
ROCKY REACH RESIDENT FISH MANAGEMENT PLAN

Final Draft

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

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

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EXECUTIVE SUMMARY

Under the direction of the Natural Resources Working Group (NRWG), numerous studies relating to resident fish species were conducted during the Rocky Reach Hydroelectric 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 any ongoing Project-related impact on current resident fish species.~~ Based on the results of these studies, the Resident Fish Technical Group (RFTG) representatives developed this Rocky Reach Resident Fish Management Plan (RFMP).

The goal of the Resident Fish Management Plan (RFMP) contained in this Chapter is to protect and enhance resident fish and habitat in the Rocky Reach Reservoir (Reservoir), and to enhance recreational fishing opportunities. ~~Although no new adverse impacts of continued operation of the Project on resident fish were identified by the NRWG for studies conducted during the relicensing process,~~ Chelan PUD has agreed to continue implementing several resident fish Protection, Mitigation, and Enhancement measures (PMEs); ~~recognizing that the Project has altered the Columbia River from riverine to more reservoir type characteristics,~~ as part of this Comprehensive Settlement Agreement, several of which are to continue funding for existing license measures for resident fish and to enhance recreational fishing opportunities. The objectives of these PME are ~~to~~: 1) continue to enhance recreational fishing opportunities; 2) monitor and evaluate the effects, if any, of future changes in Project operations on Reservoir and tailrace habitat functionally related to spawning, rearing, and migration of native, non-stocked resident fish, in order to make informed management decisions, and implement reasonable and feasible measures to address such effects~~monitor and assess changes in resident fish species abundance, composition, and distribution in the Reservoir due to ongoing Project operations~~; and 3) continue to implement Habitat Conservation Plan (HCP) programs that will provide additional benefits to resident fishery resources in the Reservoir.

Specifically, the RFMP calls for Chelan PUD to implement the following PME, as described in section 4 of this Chapter:

- 1) Continue to fund 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 annually during the term of the New License And any subsequent annual licenses;
- 2) Provide an amount not to exceed \$50,000 for resident fish enhancement measures during the first 10 years of the New License;
- 3) Provide \$2,500 in matching funds annually after year 10 of the New License for operation and maintenance of resident fish enhancement projects;

- 4) Provide an amount not to exceed \$60,000 to conduct a feasibility study of introducing a new species in the Reservoir to enhance recreational fishing;
- 5) Continue support for the annual northern pikeminnow fishing derby, as needed to assist in predator control of northern pikeminnow;
- ~~4)6) Monitor and evaluate effects, if any, to native, non-stocked resident fish due to future changes in Project operations for an amount not to exceed \$240,00 during the term of the New License and any subsequent annual licenses~~Conduct periodic resident fish monitoring and evaluation studies;
- 7) Consult with the RRF to select and implement reasonable and feasible measures to address effects if the monitoring program identifies adverse effects to native, non-stocked resident fish species attributable to future changes in Project operations; and
- ~~6)Continue support for the annual northern pikeminnow fishing derby, as needed to assist in predator control of northern pikeminnow;~~
- ~~6)8) Continue to conduct a control program for northern pikeminnow and avian predators, as described in the Rocky Reach Anadromous Fish Agreement and Habitat Conservation Plan (HCP).~~and
- ~~7)In consultation with the RRF, select and implement reasonable and feasible measures to address adverse changes, if any, to resident fish species attributable to ongoing Project operations.~~

SECTION 1: INTRODUCTION

The relicensing process for the Rocky Reach Hydroelectric Project (Project) brought fisheries agencies, tribes, and interested parties together in a Natural Resources Working Group (NRWG) and provided an opportunity for comprehensive review of current and future management priorities for fish resources potentially impacted by ongoing Project operations. The NRWG was established to identify issues, develop study plans, review study reports, and develop long-term management plans for fish and wildlife species. The NRWG consisted of representatives from the USDA Forest Service, U.S. Fish and Wildlife Service (USFWS), NOAA Fisheries, Washington Department of Ecology (WDOE), Washington Department of Fish and Wildlife (WDFW), U.S. Bureau of Land Management (BLM), Colville Confederated Tribes (CCT), Yakama Nation (YN), Columbia River Inter-Tribal Fish Commission (CRITFC), and other interested parties.

