrained (e.g., rainbow and brown trout, suckers, sunfish) are expected to have high survival rates based on the turbine characteristics. Habitat for these species exists below Post Falls Dam, as discussed in Weitkamp and Euston (2004). Therefore, the impacts of fish entrainment at Post Falls Dam are expected to be minimal.

Spokane River Developments

Each of the four Spokane River Developments was assessed with respect to individual characteristics of the dam, intake and powerhouse structural elements, reservoir characteristics, and fish populations. Several comprehensive studies of entrainment mortality data by FERC and the Electric Power Research Institute (EPRI, 1997) were examined, along with studies on fish behavior relative to turbine passage, to round out the assessment of factors that may influence turbine entrainment at Spokane River dams. Through analysis of these various factors, an entrainment risk and mortality risk was determined for the Spokane River Developments (Table 3.3.4.2-3).

During spring runoff, the limited hydraulic capacity through the turbines at Upper Falls and Monroe Street dams makes it likely that most entrained fish would pass over the spillway, rather than through the turbines. A second period of salmonid entrainment is likely to occur shortly after hatchery rainbow trout are stocked in the Upper Falls impoundment. Although the timing of release events is selected to avoid the high-flow period, some downstream movement is expected after stocking. Unlike hatchery rainbow trout, the wild rainbow trout common in the free-flowing reach below Post Falls Dam are not likely to be entrained at Upper Falls and Monroe Street. This is because the wild trout population's downstream movement is largely, though not entirely, blocked by the City of Spokane's Upriver Dam. The overall risk of entrainment to fish populations at Upper Falls and Monroe Street is considered moderate, due to the apparent abundance of native suckers and other native species throughout the area (Weitkamp and Euston, 2004). Fish passing either project are expected to experience generally high survival due to the expected small size of most

Table 3.3.4.2-3. Entrainment and mortality risk for fish at Spokane River Developments

Influence Factors	Upper Falls	Monroe Street	Nine Mile	Long Lake
Entrainment Rates				
Intake adjacent to shoreline	Yes	Yes	No	Yes
Intake location in littoral zone	No	No	No	No
Abundant littoral zone fishes (no. species)	No	No	No	Yes
Abundant littoral zone fishes (no. individuals)	No	No	No	Yes
Obligatory migrants	No	No	No	No
Intake depth-ft (at top, full pond)	9.1	5.0	15.0	29.0
Winter drawdown	No	No	No	Yes
Normal hydraulic capacity (cfs)	2,500	2,850	6,500	6,300
Approach velocity (fps, normal operation)	2.51	3.85	2.90	0.93
Water quality factor	No	No	No	No
Entrainment Risk	**Moderate**	**Moderate**	**Moderate**	**High**
Survival Rates				
Turbine type	Francis	Kaplan	Francis	Francis
High turbine speed	No	No	Units 1,2-No; Units 3,4-Yes	No
Survival rates of small fish (<8 inches)	High	High	Units 1,2-Moderate; Units 3,4-Low	High
Pressurized intake channel	No	No	No	No
Mortality Risk	**Low**	**Low**	**Moderate-High**	**Low**

Source: Weitkamp and Euston 2004

entrained fish, the relatively large-sized units and passage spaces, and slow turbine speeds. Thus, the overall estimated impact of entrainment due to turbine passage at Upper Falls and Monroe Street dams is low (Weitkamp and Euston, 2004).

Wild rainbow trout and other salmonids in the free-flowing section immediately downstream of the Monroe Street Dam are not abundant in the Nine Mile Reservoir. As a result, few wild salmonids are likely to be entrained at Nine Mile Dam. Some stocked hatchery trout may be more susceptible to entrainment, however, especially if the flashboards along the spillway are removed to pass water over the dam soon after the stocking event occurs. Overall, due to the apparent abundance of native non-game fish in the area, the risk of fish entrainment at Nine Mile Dam is considered moderate (Weitkamp and Euston, 2004). Survival estimates for fish passing through the Kaplan turbines at Nine Mile Dam are lower than for any of the other Spokane River Projects, mainly due to the turbine rotation speeds and relatively small spaces available for fish passage. Although the risk of entrainment to fish at the Nine Mile Dam is moderate, the expected low survival rates of fish passing through the turbines suggest impact to entrained fish is probably moderate to high (Weitkamp and Euston, 2004).

The intakes for Long Lake Dam are located at a moderate depth and adjacent to the shoreline where fish tend to travel. Fish populations in this reservoir are also exposed to the influences of frequent peaking operations and annual winter drawdowns that may increase entrainment rates. Thus, the entrainment risk at Long Lake Dam is likely to be high (Weitkamp and Euston, 2004). Entrainment is expected to be greatest during the spring runoff period, as well as during the winter drawdown. The likelihood for survival of fish passed through the turbines at Long Lake Dam is very good. Overall, entrainment risks may be more moderate than high due to the majority of the fish populations being present well upstream of the dam, rather than in the forebay, and the sheer-vertical rock shoreline area that continues several thousand feet upstream of the dam. However, given the expected high survival of the mostly small fish likely to be transported out of the reservoir, the overall impact of entrainment is considered low (Weitkamp and Euston, 2004).

Avista's Proposal

The Proposed Action includes no operational or structural measures that would directly influence fish entrainment at Spokane River Development powerhouses.

Other Recommendations

None.

Our Analysis

Although entrainment of individual wild rainbow trout likely occurs at each of the Project dams, viable reproducing populations of wild rainbow trout have persisted for decades in the free-flowing reaches both upstream and downstream of the Spokane River Project dams; therefore, any measures to limit entrainment would likely have only minimal benefits for wild rainbow trout populations in the Project area.

3.3.4.2.3 Aquatic Habitat Alteration

In general, alterations to aquatic habitat may occur through a variety of means, including river inundation, disruption of habitat and fish population connectivity, flow bypass/habitat dewatering, and reservoir fluctuations.

3.3.4.2.3.1 River Inundation

Post Falls Project

Post Falls Dam control of water levels during the summer and the fall drawdown (typically June through October) results in the seasonal change of the Spokane River into a more lacustrine environment above the hydroelectric development and the lower tributary reaches to Coeur d'Alene Lake.

Spawning-run westslope cutthroat trout and bull trout are expected to migrate upstream out of Coeur d'Alene Lake and through the inundated portions of the major tributaries when water temperatures are cool and in the early spring or later fall. Adult adfluvial westslope cutthroat trout migrate downstream to the lake in April and May after spawning, when Post Falls Dam typically is not actively controlling the water level in Coeur d'Alene Lake. Adult adfluvial bull trout are known to migrate back to the lake soon after spawning in September and are expected to reach the Project-affected inundated reach of the St. Joe River by early October. Observations of tagged cutthroat trout in 2003 indicated that there is not an effect on migration of fish through the inundated reaches and the free-flowing portions of Coeur d'Alene Lake's major tributaries (memorandum from D. Weitkamp, Ph.D., Fisheries Scientist, Kirkland, WA, to T. Vore, Environmental Specialist, Avista, Spokane, WA, dated June 20, 2005, as cited in Avista, 2005). Results showed about one-quarter to one-half of the cutthroat trout tagged upstream in the tributaries migrated into or through the inundated reaches (Parametrix, 2005).

Both westslope cutthroat trout and bull trout existed in substantially larger numbers than they do today as late as the 1980s. Because their populations continued to be more robust long after the current operation of Post Falls Dam had begun to influence Coeur d'Alene Lake water levels, factors other than dam operations are likely responsible for the recent population declines of these native salmonids (memorandum from D. Weitkamp, Ph.D., Fisheries Scientist, Kirkland, WA, to T. Vore, Environmental Specialist, Avista, Spokane, WA, dated June 20, 2005, as cited in Avista, 2005).

A recent Parametrix (2004b) analysis indicates that maintaining the water elevation of Coeur d'Alene Lake near 2,128 feet during the summer is unlikely to have had an influence on shoreline habitat that would influence the rate of predation or competition sufficiently to have resulted in the recent population changes in native trout (memorandum from D. Weitkamp, Ph.D., Fisheries Scientist, Kirkland, WA, to T. Vore, Environmental Specialist, Avista, Spokane, WA, dated June 20, 2005, as cited in Avista, 2005). Weitkamp also suggests that the populations of the non-native major predators (northern pike and Chinook salmon) do not appear to be controlled by or substantially influenced by the regulated lake elevation (memorandum from D. Weitkamp, Ph.D., Fisheries Scientist, Kirkland, WA, to T. Vore, Environmental Specialist, Avista, Spokane, WA, dated June 20, 2005, as cited in Avista, 2005).

Avista's Proposal

The Proposed Action at Post Falls Dam would result in Coeur d'Alene Lake levels that are the same as current conditions (Avista, 2005).

Other Recommendations

The DOI BIA 4(e) condition 5 filing of July 17, 2006, called for the development of a plan to restore tributaries on the Coeur d'Alene Reservation to mitigate for the tributaries to the Coeur d'Alene Lake inundated by the Post Falls Project (A-1). Following plan preparation, the tribe called for Avista to conduct tributary restoration, for the purpose of achieving salmonid escapement targets, including:

- Calculation of the number of tributary miles inundated by the Project (1) within the boundaries of the Reservation and (2) outside the Reservation, but within the Project boundary

- Restoration of the number of tributary miles inundated by the Project (with priority given to regions within the boundaries of the Reservation) at a minimum rate of 2 miles per year, and to be completed within 10 years following Secretarial acceptance of the plan.

Further details of the restoration and monitoring required are described in DOI BIA, condition 5.

Avista's Countermeasures

On August 17, 2006, Avista submitted its Proposed Alternative Conditions for the Preliminary Section 4(e) Conditions. Regarding condition 5, Avista's proposed alternative was that "BIA Condition 5 be deleted in its entirety and that no condition be imposed with respect to this matter."

The bases for this proposed alternative center around the effects caused by maintaining Coeur d'Alene summer lake levels at 2,128 feet. Avista argues that Project operations do not significantly alter either the slack water conditions, current velocities, or the temperature conditions in the low-gradient downstream reaches of the Coeur d'Alene Lake tributaries in a way that adversely affects fish. Additionally, escapement of native adfluvial salmonids to the spawning tributaries is controlled by a number of non-Project factors that cannot be influenced by Avista, such as mining, timber harvest, road and railroad construction, forest fires, agricultural practices, fisheries management decisions, competition with introduced species, illegal harvest, and unpredictable catastrophic events (Parametrix, 2006).

Relative to BIA condition 3 (Water Quality Standards and Water Quality Monitoring), Avista has agreed to a proposed alternative condition that would allow the BIA to specify how the elevation of Post Falls should be maintained or modified (including a return to the natural hydrograph) if it believes that Avista's operation of the dam so as to maintain the summer lake elevation at 2,128 feet is adversely impacting water quality.

Our Analysis

Under a natural hydrograph, the downstream reaches of the Coeur d'Alene Lake tributaries experience natural backwater habitat. Each tributary has a substantial natural slack-water reach (low-gradient, low-velocity reach) that is inundated by natural lake elevations. Measured releases from Post Falls Dam admittedly influence water levels in the lake's tributaries during the late spring, summer, and fall, when Post Falls operations maintain water levels that are higher than would typically occur under a natural hydrograph. The variable zone is the 7.5 feet between full lake elevation (2,128 feet) and the low natural elevation (2,120.5 feet) (Parametrix, 2006). Operation of the dam influences the location where the transition from free-flowing river to the lower velocities and deeper water of the inundated reaches occur, but the inundated portion of the river will always be present, even without the Post Falls Dam. The existing fluctuation zone between natural low flow and maintained summer flow covers approximately 2.5 miles in the Coeur d'Alene River, 1.7 miles in the St. Joe River, and 2.1 miles in the St. Maries River (Table 3.3.4.2-4). The chief effects of reservoir fluctuations on salmonid populations would occur during periods when the Project maintains the summer pool level. A generalized depiction of bull trout and westslope cutthroat trout movement in the Coeur d'Alene Basin, relative to Post Falls Dam operation, is presented in Figure 3.3.4.2-1.

Table 3.3.4.2-4. Approximate distance of inundation in Coeur d'Alene Lake major tributaries at various lake elevations

Lake Elevation (feet)	Coeur d'Alene River (river mile)	St. Joe River (river mile)	St. Maries River (river mile)
2,128	30.5	32.0	8.6
2,124	28.1	30.4	7.0
2,120	28.0	30.3	6.5

Source: Parametrix, 2006

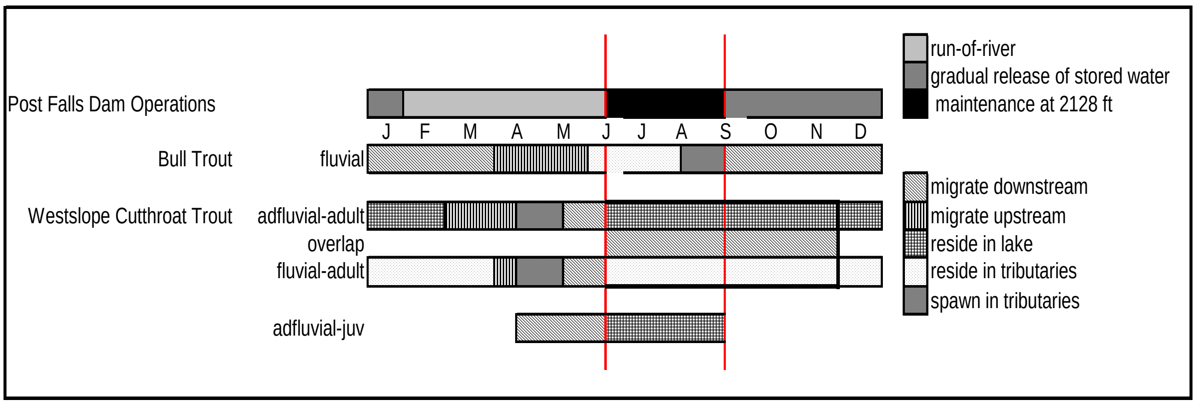


Figure 3.3.4.2-1. General movement patterns of bull trout and westslope cutthroat trout in the Coeur d'Alene Basin in relation to Post Falls Dam operations
Source: Parametrix, 2006 (data); staff (chart format)

Maintaining the summer pool level of 2,128 feet is therefore most likely to impact salmonids between June and mid-September. During that interval, most bull trout in the basin are residing in the upstream portions of the Coeur d'Alene Lake tributaries. Upstream movement from the lake or lower river segments through the inundated portion generally occurs earlier, before the Post Falls Dam begins to control water flow. Thus, dam operations that cause reservoir water levels to fluctuate in portions of the tributaries should have little impact on bull trout in the basin. Between June and mid-September, cutthroat trout are generally residing in the lake (adfluvial) or in the tributaries (fluvial). However, a portion of the adfluvial fish that have not yet reached the lake are likely to move downstream through the seasonally inundated portion of the river during that period. Even under the lowest lake level condition, these fish would navigate most of the seasonally inundated portion. This amounts to approximately 29 miles of the Coeur d'Alene River, 31 miles of the St. Joe River, and about 6.5 miles of the St. Maries River at the lowest elevation of 2,120.5 feet (Avista, 2005). The additional 1.7 to 2.5 miles of inundated river that must be navigated by migratory salmonids when the lake is maintained at 2,128 feet are unlikely to be the driving factor behind depressed escapement numbers of bull trout and westslope cutthroat trout in the basin.

Spokane River Developments

Spokane River inundation in Washington is controlled largely by Post Falls Dam operation because the Spokane River Developments are generally operated as run-of-river dams. Therefore, inundation is addressed only under the Post Falls Project section.

3.3.4.2.3.2 Habitat and Fish Population Connectivity

Post Falls Project

Because the Post Falls are a natural fish barrier, habitat and fish population connectivity is not addressed for the Post Falls Project.

Spokane River Developments

The Spokane River Development dams prevent upstream movements of fishes. Other barriers to upstream passage in the Project area include the non-Project Upriver Dam and Spokane Falls.

Avista's Proposals

The Proposed Action includes no measures that would directly influence the existing upstream fish passage conditions at the Project (Avista, 2005).

Other Recommendations

No state or federal resource agency has indicated that upstream fish passage facilities are warranted at any of the Project dams at this time. The USFWS reserved section 18 FPA authority to prescribe upstream fish passage at either Long Lake or Nine Mile dams but indicates that upstream passage is not necessary at this time (letter from R. J. Torquemadi, Supervisor, USFWS, Spokane WA, to B. Howard, Spokane River License Manager, Avista, Spokane, WA, dated May 23, 2005, as cited in Avista, 2005).

The WDFW 10(j) July 17, 2006, filing indicated that Avista should prepare, fund, and commence implementation of a program to remove fish passage barriers (e.g., culverts) and replace them with passable structures in the Little Spokane River drainage, tributary to the Spokane River and Lake Spokane. Construction of the Nine Mile, Little Falls, and Long Lake dams between 1908 and 1915 blocked passage of anadromous and resident salmonids, fragmenting the river into free-flowing and reservoir habitat types, preventing genetic exchange and fish distribution, and disrupting habitat connectivity. WDFW indicates that as an alternative to modifying Project dams for fish passage, remediation of impaired fish access to salmonid habitat in primary and secondary tributaries should be considered for Project mitigation.

Avista's Countermeasures

In its September 1, 2006, filing, Avista recommended that the Commission reject the WDFW's recommendation that Avista be required to develop and implement a Fish Passage Barrier Program. Avista feels the request has no nexus to Project operations or effects and that the WDFW recommendation is unlikely to enhance environmental benefit for salmonids in the Project area.

Our Analysis

There is no evidence in the Project record showing that installing upstream fishways at the Project dams would have any more than minimal benefits for existing salmonid populations. Although replacing or retrofitting culverts that block upstream fish passage in tributaries associated with the Spokane River would provide resident rainbow trout and other species with additional spawning and rearing habitat, such culverts are not in any way associated with the Project.

3.3.4.2.3.3 Flow Bypass / Habitat Dewatering

<u>Post Falls Project</u>

At Post Falls Dam, the north channel and south channel dam spillways discharge onto relatively steep bedrock waterfalls and associated pools before flowing through relatively short downstream channels prior to reaching the main Spokane River channel. During times of lower flows, the short north channel reach provides several pool and riffle complexes that are suitable habitat for rainbow trout or other fish (Avista and WDFW, 2004). Under current conditions, these pools and riffle areas remain wetted at all times as a result of leakage flows through the spillway gates and through the associated bedrock. Limited aquatic habitat of value is bypassed at the south channel because the dam is located on natural bedrock falls in the Spokane River (Avista and WDFW, 2004).

Avista's Proposals

The Proposed Action includes no environmental measures specifically intended to address any potential effects of Project operations on aquatic habitat or fish in the bypassed reaches. However, under the Proposed Action, upon issuance of the new FERC license, Avista would release aesthetic flows of approximately 46 cfs over the north channel waterfalls at the Post Falls Project (PF-AES-1). Avista would provide aesthetic flows on Saturdays and Sundays between the hours of 12 noon and 6 p.m. (daily) from Memorial Day weekend through Labor Day, recognizing that high spring runoff conditions in most years would provide north channel flows that exceed the desired aesthetic flows at the hydroelectric development into June and sometimes into July.

Other Recommendations

None.

Our Analysis

Any potential beneficial effects associated with increasing the magnitude of flow for fish in the bypass reaches that exist in the north and south channels at the Post Falls Dam would be minimized by the extreme nature of the habitat. Even so, by increasing the extent and duration of aesthetic flows at the bypass reaches, any usable fish habitat in the bypass reaches would remain watered more reliably over a longer period, thereby improving conditions for most fish that could become stranded in these areas.

<u>*Spokane River Developments*</u>

Within Washington, fish bypass and habitat dewatering occurs at the Upper Falls Dam and the Monroe Street Dam. Under lower flow conditions, all water at the Upper Falls is diverted through a single channel to the powerhouse, allowing bedrock ledges and pools in the north channel (0.5 mile) and middle channel (0.2 mile) to dewater (Avista and WDFW, 2004). Fish that were present in these channels may become stranded and can perish from being dewatered, overheated, preyed upon, or fished. At the Monroe Street Dam, aesthetic flows pass over the dam to bedrock ledges below during daylight hours. At night, the aesthetic flows cease and water does not reach the bedrock area. However, the dewatering of the 500-foot reach immediately downstream of the Monroe Street Dam is not likely to affect many fish, because fish are not present in large numbers on the bedrock ledges that provide little, if any, usable fish habitat (Avista and WDFW, 2004). At the Nine Mile and Long Lake dams, the intakes and powerhouses are integral to the dam structures that span a single river channel, so there are no bypassed river channels.

Avista's Proposals

The Proposed Action includes no environmental measures specifically intended to address any potential effects of Project operations on aquatic habitat or fish in the bypassed reaches.

Under the Proposed Action, Avista would implement the recommendations of the Upper Falls Aesthetics Flow Plan, a plan that would be developed in consultation with relevant cooperating parties (SRP-AES-1). The plan would address a minimum 200-cfs flow release through the bypass reach (i.e., north and middle channels), as well as efforts to direct leakage and/or the aesthetic flows through both the north and middle channels. Avista would provide the daily minimum aesthetic flows of 200 cfs between 10 a.m. and one-half hour after sunset annually between Memorial Day weekend and September 30.

At Monroe Street Development, Avista would continue the current daily minimum aesthetic flows of 200 cfs over the Monroe Street Dam between 10:00 a.m. and one-half hour after sunset, year-round.

Other Recommendations

In its July 14, 2006, submittal, the Sierra Club recommended that Avista provide no less than 200 cfs flow from 5 a.m. to midnight year-round at the Upper Falls Dam, primarily for aesthetic reasons. The CELP also submitted a request to increase instream flow for aesthetic values in its July 17, 2006, submittal.

Avista's Countermeasures

In its September 1, 2006, filing, Avista recommended that the Commission reject the Sierra Club's recommendation for extended hours of aesthetic flows. Avista indicated that members of the public do not view or listen to the falls to an appreciable degree during non-daylight hours or after the tourist season is over. Avista also recommended adopting its SRP-AES-1, Spokane River Project Aesthetic Flows, over the generic request for aesthetic flows from CELP.

Our Analysis

The bypass reach that exists at Upper Falls Dam has little in the way of usable aquatic habitat; therefore, increased flows through the reach are likely to have few, if any, benefits for rainbow trout. No usable fish habitat occurs in the bedrock falls lying below the Monroe Street Dam; therefore, increased flows through the reach are likely to have few, if any, benefits for rainbow trout. There are no bypass reaches at Nine Mile and Long Lake dams, so there would be no effects to fish from habitat dewatering as a result of flow bypass at these dams. By increasing the extent and duration of aesthetic flows at the bypass reaches, any usable fish habitat in the bypass reaches would remain watered more reliably over a longer period, thereby improving conditions for most fish that could become stranded in these areas.

3.3.4.2.3.4 Reservoir Fluctuations

<u>Post Falls Project</u>

Operation of Post Falls Dam controls water levels in Coeur d'Alene Lake for approximately 6 months of each year. During this period, water is maintained at a nearly constant level. Therefore, reservoir fluctuations related to operation of the Post Falls Project are not discussed.

Spokane River Developments

Influences of drawdown can be both positive and negative. The nature of the effects is determined by a variety of factors, including reservoir bathymetry, biota, the timing of the drawdown, and its duration and degree. Each of these factors may interact to produce different biological communities as compared to a similar body of water with a relatively constant surface elevation. Environmental issues at the forefront of concern regarding reservoir fluctuations include effects on fish production, aquatic vegetation, and water quality (Weitkamp, 2004).

In general, alteration of the natural regime can eventually lead to changes in the structure of the aquatic community. Changes may be most evident in the regions subject to water level fluctuations and less evident at other depths. While some species can simply shift to more suitable habitat during a drawdown, other organisms may be lost. For example, populations of organisms strongly associated with macrophytes may be reduced if drawdowns eliminate some of the macrophyte population. However, the populations of aquatic biota associated with the Spokane River Developments have coexisted with winter drawdown conditions for nearly 80 years (Weitkamp, 2004) and are likely to have stabilized over that time.

Avista attempts to maintain discharge flows at high enough levels to keep the majority of downstream rainbow trout spawning redds watered until fry have emerged from the gravels (Avista, 2005). Following spring runoff, Avista maintains Coeur d’Alene Lake near elevation 2,128 feet throughout the summer recreation season. Avista generally begins a gradual drawdown of Coeur d’Alene Lake, typically at a rate of 1 to 1.5 feet per month, the week following Labor Day to as late as after September 15. As operated, current conditions already seek to reduce the potential operational effects on rainbow trout spawning and successful fry emergence (Avista et al., 2004). Stakeholders, including the IDFG, USFWS, WDFW, and the Coeur d’Alene Tribe (as part of the FWG), further developed this existing practice and approved an *Upper Spokane River Rainbow Trout Spawning and Fry Emergence Protection Plan* (Avista, 2004), which would be implemented under the Proposed Action.

Because they are operated primarily as run-of-river facilities, the normal operation of the Upper Falls and Monroe Street dams results in little or no reservoir fluctuation other than that driven by high flows and natural channel configurations (Avista and WDFW, 2004).

Operation of the Nine Mile Dam does include some daily and seasonal fluctuations of the reservoir. Water level changes related to daily load following are typically not more than 1 foot. However, water levels above the dam can rapidly drop as much as 10 feet over the course of several hours in years when flashboard removal occurs, to be followed by a rise to normal full pool once the flashboards are replaced. Such operations affect the availability, characteristics, and suitability of the aquatic and shoreline riparian habitat within the reservoir. Sudden and short-term increases of flow through the turbines may result in increased fish entrainment and effects on downstream habitat and fish populations (Avista and WDFW, 2004). Wild rainbow trout, a species of particular concern, generally reside in the more suitable, free-flowing reach of the river upstream of the Nine Mile Reservoir and are not affected by this operation. Avista, in cooperation with WDFW, annually stocks this reservoir with catchable rainbow trout for angler opportunity. Consequently, any reservoir operation effects would likely impact stocked fish (Avista, 2005).

Operation of Long Lake Dam also results in fluctuating water levels, including daily, weekly, and seasonal drawdowns of the reservoir. Avista attempts to keep the reservoir within 1.5 feet of full-pool elevation during the summer recreation season.

In recent years, operation of the Long Lake Dam has resulted in winter fluctuations in the reservoir of about 14 feet or less. Typically, normal winter operational drawdown to 6 feet or more occur sometime during a 2- to 3-year period. The current FERC license allows a maximum drawdown of up to 24 feet; the last drawdown to this extent occurred in the winter of 1988-1989.

Winter reductions in lake elevation typically last for periods of days to more than a month. These winter reductions occur at a time of year when there is minimal biological activity. Fish spawning by important species is complete prior to these routine winter drawdowns. However, in the watershed upstream from the Long Lake Reservoir, kokanee spawning has been observed in the autumn and early winter. Some studies indicate that the successful reproduction of kokanee can be inhibited by reservoir drawdown during their incubation period. Also, the juveniles of some species may still be utilizing shallow-water habitat for rearing and refuge from predators at the time that drawdown occurs.

Impacts to primary production of aquatic macrophytes during winter may affect their production during the next spring and summer. In effect, a substantial drawdown in winter can reduce the abundance of aquatic macrophytes in shallow waters of the lake. Recently, drawing down the lake in winter has been done, in part, to purposefully control the growth of exotic macrophytes such as Eurasian watermilfoil (*Myriophyllum spicatum*).

Measured plankton densities in the Long Lake Reservoir are observed to be greatest in the upstream portion of the lake, though densities were low, as expected, for a run-of-river system such as the lower Spokane River. Benthic invertebrate abundance is greatest upstream from the reservoir in Hangman Creek (Latah Creek). Benthos densities were described as sufficient to sustain a large forage base for predators that consume benthic prey.

Overall, the most negative impact of water fluctuations on the aquatic biota of the Long Lake Reservoir may be the limitation potentially imposed on survival of juvenile bass and juveniles of other game fish species (Weitkamp, 2004). The decreases in lake elevations likely move juveniles out of vegetated areas and into open water, making them more susceptible to predation than they would be if elevations were maintained above 1,535 feet. However, because the reduction in reservoir elevation occurs during the winter when predation and feeding are at annually low levels, the overall impact on juvenile bass and other game fish is probably not great. A benefit of lake elevation reduction may even be production of larger individual bass through reduced competition for available prey (Weitkamp, 2004).

Osborne et al. (2003) report that the current water-level management regime of Lake Spokane provides the public with high-quality populations of largemouth bass, smallmouth bass, yellow perch, and black crappie. The proposed operation of Long Lake Dam is expected to continue to provide favorable habitat conditions for the current high-quality fishery. An overall fisheries-management objective of WDFW is to maintain the current warmwater fishery in Lake Spokane in a manner that is not detrimental to native salmonid populations (e.g., wild rainbow trout in the Little Spokane River) (Avista and WDFW, 2004). Reservoir conditions, together with the competitor and predator populations that exist in the lake, prevent rainbow trout from becoming a substantial component of the reservoir population (Weitkamp, 2004).

Avista's Proposals

No proposed activities at Upper Falls Dam, Monroe Street Dam, or Nine Mile Dam are expected to create any water-level management changes compared with the current Project operations, other than the potential for increased frequency of winter drawdowns at Lake Spokane, based on cooperating party decisions on implementation of drawdowns to control non-native aquatic plant species. Avista proposes to limit drawdowns of Lake Spokane to 14 feet from the full-pool elevation, which is similar to how the dam has operated over the last 15 years. The last drawdown greater than 14 feet occurred for a brief period in 1991, and the last drawdown of 24 feet occurred during the winter of 1988–1989. By formalizing the current informal drawdown limit of 14 feet, adverse effects, if any, of deeper drawdowns that historically occurred would be avoided. The fish populations in Lake Spokane would be subject to essentially the same drawdown regimes as have existed for many years, and no new Project-related effects from management of the lake level would be expected for the term of the new license.

Other Recommendations

No submittals related specifically to reservoir drawdown were received. However, in its July 14, 2006, submittal, the Sierra Club recommended that Avista carry out studies to evaluate the effects of habitat alteration on the benthic community, design mitigation measures, and develop a plan to implement such mitigation. It also recommended that Avista monitor the results of plan implementation on the physical, chemical, and biological habitat of the benthic community. The rationale was that the benthic community forms the basis of support for the biological productivity of a river system, and the impacts from construction and operation of the Project facilities on the benthic community has been largely unaddressed and unstudied.

Avista's Countermeasures

In its September 1, 2006, filing, Avista recommended that the Commission reject the Sierra Club's recommendation for studies and monitoring of the benthic community because "such studies are unnecessary and have no relation to Project effects." The FWG evidently discussed the need for assessment and collection of benthic community data during the relicensing process but concluded that the benthic community is not a critical controlling factor for fish in the Spokane River and did not need to be evaluated. Specifically, information on insect production as it relates to water levels had not been demonstrated to be a determining factor in making fisheries-related decisions.

Our Analysis

As shown above, we have the information we need to assess the existing and proposed conditions at the Project area; therefore, monitoring the benthic insect community for additional information on fluctuation effects as recommended by the Sierra Club would provide few, if any, additional benefits

3.3.4.2.4 Other Aquatic Resource Measures

<u>Post Falls Project</u>

Avista's Proposals

<u>PF-AR-1, Part 4 (Post Falls Fisheries Resources Public Information, Education, and Law Enforcement Program)</u>

This program would provide assistance and support for a Public Information, Education, And Law Enforcement Program specific to bull trout and westslope cutthroat trout in the Coeur d'Alene Lake Basin and native rainbow trout in the free-flowing reach of the Spokane River downstream of the Post Falls Project. Although specific activities supported by this program would not be determined until a license was issued and the IDFG, USFWS, Coeur d'Alene Tribe, and WDFW were consulted, the program could include species identification and conservation information, landowner education, educational signage and brochures, public presentations, and support of enhanced law enforcement activities specific to target species and waters. The law enforcement program would be implemented in coordination with WDFW, IDFG, and the Coeur d'Alene Tribe using appropriate personnel. Avista has committed to providing $260,000 annually for PF-AR-1 Parts 4-6, with the specified allocation of $240,000 within Idaho in the Coeur d'Alene Basin upstream of Post Falls Dam and $20,000 within Idaho and Washington in the free-flowing reach immediately downstream of Post Falls Dam.

PF-AR-1, Part 5 (Post Falls Fishery Protection and Enhancement Program)

Under this program, Avista would provide for a Population and Habitat Protection and Enhancement Program for westslope cutthroat trout and bull trout in the Coeur d'Alene Lake Basin and native rainbow trout in the free-flowing reach of the Spokane River downstream of the Post Falls Project. This component may also support wild salmonid protection by providing for alternative angling and harvest opportunities through recreational and fishery enhancement and supplementation. The existing *Coeur d'Alene Lake Basin Bull Trout and Westslope Cutthroat Trout Protection, Mitigation, and Enhancement Implementation Plan* (Kleinschmidt, 2004) would help guide the activities to be developed and implemented. Funding for the measure is described in component 4 above.

PF-AR-1, Part 6 (Post Falls Fishery Assessment and Monitoring Program)

This program would support population and habitat assessments and monitoring for westslope cutthroat trout and bull trout in the Coeur d'Alene Lake Basin and/or native rainbow trout in the free-flowing reach of the Spokane River downstream of the Post Falls Project. Supported activities would address Project-related population and habitat trends pertaining to the three target species under the terms of the new license. Activities would be developed in consultation with the IDFG, WDFW, Coeur d'Alene Tribe, and USFWS and could be related to activities relevant to implementation of the Post Falls Fishery Protection and Enhancement Program discussed in component 5 above. Funding for the measure is described in component 4 above.

PF-AR-2 (Coeur d’Alene Lake Aquatic Weed Management Program)

Under this Proposed Action, Avista would prepare annual reports that summarize the activities funded and/or conducted under PF-AR-2, the results achieved, and the activities anticipated for implementation/support in the coming year. These reports would be available to any party upon request. Avista would be required to provide an amount, not to exceed $50,000 per year, in support of PF-AR-2 implementation. Funds not expended in the year provided would carry over and accumulate up to a maximum of $150,000. Parts of the PME include the following:

- *Education*: Within 1 year of implementation of a new FERC license, Avista would work with the cooperating parties to establish or expand educational programs with respect to exotic/noxious aquatic weeds in the waters affected by the Post Falls Project.
- *Monitoring*: Within 1 year of implementation of a new FERC license, Avista would cooperate in the development of a weed-monitoring plan with the cooperating parties. The plan would be implemented through the use of trained seasonal technicians who may work for Avista or for one of the cooperating parties. Avista would provide a boat of its choosing as needed for these seasonal weed-monitoring efforts, separate from the funding described below.
- *Management*: Avista and the cooperating parties would establish cost-effective management strategies for the various exotic/noxious weed species as they are identified within Post Falls Project-affected waters. These strategies would vary depending on the weed type, level of infestation, and the area in which the weeds are identified.

Other Recommendations

Coeur d’Alene Lake Tributary Salmonid Habitat Restoration

The DOI BIA 4(e) condition 5 filing of July 17, 2006, called for the development of a Salmonid Fisheries Plan to restore tributaries on the Coeur d’Alene Reservation to mitigate for the tributaries to the Coeur d’Alene Lake inundated by the Post Falls Project. This included calculating the number of tributary miles inundated by the Project, specifically within the reservation or outside the reservation but within Project boundaries. Avista would be required to restore these tributary reaches to provide suitable salmonid habitat at a rate of at least 2 miles per year, with all restoration complete within 10 years. Tributary restoration could include instream and riparian restoration, conservation and maintenance, removal of impassable barriers, purchase of land or conservation easements, exotic species control, and supplementation. First priority for restoration would be given to tributaries within the reservation. If restoration within the reservation did not meet escapement targets outlined in the condition, then restoration of tributaries outside the reservation would commence.

The USFWS recommended that Avista develop a Migration Corridor and Tributary Restoration Plan addressing 33 miles of the St. Joe River upstream from the upper extent of the Project area. Restoration projects would focus on improving water quality (e.g., reducing sediment delivery and water temperature), adding habitat complexity, and reducing habitat suitability for non-native predators and competitors of bull trout. Restoration activities could include increasing pool habitat, increasing riparian vegetation in headwater streams, increasing large woody debris, restoring river morphology in the mainstem St. Joe River, stabilizing banks, and remediating man-made fish passage barriers. Acceptable alternate restoration sites could be considered if they are tributaries of the St. Joe upstream from river mile 34.

Coeur d'Alene Lake Basin Fisheries Enhancement

The DOI BIA 4(e) condition 5 stated that Avista must monitor escapement on tributaries on the reservation to achieve escapement targets for westslope cutthroat trout and mountain whitefish. Westslope cutthroat trout escapement goals (the number of breeding adult fish as indicated by returning spawners) are set at 3,923 adfluvial adults per year and mountain whitefish escapement goals are set at 3,923 adults per year. Juvenile outmigrating fish from each tributary would be tagged to allow future identification of natal/home tributaries, the year of first tagging, and within-lake survival for individually marked fish. Upstream migrating fish would be counted, measured, and examined for existing tags. Target escapement levels could be modified by the DOI Secretary, in consultation with the tribe, based on the results of escapement surveys, population response to tributary enhancement and supplementation measures, fisheries management strategy changes, and new information that may become available. In the event of such modifications, Avista would be required to modify the Salmonid Fisheries Plan accordingly.

The DOI BIA 4(e) condition 5 also stated that the tribe required Avista to establish supplemental fishing opportunities, including five stocked pond sites, on the reservation for the purpose of providing harvestable fish for the tribe until such time as escapement targets are met. The ponds would be closed-basin fisheries located in drainages where westslope cutthroat trout restoration is not occurring. The ponds would be stocked to maintain a minimum catchable fish density of 5,000 pounds of fish per hectare, with total stocking per year equivalent to 10,000 pounds of catchable-size salmonids (i.e., rainbow trout, westslope cutthroat trout, and mountain whitefish). Fish stocking would be reduced proportionately as escapement reached 25 to 100 percent of the targets listed above. Costs for acquiring the land for the ponds, fish stocking, and maintenance and for acquiring all necessary permits would be borne by Avista.

The IDFG stated that Parts 4, 5, and 6 of PF-AR-1 are significantly underfunded and inconsistent with the conclusions reached during many months of FWG meetings under the ALP. The IDFG recommended increasing the annual funding allocated by Avista, as well as segregating the monies set aside for use specifically on the Coeur d'Alene Tribe Reservation from monies to be utilized elsewhere in the basin.

The Sierra Club, in its July 14, 2006, submittal, recommended that Avista develop and implement a Native Resident Trout Enhancement Program for Coeur d'Alene Lake to improve trout distribution, abundance, habitat conditions, and forage base. The program would develop and implement off-site habitat measures to address unmitigated impacts to fish habitat (e.g., land acquisition, removal of fish barriers in tributaries, conservation easements), assess and mitigate impacts to physical habitat features (e.g., spawning gravels, large woody debris), implement measures for bull trout (as guided by the USFWS Recovery Plan [USFWS 2002a] or the Biological Opinion [to be written]), and conduct studies to determine how Project operations affect invertebrate and fish communities (e.g., trout prey base, foraging capability, growth, fecundity, or general fitness).

The Lands Council, in its July 24, 2006, submittal, recommended that Avista prepare a Coeur d'Alene Lake Basin Fisheries Management Plan to provide population and habitat protection measures and enhancement efforts specifically directed at bull trout and westslope cutthroat trout in the Coeur d'Alene Basin. Specific measures and justifications include:

- Fund a study tracking and monitoring bull trout and westslope cutthroat trout from Wolf Lodge, Lake, and Benewah Creeks (track from juvenile to adult life stages with passive integrated transponder tags). The study would provide information needed to determine the relationship between Post Falls Project operations, higher water temperatures, and fish migration habitat needs so that operational or fish management strategies could be developed.
- Evaluate current barriers to access between Coeur d'Alene Lake and tributary habitat and repair or replace culverts, screen irrigation diversions, address land use impacts in key tributaries (land acquisition, riparian habitat fencing, conservation easements, etc), identify erosion areas, purchase or lease water rights to provide instream flows in tributaries, and consider implementing additional measures identified by the USFWS, IDFG, and Coeur d'Alene Tribe. Bull trout and westslope cutthroat are impacted by many factors other than Project operations, and these measures would help mitigate for the impacts.

- Fund and implement measures to study and suppress exotic species that prey on native westslope cutthroat trout and bull trout. Determine the annual population and production of key non-native fish species in the lake using mark/recapture study techniques. Inundation of the lower section may create habitat for these non-native fish species. Data gaps on the effects of the non-native food web maintained by Project operations would be filled by these studies.

Coeur d'Alene Lake Basin Benthic Community Studies and Mitigation

The Sierra Club indicated that impacts from construction and operation of the Project facilities on the benthic community have been largely unaddressed and unstudied, although the benthic community forms the basis of support for the biological productivity of a river system. Thus, the Sierra Club recommended that Avista carry out studies to evaluate the effects of habitat alteration on the benthic community, design mitigation measures, and develop a plan to implement such mitigation. It also recommended that Avista monitor the results of plan implementation on the physical, chemical, and biological habitat of the benthic community.

Coeur d'Alene Lake Mitigation Trust Fund

The Sierra Club and the Lands Council recommended that Avista establish a mitigation trust fund to address ongoing impacts that cannot be mitigated through other changes in the Project operation or structure. Funds would be directed to habitat enhancement and restoration throughout the license term and would be used solely for mitigation projects, not for administrative or organizational costs.

Coeur d'Alene Lake Aquatic Weed Management

The DOI BIA 4(e) condition 6 filing of July 17, 2006, called for Avista, in collaboration with the Coeur d'Alene Tribe, to develop and implement a Coeur d'Alene Reservation Aquatic Weed Management Plan to eradicate exotic and noxious aquatic weeds in waters affected by the Project that are within or adjoining the Coeur d'Alene Indian Reservation. This plan included conducting annual surveys to map noxious weed populations, formulating management actions specific to each identified weed, scheduling and implementing annual surveying and management actions, coordinating management actions with management of other resources, developing criteria to measure the progress of exotic weed eradication, and submitting annual progress reports. The reports would contain a list of all aquatic weeds encountered and a map of the aquatic weed distribution, information on progress toward eradication, and a literature review identifying and assessing new weed management techniques and proposals for future use on Coeur d'Alene Lake.

Large Woody Debris Management

In its July 17, 2006 submittal, the WDFW recommended that Avista prepare, fund, and implement a program to assess and restore large woody debris habitat and functions to the Spokane River and reservoirs over the term of the new license. Large woody debris is important for maintaining fish habitat diversity and complexity, and WDFW indicated that the large woody debris that collects on the Post Falls Dam trash racks is removed from the facility and removed from the site. Because removal of large woody debris deprives the aquatic system of important habitat niches, WDFW proposes that restoration should be commensurate with the amount of large woody debris removed at the Project dams. Restoration efforts would be concentrated in the Project area but could also occur in tributaries to the Spokane River. Plans for design and placement of large woody debris would be developed in consultation with WDFW and the USFWS.

Avista's Countermeasures

Coeur d'Alene Lake Tributary Salmonid Habitat Restoration

On August 17, 2006, Avista submitted its Proposed Alternative Conditions for the Preliminary Section 4(e) Conditions. Regarding condition 5, Avista's proposed alternative was that "BIA Condition 5 be deleted in its entirety and that no condition be imposed with respect to this matter."

Avista also rejected the USFWS recommendation to implement a Fish Protection, Mitigation, and Enhancement Program that included development of the Migration Corridor and Tributary Restoration Plan, indicating that the Commission should instead adopt the protection and enhancement measures as proposed in PF-AR-1 component (5) to provide for habitat protection and enhancement efforts in the lake and associated tributaries.

Coeur d'Alene Lake Basin Fisheries Enhancement

Avista rejected IDFG's recommendation to increase and reallocate the annual funding from Avista.

In its September 1, 2006, filing, Avista recommended that the Commission reject the Sierra Club's recommendation to develop a Fishery Protection, Mitigation and Enhancement Program, indicating it is unnecessary, unsupported by substantial evidence, and unreasonable and onerous.

Avista also rejected the Lands Council's request that Avista develop a Coeur d'Alene Lake Basin Fisheries Management Plan. Avista believes the concerns for salmonids expressed by the Lands Council could be better and more economically addressed by Avista's proposed PF-AR-1 measure.

Coeur d'Alene Lake Basin Benthic Community Studies and Mitigation

Avista also recommended that the Commission reject the Sierra Club's recommendation for studies and monitoring of the benthic community because "such studies are unnecessary and have no relation to Project effects." The FWG evidently discussed the need for assessment and collection of benthic community data during the relicensing process but concluded that the benthic community is not a critical controlling factor for fish in the Spokane River and did not need to be evaluated. Specifically, information on insect production as it relates to water levels had not been demonstrated to be a determining factor in making fisheries-related decisions.

Coeur d'Alene Lake Mitigation Trust Fund

Avista rejected the Sierra Club and Lands Council's request that Avista be required to establish a mitigation trust fund, on the basis that it was a vague and open-ended request for funding, when Avista is not statutorily obligated to fund mitigation for all impacts.

Coeur d'Alene Lake Aquatic Weed Management

Avista proposed that DOI BIA 4(e) condition 6, Aquatic Weed Management, be deleted in its entirety and that no condition be imposed with respect to this matter. Avista asserts that Project operation is not responsible for the increased growth of exotic and noxious aquatic weeds in the lake and that eradication of Eurasian watermilfoil and other exotic aquatic plant species is not feasible because of the plant's aggressive growth and many sources for reinfestation.

Large Woody Debris Management

Avista requested that the Commission reject the WDFW's 10(j) recommendation requiring Avista to implement a Large Woody Debris Program because it did not relate to Project effects, was not supported by substantial evidence, and did not provide an environmental benefit over the historical and current conditions.

Our Analysis

PF-AR-1, Part 4 (Post Falls Fisheries Resources Public Information, Education, and Law Enforcement Program)

While Project operations do not directly influence the illegal harvest of fish in the Project area, Avista would pursue this measure to mitigate for Project operation effects on fish resources. The purpose of this program would be to reduce the illegal harvest of bull trout, westslope cutthroat trout, and wild rainbow trout in the Coeur d'Alene Basin and in the Spokane River downstream of Post

Falls Dam. Studies conducted in support of the relicensing effort and previous creel studies have documented that regulations intended to protect the wild rainbow trout population in the free-flowing reach of the Spokane River downstream of Post Falls Dam are commonly violated (Avista, 2005), but no evidence is provided by the applicant that bull trout or cutthroat trout in the Coeur d'Alene Lake Basin are impacted by illegal harvest.

Research does indicate that the degree of compliance with fishing regulations can have a significant impact on the regulation's effectiveness (Gigliotti and Taylor, 1990). Reducing losses due to illegal harvest allows more adult spawning age fish to reproduce and maintain the population. Providing public information and education in the Project area could raise awareness among fishermen for the need to protect the trout fishery in that region but does not ensure compliance. Because the benefits of catch-and-release or otherwise restricted fisheries are reduced by illegal harvest, some means to ensure compliance with the regulations is necessary to produce the desired benefit. Increased enforcement of Idaho and Washington fishing regulations would help ensure the sustainability of the fishery.

However, federal and state game and harvest laws are not within Commission jurisdiction, and the Commission is unable to recommend license conditions that require public compliance with such laws. Without increased enforcement, the benefits to rainbow trout, bull trout, or westslope cutthroat trout are likely to be minimal.

In addition, Avista provided no explanation for the disparity in funding allocated to Idaho and waters upstream from Post Falls Dam ($240,000 per year), and funding allocated for the free-flowing reach downstream of Post Falls Dam ($20,000 per year), where the applicant indicates illegal harvesting of rainbow trout is prevalent.

PF-AR-1, Part 5 (Post Falls Fishery Protection and Enhancement Program)

A Post Falls Fishery Protection and Enhancement Program based on the *Coeur d'Alene Lake Basin Bull Trout and Westslope Cutthroat Trout Protection, Mitigation, and Enhancement Implementation Plan* (Kleinschmidt, 2004) is likely to provide some benefits to westslope cutthroat and bull trout populations in the Project area. Activities designed to benefit native rainbow trout in the free-flowing reach of the Spokane River downstream of Post Falls Dam would have to be developed, although many measures described in Kleinshchmidt (2004) could be modified to benefit trout.

Potential activities outlined by Avista could include aquatic habitat protection and restoration specifically directed at westslope cutthroat trout and bull trout populations in the Coeur d'Alene Lake Basin that include mainstem-river and riparian habitat restoration and protection projects; acquisition and long-term protection of private lands where aquatic habitat important to these species exists; suppression of exotic species; collection of required or relevant baseline data; and fish stocking programs to deflect recreational angling pressure away from wild populations of bull trout and westslope cutthroat trout. Other activities could include habitat protection and enhancement of the 15-mile free-flowing reach below Post Falls Dam, additional fishery management activities supporting the protection and enhancement of wild rainbow trout in this reach, and provisions for new or improved fishing opportunities in nearby waters as a potential means of diverting illegal angler harvest of wild rainbow trout from the Spokane River.

Although Avista provides examples of potential activities, it does not provide any specific measures to be implemented using these funds. Without specific measures, we cannot evaluate the environmental effects or the nexus to the Project. In addition, Avista provides no explanation for the disparity in funding allocated to Idaho and waters upstream from Post Falls Dam ($240,000 per year) and funding allocated for the free-flowing reach downstream of Post Falls Dam ($20,000 per year). We make our final recommendation regarding the Post Falls Fishery Protection and Enhancement Program in section 5.1, *Comprehensive Development and Recommended Alternative*.

