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# **ROCKY REACH COMPREHENSIVE RESIDENT FISH MANAGEMENT PLAN**

**Final Draft**

**ROCKY REACH HYDROELECTRIC PROJECT  
FERC Project No. 2145**

**February 24, 2005**



**Public Utility District No. 1 of Chelan County  
Wenatchee, Washington**

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## ***EXECUTIVE SUMMARY***

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Under the direction of the Natural Resources Working Group , numerous studies were conducted during the Rocky Reach Project (Project) relicensing process, including a creel survey, mapping of aquatic habitat, a study of fish presence and habitat use, benthic analysis, a study of the affects of pool (reservoir) fluctuations on fish, a study of the role of large woody debris as fish habitat, and a re-identification of sport fishing access points along the Wenatchee River. None of the studies identified a Project-related impact on resident fish species.

The goal of the Resident Fish Management Plan is to protect and enhance resident fish and habitat in the Rocky Reach Project area, and to enhance recreational fishing opportunities. Although no adverse impacts of continued operation of the Project on resident fish were identified through the Natural Resources Working Group for studies described above, Chelan PUD agreed to implement several resident fish Protection, Mitigation, and Enhancement (PME) measures as part of the Rocky Reach Settlement Agreement. The objectives of these PME are to: 1) continue to enhance recreational fishing opportunities; 2) monitor and assess changes in resident fish species abundance, composition, and distribution in Rocky Reach Reservoir due to ongoing and future Project operations. If the monitoring program identifies adverse changes to resident fish species attributable to Project operations, then Chelan PUD will work with the Rocky Reach Fishery Forum (RRFF) to select and implement reasonable and feasible protection measures to address such changes; and 3) implement Habitat Conservation Plan (HCP) programs that will provide additional benefits to resident fishery resources in the Rocky Reach Reservoir.

The specific PME measures to be implemented by Chelan PUD during the term of the New License and any subsequent annual licenses to meet these goals and objectives are described in Section 4 of the Resident Fish Management Plan. They include the following:

- fish rearing;  
Chelan PUD will continue funding a fish rearing program conducted by Washington Department of Fish and Wildlife (WDFW) to produce approximately 30,000 pounds of rainbow trout, or other fish species reared at a comparable production cost for annual planting in local area waterbodies in Chelan and Douglas counties. Other fish species will be determined by WDFW with input provided by the Rocky Reach Fishery Forum (RRFF).
  
- resident fish measures;  
Chelan PUD shall make available total funding not to exceed \$50,000 for implementing resident fish enhancement measures. Funding will be available from years 1 through 10 of the New License and any subsequent annual licenses. Funding for recreational fishing enhancements will be directed to measures at Twentyfive Mile Creek or other areas described in Section 4.1.2 as determined by the RRFF.

- operation and maintenance (O&M) funding;  
From years 10 through the end of the New License and any subsequent annual licenses, Chelan PUD shall make available \$2,500 annually, on the basis of a one-for-one match provided by WDFW or other entity, for use by WDFW for the purpose of maintaining project(s) implemented under subsection 4.1.2 of this section. In the event that a project is constructed prior to year 10 of the New License, and such project requires maintenance funding prior to year 10 of the New License, then WDFW may borrow from such funding available from years 10 through the end of the New License. If no matching funds are provided in the same year that Chelan PUD makes the annual funding available, the funds from Chelan PUD may carry over to subsequent years, up to a maximum of \$25,000. During any year in which the \$25,000 maximum is reached, then Chelan PUD shall have no obligation to make such annual funding available.
  
- monitoring program; and  
To address potential effects to resident fish, Chelan PUD will conduct periodic resident fish monitoring and evaluation studies as requested and provided by the Rocky Reach Fishery Forum (RRFF) at a cost not to exceed \$300,000 for the term of the New License and any subsequent annual licenses, and not to exceed \$60,000 every ten years.
  
- predator control program.  
Chelan PUD will conduct predator control of northern pikeminnow and avian predators as provided for in the Rocky Reach Anadromous Fish Agreement and Habitat Conservation Plan (Chelan PUD 2004). Chelan PUD will also continue supporting the annual northern pikeminnow fishing derby, as needed, to assist in predator control of northern pikeminnow.

## ***SECTION 1: INTRODUCTION***

The Rocky Reach Project (Project) relicensing process brought together fisheries agencies, tribes, and other interested parties to form the Natural Resources Working Group, which provided an opportunity to comprehensively review the current and future management priorities for fish resources potentially impacted by Project operations. The Natural Resources Working Group identified issues, developed study plans, reviewed study reports, and developed long-term management plans for fish and wildlife species.

The Natural Resources Working Group consisted of representatives from the USDA Forest Service (USDA-FS), the U.S. Fish and Wildlife Service (USFWS), NOAA Fisheries (NOAA), the Washington Department of Ecology (WDOE), the Washington Department of Fish and Wildlife (WDFW), the U.S. Bureau of Land Management (BLM), the Colville Confederated Tribes (CCT), the Yakama Nation (YN), the Columbia River Inter-Tribal Fish Commission (CRITFC), and other interested parties. Due to the complexity of the issues involved, the Natural Resources Working Group formed technical working groups to address issues relating to resident fish, white sturgeon, bull trout, Pacific lamprey, and wildlife. The Resident Fish Technical Group prepared the Resident Fish Management Plan contained in this chapter. For the purposes of the Resident Fish Management Plan, resident fish are defined as non-anadromous fish species inhabiting the Project area.

The Natural Resources Working Group will continue to function as the Rocky Reach Fish Forum (RRFF) following the effective date of the New License and any subsequent annual licenses, as provided in section **XX** of the Settlement Agreement. The RRFF will be responsible for meeting to share information, coordinate efforts, and make recommendations regarding the implementation of the Resident Fish Management Plan. The Resident Fish Management Plan will be reviewed on a periodic basis to allow for planning and future adjustments over the term of the New License and any subsequent annual licenses.