Technical groups were formed for each comprehensive plan; e.g., resident fish, white sturgeon, bull trout, Pacific lamprey, and wildlife due to the complexity of issues surrounding each species and so that agency experts could focus on meetings pertaining to their specific expertise. A subgroup of the NRWG, the Resident Fish Technical Group, comprised of the WDFW, WDOE, USFWS, and Chelan PUD, completed this Rocky Reach Resident Fish Management Plan (RFMP). For the purposes of the RFMP, resident fish are defined as non-anadromous fish species inhabiting the Rocky Reach Reservoir (Reservoir). Following the effective date of the New License, the Settlement Agreement's Rocky Reach Fish Forum (RRFF) will assume responsibility for meeting to share information, coordinate efforts, and make recommendations regarding the implementation of the RFMP. The RFMP will be reviewed, in consultation with the RRFF, on a periodic basis to allow for planning and future adjustments over the term of the New License and any subsequent annual licenses.

The RFMP contains sections highlighting the background of resident fish species (section 2), relicensing and other studies conducted to determine ongoing Project-related impacts, if any, on resident fish (section 3), goals and objectives of this management plan (section 4), and PME for resident fish that Chelan PUD will implement through the term of the New License for the Project (section 4).

SECTION 2: BACKGROUND

2.1 Resident Fish Species

The Rocky Reach Project Reservoir (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 Reservoir in 1999 and 2000 (DES, 2001). The fish population 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, redbelly 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. The lower section of the Reservoir (Rocky Reach Dam to the Entiat River) is lentic in character, primarily supporting species that prefer low water velocities. The middle section of the Reservoir (from the Entiat River to the Chelan River) 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 the 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, redbelly 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 relict populations in western North America. Pygmy whitefish are not found within the Project Boundary. Therefore, they are not considered further in this RFMP. The only known population near the Project exists 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 the Washington State Department of Fish and Wildlife (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 reservoirs during implementation of the predator control program, with 25,529 coming from the Rocky Reach Reservoir. 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; prizes totaling \$20,000 were distributed.

2.4 Other Species

Several other species are native to the Reservoir, including peamouth chub (*Mylocheilus caurinus*), redbreasted 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, and 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 Reservoir 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 occasionally pumpkinseed may be taken by anglers while fishing in the Reservoir. 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 Reservoir is currently closed at all times. Fishing for spring-run Chinook salmon and bull trout is closed due to their listing under the 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 21⁰ to 27⁰C (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 15.5⁰ to 18.5⁰C. 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 reservoirs (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 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 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 Project. Under the original 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 the Reservoir were initiated in 1999 (~~Figure 1~~~~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 on the Reservoir. 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 Reservoir, 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 Reservoir 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 Reservoir. Similarly, no ESA-listed species were found.

3.1.5 Reservoir Fluctuation

In 2000, BioAnalysts, Inc. produced an investigation into the potential effects of Reservoir 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 Reservoir 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 resident fish stranding since May, 1988. The Project operational characteristics help avoid fish stranding. The Project 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.

3.1.6 Role of Large Woody Debris

BioAnalysts (2000) investigated the source, function, and fate of large woody debris in the Reservoir, emphasizing the function of large woody debris in the reservoir. Because there is virtually no information on large woody debris in the Reservoir, information from other systems was drawn upon, mostly studies 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 Reservoir from upstream locations, such as the Entiat River, or 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 shoreline may stay in the Reservoir 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 fish species 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 Dam as part of routine operations. Large woody debris is transported to below the Dam, where it is chipped. Chelan PUD will consider collecting and hauling large pieces of large woody debris suitable for tributary habitat enhancement efforts, as described in section 4.4.2.

3.1.7 Sport Fishing Access

Per a 1963 agreement with WDFW, Chelan PUD purchased easements within the vicinity of the Project to mitigate for wildlife impacts resulting from the initial development of the Project. These included easements providing public stream bank access and fishing areas along the Wenatchee and Entiat rivers. These easement areas were created as off-site mitigation for loss of sports-fishing access areas that were inundated by creation of the Project Reservoir, and were deeded to WDFW. The 28 Wenatchee River easements are located from the Wenatchee River mouth (located approximately five miles downstream of the Dam) upstream to approximately one mile below Leavenworth. The Entiat River easements are located downstream from the Forest Service boundary at river mile 26.