PF-AR-1, Part 6 (Post Falls Fishery Assessment and Monitoring Program)

Under a Post Falls Fishery Assessment and Monitoring Program, Avista-supported activities would address Project-related population and habitat trends pertaining to the three target salmonid species under the terms of the new license. The assessment and monitoring activities could be linked to projects undertaken as part of Avista's proposed Post Falls Fishery Protection and Enhancement Program (PF-AR-1, Part 5). Assessment and monitoring of specific project results over time could provide valuable information that allows for real-time adjustments that improve project outcomes or that provide lessons-learned information for future projects.

Although Avista indicates that potential activities would be Project-related and would be directed at bull trout, westslope cutthroat trout, and native rainbow trout, Avista does not provide any specific measures to be implemented using these funds. Without specific measures, we cannot evaluate the environmental effects or the nexus to the Project. In addition, Avista provides no explanation for the disparity in funding allocated to Idaho and waters upstream from Post Falls Dam ($240,000 per year) and funding allocated for the free-flowing reach downstream of Post Falls Dam ($20,000 per year). We make our final recommendation regarding the Post Falls Fishery Assessment and Monitoring Program in section 5.1, *Comprehensive Development and Recommended Alternative*.

Coeur d'Alene Lake Tributary Salmonid Habitat Restoration

Restoration projects recommended by the DOI and USFWS would focus on improving water quality, adding habitat complexity, reducing habitat suitability for non-native predators and competitors of bull trout, conserving and maintaining existing habitat, and removing fish barriers. The restoration activities proposed by DOI and the USFWS could provide some relief to bull trout and westslope cutthroat trout through habitat improvement, but additional factors outside Avista influence would continue to impact these salmonid populations (e.g., mining, forestry, and agricultural practices).

Restoration of fisheries habitat in the St. Joe River and other tributaries in the basin is unquestionably important for species such as bull trout; however, the tributary regions that the DOI and USFWS recommend be restored are not influenced by Project operations. Under the Proposed Action, outflow from Coeur d'Alene Lake would continue to be managed so that the lake would maintain a summer full-pool elevation of 2,128 feet. Implementation of the Proposed Action is expected to have a relatively minor effect on Coeur d'Alene Lake levels as compared to current operations. Overall, the Proposed Action would not cause any significant change in the location (i.e., the river mile) where static pool levels in Coeur d'Alene Lake intersect the Coeur d'Alene, St. Joe, and St. Maries rivers. Because river inundation is not expected to change significantly under the Proposed Action, and because the tributary restoration activities proposed by DOI and the USFWS would be located in regions outside Project influence, there is no nexus to existing and proposed operations.

Coeur d'Alene Lake Basin Fisheries Enhancement

The Coeur d'Alene Tribe indicates that the once cold-water lake fishery has been replaced by a warm-water lake resident fishery that is better adapted to the Project-created environmental conditions. While this is true, mitigation for Project construction is not being considered under this license renewal. Implementation of the Proposed Action is expected to have a relatively minor effect on Coeur d'Alene Lake levels as compared to current operations, which equates to there being no expected change in fish species composition or abundance, including salmonid escapement, as a direct result of continued Project operation. The tribe requires Avista to stock fish in ponds on the reservation to provide harvestable fish for the tribe until such time as escapement targets are met, but this mitigative action would provide no benefit to native salmonids or their habitat based on current or proposed Project operation.

The Sierra Club provided some examples of fish enhancement projects it would recommend, such as addressing unmitigated impacts to fish habitat, assessing and mitigating impacts to physical habitat features, implementing measures for bull trout as guided by the USFWS, and conducting studies to determine how Project operations affect invertebrate and fish communities. However, no justification or specific information that would allow us to assess the benefits of their proposed, mostly off-site, measures was provided.

The Lands Council recommended habitat protection measures and enhancement efforts specifically directed at bull trout and westslope cutthroat trout in the Coeur d'Alene Basin, including a tracking and monitoring program; an evaluation and actions to improve impacts to native salmonids from fish barriers, land use, and other non-Project related impacts in key tributaries; and funding and implementing measures to suppress exotic species that prey on native westslope cutthroat trout and bull trout.

The tracking program would provide information that could help provide information about fish migration and habitat usage in the basin, but because there would be no significant change in Project operations under the Proposed Action on a year-to-year basis, the potential to use the information to guide future Project operations would be limited. The tributary regions that the Lands Council recommend be improved are not influenced by Project operations. In addition, factors outside Avista influence would continue to impact these salmonid populations.

Non-native fish such as bass, northern pike, yellow perch, chinook salmon, and kokanee have the potential to pose a threat to native fish assemblages through direct predation, competition for food and space, and hybridization; however, maintaining the water elevation of Coeur d'Alene Lake near 2,128 feet during the summer has not been shown to have influenced shoreline habitat to the extent that the rate of predation or competition has been altered such that it is responsible for the recent population changes in native trout (see section 3.3.6.2.1). Overall, the research proposed by the Lands Council would fill some data gaps and improve understanding of the basin ecosystem, but there is no justification, based on current and proposed operating conditions, that the studies would provide significant benefits to native Coeur d'Alene Lake Basin fisheries in the context of alleviating Project-related impacts.

Coeur d'Alene Lake Basin Benthic Community Studies and Mitigation

In general, alteration of the natural regime can eventually lead to changes in the structure of the aquatic community. Changes may be most evident in the regions subject to water level fluctuations, with less evident effects at other depths. While some species can simply shift to more suitable habitat during a drawdown, other organisms may be lost. For example, populations of organisms strongly associated with macrophytes may be reduced if drawdowns eliminate some of the macrophyte population.

The Sierra Club does not provide any specific measures to be implemented under its recommendation. Without specific measures, we cannot evaluate the environmental effects or the nexus to the Project. However, because the Proposed Action would do little to alter the flow regime over current conditions, a change in the benthic community is not anticipated, and monitoring the benthic insect community for additional information on fluctuation effects as recommended by the Sierra Club would provide few, if any, additional benefits.

Coeur d'Alene Lake Mitigation Trust Fund

The Sierra Club and Lands Council recommended that Avista implement a mitigation trust fund for the purpose of addressing ongoing impacts that cannot be mitigated through other changes in operation or structure. Specific mitigation measures, including the location of implementation, have not been identified by the recommending entities. We therefore are unable to analyze the specific existing conditions that would be enhanced by the measures, the specific benefits provided by the measures, and the relationship of the measures to the Project and Project effects.

Coeur d'Alene Lake Aquatic Weed Management

Both Avista's proposal (PF-AR-2 Coeur d'Alene Lake Aquatic Weed Management Program) and the DOI measure (DOI BIA 4(e) condition 6, Aquatic Weed Management) address the need to control exotic aquatic plant species in Coeur d'Alene Lake. Both plans include education, monitoring, and management components, but there are differences between the two proposals.

The tribe's measure would apply only to weeds in waters affected by the Project that are within and "adjoining" the Coeur d'Alene Indian Reservation, while Avista's proposal includes weeds within and adjacent to the waters affected by the Post Falls Project (i.e., Coeur d'Alene Lake and portions of the Coeur d'Alene, St. Joe, and St. Maries rivers).

The tribe's plan includes details lacking in Avista's proposal. The tribe requires Avista to conduct annual surveys and to map the infestation and distribution of exotic and noxious weeds. The tribe's plan also specifies that management actions would include public awareness and education, appropriate or approved herbicide treatment, diver-operated suction removal, diver hand removal, bottom barriers, and possibly other methods, depending on the specific weeds identified during monitoring. A budget for the tribe's Aquatic Weed Management Plan is not specified.

Instead of supplying details on the frequency and methods for surveying and controlling aquatic weeds, Avista simply indicates that it would cooperate in the development of an Aquatic Weed Monitoring Plan with cooperating parties (including the tribe). Avista would provide a boat and would implement its plan through the use of trained seasonal technicians who could work for Avista or one of the other cooperating parties. Avista's proposal states that it would implement or support selected weed control strategies that are developed and coordinated through the cooperating parties and regulatory agencies. Avista would acquire all the necessary permits and approvals. The program would include establishing or expanding educational programs with respect to exotic/noxious aquatic weeds in the waters affected by the Post Falls Project. Avista proposes to invest $50,000 annually in the Coeur d'Alene Lake Aquatic Weed Management Program.

Overall, the two measures would likely employ similar methods for surveying and managing aquatic nuisance plant species. Avista's plan is less structured at this time, but states that it would be developed to accomplish goals similar to those outlined more explicitly in the tribe's proposed measure. However, the tribe's measure is limited to weeds in waters affected by the Project that are within and "adjoining" the Coeur d'Alene Indian Reservation, while Avista's measure extends to all Project-affected waters (which would include the reservation). Thus, Avista's measure would be more likely to alleviate the aquatic weed problem basin-wide than would the tribe's measure, since all of the interested parties would ensure that adequate monitoring and weed control actions were implemented.

The drawback for the tribe may be that funding earmarked for the reservation may not be as great under Avista's proposal as it would be under the tribe's own measure, because a greater number of interested parties would be involved in deciding how the funds would be allocated. While control of noxious weeds on the reservation is an achievable goal, complete eradication as called for in BIA condition 6 would be extremely difficult, or impossible, to achieve. Avista's measure recognizes that extermination of aquatic nuisance plant species is unlikely and that efforts should be concentrated on control. Because the extent of the aquatic weed infestation and plant species composition could change over time, and because the effectiveness of plant management actions are uncertain, monitoring, as recommended by both plans, would be beneficial in ensuring that the management program worked.

Large Woody Debris Management

Large woody debris can create habitat complexity, altering hydraulic complexity and creating pools, eddies, and side channels. The large wood debris retains organic matter processed by aquatic invertebrates, which provide food sources for juvenile salmonids. Over time, large wood debris decays and disintegrates and must be replaced.

Historically, woody debris has not been a major channel-forming feature in the Spokane River (Avista, 2006a). Channel characteristics, such as the entrenched narrow valley with instream substrate dominated by unembedded cobble and boulder, do not promote woody debris as channel-forming features in the river. Although Avista does not quantify the amount of wood that is retained on the trash racks at Project facilities or the amount of wood that is passed downstream when spill is in effect, the applicant does state that most woody debris in the Spokane River is passed downstream past the Project works in the spring, under spill conditions. The applicant asserts that the amount of large woody debris removed from Project trash racks is a small proportion of the whole.

Replacing large woody debris in the Spokane River system would be beneficial if it were shown to stay in the channel where it would provide habitat and contribute to overall habitat complexity. Historical photos provided by Avista (2006a) show that woody debris was not common along the Spokane River channel and was likely flushed downstream instead of accumulating. The WDFW does not provide any information that indicates the Spokane River ecosystem is being impacted because large woody debris is pulled from the Project trash racks. Without more specific information, we cannot assess the benefits of its proposed measure.

Spokane River Developments

Avista's Proposals

SRP-AR-1 (Spokane River Fish Protection, Mitigation, and Enhancement Program)

This program would (1) provide for fish population and aquatic habitat protection and enhancement efforts on the Spokane River and Lake Spokane, and (2) support the development and implementation of enhanced fish population and related aquatic habitat assessments and monitoring programs associated with the Upper Falls, Monroe Street, Nine Mile, and Long Lake Developments. Avista proposes no specific environmental measures as part of the program but would identify such measures after any license was issued for the Project.

SRP-AR-2 (Lake Spokane Aquatic Weed Management Program)

Within 1 year of implementation of a new FERC license, Avista would cooperate with the Stevens County Conservation District, Stevens County Noxious Weed Control Board, Spokane County Conservation District, Spokane County Noxious Weed Control Board, WDFW, WDNR, WSPRC, WDOE, and the Lake Spokane Protection Association (cooperating parties) to identify and begin implementing agreed-upon in-field actions to manage the spread and occurrence of Eurasian watermilfoil at public access sites. Avista would also work with the cooperating parties to monitor and manage other existing exotic aquatic weeds and any that may become established in the future. Avista would prepare annual reports that summarize the activities funded and/or conducted under SRP-AR-2, the results achieved, and the activities anticipated for implementation/support in the coming year. These reports would be available to any party upon request. Parts of this PME include the following:

- *Site-specific Weed Control Measures*: Avista would work with the cooperating parties to coordinate Project operations with the implementation of specific weed control activities related to SRP-AR-2 measures.
- *Weed Control Lake Drawdowns*: In addition to scheduled drawdowns associated with the placement and maintenance of bottom barriers or other site-specific weed control efforts, Avista would implement periodic winter lake drawdowns for the specific purpose of more widespread weed control.
- *Monitoring*: Avista would develop and implement monitoring plans specifically to evaluate bottom barriers and winter drawdowns. The cooperating agencies would assist with selecting representative sites. This includes performing a baseline assessment.

Avista would provide funding, up to $20,000 per year, for annual implementation of this measure. The funding provided by Avista would be used to pay for work by Avista or any stakeholder to implement the measure, as agreed to by the cooperating parties.

Other Recommendations

<u>Stock Status Monitoring Program</u>

The WDFW 10(j) July 17, 2006, filing recommended that Avista prepare, fund, and commence implementation of a comprehensive Salmonid Fisheries Management Plan, including implementation of a Fisheries Stock Status Monitoring Program. Components of the program included:

- Monitoring of long-term trends in rainbow trout population abundance in the Spokane River from river mile 63.0 to river mile 101.1 over a 25-year period. The data collected as part of the study would be used to evaluate progress toward meeting and/or tracking goals, implementing management actions, and monitoring and evaluating long-term operational effects of the Project. Effects from Project operations may include impacts to spawning, incubation and emergence of trout, and the quality and quantity of available rearing habitat. A standard protocol would be developed for recording multi-year trends. Estimates of trout abundance in the Spokane River would be provided every 3 years, with the exception of the mid-section of the river between the Upriver and Monroe Street dams, where estimates would be provided every 6 years. A post-monitoring technical report would be used to assist with management of fish in Project-influenced waters.

- Preparation and provision of a baseline assessment and data analysis of fish populations between the Upriver Dam and Monroe Street Dam over a 3-year period. Indices and statistics related to species composition, abundance, age, growth, and condition would be calculated by Avista and provided to WDFW and regional management biologists to help maintain or enhance native fish populations, as well as non-native sport fish populations in the middle Spokane River.
- Preparation, funding, and implementation of a 3-year radio telemetry survey of trout in the lower Little Spokane River and upper Lake Spokane. The purpose of the study would be to increase understanding of the life history diversity of native rainbow trout; to identify protection measures related to feeding, wintering, and spawning areas; and to better understand Project influences on the species. Surgically implanted transmitters would be used to track the trout and identify seasonal movement patterns consistent with various life history patterns and Project operations.

Large Woody Debris Management

In its July 17, 2006, submittal, the WDFW recommended that Avista prepare, fund, and implement a program to assess and restore large woody debris habitat and functions to the Spokane River and reservoirs over the term of the new license. Large woody debris is important for maintaining fish habitat diversity and complexity, and WDFW indicates that the large woody debris that collects on the Project trash racks is removed from the facility and removed from the site. Because removal of large woody debris deprives the aquatic system of important habitat niches, WDFW proposes that restoration should be commensurate with the amount of large woody debris removed at the Project dams. Restoration efforts would be concentrated in the Project area but could also occur in tributaries to the Spokane River. Plans for the design and placement of large woody debris would be developed in consultation with WDFW and USFWS.

Gravel Augmentation

The WDFW 10(j) July 17, 2006, filing recommended that Avista prepare, fund, and implement a comprehensive Salmonid Fisheries Management Plan that includes the preparation, funding, and implementation of a program to enhance and create spawning habitat in the free-flowing sections of the Spokane River, with emphasis placed on the river section between the Monroe Street and Nine Mile dams. The justification included in the WDFW filing indicates that the amount of spawning gravel in this section of the river may be a limiting factor to natural recruitment of native salmonids and that Project construction and operation prevents the natural downstream movement of spawning gravels. Avista currently has a permit to dredge up to 10,000 cubic yards of bedload material (i.e., native cobble, gravel, and sand) from behind Monroe Street Dam, where this material accumulates in the vicinity of the intake. A previous order required placement of spawning gravels and cover boulders as mitigation for Project-related effects. Currently, the dredged material is either placed below the dam for dispersal downstream or removed to an upland disposal site.

WDFW recommends continuing and expanding the earlier spawning gravel placement program. Its proposed Spawning Gravel Supplementation Program would replace natural bedload material removed from the Monroe Street Dam (up to 10,000 cubic yards annually) to the free-flowing portions of the Spokane River, with gravel that is sized appropriately for resident spawning salmonids. Avista would be responsible for acquiring the gravel and placing it strategically in the Spokane River. Spawning habitat assessments would be conducted every 3 years prior to gravel supplementation. If WDFW determined that gravel supplementation was not adequate or successful in providing spawning habitat for the fishery relative to the initial assessment, Avista would be required to construct a near-shore spawning channel below Monroe Street Dam. The goal would be to increase spawning habitat quality and quantity to a point where it is not limiting to the population. Avista would be required to fund and maintain the gravel supplementation program and any constructed spawning channels. Once spawning habitat was determined by WDFW to be adequate, spawning gravel maintenance would be performed as needed.

Removal of Culverts

The WDFW 10(j) July 17, 2006, filing recommended that Avista prepare, fund, and implement a comprehensive Salmonid Fisheries Management Plan that includes the preparation, funding, and implementation of a program to remove fish barriers in the Little Spokane River drainage and replace them with passable structures. Avista would be required to contribute $25,000 per year to a fund for the term of the license for use in fish passage barrier removal. Project selection would be conducted through a committee consisting of representatives from Avista, WDFW, Spokane County Conservation District, USFWS, and WDOE. WDFW states that as an alternative to modifying Project dams for fish passage, remediation of impaired fish access to salmonid habitat in primary and secondary tributaries should be considered for Project mitigation. Removing barriers in the Little Spokane River drainage, a region likely to be utilized by rainbow trout that also utilize tailwater habitat in upper Lake Spokane, could improve fish migration, habitat use, and ultimately native fish use of Project area habitat.

Fish Stocking

The WDFW 10(j) July 17, 2006, filing recommended that Avista prepare, fund, and implement a comprehensive Salmonid Fisheries Management Plan that includes the preparation, funding, and implementation of a Fishery Enhancement Supplementation and Monitoring Program in the reservoirs of Long Lake, Nine Mile, Monroe Street, and Upper Falls dams. The goal of the program would be to establish and maintain a recreational trout fishery primarily in Lake Spokane, with the ability and flexibility to enhance and maintain trout fisheries in other Project waters as noted above.

WDFW indicates that current limiting factors contributing to the condition of the coldwater fishery in Lake Spokane include Project construction and operation, which limited river flows and velocities and created a reservoir environment, and unnatural timing related to changes in reservoir water levels that could impact dynamics, predator/prey relationships, littoral habitat cover, and foraging.

Under the program proposed by WDFW, Avista would be required to provide funding for annual stocking of Lake Spokane with adipose fin-clipped, sterile female rainbow trout at a density of 75 fish per surface acre of water in the size range of 3.5 fish per pound. These stocking densities are based on achieving and sustaining 40,000 annual angler trips with an average return of 2.5 fish per angler visit. If WDFW determined that the goals were not being reached or were unattainable within 10 years, then mitigation or supplementation would be transferred to other lakes within the region while stocking rates for Lake Spokane would be re-evaluated and adjusted. To determine harvest efficacy, native fish interactions, sustainability, and feasibility, Avista would also be required to implement a 10-year monitoring program using marked stocked fish, conducting creel surveys every 3 years as long as stocking continued in Project waters, conducting a 2-year survey of fish distribution in Lake Spokane and the lower Little Spokane River using depth and temperature-sensing ultrasonic tags, and developing an evaluation process to determine the success and feasibility of maintaining the trout fishery in Lake Spokane at preferred stocking levels. Avista currently provides $1,875 per year toward fish supplementation in the Spokane area, which supports the stocking of approximately 2,000 to 2,500 fish.

Fisheries Public Outreach, Education, and Compliance

WDFW would require Avista to prepare, fund, and implement a Fisheries Public Outreach, Education, and Compliance Program specific to the protection of wild trout populations in the Spokane River. The information, education, and compliance aspects would cover Spokane River shoreline development regulations, fishery resources, and associated fishing regulations, such as catch-and-release or fishing gear restrictions. Specific activities that could be implemented include educational signage and brochures, public presentations, and support for compliance-related activities. Compliance-related activities would be conducted through WDFW using appropriate agency personnel. Costs are estimated at $15,000 per year.

Lake Spokane and Nine-Mile Reservoir Aquatic Weed Management

The WDFW 10(j) July 17, 2006, filing indicated that Avista should prepare, fund, and implement an Aquatic Weed Management Plan focusing on Eurasian watermilfoil, yellow floating heart, purple loosestrife, and other invasive plant species in the Project areas of the Nine Mile Reservoir and Lake Spokane for the purpose of improving and managing fish and wildlife habitat. Biological and physical control methods, in addition to Avista's proposed winter reservoir drawdowns, would be required during the term of the license. Control methods would be monitored annually to determine the most effective methods, operations, and conditions for controlling Eurasian watermilfoil. The plan for aquatic weed management would be developed in consultation with Avista, WDFW, USFWS, Spokane and Stevens County Conservation Districts, and WDOE.

Aquatic weeds were estimated to cover approximately 90 percent of the littoral zone in Lake Spokane in 2005. The expansion to current levels of Eurasian watermilfoil in Lake Spokane occurred under periodic winter drawdowns. The status of Eurasian watermilfoil in Nine Mile Reservoir is currently unknown.

Spokane River Trout Protection, Mitigation, and Enhancement Programs

The Sierra Club, in its July 14, 2006, submittal, recommended that Avista develop and implement a Native Resident Trout Enhancement Program for the Spokane River. The program would develop and implement off-site habitat measures to address unmitigated impacts to fish habitat, assess and mitigate impacts to physical habitat features, and conduct studies to determine how Project operations affect invertebrate and fish communities. Specific activities suggested by the Sierra Club include land acquisition; removal of fish barriers in tributaries; conservation easements; mitigation of impacts to physical habitats, including spawning gravels and large woody debris; and studies to determine how Project operations affect the trout prey base, foraging capability, growth, fecundity, or general fitness. The goal of the program recommendation would be to improve trout distribution, abundance and habitat conditions and support a more robust migratory component by improving foraging habitat conditions.

The Lands Council, in its July 24, 2006, submittal, recommended that Avista fund, develop, and implement a Spokane River Fish Protection, Mitigation and Enhancement Program targeting native trout and other trout species. Specific measures would include:

- Monitoring and assessment of fish in the Spokane River system

- Collecting data on current trout population and using the information to develop and implement management strategies

- Conducting a baseline assessment to analyze the fish population in the Spokane River between the Upriver and Monroe Street dams

- Fisheries habitat enhancement and protection measures
  - Implementing measures to address land use impacts, including land acquisition, conservation easements, and other measures necessary to improve important spawning and rearing areas

  - Restoring large woody debris habitat and functions to the Spokane River and reservoirs to improve spawning and rearing areas

- Implementation of a Public Education, Outreach, and Compliance Program specific to the protection of wild trout populations in the Spokane River, including educational signage and brochures, public presentations, and support for compliance-related activities

The goal of the Lands Council's recommendation would be to improve trout distribution, abundance and habitat conditions and support a more robust migratory component by improving foraging habitat conditions.

Spokane River Benthic Community Studies and Mitigation

The Sierra Club indicated that impacts from construction and operation of the Project facilities on the benthic community have been largely unaddressed and unstudied, although the benthic community forms the basis of support for the biological productivity of a river system. Thus, the Sierra Club recommended that Avista carry out studies to evaluate the effects of habitat alteration on the benthic community, design mitigation measures, and develop a plan to implement such mitigation. It also recommended that Avista monitor the results of plan implementation on the physical, chemical, and biological habitat of the benthic community.

Spokane River Mitigation Trust Fund

The Sierra Club and Lands Council also recommended that Avista establish a mitigation trust fund to address ongoing impacts that cannot be mitigated through other changes in the Project operation or structure. Funds would be directed to habitat enhancement and restoration throughout the license term and would be used solely for mitigation projects, not for administrative or organizational costs.

Avista's Countermeasures

Stock Status Monitoring Program, Large Woody Debris Management, Gravel Augmentation, Removal of Culverts, Fish Stocking, and Fisheries Public Outreach, Education, and Compliance

In its September 1, 2006, filing, Avista recommended that the Commission reject WDFW's proposed condition to develop a Salmonid Fisheries Management Plan, which included each of the above programs, although Avista asserts that it is committed to protecting and enhancing resources associated with the Project through implementation of the proposed measure SRP-AR-1.

Lake Spokane and Nine-Mile Reservoir Aquatic Weed Management

Avista also rejected WDFW's recommendation to prepare, fund, and implement an Aquatic Weed Management Program for Lake Spokane and Nine Mile Reservoir because it believes the problem is not related to Project effects and because Avista has already proposed SRP-AR-2, a Lake Spokane Aquatic Weed Management Program.

Spokane River Trout Protection, Mitigation, and Enhancement Programs

In its September 1, 2006, filing, Avista recommended that the Commission reject the Sierra Club's recommendation to develop a Native Resident Trout Enhancement Program for the Spokane River Developments, indicating that it is unnecessary, unsupported by substantial evidence, and unreasonable and onerous.

Avista also recommended that the Lands Council recommendation for a Spokane River Fish Protection, Mitigation and Enhancement Program targeting native trout and other trout species be rejected by the Commission, in large part because some of the recommendations were related to non-Project effects such as logging activities, road construction, and placer mining.

Spokane River Benthic Community Studies and Mitigation

Avista recommended that the Commission reject the Sierra Club's recommendation for studies and monitoring of the benthic community because "such studies are unnecessary and have no relation to Project effects." The FWG evidently discussed the need for assessment and collection of benthic community data during the relicensing process but concluded that the benthic community is not a critical controlling factor for fish in the Spokane River and did not need to be evaluated. Specifically, information on insect production as it relates to water levels had not been demonstrated to be a determining factor in making fisheries-related decisions.

Spokane River Mitigation Trust Fund

Avista rejected the Sierra Club and Lands Council's request that Avista be required to establish a mitigation trust fund, on the basis that it was a vague and open-ended request for funding, when Avista is not statutorily obligated to fund mitigation for all impacts.

Our Analysis

SRP-AR-1 (Spokane River Fish Protection, Mitigation, and Enhancement Program)

Although Avista outlines the program goals and delineates the extent of the program as encompassing the Spokane River and Lake Spokane, Avista does not provide any specific measures to be implemented using these funds. Without specific measures, we cannot evaluate the environmental effects or the nexus to the Project.

Stock Status Monitoring Program

The WDFW recommendation to implement a Stock Status Monitoring Program in the Spokane River and the Little Spokane River would provide a comprehensive dataset documenting future trends in rainbow trout population abundance. It would also further characterize the existing fish species composition, abundance, age, growth, and condition around the beginning of the license renewal period. In addition, the proposed telemetry survey could increase understanding of native rainbow trout movement within the Spokane River system. Each of these components would likely enhance general fishery management but would be of minimal direct benefit to aquatic resources, as they do not provide protection or enhancement of the resource. Existing literature already characterizes much of this information in relation to the Project (sections 3.3.4.1 and 3.3.4.2). In addition, parts of the proposed study would take place outside Project boundaries (e.g., Little Spokane River), outside the influence of Project operation.

Large Woody Debris Management

Large woody debris can create habitat complexity, altering hydraulic complexity and creating pools, eddies, and side channels. The large woody debris retains organic matter processed by aquatic invertebrates, which provide food sources for juvenile salmonids. Over time, large woody debris decays and disintegrates and must be replaced.

Historically, woody debris has not been a major channel-forming feature in the Spokane River (Avista 2006a). Channel characteristics, such as the entrenched narrow valley with instream substrate dominated by unembedded cobble and boulder, do not promote woody debris as channel-forming features in the river.

Although Avista does not quantify the amount of wood that is retained on the trash racks at Project facilities or the amount of wood that is passed downstream when spill is in effect, the applicant does state that most woody debris in the Spokane River is passed downstream past the Project works in the spring, under spill conditions. The applicant asserts that the amount of large woody debris removed from Project trash racks is a small proportion of the whole.

Replacing large woody debris in the Spokane River system would be beneficial if it were shown to stay in the channel where it would provide habitat and contribute to overall habitat complexity. Historical photos provided by Avista (2006a) show that woody debris was not common along the Spokane River channel and was likely flushed downstream instead of accumulating. The WDFW does not provide any information that indicates the Spokane River ecosystem is being impacted because large woody debris is pulled from the Project trash racks. Without more specific information, we cannot assess the benefits of its proposed measure.

Gravel Augmentation

The addition of spawning gravels to the free-flowing reach of the Spokane River downstream of Monroe Street Dam has been attempted previously by Avista, under an earlier fish enhancement plan developed during reconstruction of the dam. Monitoring conducted following the gravel supplementation found that the additions had been largely ineffective. In addition, Avista indicates that rather than removing bedload material dredged periodically from behind the Monroe Street Dam from the river environment, Avista places the material in the river channel downstream from the dam. As the dredged material is already being replaced in the river system below the dam, the material is available to replenish downstream spawning areas.

The difference between what occurs under current conditions and WDFW's proposal, therefore, is that WDFW would require Avista to strategically place the gravel material in the river and to monitor the results. However, because the gravel is already being introduced to the system, monitoring the results would provide few, if any, additional benefits to the resident trout population.

Removal of Culverts

Restoration of fisheries habitat in the Little Spokane River drainage is unquestionably important, and the fish barrier removal projects proposed by WDFW are likely to improve native rainbow trout access to spawning and rearing habitat. However, the proposed habitat restoration area is not influenced by Project operations, and additional land use factors outside Avista influence would continue to impact these salmonid populations. Because current conditions are not expected to change significantly under the Proposed Action, and because the tributary restoration activities proposed by WDFW would be located in regions outside Project influence, there is no nexus to existing and proposed operations.

Fish Stocking

Stocking hatchery fish for recreational angling in the Spokane River may alleviate angling pressure on native rainbow trout populations. Enhancement of the hatchery trout population in areas where the fish would not compete with native rainbow trout would certainly be popular with many fishing enthusiasts.

In Lake Spokane, rainbow trout are found primarily in the Nine Mile Dam tailrace and the mouth of the Little Spokane River near the upstream end of the reservoir. The WDFW currently stocks rainbow trout in the reservoir to enhance angling opportunities; it is unclear whether the stocking proposed in this measure would supplement or replace current WDFW stocking activities. The WDFW proposal recommends stocking 75 trout per acre into Lake Spokane annually, in order to sustain 40,000 annual angler trips with an average return of 2.5 fish per angler visit. Because the majority of the rainbow trout are located in the upper portion of the reservoir, the number of trout proposed for this reservoir appears to be quite high, especially when the Lake Spokane region is already considered a popular and high-quality fishery for largemouth bass, smallmouth bass, yellow perch, and crappie (Avista, 2005).

WDFW provides no recommendations for stocking densities in the remaining Spokane River Project reservoirs. Without specific information on stocking densities at each reservoir, we cannot evaluate the benefits and costs of the program or the nexus between the Project effects and the locations where fish would be stocked.

Fisheries Public Outreach, Education, and Compliance

While Project operations do not directly influence the illegal harvest of fish in the Project area, WDFW would require this measure to mitigate for Project operation effects on fish resources. The purpose of this program would be to reduce illegal harvest of wild trout populations in the Spokane River.

Research does indicate that the degree of compliance with fishing regulations can have a significant impact on the regulation’s effectiveness (Gigliotti and Taylor, 1990). Reducing losses due to illegal harvest allows more adult spawning age fish to reproduce and maintain the population. Providing public information and education in the Project area could raise awareness among fishermen for the need to protect the trout fishery in that region, but it does not ensure compliance. Because the benefits of catch-and-release or otherwise restricted fisheries are reduced by illegal harvest, some means to ensure compliance with the regulations is necessary to produce the desired benefit.

Increased enforcement of Washington fishing regulations would help ensure the sustainability of the fishery.

However, federal and state game and harvest laws are not within Commission jurisdiction, and the Commission is unable to recommend license conditions that require public compliance with such laws. Without increased enforcement, the benefits to wild rainbow trout would likely be minimal.

Lake Spokane and Nine-Mile Reservoir Aquatic Weed Management

Both Avista's proposal (SRP-AR-2 Lake Spokane Aquatic Weed Management) and the WDFW proposal for an Aquatic Weed Management Plan address the need to control exotic aquatic plant species in Lake Spokane and would improve the function and diversity of the littoral habitat in Lake Spokane for aquatic organisms. Both plans include management and monitoring components.

Both Aquatic Weed Management Programs would initially concentrate efforts on managing Eurasian watermilfoil, but they also acknowledge the importance of implementing measures to identify and manage other existing exotic aquatic weeds along with those that may become established in the future. Both proposals also acknowledge the need to utilize techniques other than winter drawdowns, such as biological and physical control methods, to manage aquatic weeds. Avista and WDFW's programs would also commit to monitoring the methods utilized to control aquatic weeds to determine the most effective methods, operations, and conditions for aquatic weed control.

The Avista proposal listed several consulting agencies not listed in WDFW's proposal, but this would not be likely to make one proposal better than the other. The main difference between the two proposals is that Avista limits its aquatic weed monitoring and management to Lake Spokane, because no known exotic aquatic weeds currently inhabit Nine Mile Reservoir. The WDFW proposal would require monitoring and potential control of aquatic weeds in Nine Mile Reservoir. This proactive approach would help identify early infestations and initiate swift control to prevent or minimize the spread of exotic aquatic weeds in Nine Mile Reservoir. Avista has committed to provide funding, up to $20,000 per year, for annual implementation of this measure. The WDFW proposal does not specify a funding amount.

Spokane River Trout PME Programs

Implementation of a Spokane River Trout Protection, Mitigation, and Enhancement Program would likely provide some benefits to native rainbow trout populations in the Project area. For example, land acquisition and preservation can ensure that high-quality habitats are not degraded by environmentally unfriendly development activities, and removal of fish barriers can provide access to additional spawning and rearing habitat for native trout species. However, many of the Sierra Club's and Lands Council's recommendations for trout PME programs involve off-site habitat measures. In addition, although the Sierra Club and Lands Council provide an overview of potential PME activities that could be conducted as part of the program, neither entity provides enough detail to enable us to evaluate the environmental effects or the nexus to the Project. We make our final recommendation regarding the Post Falls Fishery Protection and Enhancement Program in section 5.1, *Comprehensive Development and Recommended Alternative*.

Spokane River Benthic Community Studies and Mitigation

In general, alteration of the natural regime can eventually lead to changes in the structure of the aquatic community. Changes may be most evident in the regions subject to water level fluctuations, with less evident effects at other depths. While some species can simply shift to more suitable habitat during a drawdown, other organisms may be lost. For example, populations of organisms strongly associated with macrophytes may be reduced if drawdowns eliminate some of the macrophyte population. However, the populations of aquatic biota associated with the Spokane River Developments, including benthic organisms, have coexisted with winter drawdown conditions for nearly 80 years (Weitkamp, 2004) and are likely to have stabilized over that time, so Avista's proposed changes in operation are unlikely to produce a significant change in the benthic community.

The Sierra Club does not provide any specific measures to be implemented under its recommendation. Without specific measures, we cannot evaluate the environmental effects or the nexus to the Project. However, because the Proposed Action would do little to alter the flow regime over current conditions, a change in the benthic community is not anticipated, and monitoring the benthic insect community for additional information on fluctuation effects as recommended by the Sierra Club would provide few, if any, additional benefits.

Spokane River Mitigation Trust Fund

The Sierra Club and Lands Council recommended that Avista implement a mitigation trust fund for purposes of addressing ongoing impacts that cannot be mitigated through other changes in operation or structure. Specific mitigation measures, including the location of implementation, have not been identified by the recommending entities. We therefore are unable to analyze the specific existing conditions that would be enhanced by the measures, the specific benefits provided by the measures, and the relationship of the measures to the Project and Project effects.

3.3.4.2.5 Secondary Effects of Proposed Measures

Several of Avista's other proposed measures and enhancements would have minor impacts on aquatic resources. Some of these impacts may be considered adverse, while others may be considered beneficial. These are described below.

Coeur d'Alene Recreation (PF-REC-2)

Implementation of measure PF-REC-2 would include funding for improvements at several parks and on BLM, USDA Forest Service, and Coeur d'Alene Tribe lands. The improvements include extending six boat ramps on Coeur d'Alene Lake, constructing a breakwater at Higgens Point for shoreline stabilization, cost-sharing for mooring buoys at Mowry State Park, and cost-sharing for abandoned dock and debris removal from the Project area.

Extension of boat ramps in Coeur d'Alene Lake is expected to cause a temporary increase in ground-disturbing activities and sedimentation, along with temporary increases in noise levels associated with heavy equipment. Noise generated from vehicles and activities during construction could cause localized disturbance of aquatic organisms in the vicinity of the launch site. Mobile organisms are expected to leave the area if disturbed and to return following construction. There would be a small loss of benthic organisms and habitat as a result of the boat ramp extensions, but the extent of the loss is not expected to result in a measurable impact lake-wide.

The shoreline stabilization project at Higgens Point would also involve some temporary construction impacts from sediment disturbance and increased noise levels and activity, but shoreline stabilization would help reduce erosion at this location over the long term.

Proper installation of mooring buoys would have a small temporary impact on the lake substrate, aquatic vegetation, and aquatic organisms but would result in fewer overall disturbances to these resources by reducing or eliminating future impacts that would arise if many boats were to anchor at any location within the park.

Removing abandoned docks and debris from the Project area would provide benefits to the aquatic environment by reducing shading from overwater structures and decreasing the amount of debris in the Lake.

Overall, the increase in recreation use as a result of these recreation improvements could result in some minor potential for additional disturbance to aquatic organisms and habitat.

Post Falls/Spokane River Recreation (PF-REC-3) and Spokane River Recreation (SRP-REC-2)

Implementation of measures PF-REC-3 and SRP-REC-2 would include funding for improvements at the Corbin Park boat ramp, Trailer Park Wave access site, and Water Avenue access site. The boat ramp improvement effort at Corbin Park is expected to cause a temporary increase in ground-disturbing activities and sedimentation, along with temporary increases in noise levels associated with heavy equipment. Noise generated from vehicles and activities during construction could cause localized disturbance of aquatic organisms in the vicinity of the launch site. Mobile organisms are expected to leave the area if disturbed and to return following construction. There would be a small loss of benthic organisms and habitat as a result of the boat ramp extensions, but the extent of the loss is not expected to result in a measurable impact lake-wide.

Improvements at the Trailer Park Wave and the Water Avenue access sites would require the clearing of vegetation and minimal ground disturbance at the water's edge.

Overall, the increase in recreation use as a result of these recreation improvements could result in some additional disturbance to aquatic organisms and habitat.

Lake Spokane/Nine Mile Reservoir Recreation (SRP-REC-4)

Implementation of measure SRP-REC-4 would include funding for Nine Mile portage parking, Centennial Trail extension, Nine Mile Resort development, WDNR's Lake Spokane campground improvements, boat-in-only campgrounds, and the Long Lake Dam river access site development. All of these recreational improvements would result in an increase in recreation use and could result in some additional disturbance to aquatic organisms and habitat. The development of a carry-in boat access site downstream of Long Lake Dam would require the clearing of vegetation and minimal ground disturbance at the water's edge, which could temporarily disturb aquatic organisms in the local area.

3.3.4.3 Unavoidable Adverse Effects

Post Falls Project

Stranding of fish in the Spokane River is a potential adverse effect of continued Project operations regardless of the operational mode of Post Falls Dam and other Project dams. Ramping at any rate has the potential to strand some fish and aquatic invertebrates, although stranding generally increases with ramping rate, frequency, and magnitude. However, quantifying actual stranding for various species is difficult. Although fish stranding would likely be a long-term phenomenon regardless of the ramping rate that is included in a new license for this Project, the ramping rate restriction defined in the Proposed Action and Staff Alternative is an improvement on current conditions, and its adoption and use is not likely to affect the balance of the aquatic community in the Spokane River.

There is also the potential to dewater some number of rainbow trout spawning redds in the upper and lower Spokane River under any Project operational scenario. Redd dewatering also occurs naturally in unregulated systems, though generally at a lower frequency. Implementation of the Proposed Action for a Spawning and Fry Emergence Protection Plan (Avista, 2004) would improve population response to Project operations over what exists under current conditions. Regardless, some dewatering of eggs and/or fry is still a potential adverse effect of continued operation. Maintaining relatively constant river discharge at Post Falls Dam has the potential to increase survival of trout embryos.

Continued Project operation would continue to entrain fish regardless of any protective measures that may be implemented. Some entrained fish would experience turbine mortality, although no direct evidence of fish mortality from entrainment has been observed. Given the dam powerhouse turbine configurations and entrainment potential for the fish species of greatest concern, turbine entrainment and any associated mortality would likely have an insignificant effect on aquatic resources over the long term.

The dewatering of some channels at Post Falls Dam will continue under current conditions and would continue to occur under the Proposed Action. However, under the Proposed Action, the increased extent and duration of aesthetic flows may provide more continuous usable fish habitat, thereby improving conditions for fish that could become stranded in these areas.

Spokane River Developments

Continued Project operation would continue to entrain fish regardless of any protective measures that may be implemented. Some entrained fish would experience turbine mortality, although no direct evidence of fish mortality from entrainment has been observed. Given the dam powerhouse turbine configurations and entrainment potential for the fish species of greatest concern, turbine entrainment and any associated mortality would likely have an insignificant effect on aquatic resources over the long term.

The dewatering of some channels at the Upper Falls and Monroe Street dams would continue under current conditions and would continue to occur under the Proposed Action. However, under the Proposed Action, the increased extent and duration of aesthetic flows at the Upper Falls and Monroe Street dams would provide more continuous usable fish habitat, thereby improving conditions for fish that could become stranded in these areas.

3.3.4.4 Cumulative Effects

<u>*Post Falls Project and Spokane River Developments*</u>

The staff evaluated the effects of the Project and its continued operation under the Proposed Action and Staff Alternative to determine the magnitude of the Project's contribution to regional cumulative adverse impacts to aquatic ecological resources. From an aquatic ecological perspective, the construction of the Spokane River Project dams in the early 1900s converted the free-flowing Spokane River to a series of reservoirs, with some free-flowing reaches between the dams. The dams decreased the natural wide variation in river temperatures, flows, and water levels. Thus, the site has already experienced a dramatic change in habitat type and species composition.

Since the impoundment of the river, it is likely that some aquatic organisms disappeared or have been replaced, while others have been favored by the increased lake-like conditions. The Spokane River reservoirs currently support a variety of cold- and warm-water species that are managed by the IDFG and the WDFW. Populations of aquatic organisms are likely to be similar to or enhanced somewhat under the Proposed Action and Staff Alternative as compared to current operating conditions. The Proposed Action and Staff Alternative include PMEs designed to reduce and mitigate potential and unavoidable adverse effects on aquatic habitat and associated fish and aquatic plant resources with continued operation of the Spokane River Project. The PMEs are also designed to enhance these affected aquatic resources. Specific PMEs call for setting a minimum discharge flow from Post Falls Dam; cooperating with resource agencies to set spawning and emergence flows to benefit rainbow trout in the Spokane River; standardizing a maximum allowable ramping rate from Post Falls; providing assistance with Public Information, Education, and Law Enforcement Programs in the region; developing Fishery Protection and Enhancement Programs as well as Fishery Assessment and Monitoring Programs; and assisting with Aquatic Weed Management Programs.

Other major factors that have affected and will continue to affect aquatic habitat and associated resources in the Project area include non-Project dam construction and operation, timber harvesting, agriculture, animal husbandry, residential and commercial development, other infrastructure and land-use activities, mining-related discharges and related inputs of heavy metals, introduction of non-native fish and aquatic plant species, point and non-point discharges and inputs, and both legal and illegal fish harvest (Kleinschmidt, 2004; WDFW, 2004, as cited in Avista, 2005).

Aquatic habitat and associated bull trout, westslope cutthroat trout, rainbow trout, mountain whitefish, and other native and resident species have generally experienced habitat degradation and reduced populations as a result of these cumulative effects. Despite the extensive cumulative factors affecting these native fish populations, most if not all still maintain self-sustaining, although reduced, populations. These native populations now exist within fish species assemblages that also contain a large number of non-native species representing both competitor and predatory species. All of these factors would likely continue to cumulatively affect native and non-native fish species in the Project area.

During its review, the staff did not identify any other present or future actions that would significantly alter aquatic species or habitats. However, it is possible that fish passage structures may one day be fitted to the two Columbia River dams to pass anadromous fish into the Spokane River.

In summary, the staff concludes that licensing the two Projects under the Proposed Action or Staff Alternative would result in minor cumulative benefits to aquatic resources in the Spokane River Basin.

3.3.5 Terrestrial Resources

3.3.5.1 Affected Environment

Avista and the consultants selected by the Terrestrial Resources Work Group (TRWG) conducted several studies of terrestrial resources in and adjacent to the Project. The applicant's description of terrestrial resources in the vicinity of the Project (contained in the PDEA) provides the bulk of the following discussion.

The Project lies within the transition zone between the Columbia Basin ecozone to the south and west and the Northern Rockies ecozone to the north and east (Parametrix, 2004a). Ponderosa pine (*Pinus ponderosa*), grand fir (*Abies grandis*)-Douglas fir (*Pseudotsuga mentziesii*), and steppe zones encompass the Project area, with the ponderosa pine zone being the principal vegetation zone (Parametrix, 2003a). Vegetation in the Coeur d'Alene subbasin is dominated by interior mixed conifer forest, with small amounts of montane mixed conifer and lodgepole pine (*Pinus contorta*) forests at the highest elevations and interior grasslands along the western boundary. The Spokane subbasin ranges from pine savannas at mid-elevations to mixed conifer forests in the north and far southeast (GEI, 2004). Broadleaf-deciduous-forested, scrub-shrub, open-water, aquatic-bed, emergent-marsh, and riparian wetlands are the primary wetland types; however, much of the shoreline along the bays and north end of Coeur d'Alene Lake, the Spokane River, and Lake Spokane is developed, altering the shoreline habitats and plant communities (Parametrix, 2003a).

3.3.5.1.1 Plant Communities

In 2003, as part of a wetland and riparian habitat inventory, Parametrix (2004a) mapped 26,493 acres of wetlands and associated habitat types using aerial and other photographs (including digital orthophotos), historical survey maps, and field observations. The study area for the wetland and riparian habitat inventory encompassed 150 square miles, including the lower reaches of the Coeur d'Alene, St. Joe, and St. Maries rivers; associated water bodies and lateral lakes; the bays of Coeur d'Alene Lake; the free-flowing reaches of the Spokane River from Post Falls Development to the Upriver pool and from Upper Falls and Monroe Street Developments to Nine Mile Reservoir; vegetated shorelines of Nine Mile Reservoir; and Lake Spokane. The wetlands and other habitats were classified and described according to the Cowardin system (Cowardin et al., 1979), the system that USFWS uses for mapping wetlands. The inventory identified areas of forest, scrub-shrub, emergent, and aquatic bed wetland and riparian habitats. Consistent with the Cowardin system, some deepwater habitats and open-water areas, such as off-channel ponds, the lateral lakes, and the southern portion of Coeur d'Alene Lake near the St. Joe River levee, were also mapped. These open-water areas are included in the following discussion of wetland and riparian habitats because of their proximity and functional association with each other. The inventory did not include the deeper, non-vegetated portions of Coeur d'Alene Lake, Lake Spokane, and Nine Mile Reservoir or the main channel areas of the major rivers. Uplands and agricultural areas were only mapped if adjacent to or associated with wetland and riparian habitats.

Upland Habitat

Non-agricultural uplands constitute less than 1 percent of mapped habitats within the study area (240 acres); this habitat type occurs primarily in the highest terraces of the floodplain habitats. Table 3.3.5.1-1 provides acreage for all the habitat types mapped in 2003. In addition to showing the quantity of non-agricultural upland areas and wetlands, Table 3.3.5.1-1 indicates that the mapped area includes 7,523 acres of agricultural land, or about 28 percent of the mapped area.