The Resident Fish Management Plan contains chapters highlighting the background of resident fish species (Section 2), relicensing and other studies conducted to determine project-related impacts, if any, on resident fish (Section 3), goals and objectives of the management plan (Section 4), and Protection, Mitigation, and Enhancement (PME) measures for resident fish that Chelan PUD is to implement through the term of the New License and any subsequent annual licenses for the Rocky Reach Project (Section 4).

## ***SECTION 2: BACKGROUND***

### ***2.1 Resident Fish Species***

The Rocky Reach Project reservoir has sufficient spawning habitat, rearing habitat, and food supply to support sizeable populations of native catostomids (suckers), cyprinids (northern pikeminnow, chubs, shiners) and stickleback (Mullan, et al., 1986; Dell, et al., 1975; DES, 2001). Mountain whitefish are also present, although spawning success in the reservoir is probably limited because of warm temperatures in the fall and early winter (Mullan, et al., 1986).

Rainbow trout are common but not abundant. Historic planting of catchable-sized hatchery rainbow trout in the Entiat River and residualization of hatchery steelhead smolts probably contribute to this population. Bull trout, listed under the Endangered Species Act (ESA) as a threatened species, are present in limited numbers.

A fish presence and habitat use study was completed for the Rocky Reach Reservoir in 1999 and 2000 (DES, 2001). The fish population of the reservoir was dominated by non-sport fish species, constituting more than 99 percent of the fish recorded. The major non-sport fish species included, in order of decreasing abundance, threespine stickleback, northern pikeminnow, redbside shiner, sucker (various species, primarily largescale sucker), chiselmouth, and peamouth.

The most abundant resident sport fish species recorded was rainbow trout (juvenile anadromous Chinook salmon were the most abundant overall). Lesser numbers of mountain whitefish (native), and smallmouth bass (exotic) were captured. Mountain whitefish and smallmouth bass were relatively minor constituents of the sport fish population; only 10 mountain whitefish and seven smallmouth bass were recorded, compared to 549 juvenile anadromous Chinook salmon and 62 resident rainbow trout.

These fish species tend to live in different parts of the reservoir, primarily due to differences in habitat throughout the reservoir. The lower section of the reservoir (Rocky Reach Dam to the Entiat River) is lacustrine in character, primarily supporting species that prefer low water velocities. The middle section (from the Entiat River to the Chelan River) of the reservoir is a transition zone between the predominantly slower-moving, deeper habitat in the lower section and the riverine habitat in the upper section. The upper section of the reservoir (Beebe Bridge to Wells Dam) is narrower, creating higher water velocities.

Rainbow trout were recorded in all three sections of Rocky Reach Reservoir. However, the numbers of this species were highest in the upper section of the reservoir and declined with increasing distance downstream. Mountain whitefish and smallmouth bass were recorded only in the middle section of the reservoir.

Northern pikeminnow, redbside shiner, and chiselmouth were distributed throughout the reservoir, but all of these species were most abundant in the lower section of the reservoir. The numbers of these species recorded declined with increasing distance upstream. Peamouth was also most abundant in the lower portion of the reservoir, and occurred in low numbers in both the middle

and upper sections of the reservoir. The abundance of threespine stickleback was greatest in the middle section of the reservoir, and very low in the upper section. Suckers were distributed throughout the reservoir but were most abundant in the upper section. There was no apparent difference in the abundance of suckers between the lower and middle sections of the reservoir.

## **2.2 Species of Concern**

### **2.2.1 Pygmy Whitefish**

Pygmy whitefish (*Prosopium coulteri*) are listed as a Washington State sensitive species, indicating that they are vulnerable, thus declining and likely to become endangered or threatened without cooperative management or removal of threats (WDFW, 2002). Pygmy whitefish are a native species, currently found in relic populations in western North America. Pygmy whitefish are not found in the Project area. The only known population adjacent to the Project area is in Lake Chelan (Hallock and Mongillo, 1998). This species inhabits lakes, typically staying deeper than 18 feet. They also reside in streams, preferring habitats with moderate to swift current.

### **2.2.2 Burbot**

Burbot (*Lota lota*) are listed as a species of concern by WDFW. Burbot are the only fresh-water member of the cod family and are found in the Columbia River system and in deep lakes (Wydoski and Whitney, 1979). Although burbot have been documented rarely in the Rocky Reach Hydroelectric Project area, they are present in the upper Columbia River system and have been reported in Lake Roosevelt, Lake Rufus Woods, and Banks Lake. They are also present in Lake Chelan.

## **2.3 Northern Pikeminnow**

Northern pikeminnow (*Ptychocheilus oregonensis*) (formerly northern squawfish) are a native species to the Columbia River. They are slow-growing, long-lived predators. In summer, adult northern pikeminnow prefer shallow, low-velocity water in cool lakes or rivers. During the winter, they use deeper water and pools (Scott and Crossman, 1973). Spawning occurs during the summer, in shallow water areas with gravel substrate.

Northern pikeminnow are the most abundant predator species in the Columbia River system, and they account for over 75 percent of the total catch of predator fish in the mid-Columbia River (Loch, et al., 1994). They tend to concentrate in tailrace areas downstream of mainstem dams during the juvenile salmonid migration period, holding in relatively slow-moving water areas (less than about 3 feet per second) near passage routes. They also spend time in the slowing-moving portions of tributary streams.