A 2000 report by BioAnalysts described public access along the Wenatchee River commonly used by people using rafts, kayaks, canoes, and drift boats, the location of public access, and documented its uses. The report documented opinions from local fishing and rafting groups on how to improve access on the Wenatchee River, such as providing a takeout near the mouth of the Wenatchee River, improving sites at Monitor and Cashmere so that launch sites are suitable for trailers, providing a public takeout suitable for trailers near Plain and/or Tumwater Campground in Reach 4 to improve use of the upper Wenatchee River to drift boats, and improving access to lower Icicle Creek, which 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 (NRWG). Chelan PUD, in conjunction with the original license for the Project, 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. During development of PME to include in this RFMP, Chelan PUD proposed continued funding for existing license measures for resident~~

~~fish and to enhance recreational fishing opportunities, including fish rearing and operation and maintenance of the Twentyfive Mile Creek spawning channel. Specific PME's to enhance recreational fishing opportunities are outlined in section 4.1.~~

3.3.3.2 Benefits of the Anadromous Fish Agreement and Habitat Conservation Plan (HCP) for Resident Fish

The primary benefit to resident fish species of implementing the Rocky Reach Anadromous Fish Agreement and Habitat Conservation Plan (HCP) is construction, operation, and maintenance of the downstream bypass. The downstream bypass 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 downstream bypass provides resident fish species with the same passage protection.

The downstream bypass provides two passage routes for fish from the forebay to the tailrace: the juvenile collection facilities and adult bypass pipe. The downstream bypass 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 downstream bypass during routine sub-sampling operations for juvenile salmonids are threespine stickleback, peamouth, chiselmouth, juvenile suckers, mountain whitefish, redbreast 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 PROTECTION, MITIGATION, AND ENHANCEMENT MEASURES

The goal of the RFMP is to protect and enhance resident fish and habitat within the Project Boundary and enhance recreational fishing opportunities. ~~Though specific adverse impacts of continued operation of the Project were not identified through relicensing studies,~~ Chelan PUD has agreed to implement several resident fish PME's, including continued funding for existing license measures for resident fish and to enhance recreational fishing opportunities, including fish rearing and operation and maintenance of the Twentyfive Mile Creek spawning channel, as part of the RFMP to meet the following objectives:

Objective 1: Continue to enhance recreational fishing opportunities;

Objective 2: Monitor and ~~assess changes~~ evaluate the effects, if any, due to ongoing of future changes in Project operations on Reservoir and tailrace habitat functionally related to spawning, rearing, and migration of native, non-stocked resident fish, in resident fish species (particularly native species), related to relative abundance, composition, and distribution in the Reservoir, in order to make informed management decisions regarding implementation of reasonable and feasible measures to address such effects;

~~Objective 3: If the monitoring program identifies adverse changes to native resident fish species attributable to ongoing Project operations, then Chelan PUD, in consultation with the RRFF, will select and implement reasonable and feasible measures to address such changes; and~~

Objective ~~4~~3: Continue to implement HCP programs that will provide additional benefits to resident fish resources in the Reservoir.

Specifically, the RFMP calls for Chelan PUD to implement the following PMEs:

4.1 Objective 1: Continue to Enhance Recreational Fishing Opportunities

4.1.1 Fish Rearing

Chelan PUD will continue to make funding available for a fish rearing program conducted by 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 RRFF. 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 Resident Fish Enhancement Measures

The most cost-effective resident fish recreation opportunities are outside the Project Boundary. Construction of the Twentyfive Mile Creek spawning channel provided off-site mitigation under the current Rocky Reach Project license. Funding for off-site measures will continue, as outlined below, for the term of the New License.

Chelan PUD shall make available to WDFW an amount not to exceed a total of \$50,000 during years 1 through 10 of the New License for implementing resident fish enhancement measures described below.

The first priority will be to use funds in the Lake Chelan Basin. However, through recommendation by the RRFF, funding may be used within the Project Boundary or in tributaries to the Reservoir. 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 are more cost-effective in the Lake Chelan Basin than the Rocky Reach Reservoir.