Ponderosa pine and Douglas fir forests dominate the undeveloped, steep slopes bordering the lakes and rivers (Parametrix, 2004a). Interior mixed conifer forests dominate the upland forests in the Coeur d'Alene subbasin. Lodgepole, western hemlock (*Tsuga heterophylla*), western red cedar (*Thuja plicata*), western white pine (*Pinus monticola*), and western larch (*Larix occidentalis*) tend to more often occupy north-facing slopes, which are cooler and moister than south- and west-facing slopes. South- and west-facing slopes tend to be dominated by more open forests of Douglas fir, grand fir, and ponderosa pine with significant

Table 3.3.5.1-1. Habitat types mapped in 2003 in study area (acres)

Habitat Type	St. Maries River	St. Joe River	Coeur d'Alene River	Coeur d'Alene Lake	Spokane River	Little Spokane River	Lake Spokane	Total
Riverine–Lower Perennial								
Open water	2	42	47	26	6	--	--	123
Emergent	--	--	15	--	--	--	--	15
Subtotal	2	42	62	26	6	--	--	138
Lacustrine								
Open water	--	2,400	2,911	--	--	--	--	5,311
Limnetic aquatic bed	--	1,678	513	11	--	--	3	2,205
Littoral aquatic bed	--	82	860	144	--	--	370	1,456
Littoral emergent	--	--	127	4	--	--	--	131
Subtotal	--	4,160	4,411	159	--	--	373	9,103
Palustrine								
Open water	--	65	42	--	--	--	--	107
Aquatic bed	<1	19	251	17	--	--	2	289
Emergent other	182	862	953	105	35	2	30	2,167
Emergent inundated	33	93	2,381	135	1	-	38	2,681

Table 3.3.5.1-1. Habitat types mapped in 2003 in study area (acres) (continued)

Habitat Type	St. Maries River	St. Joe River	Coeur d'Alene River	Coeur d'Alene Lake	Spokane River	Little Spokane River	Lake Spokane	Total
Emergent inundate/ aquatic bed	--	--	499	5	--	--	--	504
Emergent tule	--	9	27	49	--	--	--	85
Emergent Wapato	--	322	821	45	--	--	--	1,188
Emergent reed canarygrass	59	42	77	104	--	--	--	282
Scrub-shrub	95	207	622	151	39	16	12	1,142
Forested other	4	101	108	9	60	1	10	293
Forested aspen	5	33	1	1	--	--	--	40
Forested cottonwood	73	316	286	48	5	--	--	728
Subtotal	451	2,069	6,068	669	138	--	92	9,506
Total Wetlands	**453**	**6,271**	**10,541**	**854**	**144**	**19**	**465**	**18,747**
Other								
Agriculture	474	4,334	2,588	127	--	--	--	7,523
Upland	8	22	207	1	--	--	2	240
Total Mapped Area	**935**	**10,627**	**13,336**	**982**	**144**	**19**	**467**	**26,510**

Source: Parametrix, 2004a

understory shrub and grass components. Upland forests in the Spokane subbasin are dominated by ponderosa pine and mixed-conifer forests. Ponderosa pine is found throughout the subbasin, while mixed-conifer forests are mainly found at higher elevations in the northern portion of the subbasin (GEI, 2004).

Wetland/Riparian Habitat

A total of 18,747 acres, or 71 percent of the total 26,510 acres of mapped habitats, are wetland and riparian habitat types. Fifty-one percent (9,506 acres) of the total wetland area consists of palustrine wetlands, including small ponds, aquatic-bed, emergent, scrub-shrub, and forested palustrine wetlands. Emergent wetlands are the most common palustrine type, with 6,907 acres (73 percent of the palustrine wetland area and 37 percent of total wetland area). Lacustrine habitats cover 9,103 acres, or 49 percent of the total wetland area, primarily in the lateral lakes of the Coeur d'Alene River floodplain and in Chatcolet Lake, Benewah Lake, and Hepton Lake. Riverine wetlands are the least abundant wetland type in the study area, covering less than 1 percent (138 acres) of the total wetland area.

Upstream of Post Falls Project—There are 6,271 acres of wetlands and riparian habitats within St. Joe River floodplain. Wetlands account for 59 percent of the surveyed St. Joe River area and agricultural land accounts for 41 percent (4,334 acres). There are 22 acres of uplands (less than 1 percent). Emergent wetlands are the most common palustrine wetland type, equaling 64 percent of the surveyed St. Joe River wetland area, with large areas near Bells Lake, between Bells and Turtle lakes, and around Goose Heaven and Benewah lakes. Forested and shrub wetlands equal 10 percent of the surveyed palustrine wetland area, and open-water and aquatic bed equal 4 percent. Scrub-shrub wetlands occur along many of the tributaries and the river levees, including notable stands where Benewah Creek enters the inundated areas south of Benewah Lake and along the lower St. Joe levees. The majority of the lacustrine system comprises open-water, including Chatcolet Lake, Round Lake, Benewah Lake, and Hempton Lake. Hempton Lake was a former agricultural area that was flooded by a breech in the St. Joe River levee in 1997. Only a small amount of riverine habitat is present (Parametrix, 2004a).

Wetland and riparian habitats cover 453 acres (48 percent) of the St. Maries River Valley floodplain within the study area. Agricultural lands are slightly more prevalent with 474 acres (51 percent). A small amount of upland habitat (8 acres) also occurs there. Virtually all of the wetlands within the St. Maries River floodplain are palustrine, with a tiny number of riverine. Emergent wetland types cover 61 percent of the area and are extensive near the confluence with the St. Joe River. Scrub-shrub types cover 21 percent; forested types cover 18 percent (Parametrix, 2004a).

Black cottonwood (*Populus balsamifera*) forests cover 316 acres and are found on the banks and top of the narrow levee along the St. Joe River between Round Lake and Benewah Lake. Other mixed palustrine forested habitats on the levee support birch (*Betula* sp.), alder (*Alnus* sp.), and cottonwood. On the St. Maries River between river mile 7 and river mile 9, there is a relatively undisturbed forested and scrub-shrub wetland dominated by black cottonwood, red-osier dogwood (*Cornus sericea*), and Douglas' spirea (*Spirea douglasii*) (Parametrix, 2004a).

The Coeur d'Alene River floodplain that is within the study area comprises 10,541 acres of wetland and riparian habitat (79 percent of the surveyed Coeur d'Alene River area), 2,588 acres of agricultural land (19 percent), and 207 acres of upland (2 percent). Palustrine systems account for 58 percent of the wetland area; lacustrine systems, 42 percent; and riverine systems, 1 percent. Emergent wetlands are the most plentiful palustrine wetland type (78 percent) and include large inundated stands of wild rice (*Zizania aquatica*) and water horsetail (*Equisetum fluviatile*) along with water potato (*Sagittaria latifolia*), broad-leaf plantain (*Plantago major*), and tule (*Schoenoplectus acutus*); marsh areas contain wool-grass (*Scirpus atrocinctus*), small-fruit bulrush (*Scirpus microcarpus*), cattail (*Typha latifolia*), common reed (*Phragmites communis*), and spikerushes (*Eleocharis* sp.). Inundated emergent habitats are widespread in the wetland complexes southwest of Killarney Lake, Swan Lake, and Thomson Lake (Parametrix, 2004a). Peatlands at Hidden Lake and Thompson Lake have been identified as priorities for conservation (Jankovsky-Jones, 1999).

Scrub-shrub and forested wetlands are less plentiful in the Coeur d'Alene River area, covering only 17 percent of the palustrine wetland area. They occur primarily along levees containing water birch, alder, black cottonwood, aspen (*Populus tremuloides*), Douglas' spirea, red-osier dogwood, Douglas' hawthorn (*Crataegus douglasii*), Sitka alder (*Alnus viridis*), and various willows (*Salix* sp.) (Parametrix, 2004a).

The lacustrine system includes primarily the open-water areas of the lateral lakes. Lacustrine aquatic bed habitats are abundant in the shallows of the lateral lakes and in Harrison Slough.

Because much of the Coeur d'Alene Lake shoreline is too steep to support wetlands, the majority of wetlands on the lake are in or adjacent to bays associated with stream outlets. Of the 982 acres of mapped habitat associated with the bays, 854 acres are wetlands (87 percent), 127 acres are agriculture (13 percent), and 1 acre is upland. Of the wetlands, 78 percent are palustrine, 19 percent are lacustrine, and 3 percent are riverine. Emergent wetland types comprise 66 percent of the palustrine wetlands; scrub-shrub types, 23 percent; and forested, 9 percent. Water horsetail and wild rice are dominant emergent species, followed by reed canarygrass (*Phalaris arundinacea*), which is most prevalent in Cougar and Wolf Lodge bays. Scrub-shrub species include willow, red-osier dogwood, and mountain alder (*Alnus incana*), while forested wetlands dominated by black cottonwood and Pacific willow (*Salix lucida*) occur along the southwest shoreline of Plummer Bay (Parametrix, 2004a).

Downstream of Post Falls Project—From the Post Falls Project downstream to Nine Mile Dam, palustrine wetlands occur intermittently in narrow bands on the Spokane River. Agriculture, residences, and other development on both sides of the Spokane River have modified or eliminated much of the wetland and riparian habitat. There are approximately 65 acres of forested wetlands (45 percent of the total wetland acres), 39 acres of scrub-shrub wetlands (27 percent), and 36 acres of emergent wetlands (18 percent) in this part of the study area. The largest concentration of mixed forested wetlands is associated with Nine Mile Reservoir along the shoreline. Scrub-shrub wetlands are also scattered along the shoreline of the Spokane River with narrow but sometimes dense stands of willows and mixed woody-stemmed species. There is a large scrub-shrub wetland just upstream of Nine Mile Development.

Wetland and riparian habitats are sparse in and along Lake Spokane, encompassing just 467 acres. Most of these (370 acres, or 80 percent) are lacustrine littoral aquatic bed wetlands. These aquatic bed wetlands occur primarily in the shallower areas of Lake Spokane and are almost all dominated by non-native species, especially yellow floating heart (*Nymphoides peltata*). Other non-native aquatic species found in Lake Spokane include Eurasian watermilfoil (*Myriophyllum spicatum*), purple loosestrife (*Lythrum salicaria*), and yellow flag iris (*Iris pseudacoris*). Native aquatic species include pondweeds, Canadian waterweed, and coontail. Along the shores of Lake Spokane, a narrow wetland fringe has developed in some locations, consisting primarily of emergent wetlands but comprising only 68 acres, or 15 percent, of the wetlands mapped here. The largest concentration of forested and scrub-shrub wetlands around Lake Spokane are in the delta at the mouth of the Little Spokane River (Parametrix, 2004a).

3.3.5.1.2 Plant Species of Special Concern

A sensitive, threatened, and endangered plant survey (i.e., rare plant survey) was performed throughout the entire Project area (Parametrix, 2003a). These surveys focused on those areas having suitable habitat for federally listed threatened and endangered species, state species of special status or concern, and culturally significant plants for the Coeur d’Alene and Spokane Indian tribes. These areas included the lower reaches of the Coeur d’Alene, St. Joe, and St. Maries rivers; around the shoreline of Coeur d’Alene Lake; and along the Spokane River from the Post Falls Project downstream to Long Lake Development, including around Nine Mile Reservoir; and Lake Spokane. Federally listed plant species are discussed in section 3.3.6 of this document. Specific survey sites selected for field investigation due to the potential to harbor rare plant species are shown on Figure 3.3.5.1-1.

State-Listed Threatened, Endangered, Sensitive, and Rare Species

Prairie cordgrass (*Spartina pectinata*), was the only during the rare-plant surveys (Parametrix, 2003a). Seven populations of this Washington state-listed sensitive species were found on the river banks in Riverside State Park between the Bowl and Pitcher and the Spokane Gun Club, approximately 2 miles upstream of Nine Mile Dam (between survey sites 25 and 30; see Figure 3.3.5.1-1). These populations were found in moist soil above the water's edge (Parametrix, 2003a). Prairie cordgrass is typically found in lower, poorly drained soils along roadsides, ditches, streams, marshes, and potholes, as well as in wet meadows and floodplains (NRCS, 2002). It grows on seasonally dry sites and tolerates a high water table but is not suited to prolonged flooding.

Two other potential rare plant habitats, comprising peatland habitats at Hidden Lake and Thompson Lake (survey sites 72 and 17, respectively; see Figure 3.3.5.1-1) had previously documented occurrences of state-listed species but could not be field surveyed because of access limitations. Many-fruit false loosestrife (*Ludwigia polycarpa*) was previously found at Thompson Lake, while swamp willow weed (*Epilobium palustre*) and water club-rush (*Scirpus subterminalis*) were found at both Thomson and Hidden lakes in prior surveys (Jankovsky-Jones, 1999). However, it is unknown if these species still occur at these sites (Parametrix, 2003a) because the area was unable to be surveyed in 2003.

Culturally Significant Plants

The Coeur d'Alene Tribe and Spokane Tribe of Indians identified culturally significant plants, which were included in the rare plant surveys. Field surveys located 18 of these species at 54 sites where detailed searches were conducted (Table 3.3.5.1-2) (Parametrix, 2003a). Thirteen species were located downstream and 15 species were located upstream from the Post Falls Project. The majority of the culturally significant plants identified were wetland or riparian species that were most plentiful along the Coeur d'Alene and St. Joe rivers where the most extensive wetland and riparian habitats are found. Black cottonwood, red-osier dogwood (*Cornus sericea*), water potato (*Sagittaria cuneata/latifolia*), and hardstem bulrush (tule) (*Scirpus acutus*) were the most frequently identified species in the survey sites. Red-osier dogwood and black cottonwoods were found throughout the survey area and were widespread in riparian habitats throughout the Project area. Tule was most common in the wetlands and lateral lakes along the Coeur d'Alene River, and water potato was not found west of Coeur d'Alene Lake.

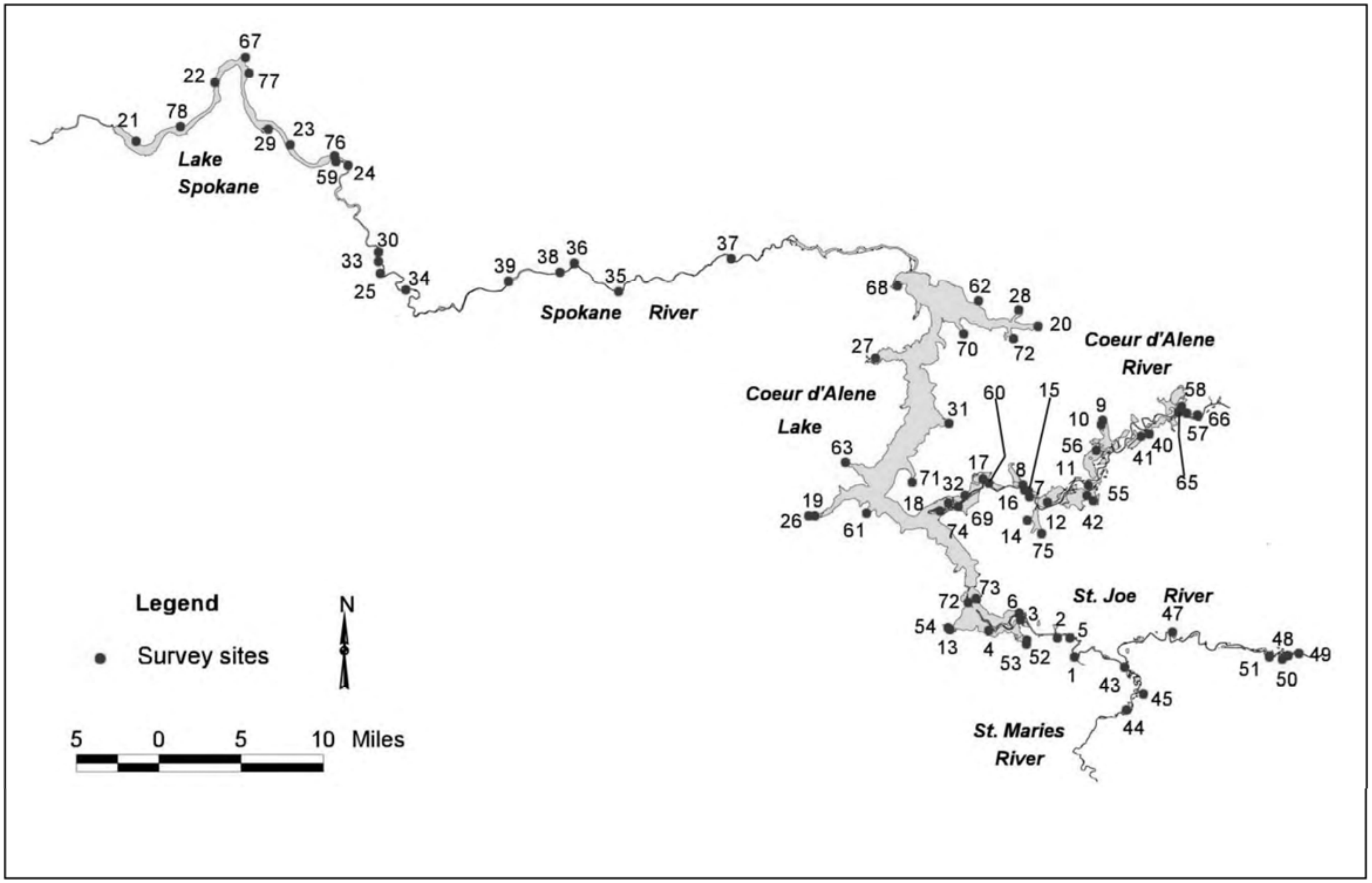


Figure 3.3.5.1-1. **Plant survey sites in the Spokane River Projects area**
Source: Avista, 2005

Table 3.3.5.1-2. Culturally important species observed during field surveys, July and August 2003

Common Name	Scientific Name	Sites Where Observed[a]
Lodgepole pine	*Pinus contorta*	8, 19
Western white pine	*Pinus monticola*	16, 19
Ponderosa pine	*Pinus ponderosa*	18, 14, 38
Black cottonwood	*Populus balsamifera*	1,2, 6, 7, 11, 14, 16, 20, 26, 31, 32, 34, 35, 36, 37, 38, 40, 43, 44, 49, 61, 62, 69, 71
Aspen	*Populus tremuloides*	3, 4, 14, 40, 57, 58, 71
Black hawthorn	*Crataegus douglasii*	15, 22, 24, 27, 36, 38
Chokecherry	*Prunus virginiana*	14
Red-osier dogwood	*Cornus sericea*	10, 14, 20, 21, 26, 27, 29, 30, 31, 33, 36, 49, 50, 53, 54, 55, 60
Serviceberry	*Amelanchier alnifolia*	14
Golden currant	*Ribes aureum*	24
Woods’ rose	*Rosa woodsii*	33, 36, 38
Black raspberry	*Rubus leucodermis*	24
Tall Oregon grape	*Mahonia aquifolium*	25, 33, 38
Creeping Oregon grape	*Mahonia repens*	38, 36
Nodding onion	*Allium cernuum*	25, 33
Cow-parsnip	*Heracleum lanatum*	23
Water potato/wapato	*Sagittaria cuneata/latifolia*	1, 2, 3, 4, 6, 8, 9, 13, 14, 15, 17, 19, 27, 31, 32, 41, 52, 54, 56, 69
Hardstem bulrush (tule)	*Schoenoplectus acutus*	2, 3, 4, 6, 9, 16, 17, 19, 21, 24, 27, 28, 29, 41

a. See Figure 3.3.5.1-1 for site locations.

Source: Parametrix, 2003a

Camas (*Camassia quamash*) was notably absent from the surveyed areas. It is found primarily in undisturbed wet meadows that are subject to spring flooding and summer drying, which are rare in the Project area. Historically, large camas meadows were reported in the Coeur d’Alene, St. Joe, and St. Maries river valleys (Parametrix, 2003a). However, Project-related inundation during the growing season, agricultural activities, grazing, and active drainage of the wet meadows greatly reduced the amount of camas in the area during Euroamerican settlement and through the 1930s (Weddell, undated).

3.3.5.1.3 Invasive Non-native Plant Species

Eighteen species of noxious weeds were identified at 25 sites during the plant surveys (Table 3.3.5.1-3) (Parametrix, 2003a). Reed canarygrass (*Phalaris arundinacea*), which is classified as a noxious weed in Washington but not in Idaho, was found at 13 sites throughout the Project area, making it the most frequently encountered noxious weed. It forms extensive stands in Cougar, Blue Creek, Wolf Lodge, and Beauty bays on Coeur d'Alene Lake and is most plentiful in the driest emergent marsh wetland zone. Reed canarygrass is very aggressive, forming monotypic stands that pose a major threat to native plants in wetland and riparian areas (WDOE, 2004c). Once established, reed canarygrass is difficult to eradicate because it spreads rapidly by rhizomes.

Table 3.3.5.1-3. Noxious weeds observed during field surveys in July and August 2003

Common Name	Scientific Name	Sites Where Observed[a]	State Noxious Weed Status
Russian knapweed	*Acroptilon repens*	38	Idaho, Washington
Spotted knapweed	*Centaurea biebersteinii*	1, 8, 20, 38, 71	Idaho, Washington
White knapweed	*Centaurea diffusa*	38	Idaho, Washington
Creeping thistle	*Cirsium arvense*	12, 21, 24, 28, 29, 53	Idaho, Washington
Bull thistle	*Cirsium vulgare*	21, 22, 29	Washington
Evergreen clematis	*Clematis vitalba*	24	Idaho, Washington
Orchard morning glory	*Convolvulus arvensis*	25, 30, 33	Washington
Common St. John's wort	*Hypericum perforatum*	1, 30, 33, 34	Washington
Yellow iris	*Iris pseudacorus*	20, 21, 22, 29, 30, 33	Washington
Dalmatian toadflax	*Linaria dalmatica*	21	Idaho, Washington
Purple loosestrife	*Lythrum salicaria*	21, 24, 29	Idaho, Washington
Eurasian watermilfoil	*Myriophyllum spicatum*	67	Washington
White water lily	*Nymphaea odorata*	21, 29, 31	Washington
Yellow floatingheart	*Nymphoides peltata*	21, 29, 59	Washington
Reed canarygrass	*Phalaris arundinacea*	6, 8, 13, 20, 21, 22, 26, 27, 28, 30, 31, 32, 33	Washington
Common reed	*Phragmites australis*	47	Washington
Common tansy	*Tanacetum vulgare*	24, 30	Washington
Common mullein	*Verbascum thapsus*	21	Washington

a. See Figure 3.3.5.1-1 for site locations.
Source: Parametrix, 2003a

Other notable noxious weeds located during the survey included Eurasian watermilfoil (*Myriophyllum spicatum*) and yellow floating heart (*Nymphoides peltata*) in Lake Spokane. Eurasian watermilfoil is considered a highly problematic plant in Washington because it is so difficult to control. It can greatly alter a water body's ecology by forming dense mats on the surface of the water (WDOE, 2004d). Like milfoil, yellow floating heart grows in dense mats on the water surface, excluding native species and restricting water activities (WDOE, 2004e).

In addition to the noxious weeds identified during the Parametrix survey, the Coeur d'Alene Tribe has recently identified occurrences of Eurasian watermilfoil in the southern portion of Coeur d'Alene Lake (personal communication, D. Lamb, Lake Ecologist, Coeur d'Alene Tribe, Plummer, ID, with the TRWG and S. Fitzhugh, Relicensing Specialist, Avista, Spokane, WA, during a TRWG meeting, October 6, 2004).

3.3.5.1.4 Wildlife Species

Above Post Falls Project—The St. Joe and Coeur d'Alene rivers, Coeur d'Alene Lake, and the lateral lakes provide abundant waterfowl breeding, migration, and wintering habitat (Avista, 2002). Nesting duck species include mallards (*Anas platyrhynchos*), wood ducks (*Aix sponsa*), green-winged teal (*Anas crecca*), ring-necked ducks (*Aythya collaris*), cinnamon teal (*Anas cyanoptera*), lesser scaups (*Aythya affinis*), northern shovelers (*Anas clypeata*), ruddy ducks (*Oxyura jamaicesis*), and redheads (*Aythya americana*). Other birds that nest in the wetlands and lateral lakes of the area include Canada geese (*Branta canadensis*), red-necked grebes (*Podiceps grisegena*), western grebes (*Podiceps occidentalis*), American coots (*Fulica americana*), pied-billed grebes (*Podilymbus podiceps*), black terns (*Chlidonias niger*), common snipe (*Gallinago gallinago*), and sora (*Porzana caroliniana*). Birds of prey found in this area include bald eagle (*Haliaeetus leucocephalus*), osprey (*Pandion haliaetus*), American kestrel (*Falco sparvarius*), red-tailed hawk (*Buteo jamaicensis*), northern harrier (Circ*us cyaneus*), sharp-shinned hawk (*Accipiter striatus*), northern goshawk (*Accipiter gentilis*), great-horned owl (*Bubo virginianus*), barred owl (*Strix varia*), and western screech owl (*Otus kennicottii*) (Stratus Consulting, 2000). Great blue heron (*Ardea herodias*) rookeries occur along the lower St. Joe (Parametrix, 2003f).

Upland game birds such as ruffed grouse (*Bonasa umbellus*), California quail (*Callipepla californica*), ring-necked pheasant (*Phasianus colchicus*), and wild turkey (*Meleagris gallopavo*) also inhabit the floodplain and upland habitats. Songbirds and other neotropical species in the Coeur d'Alene area include thrushes, sparrows, kingbirds, warblers, flycatchers, swallows, hummingbirds, and blackbirds (Stratus Consulting, 2000).

Amphibians present in the basin include Colombian spotted frogs (*Rana luteiventris*), bullfrogs (*Rana catesbeiana*), Pacific treefrogs (*Hyla regilla*), western toads (*Bufo borealis*), long-toed salamanders (*Ambystoma macrodactylum*), giant salamanders (*Dicamptodon ensatus*), and tailed frogs (*Ascaphus truei*) (Beck et al., 1997).

Mammals inhabiting the Coeur d'Alene Lake area include beaver (*Castor canadensis*), mink (*Mustela vison*), muskrat (*Ondatra zibethica*), raccoon (*Procyon lotor*), and river otter (Lutra canadensis). Larger mammals include black bear (*Ursus americanus*), bobcat (*Lynx rufus*), cougar (*Felis concolor*), coyote (*Canis latrans*), gray wolf (*Canis lupus*), elk (*Cervus elaphus*), moose (*Alces alces*), mule deer (*Odocoileus hemionus*), and white-tailed deer (*Odocoileus virginianus*). Small mammals in the basin include meadow voles (*Microtus pennsylvanicus*), shrews (*Sorex* sp.), and deer mice (*Peromyscus maniculatus*) (Stratus Consulting, 2000). White-tailed deer, mule deer, and elk have increased in population size in recent years (GEI, 2004). According to the Coeur d'Alene Tribe (letter from Chief J. Allan, Chairman, Coeur d'Alene Tribe, Plummer, ID to B. Howard, Spokane River License Manager, Avista, Spokane, WA, dated May 23, 2005), the tribe has mapped many of the hillsides surrounding Coeur d'Alene Lake, and along the Coeur d'Alene, St. Joe, and St. Maries rivers as big game winter range.

Downstream of Post Falls Project—Waterfowl species that breed throughout the Spokane River corridor include mallards, Canada geese, wood ducks, western grebes, hooded mergansers (*Lophodytes cucullatus*), green-winged teal, pied-billed grebes, common mergansers (*Mergus merganser*), American coots, and cinnamon teal. Additional wildlife species sighted in the area are blue-winged teal (*Anas discors*), northern shovelers, American wigeons (*Anas americana*), ring-necked ducks, lesser scaups, and buffleheads (*Bucephaa albeola*). Waterfowl are particularly common during the spring through fall periods along the Little Spokane River, Nine Mile Reservoir, and Lake Spokane, while in winter most of the waterfowl use is concentrated in free-flowing and open-water reaches of the lower Spokane River lying downstream of the city of Spokane. In addition to waterfowl, riparian habitats in the Project area are used by California gulls (*Larus californicus*), spotted sandpipers (*Actitis macularia*), yellow warblers (*Dendroica petechia*), Wilson's warblers (*Wilsonia pusilla*), and red-winged blackbirds (*Agelaius phoeniceus*).

Great blue heron rookeries occur along the lower Little Spokane River in Washington (Parametrix, 2003f). Parametrix consultation with WDFW (2003, as cited in Parametrix, 2003f) identified the wetland complex near river mile 49 and river mile 50 at Lake Spokane to be an important western grebe breeding area and waterfowl concentration area.

Osprey, Cooper's hawk (*Accipiter cooperi*), turkey vulture (*Cathartes aura*), red-tailed hawk, golden eagle (*Aquila chrysaetos*), and bald eagle are raptors that nest along the Spokane River. In a 2-year study (1992 and 1993), 53 osprey nests were identified along the Spokane River from the outflow of the river at Coeur d'Alene Lake to the Little Falls Dam, located downstream of Long Lake Development (Parametrix, 2003f).

Mammals that occur in riparian areas downstream of the Post Falls Project include chipmunks (*Eutamius* sp.), beavers, muskrats, coyotes, raccoons, minks, porcupines (*Erethizon dorsatum*), and striped skunks (*Mephitis mephitis*). The wetland complex along Lake Spokane near river mile 49 and river mile 50 contains a high density of muskrats. Big game species, primarily white-tailed and mule deer, are common along the Spokane River. Rocky Mountain elk use the riparian area and uplands along Lake Spokane and lower Hangman Creek and uplands near the Washington-Idaho state line year-round (Parametrix, 2003f). White-tailed and mule deer populations, as well as moose, have increased within the last few years, indicating good or very good habitat and favorable weather conditions (Parametrix, 2003f; GEI, 2004).

Consultation with WDFW indicates that deer winter range in the Project area in Washington includes riparian and upland habitat adjacent to Lake Spokane, Little Falls Reservoir (downstream of Long Lake Development), the lower Little Spokane River, and lower Deep Creek, as well as uplands near the Washington-Idaho state line (Parametrix, 2003f). White-tailed deer fawning areas include the riparian and upland areas around the lower Little Spokane River and lower Deep Creek.

Amphibians and reptiles known to occur along Lake Spokane and Nine Mile Reservoir include painted turtle (*Chrysemys picta*), western rattlesnake (*Crotalus viridis*), and western terrestrial garter snake (*Thamnophis elegans*) (Parametrix, 2003f).

3.3.5.1.5 Special Status Wildlife Species

State-Listed Threatened, Endangered, Sensitive, and Rare Species

Federal and state-listed endangered, threatened, and special concern wildlife species that occur within the Coeur d'Alene and Spokane subbasins are listed in Table 3.3.5.1-4. Federally listed wildlife species that were identified by USFWS as potentially occurring in the vicinity of the Project (letter from S. Andet, USFWS, Upper Columbia Fish and Wildlife Office, Spokane WA, to B. Howard, License Manager, Avista Utilities, Spokane, WA, dated March 9, 2005) are discussed in section 3.3.6 of this document.

Table 3.3.5.1-4. Federally and state-listed endangered, threatened, and special concern wildlife species potentially occurring within the Project area in the Coeur d'Alene and Spokane subbasins

Common Name	Scientific Name	Status (Federal/Idaho/Washington)[a]
Bald eagle	*Haliaeetus leucocephalus*	T/e/t
Fisher	*Martes penannti*	SC/-/e
Golden eagle	*Aquila chrysaetos*	-/-/c
Gray wolf	*Canis lupus*	E/e/e
Harlequin duck	*Histrionicus histrionicus*	-/sc/-
Northern goshawk	*Accipiter gentiles*	SC/sc/c
Peregrine falcon	*Falco peregrinus*	SC/e/s
Pileated woodpecker	*Dryocopus pileatus*	-/-/c
Sage sparrow	*Amphispiza belli*	-/-/c
Sharp-tailed grouse	*Tympanuchus phasianellus columbianus*	-/-/t
Upland sandpiper	*Bartramia longicauda*	-/sc/e
White-headed woodpecker	*Picoides albolarvatus*	-/sc/c
Wolverine	*Gulo gulo*	SC/-/c

a. - – no special status
C – federal candidate species
c – state candidate species
E – federal endangered
e – state endangered
SC – federal species of special concern
sc – state species of special concern
s – state sensitive species
T – federal threatened
t – state threatened

Source: GEI, 2004; letter from R. Torquemada, Supervisor, USFWS, Spokane, WA, to B. Howard, Spokane River License Manager, Avista, Spokane, WA, dated May 23, 2005

Peregrine falcons are state-listed as endangered in Idaho and as a sensitive species in Washington; they are also listed as a federal species of special concern and a sensitive species in Washington. There have been no documented peregrine sightings in the Idaho portion of the Project area. One eyrie exists along lower Hangman Creek in Washington (Parametrix, 2003f).

Fisher and upland sandpiper are listed as endangered in Washington State. The most recent record of a fisher in the Project area was in 1998 within a tributary drainage east of the Little Spokane River (WDFW, 2003); occurrence of this species in immediate proximity to the Project would not generally be expected, given habitat preferences. Upland sandpipers were observed west of

Spokane in 2003 (GEI, 2004); however, they are not known to have reproduced in Spokane County since 1993 (GEI, 2004). Sage and sharp-tailed grouse are both listed as threatened in Washington. Neither species is known to currently breed within the Spokane subbasin (GEI, 2004). Many of the species noted in Table 3.3.5.1-4 (other than the federally listed species discussed in section 3.3.6) have habitat preferences and needs that would make their occurrence in proximity to the Project unlikely or very infrequent (e.g., wolverine, woodland caribou). Others may in fact find favorable habitat conditions and be present (e.g., northern goshawk, woodpecker species), but no documented information is available concerning specific frequency of their occurrence or distribution.

3.3.5.1.6 Contaminant Levels in Wildlife

The Coeur d'Alene River Basin contains elevated concentrations of metals from historical mining activities (refer to sections 3.3.1.1.7, *Hazardous Materials*, and 3.3.3.1.4, *Metals*). Lead exposure has been found in numerous wildlife species due to the ingestion of contaminated sediments, plants, and/or prey species. Species that have been found with lead exposure include Canada geese, mallards, tundra swans, wood ducks, song sparrows, American kestrels, northern harriers, great horned owls, bald eagles, muskrats, mink, raccoons, deer, mice, and spotted frog tadpoles. Waterfowl mortality related to lead exposure has been reported frequently since the early 1900s. The majority of waterfowl mortality is associated with the highly contaminated wetland and lakes areas of the lower Coeur d'Alene River. In addition to lead, zinc and cadmium have been found to present the most risk to bird species in the area, while arsenic, cadmium, copper, lead, and zinc present the most risk to mammals. Amphibian species are at risk from cadmium, copper, lead, and zinc. Soil containing elevated concentrations of arsenic, cadmium, copper, lead, and zinc presents a risk to the plant communities in this area (Parametrix, 2003f).

Contaminant levels in the St. Joe and St. Maries rivers are significantly lower than those in the Coeur d'Alene River. Lead concentrations in wildlife and plants are at levels not considered toxic (Parametrix, 2003f).

Coeur d'Alene Lake sediment and surface water contaminant concentrations frequently exceed ecological screening criteria, which could indicate a potential for effects on terrestrial resources. Although still elevated, contaminant concentrations are lower in the lake than they are in the Coeur d'Alene River. Information about the contaminant concentrations in plants and wildlife using the lake is not available; however, the risks identified for the river would be expected to occur in the lake, but to a lesser extent (Parametrix, 2003f).

Although metal contaminant levels in the Spokane River from the Post Falls Project to Lake Roosevelt generally decrease with increased distance from

Coeur d'Alene Lake, organic chemicals, including PCBs and polycyclic aromatic hydrocarbons (PAHs), occur in the river system, most likely introduced by industrial sources along the river. Fish tissue samples from the Spokane River have shown elevated zinc and PCB concentrations that may pose a risk to fish-eating wildlife. Additionally, cadmium, zinc, and lead concentrations in soil and sediments pose a risk to birds; zinc, mercury, and lead concentrations pose a risk to mammals; and cadmium, zinc, and lead pose a risk to plants in and along the Spokane River (Parametrix, 2003f).

3.3.5.2 Environmental Consequences

3.3.5.2.1 Project Operations

Project Releases

Post Falls Project

Current Project operations require a 300-cfs minimum flow or an amount equal to Coeur d'Alene Lake inflow, whichever is less, to be released from the Post Falls Project.

Under the applicant's Proposed Action, measure PF-AR-1 would set the year-round minimum flow from the Post Falls Project at 600 cfs (reduced to 500 cfs if Coeur d'Alene Lake is lowered more than 3 inches), as measured at USGS gage no. 12419000 (Spokane River near Post Falls). As discussed in section 3.3.2.2, *Environmental Consequences* in *Water Quantity,* changing the minimum flow from 300 to 600 cfs would produce some small changes on the Coeur d'Alene Lake water level and downstream flows. As a result of this change in minimum flow, the largest decrease in Coeur d'Alene Lake elevation would typically occur in August when the elevations would decrease by as much as 6 inches in dry years. The change in minimum flow would typically result in downstream flows that are within the range of current low flows.

The applicant determined that only minimal or insignificant effects would be expected on terrestrial resources because changing the minimum discharge from the Post Falls Project from 300 to 600 cfs would result in only small differences in Coeur d'Alene Lake elevation and downstream Spokane River flows. Several agencies and organizations had comments and recommendations regarding the minimum discharge from the Post Falls Project. These are discussed in detail in section 3.3.2.2.

Our Analysis

The staff agrees that the effects of the proposed changes to the minimum release rates from the Post Falls Project would have minimal effects on terrestrial resources around Coeur d'Alene Lake.

Spokane River Developments

Our Analysis

The staff agrees that the effects of the proposed changes to the minimum release rates from the Post Falls Dam would have minimal effects on terrestrial resources along the Spokane River below Post Falls Dam, or in the vicinity of any of the downstream developments.

Lake Level Management

Post Falls Project

The Coeur d'Alene Lake summer elevation level is typically maintained at or near full pool (2,128 feet) from as early as practicable until the week after Labor Day, when it begins a gradual drawdown (typically 1 to 2 feet per month). The stable high-water level during the summer months results in shallow-water zones in shallow bays and backwater areas of Coeur d'Alene Lake that provide favorable conditions for aquatic plant growth. Additionally, the stable water level concentrates erosional forces and effects on the shoreline at elevation 2,128 feet. This is especially evident on the St. Joe River levees, where the summer lake level of 2,128 feet has inundated the low, downstream ends and the front inside edge of the levees. As a result of inundation and other forces, the levees have narrowed and vegetation has been lost or changed. Section 3.3.1.2.1, *Effects of Lake Level Management* in *Geology and Soils*, provides a more detailed description of the effects of reservoir level on erosion in the Project area.

The applicant's Proposed Action would formalize drawdown times and elevations for Coeur d'Alene Lake, reflecting operations that are the same as or close to those that are currently followed. Under the Proposed Action, Coeur d'Alene Lake would be filled to its full pool level of 2,128 feet by as early as practicable each summer and maintained near 2,128 feet, subject to minimum flows, until September 15. A fall lake drawdown, to as low as 2,120.5 feet to provide storage for winter precipitation and spring runoff, would begin on September 15.

Project lake-level management under the applicant's Proposed Action would have essentially the same effect on terrestrial resources as current Project operations. As discussed in section 3.3.1.2.1, *Effects of Lake Level Management*, in *Geology and Soils*, fixing a September 15 date when drawdown of Coeur d'Alene Lake would begin each fall would have little or no effect on the erosion that occurs at the St. Joe and Coeur d'Alene River levees. Under current Project operations, the September drawdown date is variable but generally begins the week following Labor Day. The proposed September 15 drawdown date would be within the range of existing conditions, especially considering the increased minimum flow at the Post Falls Project. Therefore, although stable, high-pool elevations throughout the summer encourage aquatic bed growth, including noxious aquatic weeds, fixing a September 15 date for drawdown to begin would not be expected to change this effect. As such, there would be little or no operational effect on wetlands, riparian habitat, and associated wildlife from keeping Coeur d'Alene Lake at full pool until September 15 each year.

The applicant's Proposed Action measures designed to protect terrestrial resources from, or enhance existing conditions as a result of, reservoir operations are summarized in section 2.2. Measures that respond in whole or in part to specific operations concerns include PF-AR-2 and PF-TR-1.

Our Analysis

The staff agrees that the Proposed Action would result in lake levels that are similar to the existing conditions, and that formalizing September 15 as the date to start the annual winter drawdown of Coeur d'Alene Lake would result in a minimal change in impacts to terrestrial resources in the vicinity of the project boundary compared to those of the current Project operations.

Spokane River Developments

Nine Mile Development—Nine Mile Development is generally operated at a relatively stable water level during the summer and fall, although some pool fluctuations have occurred in the past. During high-water years, the flashboards are removed during the high spring runoff period. As a result, the Nine Mile Reservoir water level drops 5 feet during most years and 10 feet in years with exceptional runoff. The lake level remains at this lower level until the flashboards can be safely replaced, usually in July or August, delaying the attainment of the normal summer full pool level. Avista has proposed the installation of a pneumatically operated rubber dam to replace the wooden flashboards. This would not alter the full summer pool level, but it would allow that level to be achieved much sooner after the high spring flows subside.

Long Lake Development—Currently, the maximum drawdown of the Long Lake Development operating reservoir (Lake Spokane) is limited to no more than 24 feet (elevation 1,512 feet, compared to a normal full-pool elevation of 1,536 feet); in practice, however, the winter drawdown is generally limited to 14 feet.

The applicant's Proposed Action would formalize drawdown times and elevations for Lake Spokane, reflecting operations that are the same as or close to those that are currently followed. As part of the Proposed Action, a maximum 14-foot winter drawdown at Lake Spokane, with exceptions under certain conditions, would be formalized under the new license.

The applicant has proposed no changes to the Nine Mile Reservoir level; therefore, the fluctuations resulting from flashboard removal would continue. Because this has been an ongoing occurrence for decades, the wetland and riparian habitats in the fluctuation zone have acclimated to this process. The applicant's Proposed Measure SRP-TR-1 is intended to help mitigate any loss of habitat; this Proposed Action measure is discussed in greater detail in section 3.3.5.2.2.

Formalizing the winter drawdown at Lake Spokane to no more than 14 feet would respond to WDFW requests that the 14-foot limit be included in the license and would potentially be more protective of terrestrial resources. Because the 14-foot drawdown limit reflects the current operating practice, there would be no change in the effects on terrestrial resources.

The applicant's Proposed Action measures designed to protect terrestrial resources from, or enhance existing conditions as a result of, reservoir operations are summarized in section 2.2. Measures that respond in whole or in part to specific operations concerns include SRP-AR-2 and SRP-TR-1.

Our Analysis

Installation of a more permanent spill control system at Nine Mile Dam, such as a pneumatically controlled rubber dam, would not change the full pool level of the reservoir. However, Avista would have the ability to return the water level to the full pool level earlier in the season. Under current conditions, the drawdown that occurs most years has allowed riparian or wetland vegetation to develop along portions of the Nine Mile Reservoir shoreline. Avista estimates that approximately 6 acres of wetlands or riparian vegetation could be lost due to the operational changes resulting from the installation of a rubber dam at Nine Mile Development (letter from B. Howard, Spokane River Relicensing Manager, Avista Corporation, to M.R. Salas, Secretary, FERC. Subject: "Avista Corporation's response to the Washington Department of Fish and Wildlife's request for additional information regarding the applications for new license for project nos. P-2545 and P-12606." October 14, 2005).

The proposed 14-foot drawdown limit for Lake Spokane is within the bounds of the existing license and is the current practice. Therefore, no changes to the impacts to terrestrial resources at Long Lake Development are expected during the license renewal term.

3.3.5.2.2 Plant Communities and Wetlands

Upstream of Post Falls Project—Project operations upstream of the Post Falls Project have remained relatively unchanged since 1941. As a result, the applicant determined that wetland communities have adjusted to current Project operations and have become relatively stable in both acreage and distribution of wetland and riparian habitat types throughout most of the area (Avista, 2005). Ongoing wetland losses, however, may be found along 34 miles of the St. Joe River, 9 miles of the St. Maries River and 32 miles of the Coeur d'Alene River, primarily due to erosion from a variety of sources. Based on current Project operations, estimated future erosion rates on the inner banks of the St. Joe River are 2.4 to 4 inches per year (Earth Systems and Parametrix, 2004). Erosion along the Coeur d'Alene River is less, estimated to be 1.2 to 3.6 inches per year. As a result, small amounts of forested and scrub-shrub wetland and riparian habitats may continue to be lost each year. This erosion is caused by boat- and wind-generated waves and natural erosion influences. Erosion and its causes are discussed in greater detail in section 3.3.1.1.5, *Erosion*, in *Geology and Soils*.

Under the applicant's Proposed Action, Project operations would continue relatively unchanged, and wetland and riparian habitat hydrologically connected to the Project would continue to be influenced by the same reservoir fluctuations. The applicant's Proposed Action would not change the general pattern of high summer reservoir levels with gradual drawdown in the fall. Wetland and riparian habitat would experience the same range and timing of fluctuations as under current Project operations; therefore, implementation of the applicant's Proposed Action would not be expected to change the characteristics of wetland plant communities compared to the current Project operations.

Holding the summer lake level near an elevation of 2,128 feet, as proposed in the applicant's Proposed Action, would continue to result in the loss of wetland and riparian habitat as the result of erosion-related effects. The 2004 erosion study (Earth Systems and Parametrix, 2004) estimated that if current Project operations continue (i.e., stable summer lake levels near 2,128 feet and unrestricted boat traffic on the rivers), erosional losses could be as much as 66 to 110 acres along the St. Joe River, 51 to 83 acres along the Coeur d'Alene River, and 14 to 23 acres along the St. Maries River during the next 30 to 50 years. Non-Project related factors contributing to erosion include boat- and wind-generated wave action and natural erosion influences such as vegetation removal, freeze/thaw, rain splash, and stream currents.

Although the distribution, structure, and extent of wetland and riparian habitat types may be in equilibrium with current hydrological conditions, current baseline conditions are substantially changed from historical, pre-Project conditions. Historically, the naturally occurring wetland and riparian habitats were subjected to a hydrologic regime that included high water levels during the spring or early summer runoff period, followed by a fairly rapid decline in water levels during the summer and early fall growing period. Areas that were cyclically flooded and then dewatered as well as shallow-water areas tended to support lush emergent growth, and frequently important plant species such as water potato, tule, and camas.

Operation of the Post Falls Project maintains water levels in Coeur d'Alene Lake at a higher and more stable level during the summer than would naturally occur. Maintaining this level throughout the growing season altered the hydrologic conditions in the affected wetland and near-shore riparian habitats. Avista determined that overall, wetland acreage has only slightly changed from historical numbers to current conditions, except where agriculture has altered habitat. However, as a result of the altered hydrograph, the habitats in the remaining wetland areas have generally shifted from scrub-shrub and emergent types to wetlands characterized by deeper water conditions, such as emergent inundated wetlands and open-water/aquatic bed habitat. These deeper water wetlands have significantly different functions than the forested, scrub-shrub, and emergent wetlands that were lost, and do not contain culturally important species such as tule and water potato.

Stakeholders in the TRWG expressed concern about the effects of the Post Falls Project construction and operation. Under the applicant's Proposed Action, measure PF-TR-1 would provide wetland and riparian habitat protection and enhancement, along with erosion control. The goal of this measure, developed by Avista in conjunction with the TRWG, is to provide a means for long-term protection (preferably perpetual protection) of specific wetland and riparian areas, providing relatively high-quality habitat while also identifying and evaluating opportunities for additional wetland acquisition, restoration, and/or enhancement for the term of the new license. This measure includes a specific focus on protecting wetland areas that cannot be easily replaced (levee systems, for example) and protecting and restoring wetland and riparian habitats representative of the historical wetland and riparian communities that existed prior to initial Post Falls Project construction and operation.

Additionally, measure PF-TR-1 would implement projects that would mitigate for ongoing erosion-related effects on areas of important cultural, wetland, and riparian value and would protect those resources from future erosion-related effects. Erosion control projects that address shoreline erosion and habitat loss and that offer long-term benefits would be emphasized. This measure would identify and prioritize specific areas of concern for protection needs and erosion control opportunities, with preference given to protecting wetland and riparian habitat, cultural sites, and other sensitive and high-value sites, primarily along the south end of Coeur d'Alene Lake and with an initial focus on the lower reaches of the St. Joe River and its natural levee system. The potential erosion control sites include the low, narrow sections of the St. Joe River levee system, with the highest priority going to the sites with the greatest boat- and wind-wave erosion potential.

Once the initial sites are identified and agreed upon, Avista, in consultation with landowners and the cooperating parties, would design and implement agreed-upon erosion control measures that would meet the intended purpose and goal of this measure.

Post Falls Project

The applicant's Proposed Action, with measure PF-TR-1, would result in benefits to wetland and riparian habitat compared to existing conditions. Although continued elevated summer pool levels upstream of the Post Falls Project would contribute to ongoing erosion-related wetland and riparian habitat loss, measure PF-TR-1 would mitigate for these effects by identifying and prioritizing sites for protection and erosion control opportunities. Additionally, measure PF-TR-1 would identify, evaluate, acquire, protect, and/or develop wetland and riparian sites in or around Coeur d'Alene Lake and its tributaries. This would enhance existing wetland and riparian habitat with the potential for restoring some areas to pre-Project conditions.

As 4(e) condition 2 in its July 18, 2006, filing, the BIA requested that the applicant prepare, fund, and implement a Coeur d'Alene Indian Reservation Shoreline Erosion Control Plan. This plan would be limited to the shorelines within the Coeur d'Alene Indian Reservation and would include identifying, prioritizing, mapping, and describing erosion sites. Avista responded on August 17, 2006, with an alternative condition. The BIA condition and Avista's alternative are discussed in detail in section 3.3.1.2.4.

As 4(e) condition 7 in its July 18, 2006, filing, the BIA requested that the applicant develop and implement a Coeur d'Alene Indian Reservation wetland and riparian habitat plan. While developing the plan, and in collaboration with the tribe, the applicant would determine the total acreage and ecological function of forested, scrub-shrub, and emergent wetlands lost on the Coeur d'Alene Indian Reservation between elevation 2,120 and 2,128 feet; develop restoration and management procedures for each identified parcel, and restore or replace lost wetlands within the reservation. The BIA also provided a timetable, functional criteria, and reporting procedures. BIA and the Coeur d'Alene Tribe state that because the water level in Coeur d'Alene Lake is kept at a higher level during certain times of the year than would occur naturally, there has been a significant reduction or conversion of wetland habitats within the reservation. The BIA pointed out that the ecological functions of the remaining wetlands have been inhibited or altered, resulting in a loss of Tribal resources that will continue under the new license.