Northern pikeminnow are considered a nuisance species because of their tendency to prey upon desirable native and sport fish species. Therefore, efforts have been made to remove numbers of northern pikeminnow from the Project area. Between 1994 and 2001, the predator abatement programs resulted in the removal of 33,110 northern pikeminnow at Rock Island Dam, 44,882 at Rocky Reach Dam, and 32,250 at Wells Dam (Chelan PUD, 1999; Douglas PUD, 1999; Bickford, 2002 personal communication). In 2004, a total of 39,088 northern pikeminnow were caught in the Rocky Reach and Rock Island project areas during implementation of the predator control program, with 25,529 coming from the Rocky Reach Project area. In addition, over 7,700

northern pikeminnow were removed during fishing derbies conducted between the Rock Island and Chief Joseph dams from 1998 through 2001 (West, 2002). During the 2004 derby, 114 anglers participated in the one-day event, catching 2,943 northern pikeminnow, and prizes were distributed totaling \$20,000.

## **2.4 Other Species**

Several other species are native to the Project, including peamouth chub (*Mylocheilus caurinus*), reidside shiner (*Richardsonius balteatus*), largescale sucker (*Catostomous macrocheilus*), bridgelip sucker (*C. columbianus*), longnose sucker (*C. catostomus*), longnose dace (*Rhinichthys cataractea*) and speckled dace (*Rhinichthys osculus*). No management actions or active fisheries for these species occur currently.

An initial “explosion” of non-game fish after the construction of the Rocky Reach Dam was followed by a reduction and, over the last decade, an eventual leveling off of non-game species. Mullan, et. al., (1986) theorized that the mid-Columbia reservoirs are dominated by trophic generalists, such as cyprinids, in part because of minimal predation. The reservoirs lack a substantive population of highly piscivorous keystone predators such as walleye (Burley and Poe, 1994).

## **2.5 Recreational Fisheries**

According to Washington State fishing regulations for 2002, recreational fishing within the Project area is open year-round for game fish such as smallmouth bass and walleye. In addition to these game fish species, over 20 other species, such as northern pikeminnow, mountain whitefish and pumpkinseed may be taken by anglers while fishing in the Project area. Fishing for white sturgeon is limited to catch and release only, but is allowed year-round. In addition, fishing is periodically open to summer/fall Chinook when run strength can withstand a fishery.

Fishing for trout in the Project area is closed at all times. Fishing for spring-run Chinook and bull trout is closed due to their listing under the Endangered Species Act (ESA). Fishing may occur for steelhead on a year-to-year basis, based on the run strength and wild-origin composition of the run. No fishing is allowed at any time in areas directly surrounding dams. These no-fishing zones range from the upstream line of each dam to boundary markers located 400 feet downstream of the fish ladders at Rocky Reach and Rock Island hydroelectric projects, and 400 feet downstream of the spawning channel discharge (on the Chelan County side) and the fish ladder (on the Douglas County side) at Wells Hydroelectric Project.

The fish presence and habitat use study mentioned above (DES, 2001) found that game fish species account for less than 1 percent of all fish recorded. The most abundant game fish species captured were juvenile anadromous Chinook salmon (549 fish), followed by resident rainbow trout (62 fish). Game fish species that are present in the reservoir are discussed below.

### **2.5.1 Smallmouth Bass**

Smallmouth bass (*Micropterus dolomieu*) are a non-native game fish that have inhabited the mid-Columbia River reach since at least the 1940s. They are listed as a priority species in Washington State because of their vulnerability to habitat loss or degradation and their recreational importance (WDFW, 2002). Preferred habitat for this species includes rocky shoals,

banks or gravel bars. Adult smallmouth bass in the mid-Columbia River are most abundant around the deltas of warmer tributary rivers, but they do not occur in tributary streams. The optimal temperature range for this species is from 21<sup>E</sup> to 27<sup>E</sup>C (Wydoski and Whitney, 1979), which is higher than the typical temperatures in the mid-Columbia River reservoirs.

Ideal spawning temperatures for this species range from 15.5<sup>E</sup> to 18.5<sup>E</sup>C. Such temperatures do not occur consistently in the mid-Columbia River reservoirs until late summer. Smallmouth bass build and defend nests in sloughs and littoral areas with sand and gravel substrates. Such areas are generally lacking in the mid-Columbia River system. It is believed that primary natural reproduction of smallmouth bass in the mid-Columbia River occurs only in the Hanford Reach, below Priest Rapids Hydroelectric Project, and in the Okanogan River.

Smallmouth bass were the second most abundant predator species captured in the mid-Columbia River region during predator assessment sampling conducted in 1993. They were most frequently captured from forebay sampling sites (Burley and Poe, 1994). They are a significant fish predator species in the Columbia River, preying on juvenile salmonids. Similar relative abundance estimates of smallmouth bass were observed in recent sampling programs in the mid-Columbia River reservoir areas (Beak and Rensel Associates, 1999; Parametrix and University of Idaho, 2000; DES, 2001). In the 1993 predator assessment, fish composed 87 percent of the smallmouth bass diet, with salmonids consisting of 11 percent of the fish consumed.

### **2.5.2 Walleye**

Walleye (*Stizostedion vitreum*) are a cool-water, piscivorous game fish that are believed to have moved downstream into the mid-Columbia River reach from a population that was originally established for recreational fishing in Lake Roosevelt in the late 1950s (Zook, 1983). However, they were the least abundant predator species captured in the mid-Columbia River in 1993 (Burley and Poe, 1994). They are listed as a priority species in Washington State because of their vulnerability to habitat loss or degradation and their recreational importance (WDFW, 2002).

Walleye occur throughout the mainstem reservoirs, but are not typically found in the tributaries. Although suitable spawning habitat appears to be plentiful in the mid-Columbia River, evidence of successful reproduction has not been observed (Zook, 1983). Recruitment of walleye into the mid-Columbia River reservoirs is suspected to result from the entrainment of young fish through Grand Coulee Hydroelectric Project during spring runoff (Zook, 1983).