The Resident Fish Technical Group supports continuation of the current rationale for enhancing recreational fishing. Resident fish enhancement measures may include the following:

- 1) Habitat enhancement on Twentyfive Mile Creek;
- 2) Culvert modification on Twentyfive Mile Creek to improve upstream fish passage;
- 3) Installation of remote-site egg incubators on Lake Chelan tributaries;
- 4) Blocking off entrance to the existing Twentyfive Mile Creek spawning channel to preclude fish access to the degraded channel, and re-visiting Twentyfive Mile Creek spawning channel reconfiguration some time in the future;
- 5) Lake Chelan tributary habitat enhancement;
- 6) Fishing pier acquisition/construction/enhancement in Lake Chelan (located in the lower (Wapato) Basin with suitable public access); and
- 7) Other projects as recommended by the RRFF and the Lake Chelan Fishery Forum (LCFF), pending the results of a food web model study to be performed on Lake Chelan¹

Recommendations for future implementation of resident fish PME's under this section of the RFMP will be made jointly by the LCFF and RRFF.

During preliminary discussions regarding the development of PME's to include in this RFMP, Chelan PUD proposed continued funding for existing license measures for resident fish, including fish rearing and operation and maintenance of the Twentyfive Mile Creek spawning channel. However, on July 19, 2004, a high intensity, short duration storm dropped at least 0.75

¹ Dr. Dave Beauchamp's food-web model per the Lake Chelan Comprehensive Settlement Agreement [Chelan PUD 2003]

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. 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 same amount of funding proposed for the spawning channel rehabilitation.

4.1.3 Enhancement Measures Operation and Maintenance

By January 31st of years 11 through the end of the New License and any subsequent annual licenses, Chelan PUD shall make available \$2,500, on the basis of a one-for-one match provided by WDFW or another entity, for use by WDFW for the purpose of maintaining project(s) implemented under subsection 4.1.2 of this section. 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. 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 11 through the end of the New License.

4.1.4 Recreational Fishing Feasibility Study

Chelan PUD shall make available to WDFW an amount not to exceed \$60,000 in year one of the New License for implementing a recreational fishing feasibility study in the Reservoir. The intent of the feasibility study is to determine whether a fish species, compatible with existing fish resources, can be introduced into the Reservoir to create a new recreational fishery.

4.1.4.1.5 Pikeminnow Fishing Derby

Chelan PUD shall continue to support the annual northern pikeminnow fishing derby as an additional recreational fishing opportunity in the Reservoir, as needed for predator control of northern pikeminnow.

4.2 Objective 2: Monitor and Evaluate the Effects, if any, of Future Changes in Project Operations on Reservoir and Tailrace Habitat Functionally Related to Spawning, Rearing, and Migration of Native, Non-stocked Resident Fish in Order to Make Informed Management Decisions Regarding Implementation of Reasonable and Feasible Measures to Address Such Effects ***Monitor and Assess Changes, Due to Ongoing Project Operations, in Resident Fish Species Populations***

~~During the term of the New License, Chelan PUD shall make available funding to a contracting entity agreed to by the RRF for periodic resident fish monitoring and evaluation studies to assess on-going Project effects, if any, on resident fish. Chelan PUD shall ensure that a study is conducted at least once within each ten-year period, in consultation with the RRF, which will determine the study parameters and recommend a contracting entity. The total amount Chelan PUD shall make available for such studies during the term of the New License shall not exceed \$60,000 every ten years or \$300,000, whichever is less. The \$60,000 shall be made available by Chelan PUD at the beginning of each 10-year period. [The RRF may decide to commit a portion of funds made available in one 10-year period for use in a specified study during the~~

~~following 10 year period. [PUD will check consistency with payment provisions of the boilerplate] However, any non-committed portion of the \$60,000 available every 10 years shall not carry forward into the next ten year period. For example, if \$40,000 is expended in years 1 through 10 of the New License term then the remaining \$20,000 shall no longer be available. An example of a study that could be conducted using funding described in this section is Reservoir food web model study (e.g., kokanee introduction, etc.).~~

~~Chelan PUD shall make available an amount not to exceed \$6,000 annually for study costs during any subsequent annual licenses.~~

Chelan PUD shall monitor and evaluate the effects, if any, of future changes in Project operations on Reservoir and tailrace habitat functionally related to spawning, rearing, and migration of native, non-stocked resident fish, in order to make informed management decisions. If the monitoring program identifies adverse effects to native, non-stocked resident fish species attributable to such changes in Project operations, then Chelan PUD will consult with the RRF to select and implement reasonable and feasible measures to address such effects.