The USFWS, in its July 18, 2006 10(j) filing, recommended that measure PF-TR-1 be implemented as proposed by the applicant, but also included, as recommendation 2, that Avista, in cooperation with the USFWS, the IDFG, and the Coeur d'Alene Tribe, develop a plan to restore 532 acres of wetlands classified as palustrine forested broad-leaved deciduous (PFO1) and 250 acres of palustrine scrub-shrub (PSS) wetlands to offset the modification, loss, and degradation of wetlands due to the continued operation of the Post Falls Project. The priority areas for the wetland restoration would be in the St. Joe and St. Maries River floodplains, followed by the North Fork of the Coeur d'Alene River, and the Wolf Lodge Creek floodplain watershed. The USFWS estimates that over 3,550 acres of palustrine forested wetlands and over 1,660 acres of PSS wetlands have been lost or modified since 1933 due to Project operations. The USFWS recommends that 15 percent of this lost wetland area be replaced.

As recommendation 3 in the same 10(j) filing, the USFWS recommended that in addition to implementing measure PF-TR-1, Avista, in cooperation with the USFWS, the IDFG, and the Coeur d'Alene Tribe, should prepare and implement a plan to protect or restore 445 acres of PFO1 and 49 acres of PSS wetlands in the lower St. Joe floodplain between river mile 0 and river mile 7.2. If it is determined that a portion of the existing PFO1 and PSS wetland plant community cannot be protected and/or sustained in the reach of the St. Joe River between river mile 0.0 and river mile 7.2, then the licensee should provide for the restoration of an equal area of PFO1 and PSS wetlands, in total surface area of at least 494 acres, at a location in the St. Joe and/or St. Maries rivers upstream from river mile 7.2 in the St. Joe River. These efforts would be in addition to those conducted under measure PF-TR-1 and under USFWS recommendation 2 described above.

In its July 18, 2006, 10(j) filing, the IDFG recommended the implementation of the Coeur d'Alene Lake Tributary Erosion Control and Habitat Protection and Enhancement measure but recommended that the priorities be shifted such that more of the allocated resources be spent on wetland restoration and more priority given to parts of Coeur d'Alene Lake other than the southern end.

The Lands Council in its July 17, 2006 brief, recommended that Avista implement measures to protect and enhance wetland and riparian habitat, including identifying high quality areas and initiating remedial actions within the first year of a new license. The Lands council also recommended the establishment of a habitat mitigation trust fund.

The Sierra Club (July 17, 2006)., recommended that further measures be implemented to protect and restore wetlands at Coeur d'Alene Lake including identification of high quality areas, securing and protecting habitats targeted for restoration, implementation of enhancement measures, and monitoring of the mitigation efforts. The Sierra Club also recommended the establishment of a mitigation trust fund.

Our Analysis

The staff believes that implementation of a modified form of Avista's proposed alternative to the BIA condition 2 for erosion mitigation on the Coeur d'Alene Indian Reservation as described in section 3.3.1.2.4, and the implementation of the applicant's proposed measure PF-TR-1 for erosion control on the Reservation and elsewhere on Coeur d'Alene Lake, would be adequate mitigation for future shoreline and levee erosion. These measures would also help to minimize the amount of wetland loss that would result from future Project operations.

It is clear that the installation and operation of the Post Falls Dam under the existing regime significantly altered the types and distribution of wetland habitats around Coeur d'Alene Lake, especially in the lower reaches of the Coeur d'Alene and St. Joe rivers. However, other than the additional erosion of the levees along these rivers and the loss of riparian habitat on these levees, there is little indication that continued operation of the Post Falls Dam as the applicant has proposed would result in additional loss or alterations of wetland habitats within the Project area. Most of the wetland loss in the Coeur d'Alene and St. Joe floodplains has been due to conversion to agriculture. Post Falls Project operations resulted in a large shift in wetland types from emergent types to aquatic bed forms that serve less overall ecological function and support fewer culturally significant plant species. However, this shift occurred long ago, and the areas have become re-equilibrated to the present pattern of lake level management.

The staff recommends that the BIA and USFWS conditions and recommendations regarding wetland habitat restoration and enhancement not be adopted because there is no clear linkage between expected future Project impacts and the loss or degradation of wetland habitats within the Project area. Avista's proposed measure PF-TR-1 contains provisions for wetland and riparian habitat protection and enhancement. The staff also recommends that the IDFG recommendation to change the priority of actions not be adopted because the focus and priorities for erosion and habitat enhancement actions should be developed by all of the concerned parties.

Downstream of Post Falls Project—A comparison of 1948 aerial photos with current conditions indicates that aquatic bed wetlands in Lake Spokane have increased by approximately 150 acres. This indicates that these wetland communities continue to adjust to Project operations and other influences, such as sediment deposition.

Sedimentation in Nine Mile Reservoir and Lake Spokane is an ongoing concern because of its potential to alter wetland and riparian habitat. Substantial amounts of sediment are transported into Nine Mile Reservoir and Lake Spokane, with the majority of the sediment originating in the Hangman Creek drainage, which empties into the Spokane River upstream of Nine Mile Reservoir. Sediment deposition has resulted in new and altered wetland and riparian habitats and islands in Nine Mile Reservoir. The sedimentation also causes infilling, which alters shallow-water habitats in Lake Spokane and may facilitate the establishment and spread of non-native, invasive aquatic plants. These effects, both positive and negative, are expected to continue under the applicant's Proposed Action.

Various stakeholders have expressed concern about the effects of sediment deposition in wetland and shallow-water areas and the need to protect the remaining, relatively undeveloped, riparian and other near-shore habitats occurring along the lower portions of Lake Spokane. As a result, Avista proposed measure SRP-TR-1, Lake Spokane and Nine Mile HED Terrestrial, Riparian, and Wetland Habitat Protection and Enhancement Program, as part of its Proposed Action. Under this measure, Avista may acquire (in fee simple or easement), protect, or enhance existing wetland and riparian site(s) associated with or near Nine Mile or Long Lake Developments.

Spokane River Developments

The applicant's Proposed Action would not result in any substantial adverse effects on wetland and riparian habitats downstream of the Post Falls Project, given the similarity between the proposed and current operations. Measure SRP-TR-1 would enhance existing conditions by protecting high-value wetland/riparian habitat and by developing and implementing site-specific wetland and habitat enhancement measures on or adjacent to Nine Mile and Long Lake Developments.

As recommendation 7 in its July 18, 2006 10(j) filing, the USFWS recommended that SRP-TR-1 be adopted for the protection and enhancement of habitat within the Spokane River project Long Lake Development, with the additional recommendation that Avista, in consultation with the USFWS and the WDFW, prepare an Upland Habitat Protection and Enhancement Plan. This plan would identify areas at Lake Spokane where lakeshore protection may effectively control erosion and protect upland habitat. The plan would also devise specific erosion control activities in vulnerable areas using adaptive management to determine the most effective method to protect affected resources. The plan would also provide for the enhancement of at least 24 acres of upland habitat adjacent to Lake Spokane. Enhancement activities may include, but would not be limited to, development of older and larger trees for cavity nesters, bald eagle nest and perch trees, and general wildlife habitat diversity within the area. In addition, the plan should include activities to enhance the quantity and quality of the shrub component to provide cover and forage for big game, migratory bird nesting habitat, upland game bird security, and overall habitat diversity. The plan would include provisions for continued monitoring and reporting of the erosion control and habitat enhancement measures.

The WDFW, in its 10(j) filing (July 18, 2006), recommended that Avista provide funds to purchase 300 acres of shoreline property and wetland habitat contiguous with Lake Spokane and other Avista-owned property that is to be managed for wildlife purposes. Potential parcels identified by WDFW include Sportsman's paradise, Granger slough, and the Little Spokane Delta and corridor.

In its July 14, 2006, filing, the WDOE recommended the enhancement and restoration of 42.51 acres of wetlands along Long Lake, Little Spokane River, or Hangman Creek, with a focus on the restoration of scrub shrub, forested, and forested cottonwood habitats.

The Lands Council, in its July 17, 2006, brief, recommended that Avista implement a program to identify and acquire available riparian properties, implement erosion control measures, and develop protective easements on all Avista-owned shorelines on Long Lake Reservoir. The Lands Council also recommended the establishment of a habitat mitigation trust fund.

The Sierra Club, in its July 14, 2006, brief, recommended that Avista implement measures to prevent or reduce erosion on Lake Spokane (including identifying and acquiring available riparian properties, implementing erosion control measures, and developing protective easements). The Sierra Club also recommended the establishment of a mitigation trust fund.

Our Analysis

Avista's proposed measure SRP-TR-1 includes the acquisition of a 47-acre, high-quality wetland area, and the addition to the Project area of approximately 320 acres of Avista-owned lakeshore lands. There is no indication that continued operation of the Spokane River projects would result in the continued loss or degradation of wetlands, with the potential exception of continued sedimentation and sediment management at Nine Mile and Long Lake dams. Implementation of SRP-TR-1 and the sediment management recommendations, as described in section 3.3.1.2, are expected to minimize the additional loss and degradation of wetlands. As described in section 3.3.1.2.4, erosion along the shoreline of Lake Spokane does not appear to be directly caused by Project operations.

As described under *Lake Level Management*, installation of a rubber dam at Nine Mile Dam would alter the length of time each year that the reservoir is at full summer pool. This operational change could impact approximately 6 acres of wetland and riparian habitat along the shoreline of Nine Mile Reservoir.

3.3.5.2.3 Plant Species of Special Concern

State-Listed Species

Prairie cordgrass, the one state-listed species observed in the Project area during rare-species surveys, has persisted and perhaps benefited under current Project operations. The population found on the banks of the Spokane River in Riverside State Park, upstream of the Nine Mile Development boundary, has shifted and apparently expanded since a 1992 plant survey (Parametrix, 2003a).

Under the Proposed Action, Project operations would continue to provide hydrologic conditions similar to those under current Project operations.

Because hydrologic conditions would not change appreciably under the applicant's Proposed Action, no effects on prairie cordgrass are anticipated.

Post Falls Project

Our Analysis

No federal or state-listed species were observed within the Post Falls Project area. Therefore, the staff concludes that the Proposed Action would not adversely affect plant species of concern.

Spokane River Developments

Our Analysis

The staff agrees that there is not likely to be an effect on prairie cordgrass because the hydrologic conditions would not change, and there would be no Project-induced changes to the riparian vegetation within the Project area within Riverside State Park. Because no other federal or state listed plant species are known to occur within the Project area, no effects on other species would be expected.

Culturally Significant Plant Species

Culturally significant species, with the exception of camas, are currently found throughout the Coeur d'Alene Lake area. The effects of Project operations upstream of the Post Falls Project have remained relatively unchanged since 1941. As a result, the wetland communities that include culturally significant species have adjusted to the current Project operations and have become relatively stable in both acreage and distribution of wetland and riparian habitat types throughout most of the area. Within some areas, as discussed in section 3.3.5.2.2, erosion continues to cause the loss of some wetland and riparian habitat, which could include some culturally significant species. Although water potato is extensive in the Project area upstream of the Post Falls Project, it is not available for harvest in the Coeur d’Alene River Basin due to (1) inundation and reduced access during harvest time, and (2) non-Project-related heavy-metals contamination from past mining and smelting operations.

Under the applicant’s Proposed Action, Project operations would continue to provide hydrologic conditions similar to current Project operations, resulting in no changes to the distribution and abundance of culturally significant species.

Prior to Project construction, the naturally occurring wetland and riparian habitats were subjected to a hydrologic regime that included high water levels during the spring or early summer runoff period, followed by a fairly rapid decline in water levels during the summer and early fall growing season. These cyclically flooded and then dewatered or shallow-water areas tended to support lush woody-stem and emergent wetland and riparian vegetation and frequently included culturally important plant species such as cottonwood, willow, water potato, tule (hard-stem bulrush), and camas.

Quantifying the loss of culturally significant species from the original construction and operation of the Project is not possible in all areas due to the lack of historical information. However, the *Wetland and Riparian Habitat Mapping and Assessment* (Parametrix, 2004a) was able to estimate losses along the St. Joe River. The assessment indicates that 802 acres of emergent wetlands dominated by tule were inundated and lost due to Project construction, and the area was converted to lacustrine emergent and aquatic bed wetlands. Also, 42 acres of cottonwood were inundated and lost along the northern shoreline of what is now Round Lake, and the area was converted to aquatic bed wetlands with Project construction.

As a result of these concerns, as well as the potential for ongoing erosion-related losses, Avista has proposed to implement measure PF-TR-1 to provide wetland and riparian habitat protection and enhancement, along with erosion control. This measure is discussed in greater detail in section 3.3.5.2.2.

Implementation of measure PF-TR-1 under the applicant’s Proposed Action would result in some enhancements to culturally significant plant species and their habitat compared to existing conditions. Although continued elevated summer-pool levels upstream of the Post Falls Project contribute to ongoing erosion-related habitat loss, measure PF-TR-1 would mitigate these effects by identifying and prioritizing sites for protection and erosion control opportunities. Additionally, measure PF-TR-1 would identify, evaluate, acquire, protect, and/or develop wetland and riparian sites that would provide habitat for culturally significant species in or around Coeur d’Alene Lake and its tributaries. This would enhance existing wetland and riparian habitat, with the goal of restoring certain areas to pre-Project-like conditions, especially sites with culturally significant plant species.

No conditions or recommendations that specifically addressed culturally significant plant species were submitted by the Coeur d'Alene Tribe, DOI, WDFW, IDFG, counties, or any other governmental or non-governmental organization. However, the BIA, USFWS, IDFG, and WDFW submitted several conditions and recommendations that are concerned with erosion control, shoreline protection, and wetland protection, enhancement, and restoration and have direct bearing on this issue. Most of the culturally significant plant species within the project are associated with palustrine emergent, PSS, and palustrine forested wetlands. Therefore, any measures that would protect existing wetlands, shorelines, and natural river levees from further deterioration or provide for the enhancement or restoration of these wetland types would likely benefit culturally significant species.

Post Falls Project

Our Analysis

Implementation of Avista's proposed measure PF-TR-1 would benefit culturally significant plant species within the Post Falls Project area by minimizing additional loss of riparian and wetland habitats and by creating additional emergent and scrub-shrub wetlands that are important habitats for many culturally significant plant species. Implementation of Avista's proposed measure, as well as the additional measures to control erosion described in section 3.3.1.2.4 and the noxious weed control measures described below, would help minimize the additional loss of culturally significant plant species within the Project area.

Spokane River Developments

Our Analysis

Implementation of Avista's proposed measure SRP-TR-1 would benefit culturally significant plant species within the Project area by minimizing additional losses of wetland and riparian habitats and by protecting additional habitats that support many culturally significant plant species. Implementation of Avista's proposed measures, as well as the additional measures to control erosion described in section 3.3.1.2.4 and the noxious weed control measures described below, would help minimize the additional loss of culturally significant plant species within the Project area.

3.3.5.2.4 Invasive Non-native Plant Species

Aquatic Weeds

In addition to 16 native aquatic macrophyte species that are growing in healthy and diverse beds, Coeur d'Alene Lake also contains approximately 200 acres of the non-native, invasive species Eurasian watermilfoil (*Myriophyllum spicatum*) (Golder, 2006). At present, the Eurasian watermilfoil is found in and around the mouth of the St. Joe River, in the lakes surrounding Coeur d'Alene Lake, and in the St. Maries River (Golder, 2006). This submerged aquatic plant reproduces primarily through vegetative reproduction, when fragments of the plant break off and the nodes form new plants. It is difficult to control once established and is disliked because it provides poor habitat for fish and other wildlife, can sometimes shade out native vegetation, and may form dense mats that restrict water flow and recreational activities.

In Lake Spokane, high nutrient levels result in high levels of primary productivity associated with planktonic algae. Algal blooms have occurred in small areas of the lake in recent years, especially during warm, low-flow periods. Lake Spokane also contains a number of aquatic macrophyte species. While most of the species are native to the region, the lake is inhabited by two non-native species: the yellow floating heart (*Nymphoides peltata*) and Eurasian watermilfoil (Avista, 2005). Yellow floating heart, like the Eurasian watermilfoil, is difficult to control and is disliked because it provides less effective habitat for fish and other wildlife than native species, can out-compete native macrophyte species, and may form dense mats that prohibit aquatic recreation.

Avista's Proposals

Avista has developed two PME measures regarding aquatic weed management. The first measure (PF-AR-2) provides for a Coeur d'Alene Lake Aquatic Weed Management Program (Avista, 2005). The purpose of the measure is to educate the public about, monitor for, and control the establishment and spread of exotic/noxious aquatic weeds within and adjacent to the waters affected by Post Falls Dam (Coeur d'Alene Lake, and the Coeur d'Alene, St. Joe, and St. Maries rivers). The goal is to minimize the infestation and spread of noxious aquatic weeds in Coeur d'Alene Lake and its tributaries (Avista, 2005). As part of the program, Avista would provide assistance and financial support for monitoring and control efforts in partnership with the tribe, as well as with federal, state, and local entities and other interested stakeholders. Under the agreement to monitor exotic aquatic weeds, Avista plans to implement the plan through use of trained seasonal technicians who work for Avista or for one of the cooperating agencies. Avista has also promised to provide a boat of its choosing, if needed, to assist with weed monitoring efforts. Management actions would be identified, coordinated, and implemented using strategies established through consultation with the cooperating agencies. Annual reports summarizing noxious aquatic weed-related activities would be prepared by Avista. Finally, annual funding up to $50,000 with provision for carry-over of unexpended amounts has been allocated by Avista in support of this PME measure.

The second measure (SRP-AR-2) would control and monitor exotic weeds on Lake Spokane through implementation of a Lake Spokane Aquatic Weed Management Plan. This measure would be prepared in cooperation with the Stevens County Conservation District, Stevens County Noxious Weed Control Board, Spokane County Conservation District, Spokane County Noxious Weed Control Board, WDFW, WDNR, WSPRC, WDOE, and Lake Spokane Protection Association. During this consultation process, WDFW, along with these other entities, would have the opportunity to provide input regarding the specific weed control mechanisms and locations that would be conducted. Avista also proposed, in SRP-AR-2, to work with the cooperating parties, especially those with experience managing and controlling exotic aquatic weeds, to monitor and manage existing weeds and any new exotic aquatic weeds that may become established in the future. Avista has also proposed a winter drawdown schedule, as identified in the Lake Spokane Aquatic Weed Management Program, which would be timed to coincide with freezing conditions in an attempt to "kill or otherwise adversely affect the exposed aquatic weeds on a reservoir-wide basis." More specifically, the measure proposes to maximize the drawdown to the 13- to 14-foot levels to expose the maximum amount of weeds, schedule the drawdowns when extended periods of below freezing temperatures are expected, maintain the drawdown for a sufficient period of time to achieve the desired effects, and conduct the drawdowns on a frequency sufficient to achieve a beneficial level of aquatic weed control on a reservoir-wide basis. This proposal is significantly different than the drawdowns that occur under current operations, and it represents the results of an effort of the technical work group, of which WDFW was a part.

Other Recommendations

The DOI BIA 4(e) condition 6 filing of July 17, 2006, called for Avista, in collaboration with the Coeur d'Alene Tribe, to develop and implement a Coeur d'Alene Reservation Aquatic Weed Management Plan to eradicate exotic and noxious aquatic weeds in waters affected by the Project that are within or adjoining the Coeur d'Alene Indian Reservation. This included conducting annual surveys to map noxious weed populations, formulating management actions specific to each identified weed, coordinating management actions with management of other resources, developing criteria to measure the progress of exotic weed eradication, and reporting findings annually. The BIA states that Project operations sustain higher water levels over parts of the year than would occur naturally, increasing the area of shallow bays and backwater areas that are conducive to growth of noxious aquatic plant growth.

Pursuant to section 10(j) of the FPA, the IDFG recommended that the Commission require Avista to implement measure PF-AR-2 (Coeur d'Alene Lake Aquatic Weed Management Program) in unaltered form. Avista recommended that the Commission adopt PF-AR-2 as proposed in the IDFG's section 10(j) recommendation.

The WDFW 10(j) July 17, 2006, filing indicated that Avista should prepare, fund, and commence implementation of an Aquatic Weed Management Plan focusing on Eurasian watermilfoil, yellow floating heart, purple loosestrife, and other invasive plant species in the Project areas of the Nine Mile Reservoir and Lake Spokane for the purpose of improving and managing fish and wildlife habitat. Biological and physical control methods, in addition to Avista's proposed winter reservoir drawdowns, were strongly encouraged. The creation of the reservoirs established an aquatic environment that is suitable for various aquatic plants to survive, including non-native and invasive aquatic weeds. Overall, non-native plants have reduced the function and diversity of most of the littoral habitat around Lake Spokane. Avista's Proposed Action appears to be the same as current operations, so that no significant change in the level of invasive aquatic weed control is expected. WDFW indicates that additional efforts are needed to reduce impacts on fish and wildlife inhabiting these habitats.

Our Analysis

Coeur d'Alene Lake Aquatic Weed Management

Both Avista's proposal (PF-AR-2 Coeur d'Alene Lake Aquatic Weed Management Program) and the DOI measure (DOI BIA 4(e) condition 6, Aquatic Weed Management) address the need to control exotic aquatic plant species in Coeur d'Alene Lake. Both plans include education, monitoring, and management components, but there are differences between the two proposals.

The tribe's measure applies only to weeds in waters affected by the Project that are within and "adjoining" the Coeur d'Alene Indian Reservation, while Avista's proposal includes weeds within and adjacent to the waters affected by the Post Falls Project (i.e., Coeur d'Alene Lake and portions of the Coeur d'Alene, St. Joe, and St. Maries rivers).

The tribe's plan includes details lacking in Avista's proposal. The tribe requires Avista to conduct annual surveys and to map the infestation and distribution of exotic and noxious weeds. The tribe's plan also specifies that management actions would include public awareness and education, appropriate or approved herbicide treatment, diver-operated suction removal, diver hand removal, bottom barriers, and possibly other methods, depending on the specific weeds identified during monitoring. A budget for the tribe's Aquatic Weed Management Plan is not specified.

Instead of supplying details on the frequency and methods for surveying and controlling aquatic weeds, Avista simply indicates that it would cooperate in the development of an Aquatic Weed Monitoring Plan with cooperating parties (including the tribe). Avista would provide a boat and would implement its plan through the use of trained seasonal technicians who could work for Avista or one of the other cooperating parties. Avista's proposal states that it would implement or support selected weed control strategies that are developed and coordinated through the cooperating parties and regulatory agencies. Avista would acquire all the necessary permits and approvals. The program would include establishing or expanding educational programs with respect to exotic/noxious aquatic weeds in the waters affected by the Post Falls Project. Avista proposes to invest $50,000 annually in the Coeur d'Alene Lake Aquatic Weed Management Program.

Overall, the two measures would likely employ similar methods to survey and manage aquatic nuisance plant species. Avista's plan is less structured at this time, but states that it would be developed to accomplish goals similar to those outlined more explicitly in the tribe's proposed measure. However, the tribe's measure is limited to weeds in waters affected by the Project that are within and "adjoining" the Coeur d'Alene Indian Reservation, while Avista's measure extends to all Project-affected waters (which would include the reservation). Thus, Avista's measure would be more likely to alleviate the aquatic weed problem basin-wide than would the tribe's measure, since all of the interested parties would ensure that adequate monitoring and weed control actions were implemented.

The drawback for the tribe may be that funding earmarked for the reservation may not be as great under Avista's proposal as it would be under its own measure, because a greater number of interested parties would be involved in deciding how the funds would be allocated. While control of noxious weeds on the reservation is an achievable goal, complete eradication as called for in BIA condition 6 would be extremely difficult, or impossible, to achieve. Avista's measure recognizes that extermination of aquatic nuisance plant species is unlikely and that efforts should be concentrated on control. Because the extent of the aquatic weed infestation and plant species composition may change over time, and because the effectiveness of plant management actions are uncertain, monitoring, as recommended by both plans, would be beneficial in ensuring that the management program worked.

Lake Spokane and Nine Mile Reservoir Aquatic Weed Management

Both Avista's proposal (SRP-AR-2 Lake Spokane Aquatic Weed Management) and the WDFW proposal for an Aquatic Weed Management Plan address the need to control exotic aquatic plant species in Lake Spokane and would improve the function and diversity of the littoral habitat in Lake Spokane for aquatic organisms. Both plans include management and monitoring components.

Both Aquatic Weed Management Programs would initially concentrate efforts on managing Eurasian watermilfoil, but they also acknowledge the importance of implementing measures to identify and manage other existing exotic aquatic weeds along with those that may become established in the future. Both proposals also acknowledge the need to utilize techniques other than winter drawdowns, such as biological and physical control methods, to manage aquatic weeds. Avista and WDFW's programs would also commit to monitoring the methods utilized to control aquatic weeds to determine the most effective methods, operations, and conditions for aquatic weed control.

The Avista proposal listed several consulting agencies not listed in WDFW's proposal, but this would not likely make one proposal better than the other. The main difference between the two proposals is that Avista limits its aquatic weed monitoring and management to Lake Spokane, because no known exotic aquatic weeds currently inhabit Nine Mile Reservoir. The WDFW proposal would require monitoring and potential control of aquatic weeds in Nine Mile Reservoir. This proactive approach would help identify early infestations and initiate swift control to prevent or minimize the spread of exotic aquatic weeds in Nine Mile Reservoir. Avista has committed to provide funding, up to $20,000 per year, for annual implementation of this measure. The WDFW proposal does not specify a funding amount.

Terrestrial and Wetland Noxious Weeds

A comprehensive survey specifically for terrestrial or wetland noxious weeds has not been performed for the Project area. However, at least 13 terrestrial or wetland noxious weeds were identified at many of the sites where surveys were conducted for state or federal listed rare plant species (see Table 3.3.5.1-3). These sites were located throughout the Spokane River and Post Falls Project area.

Post Falls Project

Avista has proposed control of terrestrial noxious weeds within the Post Falls Project area as part of PF-LU-1, Post Falls HED Land-Use Management Plan Implementation Management Program. PF-LU-1 would entail implementation of the Land Use Management Plan for the Post Falls Project area. This effort would include, among other factors, weed management.

As recommendation 12 in its July 18, 2006, filing under section 10(j) of the FPA, the USFWS recommended that within 1 year of license issuance, Avista survey all Project lands for noxious weeds, and within 2 years of issuance, Avista develop a management plan to control noxious weeds on Project lands in consultation with the USFWS, IDFG, WDFW, and Coeur d'Alene Tribe. The plan may include the use of biological control, hand pulling, and mechanical and chemical spraying to control existing infestations, and should emphasize using the method that would be most effective and least harmful to the environment. Both short- and long-term monitoring components would be included in the plan.

Our Analysis

Surveys for rare plants at a limited number of sites within the Project boundaries detected a number of terrestrial noxious weed species. The rare plant survey sites were specifically chosen because they included habitat features required by the rare species (especially the federal threatened or endangered species) potentially present in the Project area. Therefore, the sites selected for these careful surveys excluded many other sites within the Project area. The fact that a number of noxious weed species were observed within the relatively small areas surveyed for rare plants suggests that noxious weeds also are likely to be present at other locations within the Project area. Other than stating that it has never introduced noxious weeds to the project area, Avista provided no data indicating that the rest of Project area is otherwise weed-free. Future operation of the Post Falls and Spokane River Projects are likely to, at a minimum, perpetuate any noxious weed populations that are present within the Project area. In the case of some wetland species, such as purple loosestrife, continued operation of the Project could result in significant population expansion over the license term.

Implementation of the USFWS (10j) recommendation to survey the Project area and develop a management and control plan would help to control the spread of terrestrial and wetland noxious weeds in the Project area.

Spokane River Developments

Avista has proposed measures that include control of terrestrial noxious weeds, including SRP-LU-1, Spokane River Project Land-Use Management Plan Implementation and SRP-TR-2, Spokane River Project Transmission Line Management Program. SRP-LU-1 would entail implementation of the Land Use Management Plans for the Snake River projects. This effort would include, among other factors, weed management. Part of the goal of proposed measure SRP-TR-2 is to ensure a minimally invasive, non-chemical approach to vegetation management consistent with maintaining habitat values and an adequate transmission line corridor. Avista also proposes to provide public education about noxious weeds through SRP-REC-3, Spokane River Public Outreach.

As recommendation 12 in its July 18, 2006, filing under section 10(j) of the FPA, USFWS recommended that within 1 year of license issuance, Avista survey all Project lands for noxious weeds, and within 2 years of issuance, Avista develop a management plan to control noxious weeds on Project lands in consultation with the USFWS, IDFG, WDFW, and Coeur d'Alene Tribe. The plan may include the use of biological control, hand pulling, and mechanical and chemical spraying to control existing infestations, and should emphasize using the method that would be most effective and least harmful to the environment. Both short- and long-term monitoring components would be included in the plan.

Our Analysis

Surveys for rare plants at a limited number of sites within the Project boundaries detected a number of terrestrial noxious weed species. The rare plant survey sites were specifically chosen because they included habitat features required by the rare species (especially the federal threatened or endangered species) potentially present in the Project area. Therefore, the sites selected for these careful surveys excluded many other sites within the Project area. The fact that a number of noxious weed species were observed within the relatively small areas surveyed for rare plants suggests that noxious weeds also are likely to be present at other locations within the Project area. Other than stating that it has never introduced noxious weeds to the Project area, Avista provided no data indicating that the rest of Project area is otherwise weed-free. Future operation of the Post Falls and Spokane River Projects is likely to, at a minimum, perpetuate any noxious weed populations that are present within the Project area. In the case of some wetland species, such as purple loosestrife, continued operation of the Project could result in significant population expansion over the license term.

Implementation of the USFWS (10j) recommendation to survey the Project area and develop a management and control plan would help control the spread of noxious weeds in the terrestrial and wetland portions of the Project area.

Implementation of Avista's proposed measure SRP-TR-2, Transmission Line Management Program, would help control noxious weeds within the Project transmission corridors.

3.3.5.2.5 Wildlife Species and Habitat

In its PDEA, Avista determined that current Project operations have minor effects on wildlife and special wildlife habitat. Minor losses of habitat associated with shoreline erosion (discussed in section 3.3.5.2.2) could result in some displacement of wildlife species that inhabit those areas. No known bird interactions (i.e., collisions or electrocutions) have occurred on any Project transmission line. However, one bald eagle was killed by contacting a distribution line that leads to the employee-housing complex at Long Lake Development. Effects on the bald eagle are discussed in section 3.3.6. Osprey are also known to build nests or perch on non-Project transmission pole structures. In recent years, Avista has implemented a program for minimizing the potential for adverse interactions. These efforts have included identifying bird-nesting activities on transmission lines that pose a potential problem, removing nests where necessary, providing alternative nesting platform structures at problem locations, reconfiguring existing pole structures that are found to present a significant threat of bird electrocution to increase the spacing between hot wires and neutral wires, and constructing any new transmission lines in accordance with state-of-the-art guidelines. As part of its current vegetation management under the Long Lake Development transmission lines, Avista occasionally removes potentially problematic vegetation by mechanical methods.

Under the Proposed Action, Avista would implement three measures to protect and enhance wildlife species. Measure PF-TR-1 would identify and prioritize specific areas for protection and erosion control within Coeur d'Alene Lake and associated tributaries. Measure SRP-TR-2, the Project Transmission Line Management Program, would formalize raptor protection and non-chemical vegetation management on approximately 1.84 miles of existing Project transmission lines and any new lines that may become part of the Project in the future. Under this measure, the potential for adverse interactions among avian species and transmission lines and poles would be minimized by (1) configuring all new or replacement Project transmission line structures consistent with current state-of-the-art guidelines; (2) visually inspecting the Project transmission lines during the nest-building period each year and taking appropriate actions in compliance with the Migratory Bird Treaty Act and, where appropriate, providing a nearby nesting platform; and (3) taking remedial actions in the event of a bird injury, mortality, or other indications that a particular pole structure and/or transmission line poses a threat to an avian species. Avista also proposes to include the 1.84 miles of Project transmission lines in the Project boundary.

As part of the Proposed Action, Avista also proposes to implement the Lake Spokane and Nine Mile Development Terrestrial, Riparian, And Wetland Habitat Protection and Enhancement Program (measure SRP-TR-1). Several stakeholders, as part of the TRWG, noted the largely undeveloped nature of many near-shore areas along the lower portions of Lake Spokane. They expressed concerns that without some specific protective measures, these areas would be subject to developmental pressures in the future and associated reductions in wildlife habitat and other values.

As a result, as part of this measure, Avista would add to, protect from future development, and manage its Project lands to protect wildlife habitat values while still allowing for other appropriate uses in certain areas. Other agreed-upon uses could include limited and appropriate recreational development in accordance with the Land Use Management Plan land-use categories (measure SRP-LU-1). This measure would include incorporating additional, currently owned Avista lands located within 200 feet (measured horizontally) of the Lake Spokane shoreline into the FERC Project boundary and managing them under the Project Land Use Management Plan as conservation lands, where appropriate. Managing these lands, as subsequently deemed appropriate by the cooperating parties, could require a variety of wetland, forest, and/or range management activities, including but not limited to wetland enhancements, erosion control and remediation or other shoreline protection and enhancement measures, tree and shrub plantings, tree thinning, weed management, road management, wildlife habitat monitoring and assessments, etc.

Post Falls Project

As discussed in section 3.3.5.2.2, measure PF-TR-1 would mitigate for any ongoing erosion-related wetland and riparian habitat loss associated with the Post Falls Project. Any displaced wildlife species would re-inhabit protected and enhanced wetland and riparian habitat gained as a result of this measure.

Other than the recommendations described above regarding plant communities and wetlands, there were no wildlife or habitat specific recommendations regarding the Post Falls Project.

Our Analysis

The staff determines that continued operation of the Post Falls Project as proposed, with the implementation of proposed measure PF-TR-1 and the additional erosion control measures described in section 3.3.1.2.4, would result in minimal adverse effects on wildlife and wildlife habitat in the vicinity of Coeur d'Alene Lake.

Spokane River Developments

By formalizing and implementing measure SRP-TR-2, the Project transmission lines and transmission line corridors would continue to be managed in a manner that eliminates or minimizes the potential for bird injury or mortality and associated transmission line damage. Additionally, it would ensure a minimally invasive, non-chemical approach to vegetation management within the transmission line corridor. As a result, any adverse effects on wildlife species because of Project transmission line interactions would be minimized or eliminated.

Measure SRP-TR-1 would benefit existing wildlife species by protecting wildlife habitat along the Lake Spokane shoreline. These lands would be managed as conservation lands, where appropriate, under the Land Use Management Plan and would be protected from incompatible development. The inclusion of additional Avista-owned lands along the Lake Spokane shoreline within the

Project boundary would increase the amount of high-quality, protected wildlife habitat included in the Project.

In its July 18, 2006, filing, the WDFW recommended that the Project boundary be modified to incorporate all Avista-owned lands adjacent to Lake Spokane, which would add approximately 1,976 acres to the Project area. The WDFW recommended that Avista protect and manage all Avista-owned land in the vicinity of Lake Spokane for the purposes of preserving wildlife habitat.

The USFWS, in its July 18, 2006, 10(j) filing, included as recommendation 6 that proposed measure SRP-TR-2 be adopted for the protection of raptors and other avian species along the Project transmission lines.

Our Analysis

The staff agrees that implementation of Avista's proposed measure SRP-TR-2 would help protect raptors and other birds along the transmission lines near Long Lake.

Adoption of WDFW's recommendation to include approximately 1,970 acres of Avista-owned land in the vicinity of Lake Spokane would greatly increase the amount of terrestrial habitat within the Project area set aside for conservation purposes. In the long term, this might benefit wildlife species that inhabit the area, although in the short term there would be no change from the current conditions because these lands are not being used for other purposes. Although these lands may be valuable for the conservation of wildlife resources in the vicinity of the Project, there is not a clear linkage between the operation of the Spokane River Project and any adverse impacts to these lands, the habitats that those lands contain, or the species inhabiting these habitats. As part of its proposed measure SRP-TR-1, Avista proposes to add approximately 320 acres of its property located within 200 feet of the Lake Spokane shoreline to the Project area and to manage these lands as conservation lands for the life of the Project. Implementation of SRP-TR-1 would add to the Project area those portions of the current Avista-owned lands that are potentially directly affected by Project operations.

3.3.5.2.6 Special-Status Wildlife Species

Because Project operations have remained relatively constant for decades, special-status wildlife species are likely to have adapted to the current Project operations. None of the special-status wildlife species that could occur in the Project area are specifically wetland or riparian species, so ongoing erosion-related habitat loss and aquatic bed wetland alterations at Lake Spokane are unlikely to affect any special-status wildlife species.

In recent years, Avista has implemented a program for minimizing the potential for adverse interactions associated with birds and its transmission lines, as discussed above. Under the Proposed Action, Avista proposes measure SRP-TR-2, the Project Transmission Line Management Program, to formalize raptor protection and non-chemical vegetation management on approximately 1.84 miles of existing Project transmission lines and any new lines that may become part of the Project in the future. Avista also proposes the implementation of the Lake Spokane and Nine Mile Developments Terrestrial, Riparian, And Wetland Habitat Protection and Enhancement Program (measure SRP-TR-1), which would protect wildlife habitat along the Lake Spokane shoreline.

Implementation of measure SRP-TR-2 would ensure that the Project transmission lines and Project transmission line corridors would continue to be managed in a manner that eliminates or minimizes the potential for special-status raptor injury or mortality and associated transmission line damage. Furthermore, the protection and enhancement of wildlife habitat as part of measures PF-TR-1 and SRP-TR-1 could provide a benefit to special-status species, and would help to minimize future habitat loss. Consequently, no adverse effects on special-status wildlife species are anticipated as a result of the Proposed Action.

The USFWS submitted several 10(j) recommendations regarding bald eagle monitoring and management. These are evaluated within the context of threatened and endangered species in section 3.3.6. No other wildlife-specific conditions or recommendations were received.

Post Falls Project

Our Analysis

Continued operation of the Post Falls Project, with the implementation of proposed measure PF-TR-1 would help prevent adverse effects to wildlife species of concern within the Project area. PF-TR-1 and additional recommendations for erosion control and wetland enhancements would help minimize habitat loss due to erosion and would help increase or protect other habitats.

Spokane River Developments

Our Analysis

Continued operation of Spokane River Projects, with the implementation of proposed measures SRP-TR1 and SRP-TR-2, would help prevent adverse effects to wildlife species of concern within the Project area. Measure SRP-TR-2 would help reduce or eliminate raptor mortality. SRP-TR-1 would help minimize habitat loss due to erosion and would help increase or protect other habitats.

3.3.5.2.7 Secondary Effects of Proposed Measures

Several of Avista's other proposed measures and enhancements would have minor impacts on terrestrial resources. Some of these impacts may be considered adverse, while others may be considered beneficial. These are described below.

Coeur d'Alene Recreation (PF-REC-2)

Implementation of measure PF-REC-2 would include funding for improvements at several parks and on BLM, Forest Service, and Coeur d'Alene Tribe lands; boat ramp extensions; Higgens Point breakwater and shoreline stabilization; and construction of trail spurs on the Trail of the Coeur d'Alenes. All of these activities could result in the clearing of some vegetation; however, the effect is expected to be minimal because the clearing would occur within areas already being used as parks. The shoreline stabilization project at Higgens Point would help reduce erosion at this particular point. Overall, the increase in recreation use as a result of these recreation improvements could result in some minor potential for additional disturbance to wildlife and habitat.

Post Falls/Spokane River Recreation (PF-REC-3) and Spokane River Recreation (SRP-REC-2)

Implementation of measures PF-REC-3 and SRP-REC-2 would include funding for improvements at the Trailer Park Wave access site, Corbin Park boat ramp, and the Water Avenue access site. The efforts at Trailer Park Wave and the Water Avenue access site would require the clearing of vegetation. Overall, the increase in recreation use as a result of these recreation improvements could result in some additional disturbance to wildlife and habitat.

Lake Spokane/Nine Mile Reservoir Recreation (SRP-REC-4)

Implementation of measure SRP-REC-4 would include funding for Nine Mile portage parking, Centennial Trail extension, Nine Mile Resort development, WDNR's Lake Spokane campground improvements, boat-in-only campgrounds, and the Long Lake Dam river access site development. All of these plans would likely require the clearing of some vegetation. The Centennial Trail extension would be approximately 1 mile long. Assuming a construction width of 12 feet, approximately 1.45 acres would need to be cleared. The establishment of boat-in-only campgrounds has the potential to bring human disturbance to areas that currently are seldom used. However, these sites would be identified in consultation with WSPRC and WDNR and therefore would likely be chosen to minimize effects on habitat. Overall, the increase in recreational use as a result of these recreational improvements could result in some minor potential for additional disturbance to wildlife and habitat.

Project Land Use Management Plan Implementation (PF-LU-1 and SRP-LU-1)

Implementation of measures PF-LU-1 and SRP-LU-1 would contribute to terrestrial resource protection by providing a means to manage Project lands as Conservation lands, Public Recreation lands, Private Recreation lands, Closed/Restricted lands, or Shoreline lands. The Land Use Management Plan would provide a systematic approach to land stewardship, conservation, habitat protection, and public access on Avista-owned Project lands.

3.3.5.3 Unavoidable Adverse Effects

The Proposed Action would result in continued erosion and habitat loss along the levees of the lower St. Joe and Coeur d'Alene rivers, although this loss would be mitigated by the applicant's proposed measures and additional actions resulting from BIA, USFWS, WDFW, and IDFG recommendations. Altered sedimentation patterns would continue to affect the distribution of some wetlands, especially in the vicinity of Nine Mile and Long Lake dams.

3.3.5.4 Cumulative Effects

Cumulative effects on wetland and riparian habitat in the Coeur d'Alene Lake-Spokane River Basin have occurred as a result of initial Project operation, agriculture, residential development, and a range of other human-caused disturbances. As a result of the original development of the Project, along with subsequent operations changes, wetland habitat has been altered throughout the Project area. Habitat types have shifted from scrub-shrub, forested, and emergent wetlands to deeper water inundated wetlands such as aquatic beds. This shift in habitat types has also affected the abundance and distribution of culturally significant plant species such as tule and wapato. Because of the more stable lake levels at Coeur d'Alene Lake, and the increase in aquatic bed habitats at Nine Mile and Long Lake reservoirs, aquatic noxious weeds have become established and have thrived under these conditions. The Proposed Action would not cause any further wetland habitat changes or losses because the current system has adapted to the current operations.

Major impacts on upland habitats in the Coeur d'Alene Lake-Spokane River Basin include the steady development of lake-shore and near-lake properties, agriculture, recreational development, and other human-caused disturbances. The conversion from open meadows, shrub lands, and forests to recreational or residential areas has resulted in a significant loss of upland wildlife habitat. The Post Falls and Spokane River Projects indirectly contribute to these habitat changes because the presence of the reservoirs with controlled lake levels creates a more desirable environment for development and recreation. Continued or increased recreational use of the Project area would contribute to increased adverse impacts to bald eagles. Recreational measures to improve and construct sites would result in some vegetation clearing and could contribute to a minor adverse effect on terrestrial resources in the basin.

The Project has affected the distribution of sediment flowing into the Project waters because the dams form barriers to downstream sediment transport and Project operations alter the natural river flows. As a result, sediment has been deposited in Nine Mile Reservoir and Lake Spokane instead of being transported downstream to the next barrier. Wetland and wildlife resources have been affected by the change in sediment transport and deposition. The sediment deposition in Nine Mile Reservoir and Lake Spokane has resulted in new and altered wetland and riparian habitats and islands; however, it has also resulted in the infilling and associated alteration of various aquatic and shallow water habitats in Lake Spokane, which may facilitate the establishment and spread of non-native aquatic plants.

In summary, the staff concludes that the contribution of the continued operation of the Post Falls and Spokane River Projects under the Proposed Action to the cumulative impact on terrestrial ecological resources in the region would be similar to, or less severe than, the impacts under the current operating conditions.

3.3.6 Federally Listed Threatened and Endangered Species

3.3.6.1 Affected Environment

In its March 9, 2005, letter, the USFWS identified federally listed species and designated critical habitat that may occur in the vicinity of the Project and could potentially be affected by it. Those species are the federally listed endangered gray wolf (*Canis lupus*) and the federally listed threatened bull trout (*Salvelinus confluentus*), water howellia (*Howellia aquatilis*), Ute ladies'-tresses (*Spiranthes diluvialis*), Spalding's catchfly (*Silene spaldingii*), and bald eagle (*Haliaeetus leucocephalus*). Critical information pertaining to federally listed threatened and endangered species is provided below. A formal biological assessment (BA) will be developed by FERC, either as a separate document or in conjunction with FERC's subsequent environmental review.

3.3.6.1.1 Bull Trout

On October 30, 1992, the USFWS received a petition from an alliance of conservation organizations in Montana to list bull trout (*Salvelinus confluentus*) throughout its native range under the ESA. In 1994, the USFWS determined that listing was warranted within the coterminous United States, but was precluded due to the need to list higher priority species. Legal debate followed the warranted-but-precluded status from 1995 to 1997, until populations in the Columbia River, Klamath River, and Jarbidge River basins were listed in June 1998. On November 1, 1999, the USFWS issued a final rule announcing the listing of bull trout throughout the coterminous United States as a threatened species under the ESA (64 FR 58910). A threatened species is considered likely to become endangered within the foreseeable future.

Bull trout occur in widespread but fragmented habitats and have several life history patterns. Resident fish spend their lives near the area where they were hatched. After 1 to 4 years, adfluvial fish migrate from streams to lakes for rearing, and then after several years return to streams to spawn. Fluvial fish migrate from streams to rivers for rearing, returning to streams to spawn. The migratory varieties tend to be larger than residents. Currently, only fluvial and adfluvial life strategies are known to be present in the Coeur d'Alene subbasin (Avista, 2005). Population status and trends vary widely throughout its range, which prompted separate listings of distinctive population segments (USFWS, 2003). Bull trout occurring in the Spokane River Project area are listed under the Columbia River population.

Bull trout are members of the char subgroup of the salmon family, which also includes Dolly Varden (*Salvelinus malma*), lake trout (*S. namaycush*), and Atlantic char (*S. alpinus*). Char species such as bull trout live farther north than most other groups of freshwater fish and are well adapted for life in very cold water. However, bull trout are sensitive to increased water temperatures, poor water quality, and low flow conditions. Bull trout and Dolly Varden were once considered the same species, but taxonomic research delineated them as separate species. Bull trout are larger than Dolly Varden and are mainly an inland species, while Dolly Varden are more common in coastal areas. At the time of bull trout listing, the USFWS did not list Dolly Varden as a threatened species. In 2001, the USFWS proposed that the species be afforded protection under the "similarity of appearance" provisions of ESA (66 FR 1628). The USFWS has not made a final decision on the Dolly Varden proposal. Non-native brook trout often interbreed with bull trout, producing mostly sterile offspring. In some cases, brook trout have supplanted bull trout because they reproduce earlier and at a higher rate than bull trout (USFWS, 2003).

Small bull trout eat terrestrial and aquatic insects but shift to preying on other fish as they mature. Large bull trout are known to prey upon whitefish, sculpin, and other trout. Bull trout mature between ages 4 and 7 and generally spawn in second- to fourth-order tributary streams (Rieman and McIntyre, 1995, as cited in Avista, 2005). Bull trout growth appears to vary with life history strategy (Wydoski and Whitney, 2003, as cited in Avista, 2005).

Upstream spawning migrations may span several seasons, starting as early as late winter (early March), and often peaking during high flows in May and June (Graham et al., 1981, as cited in Avista, 2005; Shepard et al., 1984, as cited in Avista, 2005; Pratt, 1992, as cited in Avista, 2005). Bull trout are known to migrate up the St. Joe River in early spring (April and May), arriving at headwater tributaries by late summer (IDFG, 1999, as cited in Avista, 2005).

Spawning typically occurs in the fall, or after water temperatures drop below 9ºC (USFWS 2003). Bull trout prefer streams with cold, unpolluted water, clean gravel and cobble substrate, and gentle stream slopes. Adfluvial bull trout typically spawn from late August into October (Rieman and McIntyre, 1995, as cited in Avista, 2005). IDFG (1999, as cited in Avista, 2005) reported that radio-tagged adfluvial bull trout remained in the spawning areas of the upper St. Joe River from August 26 to September 18 in 1998. Spawning is known to occur at temperatures from 4 to 11ºC (39 to 51ºF), but the preferred water temperature range is 5 to 9ºC (41 to 48ºF) (64 FR 58910). After spawning, adfluvial and fluvial adult bull trout rapidly return to the lake or river where they grew to adulthood (Shepard et al., 1984; Pratt, 1992). IDFG (1999) suggested that after spawning in the upper St. Joe River, bull trout probably migrated downstream immediately and radio-tagged fish may have reached Coeur d'Alene Lake in less than 32 days (about October 15). While residing in Coeur d'Alene Lake, bull trout are believed to occupy the deeper, cooler areas of the lake. At these depths, bull trout reside below the variable zone of Coeur d'Alene Lake that is influenced by the operation of Post Falls Dam. The eggs require a long incubation period (4 to 5 months), hatching in late winter or early spring. Fry remain in the streambed for approximately 3 weeks before emerging (USFWS, 2003).

Downs and Jakubowski (2003, as cited in Parametrix, 2003b) reported that between 50 and 75 percent of age 1 and older bull trout migrated from Trestle Creek to Lake Pend Oreille between April and May during periods of increasing temperature and flow. The timing of juvenile bull trout outmigration in the St. Joe River is believed to be similar to that of other salmonids and to coincide with spring runoff and cool water temperatures (Parametrix, 2003b).

Bull trout are known to migrate through several miles of inundated habitat of the lower St. Joe River. Even under unregulated historical conditions (i.e., absent Post Falls Dam regulating summer water levels in the lake and lower tributary reaches), bull trout in the St. Joe River would have migrated through extensive reaches of backwatered river because even at a low lake surface elevation of 2,120.5 feet (reflective of pre-dam conditions), 31 miles of the lower St. Joe River are affected by the lake water level (Avista, 2005).