### **2.5.3 Largemouth Bass**

Largemouth bass (*Micropterus salmoides*) were widely introduced in Washington State in the late 1800s (Wydoski and Whitney, 1979). They are listed as a priority species in Washington State because of their vulnerability to habitat loss or degradation and their recreational importance (WDFW, 2002). They prefer clear water habitat with mud and sand substrates, which is best suited for aquatic vegetation production (Wydoski and Whitney, 1979). Largemouth bass are captured infrequently in the Project reservoir, and little is known about their populations in this area (Beak and Rensel, 1999; DES, 2001; Parametrix and University of Idaho, 2000; Burley and Poe, 1994).

### **2.5.4 Channel Catfish**

Channel catfish (*Ictalurus punctatus*) is a non-native species that is found most often in clear lakes, reservoirs, and streams. In streams, this species is usually found in moderate to swift currents over sand, gravel, and rubble substrate. However, little is known about their habitat preferences in lakes and reservoirs (Wydoski and Whitney, 1979). Channel catfish are listed as a priority species in Washington State because of their vulnerability to habitat loss or degradation, and their recreational importance (WDFW, 2002). Channel catfish are infrequently captured in the Project reservoir, and little is known about their populations in this area (DES, 2001; Parametrix and University of Idaho, 2000; Burley and Poe, 1994).

### **2.5.5 Rainbow Trout**

Rainbow trout (*Oncorhynchus mykiss*) are an inland (remains in freshwater) form of steelhead. However, some rainbow trout remain in fresh water for a significant portion of their lives, then undergo a physiological change to a smolt and migrate to the ocean late in life. In contrast to the potential for rainbow trout to become anadromous, the progeny of steelhead are believed to have the potential to become resident rainbow (Peven, 1990). Inland rainbow and juvenile steelhead are not distinguishable from each other until steelhead undergo smoltification. The mid-Columbia River tributaries contain a mixture of resident rainbow and ocean-migrating steelhead. The ability of the species to alternate life-history strategies is an adaptive mechanism to variable environmental conditions within their home (natal) streams.

Under a 1963 agreement between the Washington Department of Game (WDG) (the predecessor to WDFW) and Chelan PUD, in conjunction with the original license for the Project, Chelan PUD implemented a rainbow trout hatchery program to address the loss of a recreational whitefish fishing opportunity in the mainstem Columbia River, near the mouth of the Entiat River. A new hatchery produced 90,000 catchable-sized rainbow trout annually, originally intended for placement in tributaries. However, due to concerns about interactions between rainbow trout and native fish in the tributaries, and the fact that juvenile pre-smolt steelhead were being harvested along with the hatchery fish, the fishery management agencies decided in 1989 to instead stock the hatchery rainbow trout in local area lakes.

### **2.5.6 Mountain Whitefish**

Mountain whitefish (*Prosopium williamsoni*) are a native species and are assumed to occur in all small-order tributaries to the Wenatchee, Entiat, Methow, and Okanogan rivers, and in connecting larger lake systems. They are also believed to occur in the mainstem Columbia River reservoirs, although their behavior patterns are not known. They mostly inhabit riffles in summer and large pools in winter (Wydoski and Whitney, 1979). Spawning typically occurs from October through December, generally in riffles but also on gravel shoals of lake shores. Mountain whitefish feed primarily on instar forms of benthic aquatic insects, although they also occasionally eat crayfish, freshwater shrimp, leeches, fish eggs, and small fish. In lakes, they feed extensively on zooplankton, particularly cladocerans.

A significant recreational fishery for whitefish existed in the mainstem Columbia River, near the mouth of the Entiat River, prior to construction of the Rocky Reach Project. Under the original Rocky Reach Project license, Chelan PUD funded a rainbow trout hatchery program as mitigation for that lost recreational fishing opportunity.

## **SECTION 3: STUDIES AND EVALUATION OF PROJECT EFFECTS**

Relicensing baseline studies to determine the current status of fishery resources in Rocky Reach Reservoir were initiated in the Project area in 1999 (Figure 1 ~~Figure 1~~). Studies relevant to resident fish issues included (1) a creel study to investigate sport catch; (2) a fish presence and habitat use survey; (3) an analysis of benthic organisms; (4) a pool fluctuation report; (5) a study of the role of large woody debris; (6) aquatic habitat mapping; and (7) re-identification of sport fishing access points on the Wenatchee River.

### **3.1 Relicensing Studies**

#### **3.1.1 Creel Survey**

Creel sampling was conducted on average two days per week, including weekdays and weekends, from August through early October, 1999, and from April through July, 2000 (DES 2000). A total of 134 anglers were surveyed. Ninety of the anglers interviewed were observed on the reservoir, with the largest percentage fishing from the mouth of the Chelan River downstream to the mouth of the Entiat River. The number of anglers per weekend day was 71 percent higher than on weekdays. Walleye were the primary targeted species, followed by northern pikeminnow and smallmouth bass. Northern pikeminnow were the most abundant, with 125 captured during the surveys. Walleye were the second most abundant with 39 captured. A total of four smallmouth bass and three largemouth bass were captured. No burbot, yellow perch, catfish, or sturgeon were observed. Very little fishing was observed in the Project area. The value of the study was limited by the fact that the fishing season for salmon, trout, and char was closed during the survey periods.

#### **3.1.2 Aquatic Habitat Mapping**

In preparation for a study of fish presence and habitat use, Chelan PUD contracted with Duke Engineering Services, Inc. (2001) to conduct an aquatic habitat survey to measure and map the baseline aquatic habitat conditions of the reservoir (depth, velocity, substrate type, cover types, and fish structures) and update information on the distribution of aquatic plant growth throughout the reservoir, with an emphasis on assessing the extent of non-native, invasive Eurasian watermilfoil.