The cost of monitoring shall not exceed \$240,000 during the term of the New License and any subsequent annual licenses.

Biological objectives for supporting designated uses for resident fish are shown in Table 1. A summary of PME to be implemented for resident fish and criteria for achievement of objectives are shown in Table 2.

4.3 Objective 3: Implement Reasonable and Feasible Measures

~~If the monitoring program identifies adverse changes to resident fish species attributable to ongoing Project operations, then Chelan PUD will work with the RRF to select and implement reasonable and feasible measures to address such changes. In the course of implementing future reasonable and feasible measures, if necessary, the RRF needs to collect sufficient information to make sound fishery management decisions in order to balance PME measures. For example, if a species was stocked upon recommendation of the RRF to enhance recreational fishing but that species has detrimental affects on another resident fish species, then the RRF needs to consider discontinuing stocking that species, or changing stocking to another species. Chelan PUD should not be responsible for providing funding for both continuing the original stocking program and implementing additional measures for the species impacted by the stocking program.~~

4.4.3 Objective 4: Continue to Implement HCP Programs That Benefit Resident Fish

Chelan PUD shall conduct predator control of northern pikeminnow and avian predators as provided for in the HCP (Chelan PUD 2004). Implementation of this program is anticipated to reduce predation on resident fish as well as anadromous species covered by the HCP.

Table 1. Biological Objectives for Supporting Designated Uses for Resident Fish

<u>Designated Use</u>	<u>Biological Objective</u>	<u>Evaluation Timeframe</u>	<u>Actions if Objective Achieved</u>	<u>Alternative Management Actions</u>	<u>Plan Action</u>
<u>Native, non-stocked resident fish species</u>	<u>No negative population trend caused by ongoing Project operations.</u>	<u>Every 10 years</u>	<u>Maintain Action. No additional action needed.</u>	<u>Develop and implement a plan, in consultation with the RRFF, to address identified problem(s).</u>	<u>Section 4.2</u>

Table 12: Summary of Criteria for Achievement of Objectives for Resident Fish

Designated Use	Biological Objective	Management Action (PME)	Schedule	Criteria for Achievement	<u>Actions if Objective Not Achieved</u>	<u>Plan Action</u>
Recreational Fishing	Increase number of resident game fish for fishing	Fund rearing of 30,000 lbs. of rainbow trout, or other fish recommended by the RRF.	Annual	Fish produced and stocked	Rear different species of comparable production costs; adjust stocking location	Section 4.1.1
Recreational Fishing	Increase available habitat for resident game fish	Fund habitat projects not to exceed \$50,000 over funding timeframe.	Available from years 1-10	Enhancement projects implemented	Continue to implement measures until \$50,000 is expended	Section 4.1.2
Recreational Fishing	O&M for increasing resident game fish habitat	Provide \$2,500 one-to-one match to maintain habitat.	Annual	Funding provided and used for O&M	None	Section 4.1.3
Recreational Fishing	Recreational fishing feasibility study	Provide funding not to exceed \$60,000 to conduct feasibility study	One- time	Funding provided and used for feasibility study	None	Section 4.1.4
Native, non-stocked resident fish species	Increase recreational fishing opportunity through supporting Pikeminnow Derby	Provide support for derby promotions and sponsorships.	Annual	Derby scheduled and implemented	Develop and implement alternative programs to promote sport fishing and accomplish predator control	Section 4.1.5
Native, non-stocked resident fish species	No negative impact population trend caused by ongoing future changes in Project operations	Provide \$60,000 to conduct resident fish surveys. Monitor Project-related impacts for a cost not to exceed \$30240,000 over New License and any subsequent annual licenses.	New License Term and any subsequent annual licenses	Funding provided and used for monitoring and evaluation; population trend reporting from surveys	Develop and implement collaborative plan to address identified problem(s)	Section 4.2
Native, non-stocked resident fish species	Reduce predation on and competition with resident game fish from Northern pikeminnow	Implement Northern pikeminnow and avian predator control program.	Annual	Efficacy of predator control program meets objectives for salmon survival, including number of northern pikeminnow caught and avian predators hazed	Develop and implement collaborative plan to address identified problem(s) with efficacy of predator control program	Section 4.3

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