IDFG and the Coeur d'Alene Tribe manage fish resources in the Coeur d'Alene subbasin (Avista, 2005). The USFWS also has a specific interest in bull trout populations in the subbasin because these populations are listed as threatened under the ESA. Recovery criteria for bull trout in the Coeur d'Alene Recovery Unit, specifically encompassing the St. Joe River and North Fork Coeur d'Alene River drainages, are available in the Draft Recovery Plan (USFWS, 2002b,c) and are also incorporated in the strategies and objectives in the Coeur d'Alene Subbasin Management Plan.

The Bull Trout Recovery Team has developed a draft recovery plan providing a framework for implementing recovery actions. Twenty-seven recovery units have been identified (USFWS, 2003). Bull trout in the Project area fall under two separate recovery units. Spokane River fish are listed in the Coeur d'Alene Lake Basin recovery unit. This recovery unit encompasses the Spokane River and its tributaries upstream of Post Falls Dam, as well as Coeur d'Alene Lake and its tributaries (USFWS, 2002a). In total, there are about 4,290 miles of streams comprising 502 named streams in the unit. A core unit was delineated within the unit and includes the entire Coeur d'Alene Lake and the St. Joe and Coeur d'Alene river subbasins and their tributaries. Although the Coeur d'Alene River subbasin is included in the designated core area, surveys of 75 streams in the North Fork Coeur d'Alene River drainage conducted from 1994 to 1995 did not find bull trout (Dunnigan and Bennett, 1997, as cited in USFWS, 2002b). Three known local populations of bull trout that have been identified include Medicine Creek, Wisdom Creek, and the St. Joe River between Heller Creek and St. Joe Lake (USFWS, 2002a).

The second bull trout recovery unit in the Project area is the Northeast Washington recovery unit, which includes the Spokane River and its tributaries downstream of Post Falls Dam. However, there currently are no known populations of bull trout in the Spokane River downstream of Post Falls Dam, and the USFWS currently does not include the Spokane River downstream of Post Falls Dam in its recovery planning efforts (Avista, 2005). The USFWS indicates that the Northeast Washington recovery unit team recommends that additional survey work be conducted in order to evaluate whether these areas could contribute to future species recovery (USFWS, 2002c).

On September 26, 2005, the USFWS designated critical habitat for the Columbia River bull trout population. The Coeur d'Alene Lake, Coeur d'Alene River, North Fork Coeur d'Alene River, St. Joe River, and select tributaries were designated as bull trout critical habitat.

Critical habitat in the Coeur d'Alene Lake Basin recovery unit consists of just 124 miles of stream reaches and 27,296 acres of Coeur d'Alene Lake in Kootenai, Shoshone, Beneway, and Bonner counties. This equals about 2.9 percent of total stream length in the basin (USFWS, 2002a).

Excluded from the critical habitat designation are “those reservoirs, or pools impounded behind dams whose primary purpose is for flood control, energy production, or water supply for human consumption” (70 FR 56212).

Within designated critical habitat areas, the primary constituent elements for bull trout are those habitat components that are essential for the primary biological needs of foraging, reproducing, rearing of young, dispersal, genetic exchange, or sheltering (70 FR 56212). The primary constituent elements identified for bull trout in the critical habitat designation include:

- Water temperatures that support bull trout use (generally 2 to 15ºC);

- Complex stream channels with features such as woody debris, side channels, pools, and undercut banks to provide a variety of depths, velocities, and instream structures;

- Substrates of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival (this includes a minimum of fine substrate less than 0.25 inch in diameter);

- A natural hydrograph, including peak, high, low, and base flows within historic ranges, or, if regulated, currently operate under a biological opinion that addresses bull trout, or a hydrograph that demonstrates the ability to support bull trout populations by minimizing daily and day-to-day fluctuations and departures from the natural cycle of flow levels corresponding to seasonal variation;

- Springs, seeps, groundwater sources, and subsurface water to contribute to water quality and quantity as a coldwater source;

- Migratory corridors with minimal physical, biological, or water quality impediments between spawning, rearing, and overwintering, and foraging habitats, including intermittent or seasonal barriers induced by high water temperatures or low flows;

- An abundant food base that includes terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish; and

- Permanent water of sufficient quantity and quality such that normal reproduction, growth, and survival are not inhibited.

3.3.6.1.2 Water Howellia

Water howellia is a federally listed threatened species that inhabits palustrine wetlands such as vernal pools, ponds, and backwater stream channels prone to a cycle of flooding in spring and drying out by late summer. Within eastern Washington, water howellia has been found in kettle wetlands and wetlands within conifer forests below elevation 2,300 feet. It is known to occur at sites in Spokane County, Washington, and Latah County, Idaho. None of the identified populations are within the Project area. The closest documented population to the Project area is in the Dishman Hills Natural Area, approximately 3 miles south of the Spokane River in east Spokane. No water howellia were observed during intensive field surveys of potential habitats in July and August 2003, the time of year when this plant is most likely to be observed (Parametrix, 2003a).

3.3.6.1.3 Ute Ladies'-tresses

Ute ladies'-tresses is a federally listed threatened species that occurs in wet meadows and stream bars with relatively low vegetation density that are subject to seasonal inundation and drying. In Washington, populations of Ute ladies'-tresses have been found at sites ranging in elevation from 700 to 1,500 feet. Although it is known to exist in Washington and Idaho and suitable habitat occurs in the Project area, there are no records of Ute ladies'-tresses in the Project vicinity. No Ute ladies'-tresses were observed during intensive field surveys of potential habitats in July and August 2003, the time of year when this plant is most likely to be observed (Parametrix, 2003a).

3.3.6.1.4 Spalding's Catchfly

Spalding's catchfly is federally listed as threatened. In Washington, this species occurs primarily within open grasslands with a minor shrub component and occasionally with scattered conifers. It is found most commonly in the Idaho fescue/snowberry association at elevations of 1,900 to 3,050 feet. These sites are typically dominated by Idaho fescue (*Festuca idahoensis*) with a sparse cover of snowberry (*Symphoricarpos albus*). Some of these sites occur in a mosaic of grassland and ponderosa pine forest. Although populations have been found on all aspects, this species seems to prefer north-facing slopes. It occurs in the Blue Mountains and Columbia Basin physiographic provinces in Asotin, Lincoln, Spokane, and Whitman counties (WDNR, 2005). Potential Spalding's catchfly habitat occurs near western portions of Lake Spokane within ponderosa pine/grassland habitat found atop cliffs and plateaus overlooking the lake. These upland areas are outside of the zone of Project influence.

3.3.6.1.5 Gray Wolf

In Idaho, the gray wolf is federally listed as endangered north of I-90; however, there is only a non-essential experimental population within the Project area south of I-90 in Idaho. In Washington, the gray wolf is federally listed as threatened. No federally designated wolf recovery areas are located within the Project area, although the Project area is within the Central Idaho Non-essential Experimental Population Area. Within the Idaho portion of the Project area, the closest known wolves are the Marble Mountain pack in the St. Joe River Basin on the central border between Benewah and Shoshone counties. Wolf sightings within the Washington portion of the Project area are extremely rare. There was one unconfirmed sighting of an adult near Long Lake Development in 1991 (GEI, 2004).

3.3.6.1.6 Bald Eagle

The bald eagle is federally listed as threatened. The Coeur d'Alene Lake and St. Joe River shorelines have several active bald eagle nests and are major concentration areas for wintering eagles. The Coeur d'Alene River is also known to support wintering eagles (Parametrix, 2003f). Wintering use in the Coeur d'Alene area is believed to peak when the kokanee spawning occurs in mid-November (GEI, 2004). Six nesting territories and one active bald eagle nest are located along the Spokane River between Long Lake Dam and Nine Mile Dam. The nest is located approximately one-quarter mile from Lake Spokane on WSPRC property (e-mail from S. Fitzhugh, Relicensing Specialist, Avista, Spokane, WA, to E. Hall, Senior Project Manager, Louis Berger Group, Boise, ID, dated August 5, 2004). There are no bald eagle nests located on Avista-owned property within the Project area. Wintering eagle use along the Spokane River usually peaks in January or February, and most eagles leave the area by April. Wintering eagle use is more abundant west of the City of Spokane, especially around Long Lake Development (Parametrix, 2003f).

Avista has developed a company-wide Avian and Raptor Protection Plan. In June 2002, a bald eagle was electrocuted on a distribution pole near Long Lake Development. Avista has since retrofitted six poles along this distribution line for the protection of birds in accordance with raptor protection standards. To further minimize risk, a dumpster was relocated to discourage eagles from foraging in the area (Parametrix, 2003f).

3.3.6.2 Environmental Consequences

3.3.6.2.1 Bull Trout

No direct adverse effects on bull trout are documented or suspected to occur under current Project operations, the Proposed Action, or the Staff Alternative. A number of indirect effects that have the potential to impact bull trout in the Project area are described below.

Maintaining the stable water level of Coeur d'Alene Lake during the late spring and summer could potentially decrease the velocity of flow in inundated portions of rivers that flow into the lake, including the St. Joe River. Bull trout spawning and rearing habitat is known to occur in the upper St. Joe River Basin, and the affected lower reach of the river is a migratory corridor for both spawning run adults and downstream migrating juveniles.

Upstream migration of adult bull trout from Coeur d'Alene Lake is expected to begin in March and April when water temperature in the lake increases to about 4 to 6°C (39 to 43°F). Therefore, upstream adult bull trout migration is expected to occur prior to the time that Avista controls the water levels of Coeur d'Alene Lake.

After spawning, downstream migrating adult adfluvial bull trout are expected to reach the inundated portions of the St. Joe River and Coeur d'Alene Lake in October (IDFG, 1999, as cited in Avista, 2005). Water temperatures in the lower St. Joe River are typically less than 15°C (59°F) by the middle of September under current conditions, and this temperature pattern is expected to continue under the Proposed Action and Staff Alternative (Golder, 2004h, as cited in Avista, 2005). Consequently, water temperatures in the inundated portion of the St. Joe River should not pose a barrier to post-spawning adults returning to Coeur d'Alene Lake. Additionally, downstream migrating adult adfluvial bull trout would also encounter water velocity conditions in the inundated portion of the St. Joe River that would be similar under the Proposed Action and Staff Alternative to those that would be encountered under existing conditions.

It is not known exactly when juvenile adfluvial bull trout outmigrate through the inundated portions of the lower St. Joe River and into Coeur d'Alene Lake. However, because recorded water temperatures within and above the Project-influenced inundated reach may exceed 15°C (59°F) from late June through early September (Parametrix, 2005), juvenile bull trout would remain in the cooler portions of the upper St. Joe River and headwater tributaries during summer. Studies in the nearby Pend Oreille River Basin showed that most juvenile bull trout migrated from Trestle Creek into Lake Pend Oreille during spring high-flow periods with a second, smaller outmigration spike during the fall (Downs and

Jakubowki, 2003; as cited in Parametrix, 2003b). Assuming the same migration pattern in the St. Joe River subbasin, most juvenile adfluvial bull trout would migrate to Coeur d'Alene Lake during periods when Avista either is not regulating lake water levels in the spring or is allowing the lake level to drop in the fall. During these migration periods, water temperatures are known to be below 15°C (59°F) and are not considered a barrier to bull trout movement. Under the Proposed Action and Staff Alternative, the water level and temperature regimes would remain similar to current conditions (Golder, 2004h, as cited in Avista, 2005).

Predation on bull trout from non-native species like northern pike and chinook salmon has not been documented. Weitkamp suggests that the populations of the non-native major predators, northern pike and chinook salmon, do not appear to be controlled by or substantially influenced by the regulated lake elevation (memorandum from D. Weitkamp, Ph.D. Fisheries Scientist, Parametrix, Kirkland, WA, to T. Vore, Environmental Specialist, Avista, Spokane, WA, dated June 20, 2005). Chinook salmon do not reproduce or rely on rearing within the portion of the lake and tributary habitat influenced by lake elevations between 2,120 feet and 2,128 feet. Northern pike do likely rely on shallow vegetated habitat within this elevation range. However, northern pike most likely spawn in late winter to early spring (late February through March) when lake elevations are high due to runoff and lake elevation control is provided by the natural Spokane River channel characteristics and not Post Falls Dam. It is therefore unlikely that lake level fluctuations in the range of 2,128 feet to 2,120 feet following the spring runoff would provide substantial control of northern pike populations in Coeur d'Alene Lake.

Avista's Proposed Action includes implementation of a Post Falls Dam Fish PME Program. Because no specific measure or locations have been definitively identified, it is not possible to quantify the benefits of those actions.

3.3.6.2.2 Water Howellia

Direct and Indirect Effects

No populations of water howellia were found during surveys of the Project area, and the species has not been documented to occur within 3 miles of the Project area. No direct or indirect effects on the species would be expected to occur under the Proposed Action. Therefore, the staff concludes that the Proposed Action and environmental measures would have no effect on water howellia individuals, populations, or habitat.

3.3.6.2.3 Ute Ladies'-tresses

Direct and Indirect Effects

No populations of Ute ladies' tresses were found during surveys of the Project area, and there are no records of Ute ladies'-tresses in the Project area. No direct or indirect effects on the species would be expected to occur under the Proposed Action. Therefore, the staff concludes that implementation of the Proposed Action and environmental measures would have no effect on Ute ladies'-tresses individuals, populations, or habitat.

3.3.6.2.4 Spalding's Catchfly

Direct and Indirect Effects

Although potential habitat for Spalding's catchfly occurs in the Project vicinity, no direct or indirect effects on the species would be expected to occur under the Proposed Action. This species occurs only in upland areas that would be outside of the zone of influence affected by Project operations. Therefore, the staff concludes that implementation of the Proposed Action and its measures would have no effect on Spalding's catchfly individuals, populations, or habitat.

3.3.6.2.5 Gray Wolf

Direct and Indirect Effects

Gray wolves do not appear to be present in the area on a regular basis. Sporadic, unconfirmed sightings would likely be of transient individuals that would have little interaction with Project facilities. There are no indications of direct or indirect effects of the Project on gray wolves, and no direct or indirect effects on the species would be expected to occur under the Proposed Action. Therefore, the staff concludes that implementation of the Proposed Action and environmental measures would have no effect on the gray wolf.

3.3.6.2.6 Bald Eagle

Direct Effects

Avista has implemented a company-wide Avian and Raptor Protection Plan to define the methods for effectively reporting bird nesting and fatalities. If problem bald eagle nests (nests that interfere with power production or could be harmed due to electrical fire) were found, the USFWS would be contacted to approve and supervise any subsequent action. In 2002, a bald eagle was electrocuted on a distribution line near Long Lake Development. To minimize the risk of reoccurrence, Avista implemented a program for minimizing the potential for these adverse interactions. These efforts include identifying bird-nesting activities on transmission poles that pose a potential problem, removing nests where necessary, providing alternative nesting platform structures at problem locations, and reconfiguring existing pole structures that are found to present a significant threat of bird electrocution to increase the spacing between hot wires and neutral wires to meet Avian Power Line Interaction Committee (APLIC) guidelines presented in *Suggested Practice for Raptor Protection on Power Lines: The State of the Art in 1996.* Any new Project transmission lines would also be constructed in accordance with APLIC guidelines.

Indirect Effects

The Project currently maintains the Coeur d'Alene Lake summer elevation level at or near full pool (2,128 feet) from as early as practicable until the week after Labor Day when a gradual drawdown, typically 1 to 2 feet per month, begins. The maximum drawdown of Long Lake Development operating reservoir (Lake Spokane) is generally held to 14 feet whenever possible. These conditions have remained relatively unchanged for several decades. As a result, bald eagles in the Project area are acclimated to these conditions.

Under the Proposed Action, the Project would continue to be operated similarly to current Project operations, except that drawdown times and/or elevations for both Coeur d'Alene Lake and Lake Spokane would be formalized and the minimum flow from the Post Falls Project would be increased to 600 cfs, with a trigger to 500 cfs during drier summers. Under the Proposed Action, Coeur d'Alene Lake would be filled to its full pool level of 2,128 feet by as early as practicable each summer and maintained near 2,128 feet until September 15. A fall lake drawdown to as low as 2,120.5 feet to provide storage for winter precipitation and spring runoff would begin on September 15. Formalizing a date for the drawdown of Coeur d'Alene Lake in September would not affect bald eagle habitat or its prey base. As discussed in section 3.3.2, *Water Quantity*, changing the minimum flow from 300 to 600 cfs would have minimal effect on the Coeur d'Alene Lake water level.

Maintaining Coeur d'Alene Lake's summer level near 2,128 feet, as proposed, may continue to result in erosion-related loss of some wetland and riparian habitat along the shorelines of the lake and affected tributaries. This could result in the loss of some of the large conifers and cottonwoods used by bald eagles; however, numerous alternative perch and roost trees would still remain.

The maximum 14-foot winter drawdown of Lake Spokane would be formalized as part of the new license. Formalizing the 14-foot winter drawdown at Lake Spokane would not result in a change from existing operations. As discussed in section 3.3.2, *Water Quantity*, changing the minimum flow from 300 to 600 cfs would have minimal effect on the downstream flows. For the most part, this change in minimum flow would result in downstream flows that are within the current natural fluctuations and would not affect bald eagle habitat or the prey base. Under the Proposed Action, the slight changes to Project operations would be unlikely to result in any adverse effects on the bald eagle.

Continued or expanded use of the Project area for recreational purposes may have adverse impacts on bald eagle habitat use, foraging, and nesting.

Post Falls Project

Avista has proposed several measures that would help to mitigate adverse effects of continued Project operations on bald eagles during the new license term.

Avista's proposed measure PF-TR-1 would provide erosion control and wetland and riparian habitat protection and enhancement, which would reduce the potential for habitat loss around Coeur d'Alene Lake and its tributaries.

Under the Proposed Action, the Coeur d'Alene Recreation PME (PF-REC-2) and Post Falls/Spokane River Recreation PME (PF-REC-3) would provide funding for various recreation improvements and development, including campgrounds, boat ramps, parks, and trail extensions (see section 3.3.8.2). Although recreation enhancements would likely result in a slight increase in human activity, the bald eagles that occur in the Project area are already acclimated to the wide range of existing recreational activities. On a Project-wide basis, the additional disturbance resulting from the enhancements would be minimal. As long as the recreation site expansions and developments were outside of the bald eagle nesting, perching, and roosting areas, it is unlikely that the additional human disturbance would adversely affect bald eagles.

These enhancements would, however, require some vegetation clearing, including some tree cutting. Most enhancements would be on developed lands owned by Avista, public agencies, or municipalities. As such, these entities would be responsible for ensuring that no nesting, roosting, or perching trees would be cut as part of the recreation enhancements.

In its July 18, 2006, filing pursuant to section 10(j) of the FPA, the DOI made four recommendations regarding the bald eagle. First, "Within one year after license issuance, the Licensee shall, for the conservation and development of fish and wildlife resources and in consultation with the U.S. Fish and Wildlife Service (Service), the Idaho Department of Fish and Game (IDFG), the Washington Department of Fish and Wildlife (WDFW), and the Coeur d'Alene Tribe (Tribe), monitor on an annual basis all known bald eagle nests that are associated with waters impounded by the Post Falls, Long Lake, and Nine Mile Developments to determine bald eagle occupancy and nesting productivity. The monitoring effort would be conducted during the bald eagle nesting season (approximately

February 1 – July 31 each year) and the results would be documented in a report to be submitted on an annual basis to the Service, IDFG, WDFW, and the Tribe."

Second, the DOI recommended that, "Within one year after license issuance, the Licensee shall, for the conservation and development of fish and wildlife resources and in consultation with the US. Fish and Wildlife Service (Service), the Idaho Department of Fish and Game (IDFG), the Washington Department of Fish and Wildlife (WDFW), and the Coeur d'Alene Tribe (Tribe), annually conduct at least one survey in the vicinity of the Project area during the bald eagle nesting season (approximately February 1 – July 31 each year) to locate new bald eagle nests. The preferred survey procedure, in a five-year period, would be to use a fixed winged aircraft for at least one survey and watercraft for the other four surveys. The results of the annual survey shall be documented in a report to be submitted on an annual basis to the Service, IDFG, WDFW, and the Tribe."

Third, the DOI recommended that, "Within one year after license issuance, the Licensee shall, for the conservation and development of fish and wildlife resources and in consultation with the U.S. Fish and Wildlife Service (Service), the Idaho Department of Fish and Game (IDFG), the Washington Department of Fish and Wildlife (WDFW), and the Coeur d'Alene Tribe (Tribe), develop and implement an educational and interpretive program to inform the public about bald eagle use of Coeur d'Alene Lake and Lake Spokane, bald eagle sensitivity to human activity, and recommendations for recreational users and homeowners to protect bald eagles and their habitat. The program shall include the installation and maintenance of interpretive signs at all Licensee owned and public recreational facilities within the Project area. The signs shall include information on bald eagle response to human disturbance, the effects of human disturbance on bald eagle breeding and foraging activities, and recommendations for proper behavior within bald eagle habitat. If possible, the program should also involve private landowners who are willing to protect bald eagle habitat on their property. Habitat protection guidelines could be distributed to willing landowners where lakeshore and riverbanks are affected by Project operations. The focus would be to protect suitable nest trees and large snags near lakeshore and river banks within the Project boundaries."

Lastly, the DOI recommended that, "Within one year after license issuance, the Licensee shall, for the conservation and development of fish and wildlife resources and in consultation with the U.S. Fish and Wildlife Service (Service), the Idaho Department of Fish and Game (IDFG), the Washington Department of Fish and Wildlife (WDFW), and the Coeur d'Alene Tribe (Tribe), monitor actual bald eagle use within all known bald eagle nesting territories that are associated with waters impounded by the Spokane River and Post Falls Hydroelectric Projects. Monitoring should be conducted over two consecutive nesting seasons to determine the breeding pairs' primary use area and home range, and to identify key use sites, i.e. alternate nest stands, perch sites, and roost sites. Monitoring should also identify conflicts within the Project area between bald eagles and humans such as recreational activities and human infrastructure development. Within three years after monitoring actual bald eagle use within all known bald eagle territories, the licensee shall, in consultation with the Service, IDFG, WDFW, and the Tribe, develop a site-specific Nest Management Plan for selected nesting territories. The nesting territory selections would be based on those areas where Project operations have had a significant effect on available bald eagle habitat and opportunities for protection are possible. The plan must include background information on the territory including key use areas, areas of conflict, and specific conservation measures that protect bald eagle habitat over time and minimize bald eagle/human conflicts (MBEWG 1994, appendix VI and VII)."

Our Analysis

The continued operation of the Post Falls Project is likely to have some positive and some negative long-term effects on bald eagles. The presence of the open water reservoirs provides foraging habitat, but continued erosion along shorelines and along the levees of the Coeur d'Alene and St. Joe Rivers results in the loss of perch and roost trees and possibly the loss of nest sites. Continued monitoring and management is appropriate. In its 10j counter-filings submitted on September 1, 2006, Avista agreed to the substantive portions of DOI recommendations 1, 2, and 4. Avista did not agree with the USFWS education and interpretive recommendation, claiming that PF-REC-4 would provide adequate public outreach.

<u>*Spokane River Developments*</u>

Avista has proposed several measures that would help to mitigate adverse effects of continued Project operations on bald eagles during the new license term.

In conjunction with the company-wide Avian and Raptor Protection Plan, the Spokane River Project Transmission Line Management Program (measure SRP-TR-2) would formalize raptor protection on approximately 1.84 miles of existing Project transmission lines and any new lines that may become part of the Project in the future. Under this measure, the potential for adverse interactions between the bald eagle and transmission lines and poles would be minimized by (1) configuring all new or replacement Project transmission line structures consistent with the current state-of-the-art guidelines at that time; (2) visually inspecting the Project transmission lines during the nest-building period each year, taking appropriate actions in compliance with the Migratory Bird Treaty Act, and, where appropriate, providing a nearby nesting platform; and (3) taking remedial actions under the supervision of the USFWS in the event of a bird injury, mortality, or other indication that a particular pole structure and/or transmission line poses a threat to an avian species.

The Spokane River fish measure (SRP-AR-1) would support fishery enhancement in the Spokane River, Lake Spokane, and other waters near the Project. It would be beneficial to the bald eagle by increasing its prey base.

Under the Proposed Action, the Spokane River Project Recreation PME (SRP-REC-2), and Lake Spokane/Nine Mile Reservoir Recreation PME (SRP-REC-4) would provide funding for various recreation improvements and development, including campgrounds, boat ramps, parks, and trail extensions (see section 3.3.8.2). Although recreation enhancements would likely result in a slight increase in human activity, the bald eagles that occur in the Project area are already acclimated to the wide range of existing recreational activities. On a Project-wide basis, the additional disturbance resulting from the enhancements would be minimal. As long as the recreation site expansions and developments were outside of the bald eagle nesting, perching, and roosting areas, it is unlikely that the additional human disturbance would adversely affect bald eagles.

These enhancements would, however, require some vegetation clearing, including some tree cutting. Most enhancements would be on developed lands owned by Avista, public agencies, or municipalities. As such, these entities would be responsible for ensuring that no nesting, roosting, or perching trees would be cut as part of the recreation enhancements.

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Second, the DOI recommended that, “Within one year after license issuance, the Licensee shall, for the conservation and development of fish and wildlife resources and in consultation with the US. Fish and Wildlife Service (Service), the Idaho Department of Fish and Game (IDFG), the Washington Department of Fish and Wildlife (WDFW), and the Coeur d’Alene Tribe (Tribe), annually conduct at least one survey in the vicinity of the Project area during the bald eagle nesting season (approximately February 1 – July 31 each year) to locate new bald eagle nests. The preferred survey procedure, in a five-year period, would be to use a fixed winged aircraft for at least one survey and watercraft for the other four surveys. The results of the annual survey shall be documented in a report to be submitted on an annual basis to the Service, IDFG, WDFW, and the Tribe."

Third, the DOI recommended that, "Within one year after license issuance, the Licensee shall, for the conservation and development of fish and wildlife resources and in consultation with the U.S. Fish and Wildlife Service (Service), the Idaho Department of Fish and Game (IDFG), the Washington Department of Fish and Wildlife (WDFW), and the Coeur d'Alene Tribe (Tribe), develop and implement an educational and interpretive program to inform the public about bald eagle use of Coeur d'Alene Lake and Lake Spokane, bald eagle sensitivity to human activity, and recommendations for recreational users and homeowners to protect bald eagles and their habitat. The program shall include the installation and maintenance of interpretive signs at all Licensee owned and public recreational facilities within the Project area. The signs shall include information on bald eagle response to human disturbance, the effects of human disturbance on bald eagle breeding and foraging activities, and recommendations for proper behavior within bald eagle habitat. If possible, the program should also involve private landowners who are willing to protect bald eagle habitat on their property. Habitat protection guidelines could be distributed to willing landowners where lakeshore and riverbanks are affected by Project operations. The focus would be to protect suitable nest trees and large snags near lakeshore and river banks within the Project boundaries."

Finally, the DOI recommended that, "Within one year after license issuance, the Licensee shall, for the conservation and development of fish and wildlife resources and in consultation with the U.S. Fish and Wildlife Service (Service), the Idaho Department of Fish and Game (IDFG), the Washington Department of Fish and Wildlife (WDFW), and the Coeur d'Alene Tribe (Tribe), monitor actual bald eagle use within all known bald eagle nesting territories that are associated with waters impounded by the Spokane River and Post Falls Hydroelectric Projects. Monitoring should be conducted over two consecutive nesting seasons to determine the breeding pairs' primary use area and home range, and to identify key use sites, i.e. alternate nest stands, perch sites, and roost sites. Monitoring should also identify conflicts within the Project area between bald eagles and humans such as recreational activities and human infrastructure development. Within three years after monitoring actual bald eagle use within all known bald eagle territories, the licensee shall, in consultation with the Service, IDFG, WDFW, and the Tribe, develop a site-specific Nest Management Plan for selected nesting territories. The nesting territory selections would be based on those areas where Project operations have had a significant effect on available bald eagle habitat and opportunities for protection are possible. The plan must include background information on the territory including key use areas, areas of conflict, and specific conservation measures that protect bald eagle habitat over time and minimize bald eagle/human conflicts (MBEWG 1994, appendix VI and VII)."

Our Analysis

The continued operation of the Spokane River Projects is likely to have some positive and some negative long-term effects on bald eagles. The presence of the open water reservoirs provides foraging habitat, but continued erosion along shorelines may result in the loss of perch and roost trees and possibly the loss of nest sites. Continued monitoring and management is appropriate. In its 10j counter-filings submitted on September 1, 2006, Avista agreed to the substantive portions of DOI recommendations 1, 2, and 4. Avista did not agree with the USFWS education and interpretive recommendation, claiming that SRP-REC-3 would provide adequate public outreach.

The staff has determined that continued operation of the Post Falls and Spokane River Projects under the Proposed Action and environmental measures may affect, but is not likely to adversely affect, bald eagles. The staff also determined that the Proposed Action and measures would have no effect on any other terrestrial threatened or endangered species.

3.3.6.3 Unavoidable Adverse Impacts

The Proposed Action would have no unavoidable adverse effects on threatened or endangered species.

3.3.6.4 Cumulative Impacts

During the new licensing period, the region including the Coeur d'Alene Lake and its tributaries are likely to continue experiencing effects from timber harvesting, agriculture, animal husbandry, residential and commercial development, other infrastructure and land-use activities, mining-related discharges and related inputs of heavy metals, introduction of non-native fish and aquatic plant species, point and non-point discharges and inputs, and both legal and illegal fish harvest (Kleinschmidt, 2004; WDFW, 2004, as cited in Avista, 2005). Bull trout and their associated aquatic habitat have generally experienced habitat degradation and reduced populations as a result of these cumulative effects and would likely continue to do so in the future. Species and habitat protection and restoration programs that could be initiated in the region have the potential to slow or reverse some of these adverse effects.

Impacts to bull trout under the Proposed Action are likely to be similar to or less severe than the impacts under current operating conditions. The Proposed

Actions and Staff Alternatives are designed to reduce and mitigate for potential and unavoidable adverse effects on aquatic habitat and associated fish and aquatic plant resources with continued operation of the Spokane River Project. Specific measures that may benefit bull trout include implementing water quality PME measures, implementing Interpretation and Public Outreach Programs, and implementing Aquatic Weed Management Programs.

3.3.7 Cultural Resources

In this section, we address the effects of the Projects' operation and implementation of PME measures on cultural resources located within the Projects' area of potential effects (APE). A comprehensive overview of cultural resources located within the Projects, including the prehistory and history of the region in and around the Projects, can be found in the three cultural resource investigations completed for the purpose of the ALP (Entrix and Western Historical Services, 2004; Entrix, 2005; HRA, 2006).

3.3.7.1 Affected Environment

Except as noted, this description of the affected environment is taken from the *Spokane River Hydroelectric Project FERC No. 2545 Applicant Prepared Preliminary Draft Environmental Assessment Volume II* (Avista, 2005). Avista's description was based on the *Cultural Resources Overview for the Spokane River Hydroelectric Project Report* (Entrix and Western Historical Services, 2004). Additional information is drawn from the cultural resource inventory study (Entrix, 2005) and the historic properties evaluation report (HRA, 2006). Much of the information was taken verbatim from Entrix (2005) and used in section 3.3.7.1.2, *Cultural and Historic Context Involving the Region in and around the Projects*.

Cultural resources consist of prehistoric and historic period archaeological sites, historic structures, and traditional cultural properties (TCPs). Section 106 of the NHPA requires the Commission to evaluate potential effects of the Projects on cultural resources listed or eligible for listing in the National Register of Historic Places (National Register) and to afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment on the proposed undertaking. In this case, the undertaking is the new license. The section 106 implementing regulations, 36 CFR 800, utilize the term "historic properties" to define National Register-eligible cultural resources. To be considered eligible for listing in the National Register, properties must retain their integrity and meet one of the following criteria:

- be associated with events that may have a significant contribution to the broad patterns of our history;

- be associated with the lives of persons significant in our past;
- embody the distinctive characteristics of a type, period, or method of construction; or
- have yielded or may be likely to yield information important in history (36 CFR 60.4).

Section 106 also requires that the Commission seek ways to avoid, reduce, or mitigate adverse effects to historic properties. Such measures need to be developed in consultation with the State Historic Preservation Officer(s) (SHPO) and with Native American tribes that attach religious and cultural significance to historic properties that may be affected by the Projects (36 CFR 800). In cases where adverse effects to historic properties have been identified, a memorandum of agreement (MOA) is executed between the Commission and the other signatories (the SHPO and ACHP, if the latter decides to participate) to demonstrate that such adverse effects will be resolved. In cases where a non-federal agency, such as a licensee, is delegated major responsibilities under section 106, the Commission crafts a programmatic agreement (PA) instead of a MOA. Furthermore, since part of the Post Falls Project is on the Coeur d'Alene Reservation, the Tribal Historic Preservation Officer (THPO) would be another signatory to the PA. The PA, in turn, would stipulate that a Historic Properties Management Plan (HPMP) be implemented to carry out the resolution of identified Project-related adverse effects to historic properties. The HPMP would be crafted in accordance with the *Guidelines for the Development of Historic Properties Management Plans* issued by the Commission and the ACHP (May 2002).

For Avista, this work is accomplished through the Projects' Cultural Resources Work Group (CRWG), which was established to provide a forum for group members to guide the section 106 compliance process for relicensing the Projects. The CRWG was established out of a larger group of public participants at the beginning of the relicensing process in order to review and comment on non-public confidential information involving archaeological sites and sensitive Tribal religious issues. Before the CRWG was formed, representatives of the Historical Society of Post Falls and the City of Spokane were present at the meetings, but the two parties left voluntarily when confidential cultural resource information became available. The CRWG includes the Washington and Idaho SHPOs, Coeur d'Alene Tribe, Spokane Tribes, Kalispel Tribe, and Colville Confederated Tribes. The CRWG meetings focus on identifying cultural resource issues, gathering input and guidance on cultural resource investigations, and developing protection and mitigation actions for the HPMP. These meetings began in 2002 and will continue until the finalization of the HPMP.

3.3.7.1.1 The Projects' Area of Potential Effects

An APE, as defined in the implementing regulations for section 106, means the geographic area within which an undertaking may cause changes in the character of or use of historic properties. The CRWG for the Projects' relicensing process has developed an overall APE definition that includes all five developments. The APE includes, at a minimum, lands within the Spokane River Developments and the Post Falls Project FERC boundaries. Also included in the APE are the penstocks, powerhouses, dams, recreational sites, a limited number of power transmission lines, access roads, and other ancillary facilities as described in the FERC license associated with the Projects. The APE also includes lands outside the Projects' boundary where operations involving both Projects may affect the character or use of historic properties, including TCPs. The APE is a flexible boundary that may be adjusted as conditions change or additional effects are identified. As discussed previously, the Projects include five hydroelectric developments along the Spokane River, which flows west from Coeur d'Alene Lake almost 80 miles to where the river enters the pooled Columbia River at Lake Roosevelt, the reservoir behind Grand Coulee Dam (see Figure 1.0-1).

The APE involving the Post Falls Project includes the Post Falls Development (completed in 1906), the nine-mile Spokane River outlet, Coeur d'Alene Lake, and the Coeur d'Alene, St. Joe, and St. Maries rivers. Approximately 9 miles of the St. Maries River, 30.5 miles of the Coeur d'Alene River, and 33 miles of the St Joe River are within the Post Falls Project APE above Coeur d'Alene Lake. Coeur d'Alene Lake covers approximately 30,000 acres, and its summer elevation is 2,128 feet above sea level.

The Post Falls Development consists of three dams, each occupying a separate channel of the Post Falls. The hydroelectric facilities are 9 miles downstream from the single outlet of Coeur d'Alene Lake, which is the beginning of the Spokane River. While the presence of the Post Falls dams influences the water level of the lake, the exit passage is the lake's natural outlet; weather and hydrology of the two major feeder rivers (the Coeur d'Alene and the St. Joe) have the greatest effect on the day-to-day level of Coeur d'Alene Lake. Seasonally, the Post Falls Development affects lake levels, particularly during the summer when it is maintained at 2,128 feet above mean sea level, in contrast to the natural pattern of declining pool level over the course of the season.

From west to east (moving upriver), the APE associated with the Spokane River Developments include the Long Lake Development (completed in 1915), Nine Mile Development (1910), Monroe Street Development (1890), and Upper Falls Development (1922). Lake Spokane, the 23.5-mile-long reservoir behind Long Lake Dam, occurs largely within a relatively narrow section of the river valley. At its upper end, the Little Spokane River joins the main channel in a broader part of the valley. The upper end of the reservoir is shallower, in part due to siltation from Latah (Hangman) Creek. The Nine Mile reservoir is nearly 6 miles long and is relatively shallow, also due to siltation from Hangman Creek. The pool behind the Monroe Street Development is less than 5 acres in size. The Upper Falls Development occurs on two separate channels of the Spokane River, encompassing an island within the City of Spokane's Riverfront Park, the site of the 1974 World's Fair. Because this 4-mile-long reservoir is in the heart of the city, the banks of the river have been fortified since the early years of the city's development; little natural shoreline remains. Numerous buildings have been built, renovated, or torn down and rebuilt along this stretch of the river.

The archaeological inventory for the Projects' APE included all lands below the normal high pool mark and any exposed cutbanks at the edge of the lakes or reservoirs. The inventory of the aboveground historic resources included areas within 100 feet of the high pool mark of the lakes and rivers within the FERC boundary of the Projects. This ensures that the context of historic resources that are listed in, eligible for, or previously determined eligible for the National Register is considered when assessing the potential for effects associated with the Projects.

3.3.7.1.2 Cultural and Historic Context Involving the Region in and Around the Projects

3.3.7.1.2.1 Pre-Contact History

Environmental changes in the Plateau region through time are reflected by changes in cultural material assemblages, and the extent of influence of possible cultural and/or demographic changes is not well understood. The earliest occupants of the region, dating to ca. 10,000-13,000 before the present (B.P.), were foraging groups with high mobility, moving relatively constantly between habitation sites occupied at certain times of an annual round (Thoms, 1991). These habitation sites were located where seasonally available resources such as fish, animals, and plants could be harvested. Such habitation sites are marked archaeologically by fire hearths, scatters of stone and bone tools, and the detritus of tool manufacturing, as well as the durable remains of the resources the occupants ate and discarded, such as animal bones and shells. These remains form a "midden," the extent and density of which depends on how long or how often a site was occupied. Structural remnants are rarely found at forager habitation sites and can be confused with short-term "camp" sites commonly associated with later Plateau prehistoric settlement patterns. Resource-gathering locations contain lesser numbers and amounts of archaeological remains, as these sites were generally focused on a single resource or a small number of resources that were minimally processed at the source and taken to a habitation site for further processing and consumption. Resource location sites generally exhibit few kinds and low densities of durable remains.

At about the same time as the end of a drier climatic period in the Plateau region, approximately 4500 B.P., there is evidence of an increase in population, increasingly sedentary living, and changes in the use of food resource types (Chatters, 1995). More sedentary living is marked by the presence of villages consisting of semi-subterranean pithouses, generally in the major river valleys. After 2000 B.P., the number of pithouses increased in villages, indicating an increase in population. The larger villages were often located at prominent fishing locations, although this may have been more so in late pre-contact times (Ames et al., 1998; Hicks, 2004).

Plateau people still participated in an annual migratory round that took them to multiple resource locations at the best harvest times. But there was a stronger tie to the major habitation sites as some of the resources were processed and moved to storage areas at the valley bottom, river-side villages where they were consumed over the winter when fewer fresh resources were available. This subsistence settlement pattern is referred to as a "logistical collector" pattern (Binford, 1980). Evidence of food storage is derived from pit features. These pits increase in frequency concomitantly with the increase in village size. The types of storage pits constructed and used was variable, ranging from lined and layered pits in rockshelters to less formal types such as shallow pits excavated in rock talus slopes.

This "collector" subsistence pattern is viewed as a major socioeconomic change from the previous "forager" pattern, and tool assemblages reflect the change in organization. Collectors are expected to use fewer short-term habitation sites than foragers. These "camps" are in more redundant locations through time at the resource locations that offered the greatest opportunity to collect large amounts of storable food resources. This distribution also makes it difficult to distinguish between resource gathering locations and actual "camps", as camps are usually prominent at the resource grounds. This is especially true of late Prehistoric camps associated with root grounds, where processing included baking the roots in large volumes. Short-term camps associated with hunting and other plant collection (e.g., berries) activities are common in upland areas. Numerous stone quarry sites are recorded for the late prehistoric period. Most known sources of exposed obsidian bedrock were being exploited by late prehistory; all known obsidian sources are well to the south of the Project areas in Oregon and Idaho.

Human remains from early-Holocene sites are extremely rare; therefore, burial patterns cannot be described. Within the vicinity of the Projects, only Marmes Rockshelter has human burials that predate the 6730 B.P. Mazama ashfall (Sprague, 2000). In addition to Marmes Rockshelter, a few other sites in the region have been found to contain mid- to late-Holocene burials, which are primarily pit inhumations, with consistent orientation, and grave goods. Subsequent to this, burials are better known, in part because of the large population decline that accompanied the epidemics that began to strike the region's people in the late 1700s. The universal pattern in the late historic period was on of extended burials on the back in rough boxes (Sprague, 2000). Late prehistoric burials recovered north of the Columbia Basin along the Columbia River in recent years included three burials oriented to the south or downriver (Roulette, 1997). It is suggested that at least in prehistory, orientation may follow less a compass direction than the direction of the flow of the nearby major river (Hicks, 2004).

3.3.7.1.2.2 Ethnography

Ross (1991) indicates that the first important ethnographic work in the Plateau was conducted by Verne Ray, who essentially refuted Spinden's (1908) earlier statement that this region was not a distinct culture area, but rather what he erroneously termed a "transitional" area. Ray (1933, 1936a,b) asserted the Plateau's uniqueness as a definite culture area based on linguistic groups, subsistence orientation, and intergroup socioeconomic relationships. Tribes associated with the Project areas include the Spokane, Coeur d'Alene, and the Confederated Tribes of the Colville Reservation. Other neighboring tribes are described in a recent cultural resource study (Entrix and Western Historical Service, 2004).

Anastasio (1972), building on Ray's work, conceptualized the Plateau as a socially unified area and described the cultural and social mechanisms making this unification possible. Two interactions occurred in and among Plateau societies: one between people and their natural environment (ecological), and the other between tribes (intertribal or international). These two kinds of interactions are related, each affecting the other to form in the Plateau an overall areal entity. This resulted in an intergroup culture, which facilitated intergroup relations within the Plateau (Anastasio, 1972).

Salmon was central to the economic, cultural, and spiritual lives of many of the Plateau communities. The bountiful salmon and steelhead runs of the Columbia River provided the Plateau people with one of their main subsistence resources. Salmon also occupied a central place in their cultural and spiritual life. The people eagerly awaited the first arrival of fish from the ocean in the spring, and marked the first catch of the season with 5 days of ceremony and elaborate ritual behavior. Nineteenth century Euroamerican visitors to the Plateau described with awe the tens of thousands of pounds of fish harvested and prepared by the Native Americans at their principal fisheries (Ortolano et al., 2000).

Salmon and other fish were caught in nearly all the rivers, streams, and lakes in the region. Each tribe had its own fishing locations and also shared in the harvest at the large intertribal fisheries, following the anadromous fish in their course upriver. The tribe that controlled a particular fishery appointed a salmon chief to oversee the harvest, distribution, and proper observance of ritual. In most years there was a surplus that could be traded for items and materials not found in a tribe's own territory, such as shells and baskets from the coast. Games, horse racing, gambling, and trade took place at the camps surrounding the fisheries (Ortolano et al., 2000).

Salmon and other species of fish nourished the Native people physically, providing an estimated one-quarter or more of the caloric needs for most of the Plateau tribes (Ortolano et al., 2000). The annual salmon ceremony and the salmon stories told throughout the year were central to spiritual life; they reflected the reverence native peoples held for all life forms. The distribution of fish to all members of the community and to all visitors reinforced core cultural values of egalitarianism and generosity. The intertribal gatherings that accompanied the salmon harvest promoted reciprocal and peaceful relationships across the Plateau (Ortolano et al., 2000).

The tribes were guided in all their choices and relationships by certain well-defined beliefs and values. Emphasis in education, training, religion, and all social and political action, was strongly placed in this system of values. The responsibilities of chiefs and other leading men were primarily the support of these principles. Issues and matters of a material nature were of distinctly less importance (Ray, 1977).

Hunting, fishing, and gathering comprised the three major phases of the annual subsistence round (Keeler, 1973). These activities tended to overlap with one another and, consequently, articulated to form a complete annual cycle of resource exploitation (Liljeblad, 1972). Root digging and berry collecting camps in the spring were invariably relatively small, since little if any cooperation is required in gathering plant foods. Late summer and early fall camps, often at higher elevations, were the focus of deer hunting and plant collecting (Ross, 1991).

The fur trade, which began in the early 1800s in the Project areas, affected Native peoples before actual contact with Euroamericans through the introduction of European, British, and American trade goods that were passed from tribe to tribe. A second, more devastating effect was the introduction of diseases. Many of these diseases—including smallpox, malaria, and measles—were not formerly experienced by Native peoples, who had very little resistance to them. Successive outbreaks of smallpox decimated populations of both the Spokane and Coeur d'Alene Tribes.

Fur traders and trappers introduced Christianity to Native Americans in the Northwest beginning in the late eighteenth century. Through their contact with the French Canadian Catholic trappers, many tribes of the Northwest learned of the Black Robes (Catholic missionaries) and waited for them to enter their territories to teach their religious beliefs. In 1842, Jesuit missionaries established the first Jesuit mission among the Coeur d'Alene Tribe on land at the confluence of the St. Joe River and Coeur d'Alene Lake (Entrix and Western Historical Services, 2004). The mission proved to be of religious, strategic, and economic importance to the Coeur d'Alene. The Indian Treaty of 1873 excluded the Coeur d'Alene from the mission, and a new mission was established in DeSmet, Idaho, in 1877. Protestant missionaries also traveled west to expose Native Americans to non-Catholic Christian doctrine.

The first Colville Reservation was established by Executive Order on April 9, 1872, to accommodate about 4,200 Native Americans, including the Methow (316), Okanogan (340), Sanpoil (538), Lake (230), Colville (631), Kalispel (420), Coeur d'Alene (700), and other Native Americans. It was a large reservation bounded by the Spokane River to the south, the Columbia River to the west, the Pend Oreille River and Idaho state line to the east, and the Canadian border to the north. Within 3 months, a second Executive Order revised the boundary of the reservation, removing the rich bottomlands east of the Columbia River and excluding several of the tribes placed on the original reservation, including the Spokane, Coeur d'Alene, and Pend Oreille.

The federal government established the Coeur d'Alene Indian Reservation upstream of the current Post Falls Project location on November 8, 1873, and established the Spokane Indian Reservation downstream of the current Long Lake Development location on August 16, 1877. Intense Euroamerican settlement in eastern Washington and northern Idaho marked the decades following the 1880s. The Euroamerican settlement period brought about drastic change in the area.

3.3.7.1.2.3 Euroamerican Influence

Fur traders and trappers were the first Euroamericans to reach the current-day Spokane area. In 1810, Jacques (Jaco) Findlay, under the supervision of David Thompson of the North West Company, established the Spokane House, a fur trapping and trading depot, at the confluence of the Spokane and Little Spokane rivers. Large gatherings of Spokane Indians and other Native groups had long used this location as a place to catch and dry salmon and trout and to socialize and gamble (Bruce and Holstine, 1991). In 1812, 2 years after construction of Spokane House, the rival American-owned Pacific Fur Company built Fort Spokane within sight of the Spokane House. Because of the outbreak of the War of 1812, the Pacific Fur Company sold Fort Spokane to the North West Company in 1814. The North West Company abandoned the Spokane House to occupy the much more substantial Fort Spokane and eventually merged with the London-based Hudson's Bay Company in 1821 (Entrix and Western Historical Services, 2004). The fur trade had declined by the 1840s due to over-trapping and changes in fashion. During the great westward migration of the 1840s, settlers traveled on the roads established years earlier by fur trappers and traders (Entrix and Western Historical Services, 2004).

As discussed above, religious missionaries were established by Euroamericans in the region with the influx of the fur trade. The most prominent missionaries in and around the Project areas were French Canadian Jesuits, where they established a mission at the confluence of the St. Joe River and Coeur d'Alene Lake in 1842. The missions, along with their Native American constituents, were of great economic importance in furnishing supplies and food to the American military entering the region, and to miners into the 1880s.

The U.S. Army established the Mullan Military Road between 1859 and 1862 for the purpose of moving soldiers and goods from Fort Walla Walla to Fort Benton in Montana. The early route of the road ran north from Walla Walla to the south end of Coeur d'Alene Lake, crossing the St. Joe River near the old 1842 mission site and going further east along the Coeur d'Alene River.

Graziers (farmers) and homesteaders were the first groups of Euroamericans to settle in large numbers in Spokane country. They began moving into the region during the last part of the eighteenth century. By 1910, little more than 40 years after the first concerted agricultural immigration into the farming country of the region, almost no land was left unclaimed, including the most marginal lands. Early graziers had been pushed out of the area by bad weather and the increasing number of homesteaders. The City of Spokane had become the major urban center for the region, with the agricultural industry leading as the major supplier of resources. It was also the western terminus of the Northern Pacific line that traversed the Rocky Mountains from the east.