Results of the aquatic habitat mapping effort were used to help identify sampling areas for the fish presence and habitat use survey. The aquatic habitat model developed from this study may have its highest utility, however, as a predictive tool to analyze current conditions, predict utilization of habitat types by fish, and to address potential enhancement areas.

#### **3.1.3 Fish Presence and Habitat Use**

The specific goals and objectives of the fish presence and habitat use survey were to determine the presence of various habitat types found within the Project boundary, and describe how these areas are utilized by various species over time; to determine habitat use by species; and, in combination with the aquatic habitat mapping data, to predict habitat use and production of fish in other areas of the reservoir.

The fish presence and habitat use survey determined that non-game fish such as suckers, chubs, northern pikeminnow, stickleback and shiners make up the majority of the reservoir resident fish population (DES, 2001). The introduced species (walleye, centrarchids, catfish and carp) are common, but not abundant. Walleye, smallmouth bass, and carp recruitment is probably limited by the low temperatures in the Project pool in spring and early summer (Bennett, 1991; Mullan, et. al.,1986).

#### ***3.1.4 Benthic Analysis***

Benthic organisms provide an important source of nutrients to resident fish. Therefore, a benthic analysis was conducted in 1999 to obtain baseline macroinvertebrate data, to provide information on benthic invertebrate communities, and to examine the status and composition of mollusk populations in the reservoir. The study, conducted by Duke Engineering & Services, Inc. and RL&L Environmental Services Ltd., showed that the more diverse the habitat (e.g., local differences in substrate, depth, velocity, etc.), the higher the density and variety of macroinvertebrates. In terms of density, midges, caddisflies, sow bugs, clams and mussels, and scuds accounted for most of the benthic invertebrates. The mollusk species found were dominated by an introduced Asian clam (*Corbicula fluminea*).

None of the species found were candidates for listing as priority species by Washington State, probably because the habitat types preferred by state-listed species are not found in the Project area. Similarly, no ESA-listed species were found.

#### ***3.1.5 Pool Fluctuation***

In 2000, BioAnalysts, Inc. produced an investigation into the potential effects of Rocky Reach pool fluctuations on fisheries resources. The investigation included an assessment of effects on ESA-listed anadromous fish populations, as well as the riparian habitat bordering the pool. It considered the possibility that fluctuations in both surface water elevation and water velocity in the Rocky Reach pool may affect migration, spawning, rearing, and stranding of fish within the reservoir, as well as riparian zone structure and reservoir habitat.

The study found no incidents of fish stranding since May of 1988. The Rocky Reach forebay level is very stable (within 705-707 feet) and the forebay level changes slowly because the forebay surface area is large in comparison to the hydraulic capacity of the powerhouse. These operational characteristics help avoid fish stranding.

#### ***3.1.6 Role of Large Woody Debris***

BioAnalysts (2000) investigated the source, function, and fate of large woody debris in the Rocky Reach Reservoir, emphasizing the function of large woody debris in the reservoir. Because there is virtually no information on large woody debris in Rocky Reach Reservoir, information from other systems was drawn upon, and rely mostly on studies that examined the function of large woody debris in lakes. No studies were found that described the function of large woody debris in reservoirs of run-of-river hydroelectric projects.

It appears that most wood enters the Project area from upstream locations, such as the Entiat River, including wood that passes through Wells Dam. Riparian areas along the reservoir

probably contribute little large woody debris. Wood that enters the reservoir can submerge in littoral areas or at the bottom of the reservoir, float at or near the water surface, strand on the floodplain, or pass through Rocky Reach Dam. Wood that becomes anchored on the floodplain can trap sediments and aid in establishing riparian vegetation. Wood recruited to the reservoir from riparian areas along the pool may stay in the Project area for extended periods of time if the wood remains partially attached to the shore. Both submerged and floating large woody debris increase habitat structure and provide habitat for fish and macroinvertebrates. Several species of fish use submerged and floating wood for cover. Prey fishes use wood to make themselves less conspicuous to predators, while lurking predators use wood to conceal themselves from potential prey. The removal of large woody debris at hydroelectric projects has reduced the recruitment of debris to downstream locations and to the estuary.

Chelan PUD currently removes trash, aquatic macrophytes, and large woody debris from the forebay of Rocky Reach Dam that washes up to the face of the Project as part of routine operations. Large woody debris is transported to below the dam where it is chipped. Large pieces of large woody debris suitable for tributary habitat enhancement efforts will be stockpiled for incorporation into future enhancement projects.

### **3.1.7 Sport Fishing Access**

Per a 1968 agreement with WDFW, Chelan PUD purchased easements within the vicinity of the Project to mitigate wildlife impacts resulting from the initial development of the Project, including 28 easements that provide public stream bank access and fishing areas along the Wenatchee River. These areas were created as off-site mitigation for loss of sports-fishing access areas that were inundated by creation of the Project reservoir. These easements were deeded to WDFW. These areas are located from the Wenatchee River mouth (located approximately five miles downstream of the Project dam) upstream to approximately one mile below Leavenworth.

North Central Washington rivers offer a wide variety of recreational opportunities. Many rivers that descend the eastern slopes of the Cascades are used by a diverse group of recreational users. These different groups enjoy rafting, kayaking, canoeing, fishing, water skiing, use of personal watercraft, wind surfing, inner tubing, swimming, and sightseeing. A 2000 report by BioAnalysts evaluated public access along the Wenatchee River commonly used by rafts, kayaks, canoes, and drift boats, and described the location of public access and documented its uses. Global positioning system was used to identify the location of each access point on the river. Photographs and site visits were used to describe the conditions of each site in terms of launch conditions, facilities, and parking. Local interest groups were interviewed to get their thoughts on access and possible improvements.