Mining was a second major impetus to the development of towns, power generation, and transportation systems. Mineral extraction from the Coeur d'Alene Mining District began in 1882 when Andrew J. Prichard established the first silver lode location upstream of Coeur d'Alene Lake, and miners rushed to the area. The Coeur d'Alene Mining District eventually became the world's largest silver-producing mining district.

With access to the region by rail and then automobile, tourism reached the region by the early twentieth century. Travelers were drawn to places that featured spas and hot springs, including Medicine Lake. Autocamps and campgrounds sprang up in towns and cities and along major highways. In the 1930s, the Civilian

Conservation Corps constructed numerous public campgrounds, including several along the shoreline of Coeur d’Alene Lake.

In the community of Post Falls, population growth associated with mining spurred the development of hydroelectric power. In the late 1800s, Frederick Post, for whom the community was named, dammed the Spokane River at the location of a waterfall to provide power for his sawmill and gristmill. By 1900, Post sold his land to R.K. Neill, who in turn sold his interest to the Washington Water Power Company.

Washington Water Power used the natural deep rock gorges in the Spokane River to develop hydropower plants, beginning with Monroe Street Development in 1889. During a period of 35 years, the company completed or acquired five more plants: Post Falls Development (constructed 1904–1906); Nine Mile Development (constructed 1906–1910 by the Spokane and Inland Empire Railway Company and purchased by Washington Water Power in 1925); Little Falls Development (constructed 1908–1910); Long Lake Development (constructed 1911–1915); and Upper Falls Development (constructed 1921–1922). The City of Spokane owns and operates Upriver Dam (constructed in 1936), located upstream of Upper Falls and Monroe Street Developments.

3.3.7.1.3 Pre-Project Relicensing-Related Cultural Resource Investigations Associated with the Projects

The Spokane/Coeur d’Alene River Basin is one of the least studied and archaeologically understood river basins in the Pacific Northwest. Numerous archaeological investigations have been conducted in the middle Spokane valley; however, only a limited number have resulted in significant prehistoric era discoveries. Washington State University’s Centennial Trail Archaeological Project was the first full-scale survey, testing, and data recovery project in the Spokane/Coeur d’Alene River basin (Draper and Andrefsky, 1991). Within the Coeur d’Alene Lake study area, little systematic, multi-phase archaeological investigation has been conducted.

3.3.7.1.3.1 Spokane River

The Centennial Trail Archaeological Project consisted of the river corridor extending from the Little Spokane River to the Washington-Idaho state line. Thirty-five prehistoric, historic, and multi-component sites were identified during the survey portion of the project (Draper and Andrefsky, 1991).

3.3.7.1.3.2 Coeur d'Alene Lake

A survey by Tom Miller, Jr., in the early 1950s identified 38 sites, many of which were located along the Spokane River and its outlet from Coeur d'Alene Lake, as well as the Medicine Lake area. Miller discovered habitation sites, lithic materials, and bone tools, which led to the development of a loose typological framework for the region (Miller, 1959). Many of the sites Miller identified in the Coeur d'Alene area represent locales of larger sites when subsequently recorded (e.g., six of Miller's sites occur within the Ft. Sherman Village site on the east side of the outlet of Coeur d'Alene Lake).

Previous archaeological investigation has been conducted along the St. Joe River in the 1970s. A comprehensive study of known archaeological resources on national forest land in northern Idaho by Rice et al. (1974) compiled a list of 162 cultural resources within the USDA Forest Service's St. Maries Planning Zone, some of which may occur within the Post Falls Project APE. The identified sites were not ground-truthed by the Forest Service, and most remain potential sites marked for further evaluation in the future. A survey of the St. Joe Wild and Scenic River area included an intensive literature review, field survey, and interview process with local informants (Rice et al., 1977). The survey of the St. Joe River from Coeur d'Alene Lake to the Montana state line recorded 21 prehistoric and 37 historic archaeological sites. The prehistoric sites are generally described as camps (14), rock shelters (5), and burial grounds (2). The remaining sites are historic period structures and transportation improvements (Rice et al., 1977).

The Murphey Survey, conducted in 1977, included a survey of the south end of the Coeur d'Alene Lake during a period of lowered lake levels approaching those of the pre-dam era. The study recorded 25 archaeological sites, 19 isolates, and 5 historic sites. Included in these sites were habitation sites, purported burial sites, processing stations, and historic homesteads. Thirty-five of the sites and isolates were located along the shores of the lake, five were on the St. Joe River delta, and nine were on terraces or in talus slopes overlooking the lake. Murphey reports that all of the historic sites were found on or near the shoreline. A complex of sites was discovered near the mouth of the St. Joe River, which may represent a set of ethnographic villages (Murphey, 1995).

A 1993 survey was conducted along the south side of the mouth of the Coeur d'Alene River from Coeur d'Alene Lake northwest of Harrison to the Highway 97 bridge and Bell Bay to the Coeur d'Alene Indian Reservation at Harlow Point. This survey found evidence of habitation in undisturbed areas consisting largely of chipping detritus, fire-cracked rock, and small projectile points (Sprague, 1994). Numerous small surveys have been undertaken adjacent to the Post Falls Project outside of the APE in the recent past as urban development in the Coeur d'Alene and Post Falls areas has increased.

A total of 72 archaeological sites have been recorded by these previous archaeological investigations. The majority of these are described as temporary camps or lithic scatters indicative of processing stations. Other notable sites are the Fort Spokane site complex and the historic rail line on the shoreline of Coeur d'Alene Lake (10KA393).

The only previously recorded aboveground historic resources within the APE are the five hydroelectric developments, including their associated structures and facilities, and several bridges, including the railroad bridge and grade at Coeur d'Alene Lake that has been recently converted to the Trail of the Coeur d'Alene pedestrian/bike path.

3.3.7.1.4 Cultural Resource Investigations Related to the Projects' Relicensing Process

Three major cultural resource investigations have been undertaken for the relicensing process associated with the Projects. A cultural resources overview for the Project areas was developed in 2004 by Entrix and Western Historical Services; this overview provided a cultural and historic context for evaluating the importance of individual properties located in the Project areas and for assessing a property's eligibility for listing in the National Register. The cultural context was developed by accounting for all previously recorded historic properties in the Project areas and vicinity, and reviewing the human use of the area to develop an understanding of how individual properties reflect that use. The overview resulted in the development of research themes applicable to the region and specific topics and questions applicable to the Project areas, which guided the research design for the cultural resource inventory and historic properties evaluation.

In order to identify cultural resources within the Projects' APE, a comprehensive inventory was conducted by Entrix and a report was completed in November 2005. The cultural resources inventory was done by standard pedestrian survey using parallel, meandering transects no more than 65 feet wide. The intensity of the survey depended largely on topographic exposure at the given lake levels when the survey was conducted. Generally, the survey was limited to elevations below 2,128 feet. Areas within the APE that were not systematically walked over included areas of riverbank that were riprapped, areas that were covered by structures, areas obstructed by development such as residential hillsides and breakwater structures, areas where slopes exceed 10 degrees, and private property where landowners did not grant permission to have their lands surveyed (Entrix, 2005). Twenty five shovel test probes were conducted at three locations around Coeur d'Alene Lake and at Anderson Lake at possible ethnographic sites. None of the subsurface shovel probes resulted in the discovery of cultural material. Architectural historians conducted a historic property inventory for aboveground structures by land but were unable to obtain right of entry access for all shoreline areas.

A historic properties evaluation study was completed in June 2006 by Historical Research Associates, Inc. (HRA). The evaluation focused on archaeological test excavations of 30 archaeological sites originally deemed of uncertain eligibility for inclusion in the National Register during the inventory phase. The sites with unknown eligibility were classified within 27 different site designations, and a sample of site classes was selected for archaeological testing.

Avista also initiated TCP studies with the Colville Confederated Tribes, Spokane Tribe, and the Coeur d'Alene Tribes. Each tribe will produce a TCP report and file it with Avista for final review. These TCP reports are currently being formulated by the tribes.

3.3.7.1.5 Cultural Resources Identified in the Projects' APE

3.3.7.1.5.1 Archaeological Resources

The cultural resources inventory recorded 247 archaeological sites and 119 isolated finds within the Projects' APE (Entrix, 2005).

Ninety-three percent of the archaeological sites (231) and 97 percent of the isolated finds occur within the Post Falls Project APE.

A total of 16 archaeological sites were located in the Spokane River Developments APE. Thirteen archaeological sites and three isolated finds occur within the APE at Long Lake Development. Three archaeological sites occur within the APE at Upper Falls Development. There are no recorded archaeological sites within the APE of the Monroe and Nine-Mile Development areas.

Fifty-eight percent of all of the archaeological sites in the Projects' APE are located on river shorelines, 36 percent of the archaeological sites are located on lake shorelines, and 6 percent of the archaeological sites are located on interlake zones between lake and river shorelines, most in the low-lying areas between the chain lakes.

Of the 247 archaeological sites located in the Projects' APE, 71 are determined to be eligible for the National Register (Table 3.3.7.1-1). Sixty-one are pre-contact archaeological resources; the remaining ten are multi-component sites consisting of historic and pre-contact features. All but four of the 71 National Register-eligible archaeological sites are located in the Post Falls Project APE.

Table 3.3.7.1-1. National Register-eligible archaeological resources located within the Project APE in Idaho and Washington

Site No.	Site Class	Degree of Impacts	Potential Effects
National Register Eligibility Based on Archaeological Inventory (Surface Data)			
ENT-124	PS	M	Recreation, Vandalism, Erosion
10BW28	PS	M	Recreation, Vandalism, Erosion
10BW23	PS	M	Recreation, Vandalism, Erosion
ENT-225	PS	M	Erosion(F), Erosion
ENT-226	PF	M	Erosion(F), Erosion
ENT-224	PF	M	Erosion(F), Erosion
10BW33	PF	M	Erosion(F), Erosion
10BW22	HF, PS	M	Recreation, Vandalism, Erosion
ENT-122	PS, PF	M	Recreation, Development, Erosion(F), Erosion
ENT-155	PS, PF	M	Erosion
ENT-159	PS	M	Development, Erosion
10KA47	PS	M	Recreation, Erosion
ENT EG-02	PS	M	Erosion(F), Erosion
ENT-009	PF	H	Recreation, Erosion
ENT-008	PF	H	Recreation, Erosion
ENT-006	PF	H	Recreation, Erosion
ENT-005	PF	H	Recreation, Erosion
ENT-011	PF	H	Recreation, Erosion
ENT-010	PF	H	Recreation, Erosion
ENT-004	PF	H	Recreation, Erosion(F), Erosion
10BW120	PS	H	Recreation, Vandalism, Erosion
ENT-103	PS	H	Recreation, Vandalism, Erosion
ENT-210	PS	H	Erosion
ENT-236	PF, PS, HS	H	Erosion(F)
ENT-221	PF, HF	H	Erosion(F), Vandalism, Erosion
ENT-235	PF	H	Erosion
ENT-222	PF	H	Erosion(F), Vandalism, Erosion
ENT-213	PF	H	Erosion(F), Erosion

Table 3.3.7.1-1. National Register-eligible archaeological resources located within the Project APE in Idaho and Washington (continued)

Site No.	Site Class	Degree of Impacts	Potential Effects
10BW32/31	PF	H	Development, Erosion(F), Erosion
ENT-214	PF	H	Erosion
10KA334	PS	H	Vandalism, Erosion
ENT-187	PS, PF	H	Erosion
ENT-152	PS, HS	H	Development, Erosion
ENT-Black 1	PS	H	Development, Erosion(F), Vandalism, Erosion
ENT-BL2	PS	H	Recreation, Erosion(F), Erosion
ENT-184	PS	H	Erosion
ENT-126	PS	H	Recreation, Erosion
ENT-118	PS	H	Recreation, Development, Erosion
ENT-157	PF, HS	H	Development, Erosion
ENT-191	PF	H	Erosion
ENT-175	PF	H	Recreation, Development, Erosion
ENT-141	PF	H	Recreation, Erosion
ENT-121	PF	H	Recreation, Erosion(F), Vandalism, Erosion
ENT-116	PF	H	Recreation, Vandalism, Erosion
ENT-115	PF	H	Recreation, Vandalism, Erosion
ENT-113	PF	H	Recreation, Erosion
ENT-112	PF	H	Recreation, Erosion
ENT-110	PF	H	Recreation, Erosion
ENT-162	HF, HS, PS	H	Erosion, Development, Vandalism
10KA35	PS	H	Recreation, Development, Vandalism, Erosion
ENT-EA 006	PF	H	Recreation, Development, Erosion(F), Erosion
ENT-217	PF	H	Erosion
ENT-144	Pet	H	Erosion
ENT-130	PS	H	Recreation, Development, Vandalism, Erosion
10KA5	PF	H	Development, Erosion(F), Vandalism, Erosion
ENT-131	PF	H	Recreation, Development, Erosion(F), Vandalism, Erosion

Table 3.3.7.1-1. National Register-eligible archaeological resources located within the Project APE in Idaho and Washington (continued)

Site No.	Site Class	Degree of Impacts	Potential Effects
10KA48	HF, PS	H	Development, Recreation, Vandalism, Erosion
45SP14	PS	H	Development, Vandalism, Erosion(F), Erosion
ENT LL-04	PF, PS, HS	H	Development, Erosion(F), Erosion
ENT-136 WA	PF	H	Recreation, Erosion(F), Erosion
National Register Eligibility Based on Archaeological Test Excavations (Subsurface Data)			
10BW193	PS/HSt/HS	M	Development, Recreation, Erosion
10BW198	PF/PS	M	Erosion, Erosion (F)
10BW199	PF/PS	H	Erosion
10BW200	PS/PF/HS	H	Erosion, Erosion (F)
10BW201	PF/PS	H	Erosion, Erosion (F)
10BW202/203	PF/PS	H	Erosion, Erosion (F)
10BW204	PF	H	Erosion, Erosion (F), Vandalism
10BW206	PF	H	Erosion
10BW209	PF	H	Erosion
10KA425	PF/PS/HF	L	Development, Erosion, Erosion (F)
45SP448/483	PS/PF	H	Recreation, Erosion, Erosion (F)

Notes: Erosion – shoreline erosion
Erosion(F) – deflation (movement) of sediments
HF – historic feature
HS – historic scatter
HSt – historic structure
Pet – petroglyph
PF – prehistoric feature
PQ – prehistoric quarry
PS – prehistoric scatter

H - high
M - medium
L - low

Sources: HRA, 2006; Entrix, 2005

Avista had completed preliminary National Register-eligibility assessments of the archaeological resources recorded in the Projects' APE based on surface data and concluded that 60 sites should be considered eligible for listing in the National Register (Entrix, 2005). Another 25 could be considered not eligible, while National Register eligibility for the remaining 162 sites is unknown because the visible contents at these sites were not of sufficient density or richness, or of apparent integrity, for the surveyors to confidently judge them as either retaining or not retaining important information.

All but 11 of the 162 undetermined-eligibility sites are located in the Post Falls Project APE. None of the isolated finds investigated were considered to be eligible.

Of the 162 sites with unknown National Register-eligibility, 30 sites were selected to be evaluated for National Register eligibility evaluation through archaeological test excavations. These sites were selected based on a representative sample of sites recorded within the Projects' APE reflecting variation in site classification and geographic location and based on ease of access (sites located on private property were not as accessible for testing as those located on public lands). Archaeological testing revealed that 3 of the 30 sites tested are portions of neighboring evaluated sites, reducing the total number of archaeological sites to 27. Out of the 27 sites, 11 are considered eligible for inclusion in the National Register, while the remaining 16 are considered not eligible for the National Register (HRA, 2006). All but one of the 11 eligible sites are located in the Post Falls Project APE.

Based on the results of the evaluative testing, HRA (2006) recommended that archaeological sites located in the St. Joe River levee and in the St. Maries River valley of the Post Falls Project APE be managed as two separate historic districts.

A third historic district, in the area of the confluence of the Spokane River with the Little Spokane River, is recommended for the Spokane River Project APE. The area at the confluence of the Spokane River and the Little Spokane River has been proposed as an archaeological district in the recent past, called the Spokane House Archaeological District, but was never forwarded for consideration to the SHPO. HRA recommended that this be revisited and that the district be expanded to include newly recorded sites.

3.3.7.1.5.2 Aboveground Historic Resources

The cultural resource inventory identified 44 aboveground historic resources within the Projects' APE or within 100 feet of the APE that are considered eligible for listing in the National Register. Aboveground historic resources located within 100 feet of the APE were examined to provide context for evaluating the historic resources located within the APE.

Of the 44 aboveground historic resources located within the Projects' APE or within 100 feet of the APE, 39 are listed or considered eligible for listing in the National Register. These aboveground historic properties consist of buildings and structures associated with the Projects. Twenty of these properties are located in the State of Idaho, and 19 are located in the State of Washington. The cultural resources evaluation concluded that of the 39 National Register-eligible properties, 15 are associated with the Projects and under the control and jurisdiction of Avista and FERC. Eight of the resources are in Washington and are associated with the Spokane River Developments APE (HRA, 2006). The remaining seven are in Idaho and are associated with the Post Falls Project APE. Table 3.3.7.1-2 provides the National Register status, criteria for listing, and historic theme of each resource and indicates whether the resource is located within the APE (i.e., within the control and jurisdiction of Avista and FERC).

3.3.7.1.5.3 Traditional Cultural Properties

TCP studies are being conducted through the combined efforts of Avista, the Coeur d'Alene Tribe, the Confederated Tribes of the Colville Reservation, and the Spokane Tribe of Indians. These studies are not completed. The results of the TCP studies will be reviewed by the CRWG and as authorized by the respective tribes, and, as appropriate, will be incorporated into the proposed HPMP for the Projects. Based on the cultural resources overview and letters filed by the Coeur d'Alene Tribe, the Spokane Tribe, and the Confederated Tribes of the Colville Reservation, TCPs are likely to be located within the Projects' APE. TCPs may consist of, but are not limited to, traditional fishing locations, traditional plant and natural resource gathering areas, traditional hunting locations, petroglyphs, village sites, home sites, and other types of aboriginally occupied archaeological sites.

3.3.7.2 Environmental Consequences

3.3.7.2.1 Post Falls Project

3.3.7.2.1.1 Effects of Lake Level Management

The Post Falls Project APE includes Coeur d'Alene Lake, a natural lake and tributaries that contain a rich deposit of archaeological resources associated with Native American use and settlement. The Coeur d'Alene Indian Reservation encompasses approximately the southern one-third of Coeur d'Alene Lake. Operation of the Post Falls Project has reduced the seasonal fluctuation range of the lake by maintaining the lake level of Coeur d'Alene Lake near 2,128 feet during the summer recreation season, from late June until after Labor Day in September. Under existing conditions, shoreline erosion has had detrimental effects on archaeological resources located on the lake shoreline and its tributaries. The Proposed Action would formalize the summer lake elevation of 2,128 feet, with a drawdown beginning September 15, which would be generally consistent with current practice.

Table 3.3.7.1-2. National Register evaluation of historic buildings and structures located within the APE or within 100 feet of the APE in Idaho and Washington

Historic Resource No.	Resource Name/Location	Year Built	National Register Status/Relevant Criteria	Theme	Located Within APE?
Idaho Historic Resources					
HR-46	Post Falls Project	1906	Eligible (2005) Criteria A and C	Hydroelectric Power	Yes
HR-45	St. Maries River Railroad Bridge Milwaukee St. Paul Railroad and St. Maries Creek, St. Maries	1909	Eligible (2005) Criteria A and C	Transportation	Yes
HR-44	Omega Gospel Hall St. Maries	1909	Eligible (2005) Criteria A and C	Town Building	No
HR-43	Benewah Lake Bridge West of St. Maries	1907	Recommended eligible (1982) Criterion C	Transportation	Yes
HR-42	Hunting Cabin West of Mission point on St. Joe Levee	c. 1940	Not eligible (2005)	Recreation	No
HR-41	Rocky Point Civilian Conservation Corps (CCC) Properties Heyburn State Park	1936	Listed (1994) Criteria A and C	Recreation	No
HR-40	Chatcolet CCC Picnic and Camping Area Heyburn State Park	1936	Listed (1994) Criteria A and C	Recreation	No
HR-39	Plummer Point CCC Picnic and Hiking Area Heyburn State Park	1936	Listed (1994) Criteria A and C	Recreation	No

Table 3.3.7.1-2. National Register evaluation of historic buildings and structures located within the APE or within 100 feet of the APE in Idaho and Washington (continued)

Historic Resource No.	Resource Name/Location	Year Built	National Register Status/Relevant Criteria	Theme	Located Within APE?
HR-38	Rose Lake Grocery Rose Lake	1910	Eligible (2005) Criterion A	Town Building	No
HR-37	Moe/Klein Farm Medicine Lake	1894	Eligible (2005) Criteria A and C	Agriculture	No
HR-36	Medimont Grocery Medimont	1910	Not eligible (2005)	Town Building	No
HR-35	Union Pacific Railroad, Wallace Branch Linear Resource beginning in Plummer, ID extending east along edge of Coeur d'Alene Lake		Eligible Criteria A and C (confirming with SHPO)	Transportation	No
HR-34	Coeur d'Alene River Bridge Harrison	1930	Not eligible (2000)	Transportation	No
HR-33	Harrison Historic District Harrison	Post 1917	Listed (1996) Criteria A and C	Town Building	No
HR-32	Mullan Road St. Maries	1853-1916	Listed (1990) Criterion A	Transportation	No

Table 3.3.7.1-2. National Register evaluation of historic buildings and structures located within the APE or within 100 feet of the APE in Idaho and Washington (continued)

Historic Resource No.	Resource Name/Location	Year Built	National Register Status/Relevant Criteria	Theme	Located Within APE?
HR-31	Beauty Creek Bridge Coeur d'Alene	1939	Recommended eligible (1999) Criteria A and C	Transportation	No
HR-30	Camp Easton Cabin Coeur d'Alene Lake waterfront, North of Gotham Bay	1929	Eligible (2005) Criteria A and C	Recreation	Yes
HR-29	Log House Turner Bay	1925	Eligible (2005) Criterion C	Town Building	No
HR-28	Residence 5702 Mica Shore Road, Coeur d'Alene	1949	Eligible (2005) Criterion C	Town Building	No
HR-26	Coeur d'Alene City Park Coeur d'Alene waterfront	1904	Eligible (2005) Criterion A	Recreation	Yes
HR-25	Washington Water Power Concrete Arch Bridge 0.5 mile west of intersection of Spokane and 4th Street, Post Falls	1929	Listed (1996) Criterion A	Transportation	Yes
HR-24	Spokane Valley Land and Water Company Canal Diverts in Falls Park, 4th Street, Post Falls	1907	Listed (2003) Criterion A	Town Building	Yes

Table 3.3.7.1-2. National Register evaluation of historic buildings and structures located within the APE or within 100 feet of the APE in Idaho and Washington (continued)

Historic Resource No.	Resource Name/Location	Year Built	National Register Status/Relevant Criteria	Theme	Located Within APE?
Washington Historic Resources					
HR-23	Ross Park Steam Plant 1605 E. Upriver Drive, Spokane	1907	Eligible (2005) Criteria A and C	Hydroelectric Power	Yes
HR-22	Residence 1002 N. South Riverton Avenue, Spokane	1906	Eligible (2005) Criterion C	Town Building	No
HR-21	Residence 1008 N. South Riverton Avenue, Spokane	1907	Eligible (2005) Criterion C	Town Building	No
HR-20	Residence 920 N. Perry Street, Spokane	1908	Not eligible (2005)	Town Building	No
HR-19	Residence 924 N. Perry Street, Spokane	1906	Eligible (2005) Criterion C	Town Building	No
HR-18	Residence 928 N. Perry Street, Spokane	1909	Not eligible (2005)	Town Building	No
HR-17	Spokane River Railroad Bridge Union Pacific Railroad and Spokane River, vicinity of Spokane	1902	Eligible (2005) Criterion C	Transportation	Yes

Table 3.3.7.1-2. National Register evaluation of historic buildings and structures located within the APE or within 100 feet of the APE in Idaho and Washington (continued)

Historic Resource No.	Resource Name/Location	Year Built	National Register Status/Relevant Criteria	Theme	Located Within APE?
HR-16	Spokane Toilet Supply/Sunrise Wood Products Lumber Company 629 N. Erie Street, Spokane	1913	Eligible (2005) Criteria A and C	Town Building	No
HR-15	Cascade Laundry/ Northern Lights Brewery Building 1003 E. Trent Avenue, Spokane	1915	Eligible (2005) Criterion C	Town Building	No
HR-14	Spokane & Inland Empire RR Co. Car Barns and Repair Shops/ Taylor Edwards Warehouse 800 E. Front Avenue, Spokane	1895	Determined eligible (1979) Criterion A	Town Building	No
HR-13	Upper Falls Power Plant 600 N. Wall, Spokane	1922	Listed (1998) Criterion A	Hydroelectric Power	Yes
HR-12	Great Northern Railway Passenger Depot Tower West 400 Block S. Bank of Havermale Island, Spokane	1902	Listed (1972): WA Register of Historic Places	Transportation	No
HR-11	Natatorium Carousel Spokane Falls Boulevard Opposite Howard, Spokane	1909	Listed (1976) No criteria identified	Recreation	No

Table 3.3.7.1-2. National Register evaluation of historic buildings and structures located within the APE or within 100 feet of the APE in Idaho and Washington (continued)

Historic Resource No.	Resource Name/Location	Year Built	National Register Status/Relevant Criteria	Theme	Located Within APE?
HR-10	Spokane Flour Mill West 621 Mallon Avenue	1895	Listed (1977)	Town Building	No
HR-9	Lincoln Street Bridge Intersection BNSF mainline and Lincoln St., Spokane	c. 1915	Listed (awaiting Department of Archaeology and Historic Preservation concurrence)	Transportation	No
HR-8	West Downtown Historic Transportation Corridor Spokane	1900s	Listed (1999) Criteria A and C	Transportation	No
HR-7	Montgomery Ward West 808 Spokane Falls Boulevard	1929	Eligible (1980) Criteria A and C Washington Heritage Register (1980)	Town Building	No
HR-6	Washington Water Power Post Street Substation 333 N. Post Street	1909	Eligible (1979) Criteria A and C	Hydroelectric Power	Yes
HR-5	Post Street Bridge Post Street and Spokane River, Spokane	1917	Determined not eligible (1979)	Transportation	No

Table 3.3.7.1-2. National Register evaluation of historic buildings and structures located within the APE or within 100 feet of the APE in Idaho and Washington (continued)

Historic Resource No.	Resource Name/Location	Year Built	National Register Status/Relevant Criteria	Theme	Located Within APE?
HR-4	Monroe Street Bridge Monroe Street Between Ide Avenue and Riverfalls Boulevard, Spokane	1911	Listed (1976) No criteria identified	Transportation	Yes
HR-3	Nine-Mile Hydroelectric Power Plant Historic District Charles Road near River Mile 58 on Spokane River, Nine Mile Falls	1906–1908	Listed (1990) Criterion A	Hydroelectric Power	Yes
HR-2	Long Lake Hydroelectric Power Plant Facility, Spokane River .5 mile east of intersection with SR 231, Long Lake	1915	Listed (1988) Criteria A and C	Hydroelectric Power	Yes
HR-1	Spokane River Bridge at Long Lake Dam SR 231/101 and Spokane River, Long Lake	1949	Listed (1995) Criterion C	Transportation	Yes

Source: Modified from Entrix, 2005, and HRA, 2006

Our Analysis

The potential for erosion under the Proposed Action is analyzed in sections 3.3.1.1.5 and 3.3.1.2.4. This analysis concludes that the change in reservoir operations under the Proposed Action would result in some continued erosion along the shoreline and along the Coeur d'Alene, St. Joe, and St. Maries rivers that would be similar to existing conditions. Available studies and analysis specific to erosion and the geomorphic processes associated with the Project indicate that operation of the Post Falls Project is contributing to ongoing erosion by holding the summer lake level at or very near a constant elevation. Boat- and wind-related wave action are the primary causes of erosion and are concentrated approximately at the 2,128-foot water-surface/shoreline interface, as determined by the prevailing summer lake level. In the absence of the nearly constant summer lake level, the effects of boat- and wind-related wave action would still occur, but at lower shoreline elevations. Therefore, erosion of eligible archaeological resources along the shorelines of Coeur d'Alene Lake and its tributaries may continue under the Proposed Action in a manner similar to current conditions.

Results of the inventory and evaluation reports (Entrix, 2005; HRA, 2006) indicate that erosion is the primary source of adverse effects on historic properties (principally involving archaeological sites) located within the Post Falls Project APE. Modifications to the natural riparian habitat have occurred within the Post Falls Project as a result of multiple historic and ongoing developments related to logging, mining, agriculture, and land development that occurred before and after the construction of the Project (HRA, 2006).

Erosion can also result in secondary effects to National Register-eligible archaeological sites, such as increased looting if cultural materials become exposed. Conversely, erosion can result in a beneficial effect because sediments transported through erosion can cover up archaeological sites, thereby sealing the cultural materials underground and protecting them from exposure and degradation.

Implementation of measure PF-TR-1, the shoreline erosion plan (see section 3.3.1.2.4), and the HPMP (PF-CR-1) would minimize potential erosion impacts to National Register-eligible archaeological resources along the shorelines. The HPMP would include treatment and management recommendations for National Register-eligible archaeological sites located along the shorelines of Coeur d'Alene Lake and its tributaries and would address ongoing cultural resources protection and management under the Proposed Action. The HPMP would also analyze which effects are Project-related and which are not (HRA, 2006).

National Register-eligible aboveground cultural resources should not be affected by the Proposed Lake Level Action. Since the results of the TCP studies have not yet been completed, the effect of the Proposed Lake Level Action is unknown. The results of the TCP studies would be addressed in the HPMP.

Agency Recommendations

The DOI proposed in its July 17, 2006, BIA 4(e) condition 4 (Protection of Cultural Resources) that all cultural resources located on the Coeur d'Alene Tribe Reservation within the Post Falls Project boundary and within a 100-foot buffer zone beyond the Project boundary be identified, evaluated, and assessed for impacts resulting from Project activities, and that these effects be mitigated. Additional protection measures include implementation of a Cultural Resources Management Plan (CRMP) and Initial Cultural Resource Action Program that would provide for the following:

- law enforcement to prevent unauthorized looting,
- cultural resources monitoring,
- TCP inventory and evaluation,
- cultural resources resurvey,
- education program to educate the public about importance of cultural sites to the Coeur d'Alene Tribe,
- development of an emergency recovery plan for inadvertent discovery of cultural sites, and
- management of material remains and records recovered from reservation lands, including funds provided by Avista for the storage, inspection, inventory, maintenance, and conservation of material remains and associated records involving cultural resources.

Our Analysis

The BIA 4(e) condition 4 recommendation exceeds the requirements of section 106 pertaining to inventorying, determining National Register eligibility, and assessing effects to historic properties within a buffer zone of 100 feet beyond the Post Falls Project boundary. The APE, as defined by section 106, relates only to the geographic extent where possible effects could occur to historic properties. Avista cannot be compelled to go beyond the extent of the defined APE to resolve effects to historic properties where there are no demonstrated Project-related effects. The staff agrees that the adverse effects of the Proposed Action on TCPs have yet to be analyzed. Once TCPs have been identified, this analysis would ensure that the Project is in compliance with section 106 through implementation of the HPMP. If it were found that TCPs were being affected beyond the currently established APE, the APE could be adjusted accordingly.

In a new license, the Commission cannot exercise jurisdiction over Avista to provide law enforcement to prevent unauthorized looting on archaeological sites on reservation lands, or any other lands within the Post Falls Project APE. Nevertheless, continued monitoring of archaeological sites should be part of an ongoing program through implementation of the HPMP, and Avista should include a protocol to contact the appropriate law enforcement organization to aid in the apprehension of unauthorized looters on archaeological sites within the reservation and throughout the Post Falls Project APE.

Avista-Proposed Alternative Conditions

Avista counterproposed in its September 1, 2006, and August 17, 2006, filings to modify the BIA 4(e) condition 4 to limit Avista's responsibility to National Register-eligible cultural resources located on the Coeur d'Alene Reservation within the Post Falls Project APE. In accordance with Avista's Proposed Action, Avista would develop a comprehensive HPMP in consultation with the Coeur d'Alene Tribe, the THPO, and the SHPO within 1 year after license issuance. The focus would be limited to cultural resources located on reservation lands within the Project APE but would address most of the protection measures outlined in BIA 4(e) condition 4. These measures would identify, evaluate, and assess Project impacts and develop treatment options for National Register-eligible resources located on the Reservation within the Post Falls Project APE to the extent that such impacts and options have not already been addressed by the three cultural resources studies (Entrix and Western Historical Services, 2004; Entrix, 2005; HRA, 2006). Avista proposes to include the following management measures in the HPMP:

- Develop a program to educate the public about the importance of cultural sites to discourage unauthorized looting of cultural sites located along the shoreline of Coeur d'Alene Lake.

- Develop an emergency recovery plan for inadvertent discoveries.

- Provide funds to manage and curate material remains and records recovered from reservation lands during cultural resource studies conducted within the APE.

- Implement procedures for inadvertent discovery of artifacts or human remains.

Our Analysis

Avista's counterproposal to implement a HPMP that focuses on National Register-eligible sites located on reservation land within the Post Falls Project APE would ensure that Avista is in compliance with section 106 and with the *Guidelines for the Development of Historic Properties Management Plans* issued by the Commission and the ACHP (May 2002). As discussed above, addressing resources located outside of the Post Falls Project APE exceeds section 106 requirements. However, once the TCP inventory and evaluation were complete, Avista should address any adverse effects of the Proposed Action on TCPs in the HPMP. Additionally, and as noted above, Avista should include a program in the HPMP to conduct cultural resource monitoring of historic properties, places known to contain human remains, and areas known to be at high risk from erosion and looting located on reservation and other lands within the Post Falls Project APE. In accordance with HRA, 2006, recommendation, materials collected from the Project area in Washington would be curated with the Spokane Tribe, while artifacts collected from the Project area in Idaho would be curated with the Coeur d'Alene Tribe.

3.3.7.2.1.2 Effects of Project Releases

The Post Falls Project affects flows in the upper Spokane River about 6 to 7 months of the year, depending on inflow, weather conditions, snowpack, and other factors (Earth Systems and Parametrix, 2004). The Proposed Action would set a minimum Post Falls Project discharge flow of 600 cfs, which would drop to 500 cfs during drier summers, per criteria in PF-AR-1. This flow represents an increase of at least 300 cfs over the current minimum flow requirement during normal-water years.

Our Analysis

Provision of a 600-cfs minimum flow would slightly reduce Coeur d'Alene Lake levels in August and September in some years. A minor change in elevation should not affect the Coeur d'Alene shoreline or any archaeological sites located along the shoreline beyond existing conditions. The proposed 600-cfs minimum flow, with a trigger to change the flow to 500 cfs when low-flow conditions occur, would result in essentially the same effects on cultural resources around Coeur d'Alene Lake and downstream of Post Falls Dam as the effects associated with the provision of a 300-cfs minimum flow. Minimum flow releases would not affect any National Register-eligible aboveground resources because none are located along the immediate shoreline. Because the results of the TCP studies have not yet been completed, the effect of the Proposed Project Release action is unknown. The results of the TCP studies will be addressed in the HPMP.

3.3.7.2.1.3 Ongoing Cultural Resource Needs

The Proposed Action includes several long-term Project activities that have the potential to affect historic properties located within the Post Falls Project APE. These activities include long-term maintenance and operation activities, construction activities, increased recreation, and changes in use patterns. Avista currently maintains character-defining hydropower facilities associated with the Post Falls Development, as well as the other developments and associated structures downstream. All newly determined National Register-eligible properties would be managed and protected through the implementation of the HPMP (PF-CR-1). The HPMP will also address the ongoing identification, evaluation, and protection of historic properties during the term of any license. These efforts would be coordinated with stakeholders concerned about the management of historic properties affected by the Post Falls Project. Execution of a PA that stipulates the implementation of the HPMP would satisfy Avista's responsibilities to take into account effects on historic properties, as required under section 106 of the NHPA.

The HPMP is currently being developed by Avista in consultation with the CRWG and will be consistent with the *Guidelines for the Development of Historic Properties Management Plans* issued by the Commission and the ACHP (May 2002). The HPMP will describe the regulatory context and applicable laws, including the NHPA, the Native American Graves Protection Act, the Archaeological Resources Protection Act, and the American Indian Religious Freedom Act; provide background information on the prehistory and history of the region and Project area; describe the results of previous cultural resource surveys; and explain the method employed by the CRWG's consultants for completing Project-specific cultural resources surveys and site-specific evaluations. The HPMP will set forth management principles, goals, and standards for the treatment of historic properties and will identify decision-making responsibilities for determining and addressing Project-related effects, both current and future, on historic properties. One recommendation outlined in the historic properties evaluation report suggests that many eligible archaeological resources could be managed as districts (HRA, 2006). Other recommendations for aboveground resources, particularly Avista's National Register-eligible hydroelectric facilities (which will require continued maintenance and operation), is that a preservation treatment plan be developed in the HPMP to establish a detailed protocol for acceptable O&M procedures involving structural historic properties. Such a preservation treatment plan would also include what particular O&M procedures could be done without further consultation with the SHPOs, as well as what other kinds of O&M procedures would require further consultation.

The HPMP will include procedures for consultation, unanticipated discoveries, annual reporting, and periodic updates of the HPMP; coordination with other resource plans involving ground-disturbing activities; and interpretation and educational opportunities.

Our Analysis

The HPMP would contain all of the essential components of a plan designed to manage the effects of the Post Falls Project operations and environmental measures on historic properties in the Project area. The HPMP would implement a process for ongoing review of Project operations and potential future actions; this process would include analysis of potential effects to National Register-eligible sites and other properties to which the tribes may attach religious or cultural significance.

Among the other requirements involving the HPMP as stated above, Avista should provide a detailed schedule in the HPMP to (1) evaluate all remaining cultural resources for National Register eligibility that are being affected by the Post Falls Project, and (2) resolve adverse effects to all historic properties (i.e., any structural, archaeological, or traditional cultural resource determined to be eligible for the National Register) that are being affected by the Project. Avista would prioritize this schedule by first addressing Project-related adverse effects to all of the identified cultural resources in the Post Falls Project that are already considered eligible for inclusion in the National Register. Avista would then evaluate the remaining cultural resources and address Project-related effects to those resources considered eligible for the National Register. As noted above, Avista should also include a program in the HPMP to conduct cultural resource monitoring of historic properties, places known to contain human remains, and areas known to be at high risk from erosion and looting located on reservation and other lands within the Post Falls Project APE.

3.3.7.2.1.4 Secondary Effects of Proposed Measures

Many proposed measures include modifications to Post Falls Project facilities and maintenance and operations activities with the potential to affect historic properties. Significant changes that could change or affect historic properties are summarized below:

- The Erosion Control Program (PF-TR-1) is designed to protect high-value habitats and culturally sensitive sites currently affected by shoreline erosion. While portions of some sites have eroded away, the Erosion Control Program would benefit cultural resources by reducing the rate of erosion of shorelines containing remaining eligible archaeological sites.

- Management of aquatic weeds at Coeur d'Alene Lake (measure PF-AR-2) would include specific control methods, such as mechanical removal, that have the potential to disturb partially submerged National Register-eligible archaeological sites. To the degree noxious weed management promotes the establishment of native species, the Proposed Action could enhance cultural resources.

- Ground disturbance associated with wetlands and riparian habitat restoration could affect eligible archaeological sites along the shorelines of both lakes. Restoration of wetland and riparian areas around Coeur d'Alene Lake would benefit cultural resources by increasing woody stem and emergent-wetland vegetation necessary to support plant species of culturally significant resources that represent Tribal trust resources, including cottonwood, willow, water potato, tule, and camas (see section 3.3.5).

- Management of aquatic weeds at Coeur d'Alene Lake (measure PF-AR-2) would include specific control methods, such as mechanical removal, that have the potential to disturb partially submerged National Register-eligible archaeological sites. To the degree noxious weed management promotes the establishment of native species; the Proposed Action could enhance cultural resources.

Other modifications could affect the characteristics that make facilities eligible for listing in the National Register. Increased recreation from new and improved recreation facilities could result in increased boat wake and erosion, which in turn could expose archaeological sites and result in looting. Increased recreation could also affect TCPs because recreational use may disturb contributing elements of eligible TCPs.

- All Project-related construction activities would be reviewed under the HPMP, which will provide a process for managing future Project-related effects, including a process for identifying, evaluating, and mitigating actions that could affect historic properties. It will also provide a process for consultation with tribes that have historic traditional ties to the Project area to ensure that effects to TCPs are identified and mitigated.

3.3.7.2.2 Spokane River Developments

3.3.7.2.2.1 Effects of Project Releases

The Post Falls Project affects flows in the upper Spokane River about 6 to 7 months of the year, depending on inflow, weather conditions, snowpack, and other factors (Earth Systems and Parametrix, 2004). The Proposed Action would set a minimum Post Falls Project discharge flow of 600 cfs, which would drop to

500 cfs during drier summers, per criteria in PF-AR-1. This flow represents an increase of at least 300 cfs over the current minimum flow requirement during normal-water years.

Our Analysis

It is not expected that this slight increase in the average daily releases at the Post Falls Project would affect the downstream shorelines or any archaeological sites that may be located along downstream shorelines beyond existing conditions. The proposed 600-cfs minimum flow, with a trigger to change the flow to 500 cfs when low-flow conditions occur, would result in essentially the same effects on cultural resources located downstream of Post Falls Dam as the effects associated with the provision of a 300-cfs minimum flow. Minimum flow releases would not affect any National Register-eligible aboveground resources because none are located along the immediate shoreline. Because the results of the TCP studies have not yet been completed, the effect of the Proposed Project Release action is unknown. The results of the TCP studies will be addressed in the HPMP.

3.3.7.2.2.2 Ongoing Cultural Resource Needs

The Proposed Action includes several long-term Project activities that have the potential to affect historic properties located within the Spokane River Developments APE. These activities include long-term maintenance and operation activities, construction activities, increased recreation, and changes in use patterns. Avista currently maintains character-defining hydropower facilities associated with the four National Register-eligible developments associated with the Spokane River Developments. Current plans exist for managing National Register-eligible Nine Mile cottages and some specific additional properties, as well. All newly determined National Register-eligible properties would be managed and protected through the implementation of the HPMP (SRP-CR-1). The HPMP will also address the ongoing identification, evaluation, and protection of historic properties during the term of any license. These efforts would be coordinated with stakeholders concerned about the management of historic properties affected by the Spokane River Developments. Execution of a PA that stipulates the implementation of the HPMP would satisfy Avista's responsibilities to take into account effects on historic properties, as required under section 106 of the NHPA.

The HPMP is currently being developed by Avista in consultation with the CRWG and will be consistent with the *Guidelines for the Development of Historic Properties Management Plans* issued by the Commission and the ACHP (May 2002). The HPMP will describe the regulatory context and applicable laws, including the NHPA, the Native American Graves Protection Act, the Archaeological Resources Protection Act, and the American Indian Religious Freedom Act; provide background information on the prehistory and history of the region and Project area; describe the results of previous cultural resource surveys; and explain the methods employed by the CRWG's consultants for completing Project-specific cultural resource surveys and site-specific evaluations. The HPMP will set forth management principles, goals, and standards for the treatment of historic properties and will identify decision-making responsibilities for determining and addressing Project-related effects, both current and future, on historic properties. One recommendation outlined in the historic properties evaluation report suggests that many eligible archaeological resources could be managed as districts (HRA, 2006). Other recommendations for aboveground resources, particularly Avista's National Register-eligible hydroelectric facilities (which will require continued maintenance and operation), is that a preservation treatment plan be developed in the HPMP to establish a detailed protocol for acceptable O&M procedures involving structural historic properties. Such a preservation treatment plan would also include what particular O&M procedures could be done without further consultation with the SHPOs, as well as what other kinds of O&M procedures would require further consultation with SHPOs.

The HPMP would include procedures for consultation, unanticipated discoveries, annual reporting, and periodic updates of the HPMP; coordination with other resource plans involving ground-disturbing activities; and interpretation and educational opportunities.

Our Analysis

The HPMP will contain all of the essential components of a plan designed to manage the effects of the Project operations and environmental measures on historic properties in the Spokane River Developments APE. The HPMP would implement a process for ongoing review of Project operations and potential future actions; this process would include analysis of potential effects to National Register-eligible sites and other properties to which the tribes may attach religious or cultural significance.

Among the other requirements involving the HPMP as stated above, Avista should provide a detailed schedule in the HPMP to (1) evaluate all remaining cultural resources for National Register eligibility that are being affected by the Spokane River Developments, and (2) resolve adverse effects to all historic properties (i.e., any structural, archaeological, or traditional cultural resource determined to be eligible for the National Register) that are being affected by the Spokane River Developments. Avista would prioritize this schedule by first addressing Project-related adverse effects to all of the identified cultural resources in the Spokane River Developments that are already considered eligible for inclusion in the National Register. Avista would then evaluate the remaining cultural resources and address Project-related effects to those resources considered eligible for the National Register. Avista should also include a program in the

HPMP to conduct cultural resource monitoring of historic properties, places known to contain human remains, and areas known to be at high risk from erosion and looting located on reservation and other lands within the Spokane River Developments APE.

3.3.7.2.2.3 Secondary Effects of Proposed Measures

Many proposed measures include modifications to Spokane River Developments facilities and maintenance and operations activities with the potential to affect historic properties. Significant changes that could change or affect historic properties are summarized below:

- The proposal to replace the wooden flashboards at National Register-eligible Nine Mile Dam with a more permanent rubber dam could affect characteristics that contribute to the dam's eligibility for listing in the National Register.
- The Erosion Control Program (SRP-TR-1) is designed to protect high-value habitats and culturally sensitive sites currently affected by shoreline erosion. While portions of some sites have eroded away, the Erosion Control Program would benefit cultural resources by reducing the rate of erosion of shorelines containing remaining eligible archaeological sites.
- Ground disturbance associated with the installation of alternative nesting platforms, including relocating nests and providing alternative nesting platforms (measure SRP-TR-2), has the potential to affect National Register-eligible archaeological sites and other properties to which the tribes may attach religious or cultural significance. Migratory bird protection also affords protection for culturally significant species.
- Ground disturbance associated with the construction of new or expanded recreational facilities could affect eligible archaeological sites (SRP-REC-2, SRP-REC-4).

Other modifications could affect characteristics that could make facilities eligible for listing in the National Register. Increased recreation from new and improved recreation facilities could result in increased boat wake and erosion, which in turn could expose archaeological sites and result in looting. Increased recreation could also affect TCPs because recreational use may disturb contributing elements of eligible TCPs.

All Project-related construction activities associated with the Spokane River Developments would be reviewed under the HPMP, which will provide a process for managing future Project-related effects, including a process for identifying, evaluating, and mitigating actions that could affect historic properties.

It will also provide a process for consultation with tribes that have historic traditional ties to the Spokane River Developments area to ensure that effects to TCPs are identified and mitigated.

3.3.7.3 Unavoidable Adverse Effects

According to the inventory and evaluation reports (Entrix, 2005; HRA, 2006), such effects as shoreline erosion may not be totally eliminated; however, adoption and implementation of a HPMP would provide for the phased documentation and stabilization of affected archaeological sites. As a result, there may be the possibility of the loss of some cultural resource material and sites by shoreline erosion, but implementation of a HPMP would minimize or mitigate such effects.

3.3.7.4 Cumulative Effects

The Spokane River Developments and the Post Falls Project are among several hydroelectric projects in eastern Washington and western Idaho that affect prehistoric and historic archaeological resources located along the shorelines and in the drawdown zones of reservoirs. Within the Spokane River, Columbia River, Snake River, and Pend Oreille watersheds, the ongoing operation of the respective projects and the continued erosion of shorelines associated with them contribute to the cumulative negative effect on cultural resources by reducing the number of potential sites that can yield information about the traditional lifeways of the Native American tribal groups associated with the watersheds, as well as information involving the past activities of Euroamericans. Because excavation is an inherently destructive process, any evaluative testing or other archaeological excavations recommended in the HPMP would have some negative effect on the excavated site. The net effect would likely be positive, however, because data recovery measures would retain information that might otherwise be lost (for example, to erosion), even in the absence of hydroelectric projects. Over time, the accumulated knowledge of site contents and patterning and of landform and sediment types should lead to more proactive site protection methods, reducing the instances requiring excavation.

Within the eastern Washington and western Idaho watersheds, cultural resource surveys conducted as part of the relicensing process have identified hundreds of prehistoric and historic archaeological resources. Other surveys conducted by federal and state land-managing agencies (Bureau of Reclamation, the Corps, BLM, USDA Forest Service, WDNR, etc.) and utilities (Idaho Power and Pend Oreille Public Utility District No. 1) have added to the number of known sites within these watersheds. However, archaeological information from the Project areas is generally lacking to address most of the research themes and questions pursued by Plateau researchers during the past two decades (Entrix and

Western Historical Services, 2004). These themes include cultural chronology, effects of climate and environmental change on adaptation, site functions within settlement and subsistence models, and trade. Given the relative lack of previous cultural resources research, much of the information generated through the surveys and evaluative testing for this relicensing process applies to the identified data gaps and major research themes in the region, and contributes to a cumulative benefit that will continue with implementation of the HPMP.

3.3.8 Recreational Resources

3.3.8.1 Affected Environment

The Project is located in Kootenai and Benewah counties in Idaho, and Spokane, Lincoln, and Stevens counties in Washington (see Figure 1.0-1). Recreational lands within a 100-mile radius of the Project are extensive and include diverse rural and urban landscapes that support a wide range of recreational opportunities (Louis Berger Group, 2004a).

3.3.8.1.1 Regional Recreational Opportunities

Recreational lands within the region include six Forest Service-managed national forests (Colville, Okanogan, Clearwater, Idaho Panhandle, Nez Perce, and Kootenai forests) in Washington, Idaho, and Montana and five wilderness areas. These forests provide a range of primitive, semi-primitive, and developed recreational opportunities, including camping, boating, swimming, hiking, fishing, hunting, picnicking, environmental education, sightseeing, off-road vehicle use, and other activities. Other federal lands that provide public recreational opportunities in the region and adjacent to the Project include those managed by the BLM and the Corps.

The numerous parks within the region include 20 Washington state parks, 11 Idaho state parks, and 2 Montana state parks. Recreational opportunities and resources at these parks include camping, lodging, picnicking, interpretive programs, swimming, fishing, boating, hiking, horseback riding, rock climbing, playgrounds, golf, tennis, nature trails, natural and historic attractions, and community buildings. County and city parks also provide public recreational opportunities.

The region also includes more than 500 river miles designated as Wild and Scenic pursuant to the Wild and Scenic Rivers Act, (15 U.S.C. 1271-1287), as well as numerous non-designated rivers, lakes, and reservoirs, such as Lake Pend Oreille in Idaho and Franklin D. Roosevelt Lake in Washington. These water resources provide extensive whitewater boating, motor boating, and angling opportunities. Above Coeur d’Alene Lake, the St. Joe Wild and Scenic River is approximately 30 miles upstream of the Project boundary. Approximately 50 miles to the south of Coeur d'Alene Lake, the Middle Fork of the Clearwater River is also a federally-designated Wild and Scenic River. The nearest federally-designated wilderness area is the Selway-Bitterroot Wilderness Area, located approximately 70 miles east of Coeur d'Alene Lake.

3.3.8.1.2 Project Area Recreational Opportunities and Uses

The Project includes five distinct hydroelectric developments located along the Spokane River in northern Idaho and eastern Washington. The most upstream of the five hydroelectric developments is Post Falls (river mile 102), which is located in Idaho and controls the top 7.5 feet of Coeur d'Alene Lake during the summer season. The remaining four hydroelectric developments, from upstream to downstream, are Upper Falls (river mile 74.2), Monroe Street (river mile 74), Nine Mile (river mile 58), and Long Lake (river mile 34), all located in Washington. A total of 90 public recreational sites that are within or adjacent to the Project boundary provide public access to Project lands and waters, many of which are owned and managed by federal agencies, including the BLM and Forest Service. These sites are listed and described in detail in Louis Berger Group (2004a). Avista owns eight recreational sites (seven public sites and one commercial site) within or adjacent to the Project boundary (Table 3.3.8.1-1).

Recreational resources are generally developed commensurate with each site's proximity to urban and rural resources. Sixty-eight sites within or adjacent to the Project boundary provide recreational access to the Project at Post Falls; most of these are associated with Coeur d'Alene Lake. Coeur d'Alene Lake recreational resources range from urban parks associated with the cities of Coeur d'Alene and Post Falls to primitive campsites, formal boat launch areas, and informal road-side pull-outs. Immediately adjacent to the Post Falls Project and within the Project boundary, Avista provides lands for two recreational sites (Falls Park and Q'emiln Park) to the City of Post Falls. Together, these two sites provide trails, a barrier-free viewpoint, playground equipment, picnic facilities, interpretive signs, swimming, and boat-launching facilities.

Upper Falls and Monroe Street Developments are located in downtown Spokane. Five sites within or adjacent to the Project boundary provide public access to the Project in downtown Spokane. Huntington Park, an urban wildlife refuge, is located adjacent to the Monroe Street Dam and powerhouse and is within the Project boundary. Huntington Park provides pedestrian access to the falls adjacent to Monroe Street.

Table 3.3.8.1-1. Project recreational sites owned by Avista and within Project boundaries

Development	Site Name	Parking Spaces Total	Boat Ramp	Boat Ramp Lanes	Boat Dock	Boat Dock Slips	Angling Formal	Angling Bank	Picnic Tables	Trail Miles	Campsites	Swimming Beach	Rock Climbing	Scenic Viewpoint	Playground	Access to Spokane River	Parking Lot	Toilet	Acreage
Post Falls Project	Q’emiln Park	173	Yes	4	Yes	0	Yes	Yes	75	2	0	Yes	Yes	Yes	Yes	Yes	Yes	Yes	78.5
Post Falls Project	Falls Park	36	No	NA	No	NA	No	No	10	1.5	0	No	No	Yes	Yes	Yes	Yes	Yes	22
Monroe Street	Huntington Park	0	No	NA	No	NA	No	No	0	0	0	No	No	Yes	No	No	No	No	1
Nine Mile	Nine Mile Dam overlook	3	No	NA	No	NA	No	No	0	0	0	No	No	Yes	No	No	Yes	No	0.1
Long Lake	Nine Mile Resort	110	Yes	2	Yes	8	Yes	Yes	70	0.25	35	Yes	No	Yes	Yes	Yes	Yes	Yes	6
Long Lake	North Shore campsites	3	No	NA	No	NA	Yes	Yes	0	0.5	2	No	No	Yes	No	Yes	Yes	No	3
Long Lake	Long Lake Dam and overlook	30	No	NA	No	NA	No	No	0	0.99	0	No	No	Yes	No	Yes	Yes	No	1
Long Lake	Long Lake picnic area	150	No	NA	No	NA	Yes	Yes	6	0	0	No	No	No	Yes	Yes	No	Yes	3

Note: NA – not applicable
No – facility not present
Yes – at least one facility present

Source: Avista, 2005

Avista and the City of Spokane developed the Thornton Murphy overlook, adjacent to the Project boundary, to provide barrier-free access to views of the dam and lower falls. Avista and the city have been working together to construct a Centennial Trail underpass at the north end of the Monroe Street Bridge by the end of 2006.

The entire Upper Falls facility is surrounded by Riverfront Park, a city park established as part of the 1974 World's Fair. The park provides scenic views of the river and contains numerous recreational resources, including open-air amphitheaters, an IMAX theater, a seasonal ice skating rink and carnival rides, an antique carousel, pedestrian paths, and scheduled interpretive tours of the Upper Falls powerhouse. The city prohibits boating and swimming within the Project boundary downstream of the Division Street Bridge because of the dams and the dangerous currents associated with the river channels and falls. Monroe Street Development is located just downstream of Upper Falls. Spokane's Riverfront Park is adjacent to the development and provides pedestrian access to numerous viewpoints and a city-operated seasonal gondola ride over the lower falls.

Nine Mile and Long Lake Developments are downstream of the city of Spokane and are located in less-developed parts of the Spokane River. Nine Mile Reservoir is narrow and relatively short; Lake Spokane, formed by Long Lake Development, is approximately 24 miles long, though fairly narrow. These reservoirs provide different recreational opportunities. Most of Nine Mile Development lies within or adjacent to the 10,000-acre Riverside State Park. The park is administered by the WSPRC. The park includes seven formal recreational sites within the Project boundary, one of which, Nine Mile Dam overlook, is owned and managed by Avista (Louis Berger Group, 2004a). Together, these recreational sites provide visitors with non-motorized boating, hiking, bicycling, picnicking, fishing, and equestrian trail-riding opportunities.

Lake Spokane provides a multitude of recreational opportunities. Slightly more than 1 mile of the lake is adjacent to Riverside State Park. Public access to the Project is achieved through nine recreational sites within or adjacent to the Project boundary. Avista owns and maintains four of these sites: Nine Mile Resort, Long Lake picnic area, Long Lake Dam overlook, and the North Shore campsites (Louis Berger Group, 2004a, Appendix A). Recreational sites at Long Lake Development provide visitors with camping, picnicking, swimming, boating, hiking, fishing, and sight-seeing opportunities.

The Centennial Trail is an important public recreational resource that links the Project developments as it follows the Spokane River more than 60 miles from the City of Coeur d'Alene downstream through the Post Falls Project to its western terminus near Lake Spokane (City of Post Falls, 2004). The trail is paved and accessible, links numerous urban and rural parks, and provides public access to activities such as walking, running, cycling, rollerblading, horseback riding, picnicking, fishing, canoeing, kayaking, and rafting.

In addition to the Avista-owned sites, there are many other recreation sites and opportunities within the Project area. Avista's inventory of facilities included 12 sites on Lake Spokane,[1] 53 sites on the Spokane River between Post Falls Dam and Nine Mile Dam, and 77 sites on the Coeur d'Alene waterway,[2] some of which are outside of the Project boundary. Table 3.3.8.1-2 summarizes annual recreation use at the developed sites within or adjacent to the Project boundary that provide public access to Project lands and waters. The table shows that approximately 70 percent of the total recreational use at the Project takes place on weekends and weekdays during the summer.

Recreational activities that take place in the Project area are varied and generally site-specific. Overall, jogging and walking, sightseeing, and bank- and boat-fishing are the most important activities. However, the importance of these activities varies between developments. For example, at Coeur d'Alene Lake, most of the recreational use (more than 50 percent) is associated with boating, boat-fishing, and other water sports, with less overall emphasis on jogging, walking, and biking. Conversely, for those recreational sites along the Spokane River through the City of Spokane, trail-related recreational activities such as jogging, walking, biking, mountain biking, and rollerblading represent more than 55 percent of total use, with essentially no boat-fishing and little angling occurring on the river. Recreational activities at Nine Mile Reservoir and Lake Spokane include a mix of the primary activities found at the upstream developments with prominent water recreation, such as bank angling, swimming, picnicking, and trail-related recreation on the Centennial Trail, such as jogging, walking, and biking.

The Spokane River downstream of the Post Falls Project runs through the center of an urbanized area, and local residents and visitors use the river for boating, tubing, swimming, and fishing. A whitewater paddling instream flow assessment study (Louis Berger Group, 2004b) was conducted to determine whitewater boating opportunities, availability of access, and potential Project-related effects on whitewater boating opportunities. Results indicate that whitewater boating opportunities, which include the upper and lower Spokane River reaches that boaters use for downriver runs, generally exist when flows

[1] Lake Spokane was defined as all formal recreational sites between Nine Mile Dam and Long Lake Dam.

[2] Coeur d'Alene waterway was defined as all sites adjacent to the Project and on Coeur d'Alene Lake and the St. Joe River, St. Maries River, Coeur d'Alene River, and Spokane River upstream of Post Falls Dam.

Table 3.3.8.1-2. Recreation use at developed sites within or adjacent to the Project boundaries

	Coeur d'Alene Waterway Sites		Upper Falls/Monroe Street/Nine Mile Reservoir Sites		Lake Spokane Sites		Total	
Estimated Seasonal Use	**Number of Users**	**% of Area Total**	**Number of Users**	**% of Area Total**	**Number of Users**	**% of Area Total**	**Number of Users**	**%**
Rec. Season Weekday[b]	316,807	31	36,836	31	27,716	35	381,358	32
Rec. Season Weekend[b]	393,389	39	51,405	43	20,732	27	465,526	38
Off-season Weekday[b]	163,309	16	19,387	16	16,584	21	199,280	16
Off-season Weekend[b]	139,310	14	11,693	10	13,190	17	164,193	14
Total Estimated Annual Use	**1,012,814**		**119,321**		**78,222**		**1,210,358**	**100**

Notes: % – percent

a. Riverfront Park in Spokane and Coeur d'Alene City Park are not included because the study was not able to make dependable vehicle or users counts at these busy downtown sites. Avista consultant Louis Berger estimated that including these two sites in recreational use estimates would bring the total annual use to more than 2 million visits.

b.

Season	Definition	No. of Days
Rec. season weekday	Non-holiday weekdays between May 24 and September 1, 2003	68
Rec. season weekend	Weekends and holidays from May 24 through September 1, 2003	33
Off-season weekday	Weekdays from September 2 through May 23	189
Off-season weekend	Weekends from September 2 through May 23	76

Source: Avista, 2005

exceed 1,500 cfs and that numerous "park-and-play" areas generally exist when flows exceed 2,500 cfs. The upper Spokane River reach is a 17-mile segment between McGuire Park and Bouder Beach, although the upper Spokane reach extends from Post Falls Dam to just past Barker Road. Multiple access points along the upper Spokane River reach provide for longer or shorter runs. The lower Spokane River reach extends from Peaceful Valley to the Plese Flats access area in Riverside State Park, with the most challenging run being from Meenach Bridge to Plese Flats. As with the upper Spokane River reach, there are a number of access points that can shorten the trip. The degrees of whitewater difficulty range from Class II to Class IV[3]. Whitewater boating opportunities on the Spokane River occur year-round.

3.3.8.1.3 Recreational Needs

Avista's recreational studies (Louis Berger Group, 2004a) assessed the quality of the recreational experience, including recreational site needs and crowding on the water and at the recreational sites. Overall, most visitors indicated that the recreational sites and lake are not crowded. Avista studies show approximately 98 percent of the visitors indicated that the recreational sites are either not crowded or are only slightly crowded.

The Avista studies also show that overall visitor satisfaction with the number and type of recreational facilities is generally high. More than 80 percent of the visitors to all sites indicated that they are satisfied or very satisfied with the number and type of recreational facilities. Of those few visitors who were dissatisfied with the recreational resources available at Project-related sites, recommendations for additional facilities were generally site-specific. At Coeur d'Alene Lake and Lake Spokane, most of those who made a recommendation indicated a desire for lengthening or adding more public boat ramps. At the Spokane River sites, most of those who made a recommendation indicated a desire for additional pathways that access the river.

3.3.8.2 Environmental Consequences

The current Project license permits Avista to operate Coeur d'Alene Lake within a 7.5-foot range, but Avista has historically operated the lake at or near 2,128 feet during the summer months. Starting after Labor Day, Avista begins to release water at Post Falls Dam, resulting in a gradual drawdown of Coeur d'Alene Lake, typically 1 to 2 feet per month, until it reaches the minimum-pool elevation of 2,120.5 feet.

Avista studies indicated that the September drawdown limits access to some boat launches and private docks in the shallow bays and on the Spokane River upstream of Post Falls Dam. Avista and stakeholders also identified a desire for scheduled recreational boating releases downstream of Post Falls Dam. Under existing conditions, recreational boating opportunities during late summer months are limited by low flows in the Spokane River. Although optimal flows are typically above 2,500 cfs, Avista studies and stakeholders determined that the Spokane River is navigable at flows down to 1,000 cfs. In most water years, flows

[3] Based on the International Scale of River Difficulty, which defines six difficulty classes of whitewater: Class I – easy; Class II – novice; Class III – intermediate; Class IV – advanced; Class V – expert; and Class VI – extreme.

drop below 1,000 cfs in late July and August, reducing boating opportunities in the Spokane River.

3.3.8.2.1 Post Falls Project Operations and Coeur d'Alene Lake Management

To enhance recreation and other related environmental resources, Avista proposes to maintain the elevation of Coeur d'Alene Lake at or near 2,128 feet as soon as practicable each summer (the same as current Project operations) until September 15 each year. Exceptions would occur, if needed, to maintain the minimum discharge flow from Post Falls Dam and to meet fisheries resource needs, as noted above. This proposal would maintain the pool elevation in Coeur d'Alene Lake at 2,128 feet about 10 days longer than current practice.

Kootenai County commissioners state that a consensus of stakeholders supports Avista's proposal for operating the Post Falls Project, as discussed above. The proposal is an adaptive management tool that would improve rainbow trout habitat and address concerns (e.g., continued public access to Project waters) of the public utilizing Coeur d'Alene Lake and the Spokane River. The USFWS does not support Avista's proposal for the Post Falls Project to extend the summer pool elevation of Coeur d'Alene Lake from Labor Day to September 15 each year. According to the USFWS, extending the lake level for an additional 10 days would increase the risk of predation on bull trout and other native salmonids by non-native piscivorous fish (for further discussion, see section 3.3.4). Other stakeholders (the Northwest Whitewater Association, the Spokane Canoe and Kayak Club) do not support the allowance for reduction of minimum instream flow releases from Post Falls Dam to 500 cfs because additional Coeur d'Alene Lake water could be used to supplement downstream flow requirements.

Avista proposes to limit drawdown of Lake Spokane to 14 feet, which would constitute a change from current license condition (for a 24-foot maximum drawdown). The USFWS supports Avista's proposal to limit the drawdown of Lake Spokane to 14 feet, except under certain emergency conditions. The USFWS states that the Lake Spokane aquatic ecosystem would likely benefit from the implementation of a 14-foot drawdown limit.

Our Analysis

See Chapter 5.0, *Staff's Conclusions*, for the staff's recommendation on Avista's proposed lake level management for Coeur d'Alene Lake.

Under the Proposed Action, Avista proposes to contribute funds to and collaborate with the Coeur d'Alene Tribe, Kootenai County Parks and Waterways, IDPR, and IDFG in planning and design efforts for removing abandoned docks, other human-made structures, and debris from Coeur d'Alene Lake. This action would be conducted over a 2-year period to accommodate removal during spring runoff.

Under the Proposed Action, Avista proposes to contribute funds to and collaborate with the Coeur d'Alene Tribe, Kootenai County Parks and Waterways, Benewah County, and the U.S. Coast Guard in planning and design efforts for installing private navigational aids on Coeur d'Alene Lake and at the mouth of the Coeur d'Alene and St. Joe rivers.

Removing abandoned docks, gangways, and pilings could improve safety for boaters by reducing the likelihood of collisions and other boating accidents associated with these structures. Avista's proposal in consultation with certain parties to fund the installation of navigational aids at the mouths of the Coeur d'Alene and St. Joe rivers could provide assistance to boaters in the area, particularly when the pool is low. The navigational aids could help pinpoint shallow areas and reduce the likelihood of stranding or accidents. For our recommendations on this measure and the funds, see Chapter 5.0, *Staff's Conclusions*.

To improve flows for fisheries and enhance recreation, Avista proposes to adjust its Post Falls Project operations and maintain a minimum discharge flow of 600 cfs at Post Falls Dam, reducing flows to 500 cfs in drier summers when the lake drops 3 inches or more. We discuss lake level management and flow releases in section 3.3.2.2 and make our recommendation in Chapter 5.0, *Staff's Conclusions*.

3.3.8.2.2 Post Falls Project Whitewater Boating Effects

After the completion of annual spill from the Post Falls Project, the power generation flows are currently often within a few hundred cubic feet per second of optimum for Trailer Park Wave, Sullivan Hole, and Zoo Hole. These sites are of local and regional importance when flows are optimized; however, the quality of these freestyle boating sites is very sensitive to small changes in flow (Louis Berger Group, 2004b). For example, while Sullivan Hole is optimized between 2,900 and 3,000 cfs, when flows reach 3,100 cfs or drop below 2,700 cfs, the feature provides little attraction for intermediate and advanced boaters. Also, at Trailer Park Wave, any significant spill in the north bypassed channel reduces or precludes freestyle boating opportunities by "backwatering" the feature.

Under the Proposed Action, Avista would start optimizing flows from Post Falls Dam for freestyle boating sites in the Spokane River within the first year of the new license. During the late spring, summer, and fall, Avista would target flows released from the Post Falls Project to fit within the minimum and maximum flow ranges for freestyle boating opportunities at Trailer Park Wave, Sullivan Hole, and Zoo Hole. Avista would incorporate other natural resource needs into the planning efforts for the flow augmentation measure. To the extent that flow augmentation would adversely affect another environmental resource, the needs of the other resource would take precedence over the flow augmentation measure.

Avista would hold semi-annual coordination meetings, once in the spring and once in the fall, to coordinate the whitewater and open-water flow releases with interested stakeholders and the parties responsible for augmenting flows and managing the recreational resource along the Spokane River between Post Falls and Nine Mile Developments.

Avista proposes to provide scheduled flows downstream of Post Falls Dam to accommodate open-water boating on selected weekends in August (Avista measure PF-REC-3) as follows (Louis Berger Group, 2004b):

Location	**Minimum (cfs)**	**Maximum (cfs)**	**Optimum (cfs)**
River Reach:			
Upper Spokane River	1,350	Spring runoff	3,000
Lower Spokane River	1,250	Spring runoff	3,700
Play Spot:			
Trailer Park Wave	3,300	5,500	4,500+
Sullivan Hole	2,500	3,100	2,800-3,100
Zoo Hole	2,200	3,500	2,500-2,800

Flows of approximately 1,250 cfs would be provided during two weekends in August (for example, the first and last weekends) when average and projected river flows at Post Falls Dam exceed 800 cfs. Avista would coordinate the flow releases with the relevant parties to reduce or eliminate adverse effects on fish and aquatic resources. Avista would make the flow schedule and release dates and times available to the public via telephone or Internet access.

To address the need for boaters to regularly monitor flows during all periods, Avista would contribute funds to and collaborate in the planning and design with USGS to modify the Post Falls gage (gage no. 12419000, just downstream of the Post Falls Project) to provide real-time flow information. Avista would provide funding in amounts not to exceed $15,000 for upgrading the gaging station and, through a separate agreement with USGS, $2,500 annually for O&M costs.

Our Analysis

Currently, August flows in the Spokane River are typically below the navigable range, which precludes late-summer boating opportunities. The proposed recreational release could provide new recreational opportunities during late-summer months with coordination of aquatic resource constraints. We find that the scheduled releases could vary year-to-year, depending on the water year; however, we anticipate that such releases for recreation should have a minor effect on Coeur d'Alene Lake.

The whitewater boating releases and proposed activities were generally endorsed by several stakeholder groups and resources agencies, and both IDFG and NPS specifically endorsed the measures in their recommendations. The Northwest Whitewater Association, in its letter filed July 17, 2006, supported most of Avista's proposed recreation measures, including the whitewater boating measures. However, Northwest Whitewater Association did not endorse allowing minimum instream flow levels to go below 600 cfs in summer and supported a generally higher release of water from Post Falls Dam to ensure that 500 cfs is realized at Barker Road. We note, however, that the Northwest Whitewater Association did not provide any justification for its proposal. See Chapter 5.0, *Staff's Conclusions*, regarding funds to the USGS for modifying its Post Falls gage.

3.3.8.2.3 Post Falls Project Recreation Plan

The Proposed Action includes a Post Falls Project recreation plan (PF-REC-1) that would provide vehicles for implementing Avista's recreation-related PME measures. Avista would develop this recreation plan in consultation with the relevant cooperating parties. It would include (1) recreational facility improvements throughout the Project; (2) a program to improve access and safety for boaters on Coeur d'Alene Lake; and (3) a program to improve whitewater boating flows, access, and the flow information system outside of the Post Falls Project boundary. The recreation plan would be submitted to the Commission for approval within 1 year of new license issuance, and the new measures would be carried out over a 10-year period, beginning within 1 year of the new license issuance.

At a minimum, the plan would include:

1. a general description of the recreational sites;
2. a discussion of the facilities that would be designed or redesigned to take into account the needs of disabled persons;
3. a description of the erosion- and-sediment-control measures where ground-disturbing activities are proposed;

4. a means for monitoring and reporting recreational use;
5. a means to conduct consultation with stakeholders; and
6. an implementation schedule, estimated construction costs, and estimated annual O&M costs for all measures.

The Proposed Action includes a provision that Avista provide 25 percent of the total cost of the measure. The remaining funds necessary to complete the measure would come from the applicable agency. If the agency could not secure the necessary matching funds to complete the measure, Avista proposes to place its contribution into a recreation enhancement fund. Kootenai County Commissioners agreed that Avista should provide only 25 percent of the cost as seed money (grant match dollars). This solution provides the matching funds and allows Avista to reduce the future cost to rate-payers.

Our Analysis

For site-specific measures at Coeur d'Alene Lake, Avista would consult with the cities or towns of Coeur d'Alene, Post Falls, Harrison, and St. Maries; Kootenai County Parks and Waterways; IDPR; IDFG; BLM; USDA Forest Service; and the Coeur d'Alene Tribe, as appropriate.

Avista's proposed recreation plan would likely lead to improvements that would increase public access to Project lands and waters, enhance recreational facilities, and provide additional recreational opportunities at the developments. Avista's proposed measures would (1) help meet the need to increase the developed capacity at Coeur d'Alene Lake by improving overnight and day use areas; (2) help meet the need to provide and protect outdoor recreation opportunities, a top priority for Idaho as identified by the IDPR in its 2003-2007 Idaho Statewide Comprehensive Outdoor Recreation and Tourism Plan; and (3) provide a means to monitor use levels and trends and help prioritize future Project recreational improvements. Regarding the recreation enhancement fund and associated funds, see Chapter 5.0, *Staff's Conclusions*.

3.3.8.2.4 Spokane River Developments Recreation Plan

The Proposed Action includes a Spokane River Project recreation plan (SRP-REC-1) that would provide vehicles for implementing Avista's recreation-related PME measures. This plan's structure would be the same as the Post Falls Project plan outlined above.

For site-specific measures along the Spokane River between Post Falls Dam and the inflow to Nine Mile Reservoir, Avista would consult with the Spokane Canoe and Kayak Club; Northwest Whitewater Association; Spokane Mountaineers; IDPR; Kootenai County Parks and Waterways; the cities of Post

Falls and Spokane; WSPRC; Spokane County; and Friends of the Centennial Trail, as appropriate.

For site-specific measures at the Nine Mile and Long Lake Developments, Avista would consult with WDNR; WDFW; WSPRC; Spokane County; Stevens County; the Spokane Tribe of Indians; Friends of the Centennial Trail; and the Lake Spokane Protection Association, as appropriate.

Our Analysis

As previously discussed, Avista's proposed recreation plan would likely lead to improvements that would increase public access to Project lands and waters, enhance recreational facilities, and provide additional recreational opportunities at the developments.

3.3.8.2.5 Post Falls Project and Spokane River Developments Public Outreach Plans

The Proposed Action includes implementation of Public Outreach Programs at the Projects (PF-REC-4 and SRP-REC-3). These programs would provide Interpretive and Educational Programs directed at providing information about the Project facilities and the natural, cultural, and recreational resources at the Projects. The programs include provisions for follow-up visitor surveys that would allow changes every 6 years, depending on the outcome of the surveys.

During the pre- and post-filing phases of the relicensing process, stakeholders (including WDFW) indicated that illegal harvest of wild rainbow trout in the upper Spokane River negatively affects trout populations in the river (Parametrix, 2004d). Stakeholders also indicated that increased public information, education, and law enforcement activities in the Post Falls Project area could provide a desirable means of mitigating for adverse project effects and reduce illegal harvest of bull trout and westslope cutthroat trout.

To address these concerns, Avista proposes to implement a Post Falls Project Fish PME Program and a Spokane River Fish PME Program (PF-AR-1 and SRP-AR-1). These programs are designed to primarily address specific operations, monitoring, and habitat enhancement measures that are considered in section 3.3.4, *Aquatic Resources*, of this document.

Our Analysis

The Interpretation and Education Plan for the Projects would improve the recreational experience by providing information about the Projects and Project-related recreation opportunities, as well as general information about cultural, wildlife, and aquatic resources at the Projects. The plan would lead to better stewardship of the resources by the public, which in turn would likely help protect environmental resources at the Projects. The visitor surveys would help provide estimates of visitor use collected in time to complete the FERC Form 80 filings that report visitor use levels. The above-mentioned programs are designed to work with and educate anglers and other recreational visitors about the importance of preserving healthy salmonid populations. Specifically, under the Proposed Action, Avista would consult with the IDFG, USFWS, Coeur d'Alene Tribe, and WDFW to develop information and education programs and enhanced law enforcement programs. These programs would be coordinated with other similar efforts developed and implemented for the Coeur d'Alene Lake Basin and for the Spokane River downstream of Post Falls and Monroe Street Developments. Specific topics may include species identification, landowner education, educational signage and brochures, public presentations, and support of law enforcement activities. The information and education programs would be coordinated with the Public Outreach Program measures (PF-REC-4 and SRP-REC-3), and the enforcement program would be implemented in coordination with the WDFW, Coeur d'Alene Tribe, and IDFG.

The fisheries public information and education components of the Post Falls Project and Spokane River Fish PME Programs would provide information to anglers and other recreational visitors about important practices to help protect the rainbow trout population in the free-flowing reaches of the Spokane River downstream of the Post Falls Project. The radio-tracking study indicated that illegal harvest of wild rainbow trout in the free-flowing reach of the upper Spokane River is more prevalent than previously thought and is a potential factor in adult rainbow trout mortality (Parametrix, 2004c). These findings are consistent with earlier creel surveys of the lower Spokane River that found limited compliance with fishing regulations (Avista, 2000). These results suggested that an enhanced public education program specific to fishery resources that includes information about applicable regulations could provide substantial benefit to rainbow trout. An enhanced public education program could also help with the protection and enhancement of bull trout and westslope cutthroat trout in the Coeur d'Alene Lake Basin.

The law enforcement component of the Post Falls Project and Spokane River Fish PME Programs would help encourage angler compliance with fishery regulations. The fisheries studies suggest that more visible law enforcement efforts could provide substantial benefit to rainbow trout populations by reducing illegal harvest. Funding additional patrols at primary angler areas where illegal harvesting has been observed could improve management of fishery resources by increasing visitor contact with enforcement agencies and help to educate visitors. While the measures associated with education, information, and law enforcement are sound, our recommendations regarding this measure and its funding and ties to other aquatic measures are discussed in Chapter 5.0, *Staff's Conclusions*.

3.3.8.2.6 Post Falls Project Recreation Resource Measures

The Proposed Action includes the following recreation measures associated with Coeur d'Alene Lake (PF-REC-2) to provide public access to Project lands and waters. The facilities and associated measures are as follows:

City of Coeur d'Alene Parks—Under the Proposed Action, Avista would contribute funds to and collaborate with the City of Coeur d'Alene in planning and design efforts to develop new recreational sites and/or improve existing recreational facilities at city parks adjacent to Coeur d'Alene Lake and the upper Spokane River. Measures would include (1) installing showers at Coeur d'Alene City Park for beach users; (2) installing a new restroom shelter at McEuen Field and Park; and (3) connecting Mill River Park to the Idaho Centennial Trail at the Huetter Road Overpass.

Falls Park and Q'emiln Park—Under the Proposed Action, Avista would contribute funds to and collaborate with the City of Post Falls in planning and design efforts to improve the existing recreational facilities at Falls Park and Q'emiln Park by improving the trail system, scenic overlooks, interpretive displays, and fencing at both sites. Where feasible, Avista would consider the parks' natural features and incorporate these features into the improvements.

Avista is currently negotiating new leases with the City of Post Falls, which desires to operate and manage the parks as a component of its citywide park system. If new leases could not be negotiated with the city, Avista would either seek a new managing partner or assume management responsibilities for the parks.

Boat Ramp Extensions and Mooring Buoys—Under the Proposed Action, Avista would contribute funds to and collaborate with IDFG, Kootenai County Parks and Waterways, IDPR, and the Coeur d'Alene Tribe in planning and design efforts to extend six motorboat ramps to accommodate off-season recreational use on Coeur d'Alene Lake and the Coeur d'Alene and the St. Joe rivers. The boat ramps are located at Anderson Lake, Round Lake, Sun Up Bay, Loffs Bay, Harrison, Chatcolet, and Rocky Point. Additionally, Avista would provide funding of $1,500 to Kootenai County for new mooring buoys at Mowry State Park and an additional $3,500 annually to supplement O&M costs of the facilities at Mowry State Park.

BLM Recreation Lands—Under the Proposed Action, Avista would contribute funds to and collaborate with BLM in planning and design efforts to develop or enhance water-based recreational facilities on Coeur d'Alene Lake and its tributaries. The BLM and Avista agreed upon a specific plan as outlined in DOI's filing of preliminary recommendations, terms, and conditions on July 18, 2006. Avista would collaborate in the planning and design of recreation improvements on BLM lands and would pay 25 percent of the construction costs of such development, not to exceed $200,000. Avista would also provide $28,000 a year to BLM in O&M costs of recreation sites, increasing to $33,000 a year once new recreation developments were completed (DOI letter, filed July 18, 2006).

Coeur d'Alene Tribe Recreation Lands—Under the Proposed Action, Avista would contribute funds to and collaborate with the Coeur d'Alene Tribe in planning and design efforts to develop or enhance water-based recreational facilities on the lake and its tributaries. Avista would provide funding to support the development of a recreational site that would be used in part to educate tribal members and the general public regarding current and historic cultural practices of the Coeur d'Alene Tribe.

Higgens Point—Under the Proposed Action, Avista would contribute funds to and collaborate with IDPR in planning and design efforts to construct a breakwater for the boat launch area, stabilize the shoreline that is eroding due to wind fetch, and reconstruct the docks at the boat-in-only sites.

Forest Service Recreation Lands—Under the Proposed Action, Avista would contribute funds to and collaborate with the Forest Service in planning and design efforts to enhance the Bell Bay Campground, Medimont Recreation Area, and Rainey Hill Recreation Area. The Forest Service and Avista have agreed upon a plan where Avista would provide approximately 25 percent of the necessary funding for improvements to the Bell Bay Campground and Medimont Recreation Area and also provide $15,000 annually for Forest Service operation of the three recreation areas over the term of the new license (USDA Forest Service Letter, filed August 21, 2006).

Trail of the Coeur d'Alenes Trail Spurs—Under the Proposed Action, Avista would contribute funds to and collaborate with the Coeur d'Alene Tribe and IDPR in planning and design efforts to develop three barrier-free trail spurs located along the Trail of the Coeur d'Alenes between Harrison and Plummer, with one spur in Heyburn State Park. The trail spurs would include interpretive displays depicting tribal history and natural history of the lake area, and the spurs would include other amenities such as picnic tables or park benches. Avista would also cooperate with the Coeur d'Alene Tribe to develop a pedestrian pullout along the trail at the Plummer Trailhead that would include an interpretive/educational display, picnic tables, and/or park benches.

Heyburn State Park—Under the Proposed Action, Avista would contribute funds to and collaborate with IDPR in planning and design efforts to reconstruct the pedestrian trail from the campground to the Trail of the Coeur d'Alenes and install a sealed vault toilet to accommodate off-season use.

Hawleys Landing—Under the Proposed Action, Avista would contribute funds to and collaborate in the planning and design with IDPR to extend the boat docks to accommodate off-season use.

Plummer and Rocky Points—Under the Proposed Action, Avista would contribute funds to and collaborate in the planning and design with IDPR to provide sand at the two swimming beaches.

Future Coeur d'Alene Recreation Projects—Under the Proposed Action, Avista would work with the relevant cooperating parties to plan and develop new and/or reconstructed recreation projects after the initial projects are completed. The ongoing visitor studies, agency input, and input from the cooperating parties would provide guidance on the projects. Avista would provide funding not to exceed $60,000 annually, after the initial recreation projects were completed.

On July 14, 2006, the USDA Forest Service filed preliminary 4(e) conditions and 10(a) recommendations for the Post Falls Project. Pursuant to an August 16, 2006, settlement agreement between the Forest Service and Avista, the Forest Service withdrew its previously filed preliminary conditions and filed modified preliminary terms and conditions on August 21, 2006. The preliminary 4(e) conditions would require Avista to (1) obtain written approval of the Forest Service for all final design plans for improvements affected or deemed as affecting USDA Forest Service resources; (2) indemnify the U.S. government harmless for any damages or losses sustained by the government during construction of improvements at Bell Bay Campground, Medimont Recreation Area, and Rainey Hill Recreation Area; (3) be liable for fire and other damages to National Forest System lands according to standard L-Form License Articles 22 and 24 of a new license; and (4) identify and report to the USDA Forest Service all known or observed hazardous conditions on or directly affecting such National Forest System lands during construction at the three facilities. None of these preliminary 4(e) conditions would likely change the outcome of the recreation improvements proposed by Avista, as most are administrative in nature.

Other agencies such as the IDFG, NPS, and IDPR provided recommended measures that fully endorsed Avista's proposed recreation measures and enhancement programs. The BLM also endorsed Avista's proposed measures, and Avista concurred with BLM's interpretation of its measures as outlined in DOI's July 18, 2006, preliminary recommendations filing.

The City of Coeur d'Alene supports Avista's proposal. The city notes that Avista would provide funding in the amount of $27,750 for construction of three projects and $3,500 annually for O&M costs.

Our Analysis

Avista's proposal for these site developments would (1) help meet the need to increase developed capacity and to provide trails, (2) provide accessible recreational facilities by redesigning and reconstructing existing facilities, including boat ramps, and (3) provide for public health and safety needs by replacing deficient infrastructure (e.g. restrooms and roads). All of the recreation developments slated for improvements are along the shoreline of Coeur d'Alene Lake directly adjacent to the Project boundary. These facilities have a direct connection with the Project through the Project's maintenance of the summer lake level at the 2, 218-foot elevation level mark. The facilities and their use patterns have all adopted to this lake level and thus, to varying degrees, are dependent upon the steady lake level resulting from continued annual Project operations.

Our analysis indicates that recreational use at the projects has increased considerably over the term of the existing license. Kootenai County alone has experienced a near doubling of its population from 1980 through 2003, and recreation use at Coeur d'Alene Lake has increased commensurately as a result of this growth, growth in the greater Spokane area, and growth in other cities of the Pacific Northwest (Avista, 2005). The site-specific proposed measures would improve access to Project waters and improve the recreational experience. All of these improvements generally involve some ground or soil disturbance and could result in the clearing of some vegetation; however, the effect is expected to be minimal because the clearing would generally occur within areas already being used as parks. Avista's proposed recreation improvements were developed in a formal process with considerable stakeholder involvement through its workgroups and relicensing process, and are based upon several years of study results and assessment. The sites identified for improvement are in need of improvement and are also located in the more desirable settings for overnight and day use improvements to meet the growing demand for recreation uses. Finally, due to the potential for increased recreation demand at the Project and due to the proximity of the Project to Spokane, a major population center, we find that improving these sites would allow Avista to meet recreation needs over the terms of a new license.

Downstream of Post Falls Dam, the whitewater boating resource can be quite good; however, the overall condition of some of the recreational access sites on the upper Spokane River has been degraded by recreational use and deferred maintenance, and there is currently a lack of adequate flow information. Under the Proposed Action (PF-REC-3), Avista would work with local municipalities to provide or improve public access at a number of recreational sites along the upper

Spokane River, including Trailer Park Wave and Corbin Park. The City of Post Falls owns and manages Corbin Park.

Currently, public access to Trailer Park Wave either is achieved illegally across private lands or requires difficult and lengthy portaging from the Post Falls Project. The site is considered to offer excellent freestyle boating opportunities when flows are between 4,500 and 6,500 cfs (Louis Berger Group, 2004b). However, the lack of good public access, in combination with the lack of adequate flow information, has limited recreational opportunities at the site.

Under the Proposed Action (PF-REC-3), Avista would cooperate with the City of Post Falls, Kootenai County Parks and Waterways, IDPR, Spokane Canoe and Kayak Club, and Northwest Whitewater Association to develop public access to Trailer Park Wave. The best location for the access site appears to be on the south side of the river on private lands. Avista would work with the landowner to secure fee-simple ownership or public access easements to the property. Facilities that would be developed at the access site include parking, an access trail connecting the parking lot to the shoreline, a toilet, and appropriate signage. Avista would either enter into a long-term agreement with one of the above-mentioned entities to manage the property or manage it directly. Avista would provide funding, not to exceed $150,000, for site acquisition and/or project development and $15,000 annual for O&M. If negotiations with the landowner were unsuccessful, Avista would work with the partnering entities to develop an alternative access approach. The actions slated for improving the Trailer Park Wave site and Water Avenue access could involve clearing vegetation, which could result in some minor disturbance to wildlife habitats along the river in these areas (see section 3.3.5.2.7).

3.3.8.2.7 Spokane River Developments Recreation Resource Measures

The Proposed Action includes the following facilities and recreation measures associated with the Spokane River Developments (SRP-REC-2 and SRP-REC-4) to provide public access to Project lands and waters.

Monroe Street Development

Avista owns land in downtown Spokane adjacent to Monroe Street Development that is used for public viewing of the lower falls. No formal public boater or angler access exists immediately downstream of Monroe Street Development due to the topography.

Huntington Park—Under the Proposed Action, Avista would continue operating Huntington Park at Monroe Street Development as a natural area/buffer within the City of Spokane. Avista would also cooperate with the Friends of the Falls Association (Great Gorge Project Steering Committee) to allow possible enhancements to Huntington Park related to the Great Gorge Park plan so long as the enhancements are in keeping with the park's current level and type of development.

Water Avenue Access Site—Under the Proposed Action, Avista would contribute funds to and collaborate with WSPRC, Spokane County, the City of Spokane, the Spokane Canoe and Kayak Club, the Northwest Whitewater Association, and the Friends of the Falls in planning and design efforts to develop the Water Avenue Access Site. The access site would include designated parking, a gravel carry-in-only boat launch with emergency vehicle and boat access gate, portable seasonal toilets, changing area, and appropriate signage. The Spokane Parks and Recreation Department owns the land and manages the site and must approve all facility improvements.

Nine Mile Reservoir

Nine Mile Cottages—Under the Proposed Action, Avista would either enter into a long-term lease with WSPRC or transfer ownership of the cottages to them in fee through a separate agreement. Avista is also proposing to remove the cottage compound from the Project boundary because as a State Park residential compound, it does not serve Project purposes (see section 3.3.9.2).

Nine Mile/Spokane House Interpretation—Under the Proposed Action, Avista would contribute funds to and collaborate with WSPRC in planning and design efforts to develop an interpretive center with a focus on hydroelectric generation and the history of Riverside State Park. Avista also proposes to relocate the existing Nine Mile overlook to the Charles Road Bridge to accommodate disabled individuals and to include interpretive signage. In addition, Avista would cooperate with WSPRC to redevelop the interpretive displays at the Spokane House in accordance with the HPMP.

Nine Mile Portage Parking and Signage—Under the Proposed Action, Avista would contribute funds to and collaborate with WSPRC in planning and design efforts to identify and develop a floater take-out immediately upstream of the Nine Mile Development boat restraining system. Avista would cooperate with WSPRC to construct a four- or five-stall parking area near the take-out and to install informational and warning signs at the Plese Flats access site and upstream of Nine Mile Dam. The signs would warn floaters that they should exit the river on the left (south) side as they approach the boat restraining system. The Nine Mile Portage would be identified with a "Portage Here" or "Take Out Here" sign. Avista would also work with WSPRC to recommend and identify timeframes, based on river flows, when the public should not use the portage due to safety concerns.

Centennial Trail Extension—Under the Proposed Action, Avista would contribute funds to and collaborate with WSPRC and the Friends of the Centennial Trail in planning and design efforts to improve pedestrian and bicycle access to Lake Spokane by extending the Centennial Trail by approximately 1 mile from Sontag Park to the Nine Mile Resort. Assuming a construction width of 12 feet, approximately 1.45 acres would need to be cleared. This trail extension is specifically called for as a priority in the 2006 Spokane County Regional Trails Plan prepared by the Inland Northwest Trails Coalition.

Lake Spokane

Nine Mile Resort—Under the Proposed Action, Avista would reconfigure the Nine Mile Resort to provide expanded day-use and seasonally extended boating opportunities, which would be operated in conjunction with Washington State Park's proposed new campground. Avista would retain ownership of the Nine Mile Resort property and would either manage the property with a concessionaire or enter into a long-term management agreement with WSPRC.

WDNR's Lake Spokane Campground—Under the Proposed Action, Avista would contribute funds to and collaborate with WDNR in planning and design efforts to expand camping opportunities and extend seasonal boating and day-use opportunities at the Lake Spokane Campground. The nature of the improvements would be consistent with the current level of development at the site.

Boat-in-Only Campgrounds—Under the Proposed Action, Avista would contribute funds to and collaborate with WSPRC and WDNR in planning and design efforts to identify, plan, and develop up to 10 boat-in-only campsites on Lake Spokane. Avista would also consult with WDFW to minimize potential effects on wildlife when selecting the locations of the boat-in-only sites. The campsites would be developed in groups, located on property belonging to WSPRC, WDNR, or Avista, and developed to provide semi-primitive camping experiences.

Long Lake Dam Overlook—Under the Proposed Action, Avista would reconstruct the Avista-owned Long Lake Dam overlook to be more harmonious with the natural surroundings. Interpretive signs pertaining to hydroelectric generation and the river's natural features would be installed, and the parking area would be reconfigured.

Long Lake Dam River Access Site—Under the Proposed Action, Avista would develop a carry-in-only boat launch with improved parking and picnic facilities at a point immediately downstream of its Long Lake Dam picnic area on Avista lands.

Devil's Gap Trailhead—The trailhead site is located on the southern edge of Avista property along the Long Lake Road. The site provides pedestrian access to the southwestern-most Project lands for wildlife viewing, hiking, fishing, etc. Under the Proposed Action, Avista would continue providing public access to the site and would provide funding for annual O&M.

Future Lake Spokane/Nine Mile Recreation Projects—Under the Proposed Action, Avista would work with relevant cooperating parties to plan and develop new and/or reconstructed recreation projects after the initial projects are completed. The ongoing visitor studies, agency input, and input from other cooperating parties would provide guidance on the projects. Avista would provide funding not to exceed $300,000 every 10 years after the initial recreation projects were completed.

Our Analysis

Avista's proposed recreation improvements were developed through a cooperative process with other entities during the preparation of its final application The NPS and Northwest Whitewater Association, in letters filed July 18, 2006, and July 17, 2006, respectively, endorse Avista's proposed recreation improvement plans for the Spokane River Developments. The recreation sites identified for improvement are generally in need of improvement and are also located in established and generally more desirable settings for overnight and day use to meet the growing demand for recreation uses. Due to the potential for increased recreation demand at the Project and due to the proximity of the Project to Spokane, a major population center, we find that improving these sites as proposed by Avista would allow Avista to meet recreation needs over the terms of a new license. Over the next 10 years, water-based recreation participation levels in the State of Washington are expected to increase by approximately 10 to 20 percent (IAC, 2003). The proposed emphasis on trail improvements is complementary to the regional efforts in extending and improving the Centennial Trail. The proposed developments would involve shoreline areas either directly adjacent to or near Project waters with recreation attributes that depend upon the Project and its operations to maintain the river and reservoir environments to which the facilities and users have adapted. The proposed improvements would increase the capacity of developed facilities for the public and provide visitors with improved access to the Spokane River areas influenced by continued Project operations. Finally, all of these improvements would involve some ground or soil disturbance and could result in the clearing of some vegetation; however, the effect is expected to be minimal because the clearing would generally occur within areas already being used as parks. The establishment of boat-in campgrounds has the potential to bring human disturbance to areas that currently are seldom used and could have minor effects to the wildlife in the area (see section 3.3.5.2.7).

3.3.8.3 Land and Water Conservation Fund Recreation Resources

The Land and Water Conservation Fund (LWCF) program was established by the LWCF Act of 1965 (Pub. L. 88-578) to preserve, develop, and assure accessibility of the public to outdoor recreation resources. The program provides matching grants to states, and through the states to local government, for the acquisition and development of public outdoor recreation sites and facilities. (For further discussion, see section 5.4.5).

Regarding the Spokane River Developments and the Post Falls Project, the Louis Berger Group (2004a) identified existing recreation sites that were developed with LWCF funds. For the Spokane River Developments, Riverside State Park was developed in 1982. The Nine Mile Development, a component of the Spokane River Project, lies within or adjacent to Riverside State Park. At the Nine Mile Development, Avista owns and maintains Nine Mile Dam overlook, which provides visitors with a scenic viewpoint. Long Lake (the original name of Lake Spokane) was also identified as acquired in 1967 or developed between 1986 and 1992. At Lake Spokane and within the Project boundary, Avista owns and maintains North Shore campsites, Long Lake Dam overlook, Nine Mile Resort, and Long Lake picnic area. These facilities provide recreational opportunities and scenic vistas.

Regarding the Post Falls Project, the Louis Berger Group (2004a) identified the following existing sites with their dates of development in parentheses: Hawley's Landing (1987); Heyburn State Park (1965); Mowry State Park (1972, 1975); and Coeur d'Alene City Park (1971). These sites, which Avista proposes to enhance and improve under the Proposed Action, are located outside the Project boundary. We note that if measures at the non-Project sites are found to be necessary for the Project purposes, then lands dedicated to Project purposes must be included in the Project boundary. See Chapter 5.0, *Staff's Conclusions*, for further discussion.

3.3.8.4 Unavoidable Adverse Effects

Implementing the Proposed Action would have no unavoidable adverse effects on recreation.

3.3.8.5 Cumulative Effects

The recreational measures included in the Proposed Action would contribute to the beneficial effect on recreational resources. The improvements to facilities and the management measures would help achieve these goals by reducing user conflicts, distributing recreational visitors more evenly throughout the Project area, and improving the quality of the recreational facilities. However, as recreational demand for boating and camping opportunities at the Project increases over time, some recreational visitors may be displaced to dispersed sites adjacent to the Project. Although individually minor, the cumulative effect of increased use of the dispersed sites may adversely affect wildlife and recreational values of these sites. The site stabilization measures, development of new campsites, and closures of dispersed recreational areas on Lake Spokane should help preserve the recreational and wildlife attributes of these sites as demand increases. Overall, the site improvements and improved management strategies within and adjacent to the Project would offset any cumulative adverse effects of increased dispersed recreational use.

3.3.9 Land Management and Use

The topography of the region varies from rolling fields to mountains and includes lush forests, grasslands, deserts, lakes, and rivers. The area west of the Project includes the gradually sloping Columbia River Basin with agricultural lands and upland deserts. The area north and east of the Project includes heavily forested foothills and mountains associated with the northern Rocky Mountains. The area to the south includes the rolling hills and upland agricultural lands known as the Palouse.