Local fishing and rafting groups provided opinions on how to improve access to the Wenatchee River. One suggestion was to make Dryden weir “runable.” The Dryden weir is used to divert water for irrigation and is designed as a wild stock salmon supplementation facility. at the design of the Dryden weir make it unsafe to pass the structure, and all floats downstream require portage around the dam. Another suggestion was to provide a boat takeout point near the mouth of the Wenatchee River. This would reduce the necessity of using takeouts on the Columbia River. It was also suggested that sites at Monitor and Cashmere be improved so that launch sites are suitable for trailers. A public takeout suitable for trailers near Plain and/or Tumwater

Campground would improve the availability of the upper Wenatchee River to drift boats. Tumwater Canyon has dangerous rapids and there is little opportunity to increase access without more parking. Improved access to lower Icicle Creek would allow bank anglers to access the spring Chinook salmon fishery in the lower river.

### **3.2 Project Effects**

None of the studies described in this chapter identified any impacts on resident fish from ongoing Project operations, and no other adverse effects of Project operations on resident fish were identified by the Natural Resources Working Group.

### **3.3 Benefits of the HCP for Resident Fish**

The primary benefit to resident fish species of implementing the Rocky Reach Project HCP is construction, operation, and maintenance of the juvenile fish bypass system. The juvenile fish bypass system provides a non-turbine passage route for anadromous fish, primarily juvenile salmon and steelhead, past Rocky Reach Dam to increase their downstream migration survival. The juvenile fish bypass system provides resident fish species with the same passage protection.

The juvenile fish bypass system provides two passage routes for fish from the forebay to the tailrace: the juvenile collection facilities and adult bypass pipe. The juvenile fish bypass system contains adult separator bars that divert fish smaller than 12 to 15 inches through the juvenile collection facilities during sub-sampling operations, which occurs a small percentage of the time, and larger fish around the facilities directly to the tailrace of the Project.

Resident fish species smaller than 12 to 15 inches observed regularly in the juvenile fish bypass system during routine sub-sampling operations for juvenile salmonids are threespine stickleback, peamouth, chiselmouth, juvenile suckers sp., mountain whitefish, redband shiner, bluegill, crappie, smallmouth and largemouth bass, rainbow trout, pikeminnow, and, rarely, Westslope cutthroat trout. Adult (larger than 12 to 15 inches) resident fish species observed include suckers, walleye, and mountain whitefish.



Figure 1: Rocky Reach Hydroelectric Project Area Map

## **SECTION 4: ACHIEVEMENT OF OBJECTIVES AND IMPLEMENTATION**

The goal of the Resident Fish Management Plan is to protect and enhance resident fish and habitat in the Rocky Reach Project area and enhance recreational fishing opportunities. Though specific adverse impacts of continued operation of the Rocky Reach Hydroelectric Project were not identified through relicensing studies, Chelan PUD agreed to implement several resident fish protection, mitigation and enhancement (PME) measures as part of the Rocky Reach Settlement Agreement to meet the following objectives:

Objective 1: Continue to enhance recreational fishing opportunities;

Objective 2: Monitor and assess changes in resident fish species, particularly native species, abundance, composition, and distribution in Rocky Reach Reservoir due to ongoing and future Project operations. If the monitoring program outlined below identifies adverse changes to resident fish species attributable to Project operations, then Chelan PUD will work with the RFFF to select and implement reasonable and feasible protection measures to address such changes; and

Objective 3: Implement Habitat Conservation Plan (HCP) programs that will provide additional benefits to resident fishery resources in the Rocky Reach Reservoir.

### **4.1 Objective 1: Enhance Recreational Fishing Opportunities**

#### **4.1.1 Protection, Mitigation, and Enhancement (PME) Measure: Fish Rearing**

Chelan PUD will implement the following in accordance with License Article X:

Chelan PUD will continue funding a fish rearing program conducted by Washington Department of Fish and Wildlife (WDFW) to produce approximately 30,000 pounds of rainbow trout, or other fish species reared at a comparable production cost for annual planting in local area waterbodies in Chelan and Douglas counties. Other fish species will be determined by WDFW with input provided by the Rocky Reach Fishery Forum (RFFF). The estimated cost of this measure is \$100,000 per year for the New License term and any subsequent annual licenses. Funding for the purposes of this section is intended to allow WDFW to exercise a least-cost method of obtaining high quality fish, and may include raising or purchasing such fish. Use of existing hatchery facilities to produce these fish is included in the Habitat Conservation Plan (HCP) Hatchery Facilities Evaluation–Suggested Guidelines for Anadromous Fish Hatchery Programs (Chelan PUD 2004).

#### **4.1.2 PME Measure: Resident Fish Measures**

Chelan PUD will implement the following in accordance with License Article X:

Chelan PUD shall make available funding not to exceed a total of \$50,000 for implementing resident fish enhancement measures described below. Funding will be available only during years 1 through 10 of the New License and any subsequent annual licenses. The first priority will be to use funds in the Lake Chelan Basin. However, through recommendation by the Rocky Reach Fishery Forum (RRFF), funding may be used outside the Lake Chelan Basin. The rationale for prioritizing the Lake Chelan Basin is two-fold: 1) maintain the existing license benefits to recreational fisheries; and 2) recreational fishing enhancements in the Lake Chelan Basin are most cost-effective, greater benefit provided for the funding made available, than for the Rocky Reach Reservoir. The second point, cost-effectiveness, was one of the original rationales for construction of the Twentyfive Mile Creek spawning channel for providing off-site mitigation in the existing Rocky Reach license. The Resident Fish Technical Group supports continuation of the current rationale for enhancing recreational fishing. Resident fish enhancement measures may include the following:

- a. Habitat enhancement on Twentyfive Mile Creek;
- b. Culvert modification on Twentyfive Mile Creek to improve upstream fish passage;
- c. Installation of remote-site egg incubators on Lake Chelan tributaries;
- d. Blocking off entrance to the existing Twentyfive Mile Creek spawning channel to preclude fish access to the degraded channel;
- e. Lake Chelan tributary habitat enhancement;
- f. Rocky Reach Reservoir food-web model study (e.g., kokanee introduction, etc.)
- g. Fishing pier acquisition/construction/enhancement in Lake Chelan (located in the lower (Wapato) Basin with suitable public access);
- h. Re-visiting Twentyfive Mile Creek spawning channel reconfiguration some time in the future;
- i. Other projects as recommended by the Rocky Reach Fishery Forum (RRFF) and Lake Chelan Fishery Forum (LCFF) pending Dr. Beauchamp's food-web model results

Recommendations for future implementation of resident fish PME measures under this section of the Resident Fish Management Plan will be made jointly by the Lake Chelan Fishery Forum (LCFF) and Rocky Reach Fishery Forum (RRFF).

During preliminary discussions regarding the development of PME measures to include in this Resident Fish Management Plan, Chelan PUD proposed continued funding for existing license measures for resident fish, including fish rearing and operation and maintenance of the Twenty-five Mile Creek spawning channel. However, on July 19, 2004, a high intensity, short duration convective storm event dropped at least 0.75 inches of rain on the recently burned South Fork Twentyfive Mile Creek drainage resulting in a mud/debris torrent that totally inundated the spawning channel with an estimated 200 cubic yards of silt. At the October 25, 2004, Resident Fish Technical Group meeting, the Resident Fish Technical Group supported the continuation of funding for resident fish rearing by Chelan PUD. At the same meeting, the Resident Fish Technical Group made the determination that providing funding for spawning channel rehabilitation at the present time would not be the best use of these funds because continued siltation of the channel is expected to occur over the next four to five years. Instead, the Resident

Fish Technical Group developed the preceding list of potential PME projects that could be implemented with the funding proposed for the spawning channel rehabilitation.

***4.1.3 PME Measure: Operation and Maintenance Funding***

Chelan PUD will implement the following in accordance with License Article X:

From years 10 through the end of the New License and any subsequent annual licenses, Chelan PUD shall make available \$2,500 annually, on the basis of a one-for-one match provided by WDFW or other entity, for use by WDFW for the purpose of maintaining project(s) implemented under subsection 4.1.2 of this section. In the event that a project is constructed prior to year 10 of the New License, and such project requires maintenance funding prior to year 10 of the New License, then WDFW may borrow from such funding available from years 10 through the end of the New License. If no matching funds are provided in the same year that Chelan PUD makes the annual funding available, the funds from Chelan PUD may carry over to subsequent years, up to a maximum of \$25,000. During any year in which the \$25,000 maximum is reached, then Chelan PUD shall have no obligation to make such annual funding available.

***4.2 Objective 2: Assess Change in Resident Fish Species in Rocky Reach Project Reservoir***

***4.2.1 Measure: Monitoring Program***

Chelan PUD will implement the following in accordance with License Article X:

To address potential effects to resident fish, Chelan PUD will conduct periodic resident fish monitoring and evaluation studies as requested and provided by the Rocky Reach Fishery Forum (RRFF) at a cost not to exceed \$300,000 for the term of the New License and any subsequent annual licenses, not to exceed \$60,000 every ten years. Any portion of the \$60,000 available every 10 years that is not expended during such 10-year period, shall no longer be available. For example, if \$40,000 is expended in years 1 through 10 of the New License term and any subsequent annual licenses, then the remaining \$20,000 shall no longer be available.

***4.3 Objective 3: Implement HCP Programs That Benefit Resident Fish***

***4.3.1 PME Measure: Predator Control***

Chelan PUD will implement the following in accordance with License Article X:

Chelan PUD will conduct predator control of northern pikeminnow and avian predators as provided for in the Rocky Reach Anadromous Fish Agreement and Habitat Conservation Plan (Chelan PUD 2004).

***4.3.2 PME Measure: Pikeminnow Fishing Derby***

Chelan PUD will implement the following in accordance with License Article Y(?):

Chelan PUD will continue supporting the annual northern pikeminnow fishing derby, as needed, to assist in predator control of northern pikeminnow. This Derby also provides an additional recreational fishing opportunity in the Rocky Reach Reservoir.

**Table 1: Criteria for Achievement of Objectives for Resident Fish**

<b>Use/Action</b>	<b>Objective</b>	<b>Measured Parameter</b>	<b>Schedule</b>	<b>Actions if Objective Achieved</b>	<b>Alternative Management Actions</b>
Recreational Fishing	Off-site enhancement of recreational fishing opportunities	30,000 lbs. of rainbow trout, or other fish recommended by the RFFF. (Section 4.1.1)	Annual	Maintain Action. No additional action needed.	Rear different species of comparable production costs; adjust stocking location
Resident fish Measures	Additional recreational fishing opportunities	Funding not to exceed \$50,000 over funding timeframe. (Section 4.1.2)	Available from years 1-10	Maintain Action. No additional action needed.	Continue to implement measures identified in section 4.1.2 until \$50,000 is expended.
Resident Fish Measure Maintenance	Resident fish O&M	\$2,500 one-to-one match (Section 4.1.3)	Annual	Maintain Action. No additional action needed.	None
Monitoring and Evaluation	Monitor and assess changes in resident fish populations	\$6,000 to conduct resident fish surveys, not to exceed \$300,000 over New License and any subsequent annual licenses. (Section 4.2.1)	Annual	Maintain Action. No additional action needed.	Develop and implement collaborative plan to address identified problem(s)
Predator Control	Control predation on juvenile salmonids by northern pikeminnow and avian predators	Number of northern pikeminnow caught; number of avian predators hazed or population reduction. (Section 4.3.1, 4.3.2)	Annual	Maintain Action. No additional action needed.	Develop and implement collaborative plan to address identified problem(s)

## ***SECTION 5: LITERATURE CITED***

- Beak Consultants, Inc., and Rensel Associates. 1999. Assessment of resident fish in Lake Pateros, Washington, final report. Prepared by Beak Consultants, Inc., in cooperation with Rensel Associates, Arlington, Washington, for Douglas PUD.
- Bennett, D. H. 1991. Potential for predator increase associated with a three-foot pool rise in Rocky Reach Reservoir, Columbia River, Washington. WDFW Resources, Moscow, Idaho. 14 pp.
- Bickford, S. A. 2002. Personal communication - telephone conversation regarding predator abatement program at Wells Dam with Bob Sullivan (Parametrix). Biologist with Douglas PUD, East Wenatchee, Washington.
- BioAnalysts. 2000. Effects of pool fluctuations on natural resources in the Rocky Reach Project area - final, Rocky Reach Hydroelectric Project No. 2145. Prepared by BioAnalysts, Inc., Boise, Idaho, for Chelan PUD. December 15, 2000. 25 pp.
- Burley, C. C. and T. P. Poe. 1994. Significance of predation in the Columbia River from Priest Rapids Dam to Chief Joseph Dam, predator consumption indexing. Contract 430-486. Prepared for Chelan PUD, Douglas PUD and Grant PUD. Reports A, B and C, plus appendices.
- Chelan PUD. 1999. Biological assessment of Rock Island Dam operations for interim protection of spring Chinook salmon, draft.
- Chelan PUD. 2004. Hatchery facilities evaluation – suggested guidelines for anadromous fish hatchery programs. Prepared by Sapere Consulting, Inc. for the Public Utility District No. 1 of Chelan County.
- Douglas PUD. 1999. Biological assessment of the Wells Hydroelectric Project, interim protection plan for upper Columbia River spring chinook. Report prepared by Douglas PUD for FERC.
- Dell, M. B., M. W. Erho and B. D. Leman. 1975. Occurrence of gas bubble disease symptoms on fish in mid-Columbia River reservoirs. Mid-Columbia PUDs. Portland, Oregon.
- DES. 2001. Rocky Reach fish presence and habitat use survey - final, Rocky Reach Hydroelectric Project No. 2145. Prepared by DES, Bellingham, Washington, for Chelan PUD. June 1, 2001. 81 pp.
- Hallock M. and P. E. Mongillo. 1998. Washington State status report for the pygmy whitefish. Washington Department of Fish and Wildlife, Olympia, Washington.

- Loch, J. J., D. Ballinger, G. Christofferson, J. A. Ross, M. Hack, C. Foster, D. Snyder and D. Schultz. 1994. Significance of predation in the Columbia River from Priest Rapids Dam to Chief Joseph Dam: abundance and predation indexing. In: Burley, C. C. and T. P. Poe, editors. 1994. Significance of predation in the Columbia River from Priest Rapids Dam to Chief Joseph Dam. Contract 430-486. Prepared for Chelan PUD, Douglas PUD and Grant PUD. Reports A and B plus appendices.
- Mullan, J. W., M. B. Dell, S. G. Hays and J. A. McGee. 1986. Some factors affecting fish production in the mid-Columbia River 1934 - 1983. USFWS Report No. FRI/FAO-86-15. 69 pp.
- Parametrix, Inc., and University of Idaho. 2000. An evaluation of fish species present in the Priest Rapids project area. Prepared for Grant PUD, Ephrata, Washington.
- Peven, C.M. 1990. The life history of naturally produced steelhead trout from the mid-Columbia River Basin. M.S. thesis. Univ. of Washington, Seattle, WA.
- Peven, C.M. 1992. Population status of selected stocks of salmonids from the mid-Columbia River basin. Chelan PUD Fish and Wildlife Operations, Wenatchee, Washington. 52 pp.
- R.L. & L. 2002. Rocky Reach white sturgeon investigations, 2001 study results - final, Rocky Reach Hydroelectric Project No. 2145. Prepared by R.L. & L., Castlegar, British Columbia, for Chelan PUD. April 26, 2002. 52 pp.
- Scott, W. B. and E. J. Crossman. 1973. Freshwater fishes of Canada. Fisheries Research Board of Canada, Ottawa, Canada.
- WDFW. 2002. Species of concern in Washington State. Available at: <http://www.wa.gov/wdfw/diversity/soc/soc.htm>.
- West, T. R. 2000. Northern squawfish (*Ptychocheilus oregonensis*) population reduction program, Rocky Reach Dam and Rock Island Dam, 2001. Chelan PUD, Wenatchee, Washington.
- West, T. R. 2001. Northern pikeminnow (*Ptychocheilus oregonensis*) population reduction program, Rocky Reach Dam and Rock Island Dam, 2000. Chelan PUD, Wenatchee, Washington.
- West, T. R. 2002. Northern pikeminnow (*Ptychocheilus oregonensis*) population reduction program, Rocky Reach Dam and Rock Island Dam, 2001. Chelan PUD, Wenatchee, Washington.
- Wydoski, R. and R. Whitney. 1979. Inland fishes of Washington. University of Seattle Press, Seattle, Washington.

Zook, W. J. 1983. Resident fisheries of Wells pool (a review) - draft. 1990. Prepared by Fulton Fisheries Advisors for Douglas PUD. 56 pp.