3.3.9.1 Affected Environment

Land use in southeastern Washington is dominated by agriculture, including 49 percent cropland, 21 percent rangeland, and 8 percent private forestland (NRCS, 2000). The area is considered the world’s leading producer of peas and lentils and is an important international producer of wheat and other agricultural products (WSU, 2004a,b). In contrast, regional land use in northeastern Washington and northern Idaho is dominated by federal forestlands (40 percent) and private forestlands (27 percent) (NRCS, 2000). In Kootenai County, Idaho—which includes the Post Falls Project and most of Coeur d’Alene Lake—approximately 77 percent of land use is forestry, with 62 percent of the forests privately owned, 32 percent under federal management, and 6 percent state owned (University of Idaho, 2003). Most of the agricultural uses in Kootenai County are associated with approximately 600 small- to medium-sized farms that produce wheat, bluegrass seed, ornamental nursery stock, Christmas trees, and beef cattle, among other products.

The Coeur d’Alene Tribe is an important land manager in the region. The Coeur d’Alene Indian Reservation encompasses approximately 345,000 acres of mountainous lands, as well as lands around much of the southern end of Coeur d’Alene Lake (ITD, 2002). The reservation’s land-based economy is based on agriculture, with some selective logging of the forestlands. The Tribal Council, which comprises seven elected officials, manages land use on the reservation.

Within the Post Falls Project boundary, approximately 8,396 acres of submerged lands lie within the reservation.

Much of the area around the Project, particularly along the Interstate 90 corridor around the Cities of Coeur d'Alene, Post Falls, and Spokane, has experienced rapid growth during the last 20 years, including residential, commercial, and industrial development (ITD, 2002). The majority of the development has occurred in Spokane County, Washington, and Kootenai County, Idaho. Comprehensive plans and zoning guide land use within these counties. In an effort to contain development consistent with Washington's Growth Management Act, Spokane County has defined an urban growth boundary around the City of Spokane that includes density nodes outside of the city on primary transportation routes (Spokane County, 2003). Land uses surrounding the urban growth boundary include rural, forest, and agricultural uses.

Land use adjacent to the Project boundary varies from rural, rural conservation, and agricultural lands around Coeur d'Alene Lake, Nine Mile Reservoir, and Lake Spokane to residential and urban growth areas around downtown Spokane and the Cities of Coeur d'Alene and Post Falls.

3.3.9.1.1 Post Falls

The Project boundary around the Post Falls Project abuts a wide variety of land uses around the Project development and Coeur d'Alene Lake. Post Falls Dam and powerhouse is located 9 miles downstream of the outlet of Coeur d'Alene Lake, a natural lake. Much of Coeur d'Alene Lake's shoreline is used for primary homes, particularly near the Cities of Coeur d'Alene and Post Falls and the towns of Harrison and St. Maries, as well as secondary recreational homes in the more rural areas. The shoreline also has large tracts of undeveloped private lands, as well as 70 public, 18 commercial, and 13 private association recreational sites (Louis Berger Group, 2004a). The full pool lake level maintained by Post Falls Dam in the summer also supports commercial logging activities, including the storage and transport of logs to mills located on the Spokane River above the Post Falls Dam, though this activity has declined in recent years.

Post Falls Dam maintains Coeur d'Alene Lake at a stable summer lake elevation as much as 7.5 feet higher than it would be under natural conditions. Coeur d'Alene lake has approximately 40,580 surface acres at elevation summer pool level of 2,218 feet. The only Project lands that Avista owns are located immediately adjacent to the Post Falls dams. The lands adjacent to Coeur d'Alene Lake and the upper Spokane River outside of the Project boundary are owned by the abutting property owners. The lands that are inundated by the lake or river to the ordinary high water mark are owned by the State of Idaho or the United States in trust for the Coeur d'Alene Tribe. BLM and the USDA Forest Service also claim ownership of some of the lands within the Post Falls Project boundary. The BLM ownership records indicate that 308 acres of BLM submerged lands are within the Project boundary, and similar USDA Forest Service records indicate that USDA Forest Service-administered lands within the reservoir amount to 91 acres (Avista Response to Additional Information Request, March 21, 2006). Approximately 20 percent of Coeur d'Alene Lake, at its summer elevation of 2,128 feet, is within the Coeur d'Alene Indian Reservation. Of those Reservation lands that are within the Post Falls Project boundary, approximately 1,593 acres are owned by the State of Idaho as part of Heyburn State Park, and approximately 5,996 acres are lands owned by the United States and held in trust for the Coeur d'Alene Tribe.

Shoreline construction and the installation of docks, moorings, and floating structures located inside the Coeur d'Alene Indian Reservation are overseen and approved by the Coeur d'Alene Tribe. Similar activities located outside the Coeur d'Alene Indian Reservation are permitted, overseen, and approved by the Corps, IDWR, and/or the Idaho Department of Lands.

The Post Falls Project started operating in 1906 and was constructed at the site of existing dams, where the Spokane River branches into three separate channels. The Post Falls Project includes three dams (north channel, middle channel, and south channel), spillways along the tops of the north channel and south channel dams, a powerhouse integral to the middle channel dam, and various appurtenant structures. Falls Park and Q'emiln Park, located adjacent to the north channel and south channel dams, together provide picnic areas, playground equipment, interpretive signs, swimming and boat-launching facilities, and a system of trails for public hiking. The Project boundary includes the two islands connecting the north and south channels. Avista maintains private access to the powerhouse and company housing on the north island. The south island is accessible only via the south channel dam or the powerhouse.

3.3.9.1.2 Upper Falls and Monroe Street

Upper Falls and Monroe Street Developments are located in downtown Spokane. Land use within and adjacent to the Project boundary at these developments is primarily hydroelectric and commercial development and recreation, including five public recreational sites. Upper Falls Development includes two dams located on either side of a natural island (Havermale Island). A dam and headgate structure are located on the south channel, and a dam and control works structure for water level and spill control are located on the north channel. The north channel downstream of the dam splits into two branches around Canada Island. The southern branch has a lower elevation than the northern branch and, consequently, accepts most of the water coming past the control works, while the northern branch has little flow during low-flow periods.

This flow pattern is also a result of channels that were cut into the riverbed during the late nineteenth century in an effort to funnel water, during low flows, to the various mills that were located along this river reach.

Avista and the City of Spokane provide public access to pathways, scenic overlooks, fishing areas, and other recreational facilities. The entire Upper Falls facility is surrounded by Riverfront Park, and numerous hotels/motels and businesses are located immediately adjacent to the Project boundary or are separated from the Project boundary only by a sidewalk or trail in the downtown area. Seven primary vehicle bridges and nine pedestrian bridges cross the various river channels and provide public access to the area's features. All of the pedestrian bridges except for one are part of Riverfront Park, and all are outside of the Project boundary. The park offers visitors scenic views of the falls and contains numerous recreational opportunities, including open-air concerts, an IMAX theatre, a seasonal ice skating rink and amusement park rides, and an antique carousel. The park also provides a self-guided scenic tour of Upper Falls Development.

At Monroe Street Development, the Project development and Huntington Park are the only public access lands within the Project boundary. Avista provides public access to the tailrace area and lower falls at Monroe Street Development via Huntington Park, and the City of Spokane operates seasonal gondola rides starting at Riverfront Park and continuing over the lower falls. In 2004, Avista also cooperated with the City of Spokane to develop the Thornton Murphy overlook along Spokane Falls Boulevard to provide viewing opportunities of the lower falls for people with physical disabilities. Because of dangerous river currents, the City of Spokane prohibits boating and swimming in the area.

3.3.9.1.3 Nine Mile and Long Lake

Land use within and adjacent to the Project boundary at Nine Mile Development includes hydroelectric development and recreation, with six public recreational sites. The Nine Mile Development began operating in 1908 and was purchased by Avista (then Washington Water Power) in 1925. Between 1928 and 1930, 10 brick cottages were constructed just northwest of the dam to provide housing for company employees. The dam, powerhouse, and cottages are now listed on the National Register. Avista currently leases seven of the cottages to WSPRC for park employee residences.

Most of the shoreline of Nine Mile Reservoir is owned by the State of Washington and is undeveloped. The state manages the shoreline as a component of the 10,000-acre Riverside State Park, which provides camping, boating, hiking, biking, sightseeing, and equestrian trail-riding opportunities. There are scattered residential developments along the reservoir, outside the Riverside State Park boundary. Shoreline construction and installation of docks, moorings, and floating structures are overseen and approved by the Corps, Spokane County, WDOE, and WDFW.

Land use at Long Lake Development includes hydroelectric development, agriculture, residential development, conservation, and recreation with nine public, two commercial, and one private recreational sites. The Long Lake Dam and powerhouse were completed in 1915. The facility can be viewed from a public overlook on the canyon rim.

Lake Spokane is 23.5 miles long and has a linear character defined by the topography of the natural course of the Spokane River. The lake provides fishing, boating, picnicking, swimming, and camping opportunities. Both sides of the shoreline between the upper reaches of the lake and the community of Tum Tum are developed with scattered residential tracts at various levels of development. In contrast, the area downstream of Tum Tum is largely undeveloped, in part because Avista owns over 15 miles of shoreline and the State of Washington owns about 3 miles of shoreline. The remaining shoreline lands that abut the Project are privately owned. Shoreline construction and installation of docks, moorings, and floating structures are overseen and approved by the Corps, WDOE, WDFW, and Spokane, Stevens, and Lincoln counties, depending on the facility location.

3.3.9.2 Environmental Consequences

Because there are no specific provisions in the existing license to guide comprehensive land management, Avista has proposed development of Land Use Management Plans for the Projects. These plans are intended to provide systematic management direction for Avista-owned Project lands. During the relicensing process, several stakeholders expressed a desire for periodic financial assistance to ensure public compliance with laws and regulations on Project lands and waters. Stakeholders were concerned about possible encroachments by adjacent property owners onto Avista-owned Project lands and had questions and concerns about the future management of Avista-owned Project lands.

3.3.9.2.1 Post Falls Project and Spokane River Developments Land Use Management Plans

Under the Proposed Action (measures PF-LU-1 and SRP-LU-1), Avista proposes to finalize and implement Land Use Management Plans for both the Post Falls Project and the other Spokane River Developments within 1 year of new license issuance. Avista, with the assistance of the recreation and land use work group, prepared a draft Land Use Management Plan during the pre-filing consultation phase. The proposed final Land Use Management Plans would include management goals, objectives, and implementation measures for the following specific land-use categories on Avista-owned Project lands:

- Conservation Lands—lands that possess general wildlife, botanical, cultural, aesthetic, or other natural resource values;
- Public Recreation Lands—lands that contain existing recreational facilities or possess desirable and currently recognized recreational facility developmental potential;
- Private Recreation Lands—lands that are available for permitted uses by adjacent landowners;
- Closed/Restricted Lands—lands where the public is not allowed or is severely restricted due to security, operational, or safety concerns; to ensure residential privacy at Avista's employee housing; or for resource protection concerns; and
- Shoreline Lands—shoreline lands where any recreational use occurs. Measures may include erosion or bank stabilization, shoreline buffers, and public outreach.

Avista anticipates funding on-the-ground management each year, including annual inspections of the Project lands, fence and gate repairs, weed management, forest thinning, sign management, permitting, etc.

In addition, the final Land Use Management Plans would outline procedures for Avista to partner with land managers actively involved in ensuring compliance with current and future land- and water-based laws and regulations. Specifically, Avista would provide assistance and financial support for enforcement of land- and water-based laws and regulations administered by federal, state, and local governmental entities. The parties listed in the final Land Use Management Plan would include, but are not necessarily limited to, WDNR; WDOE; WDFW; and Spokane, Stevens, and Lincoln counties in Washington; and the Coeur d'Alene Tribe, IDFG, and Kootenai and Benewah counties in Idaho. Avista would prepare annual reports for submittal to the Commission summarizing activities funded by Avista.

Our Analysis

Finalization and implementation of the Land Use Management Plans would improve land management on Avista-owned Project lands. The Land Use Management Plans would provide a systematic approach to land stewardship, conservation, habitat protection, and public access on Avista-owned Project lands. The proposed shoreline management measures to be included in the final Land

Use Management Plans would also address shoreline development and balance development with important environmental resources on Avista-owned lands.

Avista's plan to work with public land managers to implement the goals of the Land Use Management Plan on lands not owned by Avista would also improve land management within the Project. The staff recommends that Avista complete the Land Use Management Plans for both projects as a means to better manage its lands for multiple purposes and to provide a means for Avista to (1) assist with the enforcement of federal, state, and local shoreline regulations on and adjacent to Project waters and (2) coordinate land management efforts and goals in the Project area. However, Avista's measure to provide financial support for enforcement of land- and water-based laws and regulations administered by federal, state, and local governmental entities is not the licensee's responsibility within the context of a FERC license and is not required in order to fulfill the Project purposes. The staff therefore does not recommend this provision of measures PF-LU-1 and SRP-LU-1 in any license issued for the Project.

3.3.9.2.2 Project Boundary Changes

As part of the Proposed Action, Avista intends to change the Post Falls Project boundary and the Spokane River Project boundary at Monroe Street/Upper Falls, Nine Mile, and Long Lake Developments.

Post Falls Project

At the Post Falls Project, Avista proposes to add 2,352 acres in the Thompson, Benewah, Chatcolet, and Hepton cove or "lake" areas and other areas and remove approximately 0.5 acre east of the abandoned Corbin Ditch near Post Falls Dam. Table 3.3.9.2-1 provides a summary of land ownership and changes proposed within the Post Falls Project boundaries.

Our Analysis

Adding the land area within the Thompson, Benewah, Chatcolet, and Hepton Lake areas of Coeur d'Alene Lake is necessary to readjust the Project boundary to the full extent of the current lake. All of these lands are currently inundated when Coeur d'Alene Lake is at its full pool summer elevation (2,128 feet). The Hepton Lake area is a large tract (approximately 1,100 acres) of land on the Coeur d'Alene Indian Reservation adjacent to the lower St. Joe River levee. The land is just below the 2,128-foot elevation contour. Previously, this land was drained and used for agricultural purposes and was protected by a levee. However, the levee was breached in May 1997; the lands are no longer used for agricultural purposes and are typically inundated when Coeur d'Alene Lake is at or above full pool (2,128 feet) from spring through summer each year.

Table 3.3.9.2-1. Summary of land ownership within Post Falls Project boundaries

Project Area Component	Total Reservoir Surface (Acres)[a]	Current Ownership (Acres)	Proposed Ownership Change (Acres)
Post Falls Project			
Coeur d'Alene Lake reservoir area	40,580		
Avista ownership		161	+1
BLM ownership		308	+65
USDA Forest Service ownership		54	+38
State of Idaho ownership		31,872	+1,200
Coeur d'Alene Tribe ownership[b]		5,996	+1,048
Total		**38,391**	**+2,352**

a Includes the area within the normal full pool level of 2,128 feet for Coeur d'Alene Lake and elevation 1,606.6 feet for Nine Mile Reservoir (with flashboards).

b Includes lands held in trust by the United States for the Coeur d'Alene Tribe and lands owned in fee by the Tribe (i.e., Hepton Lake property).

Source: Avista, 2005, and staff

Also at the Post Falls Project, Avista proposes to remove a small, approximately 0.5-acre parcel of private land located east of the abandoned Corbin Ditch that separates Falls Park from land previously occupied by the Louisiana Pacific mill site. The 0.5-acre parcel was used for log storage by the Louisiana Pacific lumber mill, which was closed and subsequently removed from the property. The land was originally included in the boundary because the mill required access to the reservoir to extract and store logs that were cut in the upper tributaries and floated across the reservoir. The old mill site, including the 0.5-acre parcel, is currently being developed for commercial and residential purposes. The proposed boundary adjustment would exclude these private lands by following the 2,128-foot contour, similar to adjacent properties.

Avista is required to provide safe public access to Project lands and waters and include those lands necessary for Project operations in the Project boundary. Avista's proposed changes would include water storage and terrestrial and aquatic resource benefits. The small parcel that is being proposed for removal from the Post Falls Project boundary does not serve any Project purposes or provide any public benefits. Currently, these private lands are scheduled for redevelopment as commercial, residential, or related uses. The proposed Project boundary would exclude this small area and follow the 2,128-foot contour, consistent with the Project boundary at neighboring private and public properties. The staff concurs with these changes to the Project boundary at the Post Falls Project.

Spokane River Developments

Avista proposes to remove 2.8 acres from the Monroe Street/Upper Falls Project boundary and 66 acres of land at Nine Mile Development because these lands serve no Project purpose. At Long Lake Development, Avista proposes to add 350.1 acres of Avista-owned lands, including a shoreline buffer, the Nine Mile Resort, and two short sections of Project transmission lines. Table 3.3.9.2-2 provides a summary of land ownership and changes proposed within the Spokane River Developments boundaries.

Table 3.3.9.2-2. Summary of land ownership within Spokane River Developments boundaries

Project Area Component	Total Reservoir Surface (Acres)[a]	Current Ownership (Acres)	Proposed Ownership Change (Acres)
Spokane River Developments			
Upper Falls/Monroe Street	128		
Avista ownership		41	-3
City of Spokane		35	
Other ownership (Private)		62	
Subtotal		***138***	***-3***
Nine Mile	414		
Avista ownership		123	-66
State of Washington ownership		57	
Other ownership (Private)		234	
Subtotal		***414***	***-66***
Long Lake	5,060		
Avista ownership		3381	+350
State of Washington ownership		380	
Other ownership (Private)		1852	
Subtotal		***5613***	***+350***
Total		**6,165**	**+281**

Source: Avista, 2005, and staff

At Monroe Street and Upper Falls Developments, Avista proposes to remove approximately 2.8 acres of land that was originally included in the Project boundary based on a metes and bounds survey. Much of the shoreline area originally included in the Project boundary has been modified over the years, especially during the preparation for Expo 74, when this heavily industrialized area was completely redeveloped. The Proposed Action would provide a Project boundary that would follow pool elevations pertinent to the two developments.

At Nine Mile Development, Avista proposes to remove 66 acres from the Project boundary. The Proposed Action includes removing 19.1 acres on the east side of the development that is separated from the remainder of the Project lands by State Highway 291, an area that includes a non-Project transmission line right-of-way. Avista also proposes to remove 5.4 acres on the west side of the river that includes the old overlook and cottage compound used by WSPRC for employee housing and 3.3 acres from the Project boundary that is located downstream of the dam and powerhouse facility and is separated from the Project lands by Charles Road. These lands would be removed because they serve no Project purpose. Finally, Avista proposes to remove 38.2 acres of private and state-owned land in small scattered parcels located adjacent to the Project boundary. These private lands serve no Project purpose, and the small state-owned parcels are managed as part of the 10,000-acre Riverside State Park.

At Long Lake Development, Avista proposes to expand the Project boundary by adding 350.1 acres of Avista-owned lands. This addition would include 319.9 acres in a 200-foot-wide shoreline buffer, 15.4 acres for the Nine Mile Resort property, and 3.0 acres at a dredged boat area. Avista also proposes to add 11.8 acres for the 1.8-mile-long section of transmission line associated with Long Lake Development, which as a result of transmission system changes, serves to deliver Project-generated power to the regional system.

Our Analysis

The proposed changes to the Project boundary at Monroe Street and Upper Falls Developments essentially involve readjusting the Project boundary to include only those lands that are useful for Project operations. These adjustments would follow the 2,128-foot contour and would address previously imprecise boundaries that were established based on older, less accurate surveys around the reservoirs. Lands that would be excluded are suitable for removal because there is no public access to Project waters in the area where the Project boundary would be modified, nor are there any special habitat or other wildlife benefits to be protected.

At Nine Mile Development, Avista’s proposal to remove the lands around the non-Project transmission line and the old overlook/cottages area would be consistent with the FPA. The transmission line right-of-way no longer transfers any Project power and is unrelated to current Project operations. Visitors currently access the overlook area near the old bridge abutment by following the road between the cottages to reach the overlook platform. As part of the Proposed Action, Avista proposes to close the existing overlook and relocate the overlook platform and interpretive facilities to the Charles Road Bridge. The cottages, which are currently leased to WSPRC for Riverside State Park employee housing, were originally built to house workers for the dam but have not been used for Project purposes for many years. In conjunction with the new overlook, the old overlook and the cottages would not serve any Project purposes and removing these lands would be consistent with FPA. Additionally, removing the other small scattered tracts of private land and the small parcel of state land from the Project boundary would be consistent with the FPA because they serve no Project purpose.

At Long Lake Development, the proposed inclusion of the 200-foot-wide buffer and the Nine Mile Resort would incorporate Avista-owned shoreline lands and Avista-owned recreational lands that are not currently within the Project boundary. Expanding the Project boundary to include the shoreline buffer as proposed would ensure that Avista-owned shoreline lands at Lake Spokane are managed and protected consistent with the Land Use Management Plan. Expanding the boundary to include the Nine Mile Resort would ensure that this primary Avista-owned recreational site provides public access to Project waters for the term of the new license. Including the two segments of Project primary transmission lines into the Project boundary would be consistent with the FPA. The staff concurs with these changes to the Project boundary at the Spokane River Developments.

3.3.9.2.3 Other Measures

<u>Post Falls Project and Spokane River Developments</u>

As part of Avista's comprehensive proposal for the Projects, there are also measures proposed for (1) purchase and maintenance of a boat for use in implementing all PMEs at the Projects (cost shared equally between the Projects); (2) funding allocated to administrative overhead costs for the new PME measures at the Projects; and (3) funding allocated to support office staff and expenses associated with new PME measures at the Projects (Avista 2005, Tables 6-4 and 6-5).

Our Analysis

While these measures may have merit outside a FERC license for the Projects, we find that providing funds for agency or other monitoring services personnel in performing PME implementation duties is not required in order to fulfill the Project's purposes. We therefore do not recommend including any of the above funds for administrative or implementation and associated uses in any license issued for the Project.

3.3.9.3 Unavoidable Adverse Effects

None.

3.3.10 Aesthetic Resources

3.3.10.1 Affected Environment

Aesthetic resources within the Project are site-specific and reflective of the character found at each of the developments. Recreational sites, scenic overlooks, and roads adjacent to the Post Falls Project and Coeur d'Alene Lake provide a wide variety of views. Around Post Falls Dam, the viewshed is typically foreground to mid-range, with views of Project facilities and the Spokane River gorge. Mid-range to long-range views are typical at Coeur d'Alene Lake, with forested and developed shorelines in the mid-range view and forests and mountains in the long-range view.

The White Pine and Coeur d'Alene Lake scenic byways cross Project lands near Coeur d'Alene Lake (ITD, 2001). The White Pine Scenic Byway follows Highway 3 through Benewah and Kootenai counties, across the St. Joe and Coeur d'Alene rivers, and along the upper reaches of Coeur d'Alene Lake. The Lake Coeur d'Alene Scenic Byway begins at the junction of Interstate 90 and Highway 97 and follows Highway 97 south and east along Coeur d'Alene Lake to Highway 3.

At Upper Falls Development, views are generally within the foreground and mid-range, and aesthetic resources are mostly associated with the river channels and falls, industrial works of the hydroelectric facilities, and urban development along the Spokane River. Adjacent hotels/motels, restaurants, the YMCA and other businesses, exclusive condominium developments, recreational facilities, and numerous vehicular and pedestrian bridges are important factors related to the Upper Falls aesthetic resource. Spill typically occurs at Upper Falls Development through June and into mid-July, when river flows exceed the turbine's hydraulic capacity of 2,500 cfs. Flows in excess of 2,500 cfs are spilled down the middle and north channels of the river, with most of the water going down the middle channel. In the middle channel, the flow follows the course of human-made channels that were cut into the riverbed in the late nineteenth century to funnel water to the mills that once occupied the riverbanks. With higher flows, more water goes down the north channel of the river. Leakage of approximately 40 cfs flows into the middle channel of the river when flows drop below 2,500 cfs, typically after late-June to mid-July. Flows increase in the channels once Avista begins drafting Coeur d'Alene Lake in September. Visitors can view the channels and falls from parks, overlooks, roads, bridges, and paths within and adjacent to the Project boundary.

At Monroe Street Development, views are similarly within the foreground and mid-range. Under the terms of the current license, Avista maintains aesthetic flows of at least 200 cfs over the Monroe Street Dam and downstream ledges during normal viewing hours (10 a.m. to one-half hour after sunset) every day, year-round. Shortly before the World's Fair was held near the site in 1974, the Monroe Street Dam was reconstructed and designed to enhance this aesthetic flow. The nearby Monroe Street Bridge is currently being rebuilt and will provide pedestrian viewing opportunities of the dam, downstream ledges, river channel, and lower falls in the same manner as the previous bridge. The city-operated gondola ride also affords views of this area, especially as it passes across the river immediately below the lower falls.

The landscape adjacent to Nine Mile and Long Lake Developments have primarily a rural character, with recreational facilities and roads providing mid-range views of undeveloped shorelines. A substantial portion of the Nine Mile Reservoir is flanked by Riverside State Park, which is primarily undeveloped. The park has limited recreational developments, including the Centennial Trail, which parallels the reservoir for its entire length.

As part of a survey of 157 persons done by Avista, the Post Falls Project and Upper Falls Developments were identified as developments that could adversely affect aesthetics because water is diverted from the falls in the bypassed reaches of both developments. The study found that summer low flows often create a view of exposed rocks in the channels. Typically, the flows in the north channel at Upper Falls Development are reduced to their lowest level (i.e., leakage flow of approximately 40 cfs) from mid-July until after the September drawdown begins at the Post Falls Project. At the Post Falls Project, the flows in the north channel are typically at their lowest level (leakage) between early July and mid-January.

When looking at the bypassed reach at the Post Falls Project, most study participants did not associate the leakage flow with pleasing aesthetic attributes. The most common comments criticized the artificial character of the waterway in its dewatered state and expressed the desire to hear and see water flowing over rocks. However, even at the leakage flow, some study participants identified the rocky gorge and cliffs as visually pleasing.

At Upper Falls, study participants commented about the lack of water in the north channel at the leakage flow and indicated that they did not like to see the channel's exposed angular rocks in the riverbed resulting from the lack of water. The most common attributes that were criticized included the exposed rocks and the overall bare appearance of the north channel without water. Participants indicated that water flowing around the large rock in the center of the south (middle) channel was a pleasing attribute.

Overall, the study found that the aesthetic quality of the bypassed reaches is enhanced with higher flows than exist as seepage.

3.3.10.2 Environmental Consequences

During summer months when the developments are not spilling, there are only leakage flows in the north channel at the Post Falls Project and leakage flows of about 40 cfs through the control works at Upper Falls Development, most of which reaches only the middle channel downstream. Avista currently releases a minimum aesthetic flow of 200 cfs over the Monroe Street Dam and the lower falls, during normal viewing hours (10 a.m. to one-half hour after sunset) every day, year-round, as required under the current license.

Post Falls Project

During collaborative work group meetings, stakeholders expressed concern about the lack of water flowing through the north channels at the Post Falls Project.

As a result of stakeholder concern about the need for aesthetic flows at the Post Falls Project, Avista and the relicensing study work group for recreation, land use, and aesthetics directed an aesthetics study to help determine acceptable viewing experiences and preferred viewing times at the Post Falls Project (Louis Berger Group, 2003). The study focused specifically on the waterfalls at the Post Falls Project because the Project controls the flows in these reaches and the adjacent park is a popular viewing area. The primary objectives of the study were to determine desirable viewing times and the attributes that the public liked about the flows.

Under the Proposed Action, upon issuance of the new FERC license, Avista would release aesthetic flows of approximately 46 cfs over the north channel waterfalls at the Post Falls Project (PF-AES-1). The flows would typically be released through the second and fifth tainter gates, with both gates open approximately 0.5 inch (estimated to be 23 cfs per gate). Avista would provide aesthetic flows on Saturdays and Sundays between the hours of 12 noon and 6 p.m. (daily) from Memorial Day weekend through Labor Day, recognizing that high spring runoff conditions in most years would provide north channel flows that exceed the desired aesthetic flows at the hydroelectric development into June and sometimes into July.

Our Analysis

At the Post Falls Project, the Proposed Action’s aesthetic release would provide substantial improvements over existing conditions. Several stakeholders and agencies have endorsed the plan. Specifically, the IDFG, IDPR, Northwest

Whitewater Association, and NPS have provided recommendations to fully adopt Avista's proposed aesthetic flow measures at the Post Falls Project. In most years, Avista spills flows that exceed the Post Falls Project hydraulic capacity in the north channel. Typically, spill exceeds the proposed aesthetic flows in the north channel well into June and sometimes July. The measure would ensure that aesthetic releases into the north channel would continue when the Post Falls Project is not spilling. Avista and the relicensing work groups selected the Post Falls aesthetic flow measure to minimize wear on the gate seals and reduce operational costs while releasing flows that provide many of the desired attributes identified in the aesthetic study. The release into the north channel would improve aesthetic resources beyond existing conditions, balance lost generation with aesthetic needs, and provide aesthetic flows on a schedule that would be used by many visitors to the Project.

Spokane River Developments

During collaborative work group meetings, stakeholders expressed concern about the lack of water flowing through Upper Falls Development and expressed desires that Avista continue releasing aesthetic flows over the Monroe Street Dam.

As a result of stakeholder concern about the need for aesthetic flows at the Upper Falls Development, Avista and the relicensing study work group for recreation, land use, and aesthetics directed an aesthetics study to help determine acceptable viewing experiences and preferred viewing times at the two hydroelectric developments (Louis Berger Group, 2003). The study focused specifically on the north and middle channels and Upper Falls Development because the Project controls the flows in these reaches and the adjacent parks are popular viewing areas. The primary objectives of the study were to determine desirable viewing times and the attributes of the flows that appealed to the public.

Based on the results of the licensing studies, it was found that most people visit Upper Falls between noon and 7 p.m. Aesthetic flows in the 200-cfs range could provide desirable attributes that would enhance visitors' experiences by diverting water from the human-made channels that once led water to the early mill sites. The goal would be to split the 200 cfs between the two channels so that approximately 100 cfs passed through each channel. This would be two and one-half to three times as much water as currently passes through the middle channel as leakage. The aesthetic appeal in the north channel would be significantly improved because it is generally dry in the summer months under current conditions.

Under the Proposed Action, Avista would implement the recommendations that arise from the Upper Falls Aesthetics Flow Plan, a plan that would be developed in consultation with relevant cooperating parties (SRP-AES-1). The plan would address a minimum 200-cfs flow release through the bypass reach (i.e., north and middle channels), as well as efforts to direct leakage and/or the aesthetic flows through both the north and middle channels. These efforts may include, but would not be limited to, a pilot study that would use sandbags to direct flows, documentation of the related visual and audible effects, an evaluation of the pilot study, and engineering documents. Avista would pursue permitting and construction once the plan was complete and the new FERC license was issued, with a goal of implementing the plan within 1 year of issuance of the new FERC license.

Our Analysis

At Upper Falls Development, the Proposed Action's aesthetic flows would provide substantial improvements over existing conditions. Currently, no aesthetic flows are released from the Upper Falls Dam, and leakage flows and spill are channeled through narrow human-made flumes in the bedrock, bypassing most of the cascades in the middle channel and essentially all of the cascades in the north channel. The 200-cfs release would provide substantial improvements to existing conditions. In addition, the release schedule would provide visual benefits throughout the summer when the public is most likely to have the time and inclination to view them.

In addition, the Proposed Action measure to redirect flows in the middle and north channels would make better use of the 200-cfs release by diverting the aesthetic releases and leakage flows away from or out of the human-made channels that once led water to early mill sites and redirecting the flows toward natural falls and cascades. Avista anticipates that redirecting flows from the channels would achieve the desired features or attributes identified at flows of 300 to 400 cfs by the aesthetics study's focus group (Louis Berger Group, 2003). To divert flows out of the human-made flumes, Avista would perform some in-channel construction. Avista anticipates that the construction effort would include small diversions, likely only inches high, to direct water away from the man-made channels, to a few feet high inside a few of the narrow and deep human-made channels. The diversions would be established with aesthetically consistent materials and would likely be inundated most of the time from leakage and spill. Avista would secure all necessary permits before implementing any construction activities in the channel. The aesthetic release of 200 cfs, and modifications engineered to avoid the human-made flumes, would provide visual benefits that exceed existing conditions and would create visual and auditory experiences that mimic spills in the range of 300 to 400 cfs. At Monroe Street Development, an aesthetic flow of 200 cfs over the dam would ensure that existing visual benefits of the lower falls are preserved for the term of the new license.

Most of the stakeholder groups and interested parties have agreed with Avista's proposed aesthetic flow measures that were discussed and presented at throughout the relicensing process. Subsequent to Avista's filing of its application, several stakeholders and agencies have also endorsed Avista's proposed measures at Upper Falls and Monroe Street. Specifically, the NPS and Northwest Whitewater Association have provided recommendations to fully adopt Avista's proposed aesthetic flow measures at the Upper Falls and Monroe Street Developments. However, the Sierra Club, through the Center for Justice, has recommended that Avista not only provide at least 200 cfs of flow from 5 a.m. to midnight year-round, but also conduct a feasibility study of altering the north channel of Upper Falls to spread the water across the entire width of the channel and eliminate the current channelization of the falls that occurs at low flows. Further, Sierra Club contends that if the stream channel modifications prove infeasible, Avista should provide at least 500 cfs for aesthetic flows from Upper Falls Dam. Avista's proposed times for aesthetic flow release are consistent with the findings of the Aesthetics Study Report stating that people view the falls from noon to 7 p.m. Similarly, a release of 200 cfs is an optimum release while minimizing generation loss and operational cost and is also consistent with the Study Report.

3.3.10.3 Unavoidable Adverse Effects

None.

3.3.11 Socioeconomic Resources

3.3.11.1 Affected Environment

The Projects consists of five developments and their associated reservoirs along the Spokane River spanning five counties in two states, including Spokane, Lincoln, and Stevens counties in Washington, and Kootenai and Benewah counties in Idaho. The counties are a mix of rural and developed lands. Industrial and urban uses are generally concentrated in the Spokane River valley and are associated with the city and suburbs of Spokane, Post Falls, and Coeur d'Alene.

Population trends are one indicator of growth and can act as a proxy to understand whether the economy is expanding at a sufficient rate to attract new residents and workers to the area. Population trends show growth in all five counties from 1980 to 2003, with Kootenai County almost doubling its population (95.8 percent increase) and Benewah and Lincoln counties showing very little growth (8.6 percent and 6.1 percent population increase, respectively). Over the same period, Idaho's total population increased by 44.7 percent, which is a more moderate growth rate than the two extremes represented by Benewah and

Kootenai counties. The total population in Washington increased by 48.4 percent, a greater rate than the three Washington counties in the Project area.

Table 3.3.11.1-1 summarizes population density and shows that the population of the five counties reflects the rural and urban character of the area. At 4 people per square mile, Lincoln County has a very low population density compared to the 224 people per square mile in Spokane County.

Table 3.3.11.1-1. Population density for the five counties within the Project area

Region	2003 Population Estimates	Total Land Area (square miles)	Population Density (people per square mile)
Lincoln County	10,201	2,311	4.41
Spokane County	431,027	1,764	224.35
Stevens County	40,776	2,478	16.45
Benewah County	9,029	776	11.64
Kootenai County	117,481	1,245	94.36

Source: NEA, 2004

The number of jobs is another aspect of the socioeconomic conditions for each county in the study area. The Bureau of Economic Analysis (BEA) defines county employment as "...the number of jobs, full-time plus part-time, by place of work." This includes employees, sole proprietors, and active partners. Employment trends in the five counties show a steady decline in agricultural and resource extraction jobs and growth in service and manufacturing jobs, a trend that reflects the urbanization and industrial growth along the Spokane River valley. Table 3.3.11.1-2 summarizes the type of employment by industry for each county.

In Lincoln County, the least populated of the five counties, farm employment contributed approximately 40 percent to total employment in 1980, but by1987, farm employment decreased to almost 20 percent of total employment. From 1990 to 2000, industries that contributed larger shares of employment to the county with large increases in growth included: services (50 percent increase), government (13 percent increase), and retail trade (13 percent increase). Total jobs grew from 4,266 in 1990 to 5,101 in 2000.

In Spokane County, the number of jobs increased from 164,740 in 1980 to 249,578 in 2000, with the services and retail trade industries showing the greatest number of jobs and the greatest percentage increase in jobs. Services industry recorded a 35 percent increase in employment and contributed a 32 percent share

Table 3.3.11.1-2. Percent share of each industry to total employment in the five Spokane River study area counties

Industry	Percent Share of Total Employment 2002				
	Lincoln	Spokane	Stevens	Benewah	Kootenai
Farm employment	22.3	1.0	8.6	5.9	1.1
Agricultural services, forestry, fishing, and other	3.4	0.9	2.6	(D)	1.8
Mining	(L)	0.1	0.5	(D)	0.3
Construction	3.8	6.0	5.2	4.8	8.7
Manufacturing	1.9	9.5	16.5	23.0	9.9
Transportation and public utilities	2.1	4.0	3.2	7.0	3.6
Wholesale trade	5.5	5.6	1.9	1.6	3.4
Retail trade	12.2	17.9	15.2	13.4	20.5
Finance, insurance, and real estate (FIRE)	6.4	8.3	4.4	3.0	8.0
Services	16.8	32.2	25.7	24.7	29.1
Government and government enterprises	25.6	14.4	16.2	16.6	13.5

Notes: (L) – less than 10 jobs
(D) – not shown to avoid disclosure of confidential information, but estimates for this item are included in the totals.

Source: NEA, 2004

to total county employment in 2002. Retail trade recorded a 25 percent increase in employment and contributed 18 percent to total county employment in 2002.

Stevens County experienced a steady increase in employment from 1980 to 2000, with the total number of job increasing from 10,777 in 1980 to 15,962 in 2000. Industries contributing the most in terms of number of jobs and the rate of growth from 1990 to 2000 include: services (50 percent increase, with a 26 percent share of total employment in 2002), retail trade (41 percent increase, with a 15 percent share of total employment in 2002), and government (19 percent increase, with a 16 percent share of total employment in 2002).

Total employment for Benewah County increased 11 percent from 1980 to 1990 and 18 percent from 1990 to 2000, for a total increase of 1,082 jobs. From 1990 to 2000, the largest growth occurred in the construction industry (86 percent) and the services industry (75 percent), while manufacturing jobs decreased by 13 percent.

Employment in Kootenai County grew from 23,588 in 1980 to 60,772 in 2000, a 52 percent increase from 1980 to 1990 and a 70 percent increase from 1990 to 2000. Industries that experienced the greatest expansion in jobs from 1990 to 2000 include retail trade (82 percent); finance, insurance, and real estate (85 percent); and services (83 percent). The “agricultural services, forestry, fishing and other” category expanded jobs by 188 percent (from 383 jobs to 1,102 jobs), but it contributes only 2 percent to the employment totals in Kootenai County.

Historically, Stevens County has had a high unemployment rate compared to other counties, the state, and the nation, with rates measuring a low of 8.6 percent in 1999 to a high of 11.3 percent in 1999. Spokane County experienced a high unemployment rate of 6.9 percent in 2002, with the 2003 level declining to 6.8 percent. Lincoln County has the lowest annual unemployment rates of the three Washington counties, with its highest rate of 5.7 percent occurring in the years 1996 and 2002. The state and county levels have been historically higher than the national average in the same time period.

The unemployment trends for the period 1992 to 2003 for Benewah and Kootenai counties show higher rates of unemployment than Idaho or the nation. Benewah County consistently has a 10 to 12 percent unemployment rate, with the 2003 rate at 10.1 percent. Kootenai County is slightly lower, with its unemployment rate in the range of 7 to 8 percent.

BEA calculates per capita income by totaling the income of residents in an area and dividing total income by the resident population of the area. Table 3.3.11.1-3 summarizes per capita income levels for the counties and shows that income in the more populated and urban counties of Spokane and Kootenai, with the highest per capita incomes in the Project area, is less than their respective state averages.

Table 3.3.11.1-3. Per capita income in the five counties within the Project area, 2002

Location	Per Capita Income 2002	Percent of State Average
Washington State	$32,638	
Lincoln County	$24,528	75.2
Spokane County	$26,637	81.6
Stevens County	$20,610	63.1
Idaho State	$25,476	
Benewah County	$22,271	87.4
Kootenai County	$24,164	94.9

Source: NEA, 2004

Total personal income includes adjusted earnings by place of work; dividends, interest, and rent; and transfer payments. In the five counties, the dividends, interest, and rent category and transfer payments represent approximately one-third of total personal income, a relatively large source of income, as compared to the states and the nation, for each county. In 2000, total personal income for the five-county area totaled $15 billion. Of this total, transfer payments contributed 15 percent or $2.3 billion; dividends, interest, and rent contributed 19 percent or $2.8 billion; and earnings by place of work made up the remaining 66 percent, or $10 billion.

Overall, the five counties in the Project area depend mainly on the earnings from three industries: government (federal, state, and local), services, and manufacturing. While these industries do not necessarily have the highest employment levels for the counties, they generate the highest wages and income.

The Project produces an annual average of 861,500 MWh (95 aMW), or approximately 10 percent of Avista Utilities' power requirements, with 137 MW of capacity. This is enough energy for more than 60,000 households per year in the Project area. The power is generated on a seasonal basis, in consideration of several regional factors, including consistent summer lake levels at Coeur d'Alene Lake for recreational and other uses, and a drawdown of up to 7.5 feet between September and January to meet power generation objectives and provide flood control assistance.

The Project directly employs 31 people, as well as other corporate Avista employees who provide support for, but are not fully employed by, the Project. The Project also creates indirect employment, which includes a variety of jobs such as recreation-based employment, service industries such as restaurants and hotels/motels, and those who provide supplies to each of the direct and indirect employers. The jobs provided directly and indirectly by the Project provide an income and, in turn, a source of revenue for the community. With an estimated average disposable income of $36,000 per job, the direct labor income into the community associated with the Project is estimated at $1.12 million, and the indirect labor income associated with the Project is estimated to be $603,000.

There is also a direct tie between the Project and housing in the area. The 31 people directly employed by the Project can be interpreted as 31 households, or the equivalent of 31 houses within the study area.

There are several industrial ties to the Project, including Stimson Lumber Company, which is located on Coeur d'Alene Lake in the Post Falls area. The lake is a vital part of Stimson Lumber's operations because it is the most cost-effective means of log transportation. In addition, the lake is used to store the company's log inventory, which operates on a first-in/first-out basis.

Tourism is a key industry for the region, especially for Kootenai County, Idaho, when the existence of Coeur d'Alene Lake, as affected by the Project, enhances the draw of tourists to the region. The region counts on revenues from the various tourist industries, including lodging, restaurants, tour guides, rental equipment, gift shops, and others. Tourism is also an important part of the economy due to the taxes associated with those types of activities, which help pay for community services such as police, fire, ambulance, schools, and infrastructure.

Other ties between the Project and the local economy include recreation, cultural, aquatic, and terrestrial resources that provide leisure and natural resource benefits to the local economy. While difficult to measure in economic terms, these services are important contributors to socioeconomic resources in the region.

3.3.11.2 Environmental Consequences at Post Falls Project and Spokane River Developments

Our Analysis

Without the Proposed Action, there would be no new Project-related changes in the current socioeconomic conditions of the local communities. Any changes in population growth, employment, property tax payments, and recreation expenditures would be unrelated to Project relicensing, and there would be no change in government revenue related to the Project. The government, manufacturing, and services industries, including those associated with outdoor recreation in the Project area, would likely continue to make up a substantial portion of the local economy.

Avista's Proposed Action does not include any specific socioeconomic measures. However, it is likely that the environmental measures included in the Proposed Action would have positive or negative effects on socioeconomic resources in the Project area. Possible effects include direct changes in employment, tax revenue, and local expenditures, as well as indirect influences on the local economy.

The Proposed Action includes extensive environmental measures, the cost of which would be paid for through some combination of reduction in other operating costs and increases in electricity rates. Increased electricity rates could adversely affect users in the region, particularly those businesses and industries that depend on low-cost electricity as a primary factor in maintaining their competitive position.

Some measures that are part of Avista's Proposed Action would have beneficial economic effects on the area. These measures include the following:

- finalizing and implementing the Recreation Management Plan;
- improving accessibility for the disabled;
- improving existing and providing new campground facilities, day-use facilities, boat launches, and trails;
- implementing river recreation flows and targeting releases toward levels appropriate for free-style whitewater boating;
- improving the fishery downstream of the Post Falls Project;
- maintaining the summer level of Coeur d'Alene Lake through September 15 each year; and
- improving the aesthetics of some Project features.

These measures would help meet future recreation demand and could encourage additional tourism to the area, thereby increasing expenditures in the region. In addition, maintaining the Coeur d'Alene Lake level through a fixed date (September 15) each year could benefit shoreline residential property values and flat-water recreation-related businesses, as well as the broader tourism industry.

Additional environmental measures designed to enhance the native fishery upstream of the Post Falls Project would reduce erosion, provide improved aesthetic experience, and pursue similar goals with the potential to provide indirect benefits to the Project area's economy.

Environmental Justice

Executive Order 12898, pertaining to environmental justice, requires each federal agency to address, as appropriate, disproportionately high and adverse health or environmental effects of its programs, policies, and activities on minority populations and low-income populations, including Native Americans. In the memorandum to heads of departments and agencies that accompanied Executive Order 12898, the President specifically recognized the importance of procedures under NEPA for identifying and addressing environmental justice concerns. The memorandum particularly emphasizes the importance of NEPA's public participation process, directing that "each Federal agency shall provide opportunities for community input in the NEPA process." (CEQ, 1997).

When considering environmental justice under NEPA, the CEQ guidelines suggest that agencies consider the composition of the affected area to determine whether minority populations, low-income populations, or Indian tribes are present in the area affected by a proposed action, and if so, whether there may be disproportionately high and adverse human health or environmental effects on minority populations, low-income populations, or Indian tribes.

Our Analysis

Coeur d'Alene Lake, at the summer pool elevation of 2,128 feet, covers approximately 5,996 acres of land within the Coeur d'Alene Indian Reservation (not including Heyburn State Park lands). The tribe has approximately 5,778 members and is reported to have an unemployment rate of approximately 18 percent (http://www.cradleboard.org/sites/coeur.html). This unemployment rate is about one-third higher than the remainder of the counties surrounding the reservation and the economies of all areas are changing from agricultural and forestry occupations to more trade, tourism, and development-based industries. The tribe has prepared an Impact Assessment Report outlining the effects of the Spokane River Developments and the Post Falls Project on tribal well-being (Coeur d'Alene Tribe, 2005). The document provides an extensive assessment of the effects on tribal natural and cultural resources and concludes that the Project's main effects are related to water quality, fisheries, wetlands, and cultural/archaeological resources (see sections 3.3.3, 3.3.4, 3.3.5, and 3.3.7 for more details on Project effects on these resources).

To address the issue of environmental justice, we assess whether there would be disproportionately high and adverse health or environmental effects under the Proposed Action. The Proposed Action in this case is to issue a new license for the continued operation of the Spokane River Developments and the Post Falls Project.

We do not believe there would be disproportionately high and adverse health or environmental effects on minorities, low-income populations, or Indian tribes from continuing to operate the Projects. The Projects produce a large amount of clean, renewable, and relatively low-cost electricity that helps reduce the need for fossil-fueled generation. The Project also directly employs 31 people and while that number of jobs is low, it does contribute toward economic diversification and has other indirect economic benefits and opportunities in the area. Continued operation of the Project would extend these benefits into the future. The primary environmental effects of continuing to operate the Post Falls Project would be related to the Project's contribution to the continuation of water level stabilization during summer in Coeur d'Alene Lake and Lake Spokane. Northwest Economics Associates found that Kootenai County and Spokane County had the highest housing costs of the five-county region. The higher housing costs are likely due to the high desirability of Coeur d'Alene Lake properties. There are 3,149 waterfront homes and parcels that were found to have a total value of over $690 million, which is almost 10 percent of the Kootenai County taxable real estate value (NEA, 2004). The economies of these areas are in transition from more natural-resource-based industries to more tourism and services industries. The continued operation of the Projects likely would assist in this transition, which the tribe and other social groups are adapting to. While the Projects do have effects on fish and wildlife resources, the PME measures would likely improve the state of these resources to the benefit of the tribe and other groups in the region.

Finally, as described above, several measures proposed by Avista would likely benefit local communities, including the Coeur d'Alene Tribe and surrounding communities.

3.3.11.3 Unavoidable Adverse Impacts

None.

3.4 NO-ACTION ALTERNATIVE

We evaluated the relative merits of the various recommendations against the baseline condition (No-Action Alternative) in the Coeur d'Alene and Spokane River basins. Under the No-Action Alternative, the Projects would continue to operate under the terms and conditions of the existing license; no new environmental protection or enhancement measures would be implemented.

3.5 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Our recommended action alternative to relicense the existing Projects would not irreversibly or irretrievably commit any significant developmental or nondevelopmental resources in the basin. At any point in the future, Project facilities could be modified or removed and any operational effects altered. No major new capacity or construction that would commit lands or resources in an irreversible manner is proposed or recommended.

3.6 RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

The Spokane River Developments and the Post Falls Project would provide an annual energy production of 872,816 MWh (Proposed Action with staff-recommended measures) to help meet consumer demand for electricity and help industries meet electricity needs. Long-term productivity would extend at least as long as the duration of any license issued for the Project (up to 50 years). The recommended alternative is designed to increase short-term recreational uses and long-term biological productivity of the ecosystems in the area. This includes enhanced vegetation, fish habitat, and water quality, and protection of habitat for species of special concern such as the federally listed bald eagle and bull trout.