
FISH PRESENCE AND HABITAT USE SURVEY STUDY PLAN

Final

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

October 15, 1999



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

TABLE OF CONTENTS

SECTION 1: INTRODUCTION	1
1.1 General Description of the Region and Rocky Reach Project	1
1.2 General Description of the Relicensing Process	7
1.3 Need Statement	7
SECTION 2: STUDY GOAL	7
SECTION 3: STUDY AREA	7
SECTION 4: METHODOLOGY	8
Approach Overview	8
4.1 Determine the Presence and Absence of Anadromous and Resident Fishes in the Rocky Reach Project Area	8
4.2 Determine Habitat Preferences for Anadromous and Resident Fishes in the Rocky Reach Project Area	12
SECTION 5: TASK LIST	13
SECTION 6: ANALYSIS AND REPORTING.....	15
Fish Presence and Absence	15
SECTION 7: STAFFING AND EQUIPMENT NEEDS	16
SECTION 8: SCHEDULE.....	16
SECTION 9: BUDGET	17
SECTION 10: NEXT STEPS	17
SECTION 11: REFERENCES.....	17

LIST OF FIGURES

FIGURE 1: Rocky Reach Area Map.....	5
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LIST OF TABLES

TABLE 1: Scientific Names Of Fishes Known Or Thought To Occur In Rocky Reach Pool.....	19
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SECTION 1: INTRODUCTION

1.1 General Description of the Region and Rocky Reach Project

The Rocky Reach hydroelectric project is located at river mile (RM) 473.7 on the Columbia River. This is downstream of Wells Dam and upstream from Rock Island Dam (Figure 1). It is the one project in a series of five hydropower projects built by Chelan, Douglas and Grant County Public Utility Districts (PUD's) between RM 397.1 and RM 515.1 on the mainstem Columbia River. Rocky Reach Dam consists of 11 generating units, producing a total peak capacity of approximately 1,287 megawatts of power, and 12 gated spillway openings. The hydraulic capacity of the Rocky Reach powerhouse is 217,000 cfs (Chelan PUD 1991a). Rocky Reach, as a run-of-river project, has little pondage and no usable storage volume. The project has a small operating range and must pass inflow on a daily average basis.

The Columbia River and its tributaries drain an area of 219,000 square miles in seven western states and 39,500 square miles in British Columbia. In the United States, most of the basin is located in Washington, Oregon, Idaho and Montana. The Columbia River originates at Columbia Lake on the west slope of Rocky Mountain Range in British Columbia and flows west and south, eventually draining into the Pacific Ocean between Washington and Oregon. Total river length is 1,214 miles (Bonneville Power Administration [BPA] et al. 1994a). Rocky Reach reservoir extends approximately 43 miles upstream to the tailrace of Wells dam. Rocky Reach reservoir has a surface area of approximately 9,100 acres, a gross storage capacity of 382,000 acre-feet, a mean depth of 42 feet and a shoreline length of approximately 93 miles. The Entiat River is the primary tributary flowing into the reservoir.

The mid-Columbia River reach forms the boundary between the North Cascade Mountains to the west and the Columbia Plateau to the east. In the vicinity of the Rocky Reach project, the river flows over mainly Paleozoic metamorphic and intrusive rocks. Further south, toward Rock Island dam, the river passes into the Columbia basalt group (BPA et al. 1994b). In and around Rocky Reach, the Columbia River flows through a gorge interrupted by confluences with several tributary valleys. The Entiat River and a number of intermittent streams with deep "V" shaped valleys flow into the Columbia River from the west (Chelan PUD 1991c).

Land use in the mid-Columbia reach varies considerably from north to south. Rangeland predominates around Rufus Woods Lake, impounded by Chief Joseph dam, while irrigated cropland and orchards predominate the river corridor around the Rocky Reach project and reservoir. Below Rock Island dam, land cover is mostly rangeland, with irrigated cropland on the east side of the river. Land throughout the project reach is predominantly in private ownership, although there are a number of public land units. Federal land in the mid-Columbia River includes the Colville Indian Reservation to the north, the Okanogan and Wenatchee National Forests in sections between Wells and Rocky Reach dams, and scattered tracts of U.S. Bureau of Land Management (BLM) land. There are also 13 state wildlife refuges and seven state parks in the mid-Columbia region (BPA et al. 1994b).

A wide variety of soils occur in the mid-Columbia reach including Camborthrids, Haploxerolls and Argixerolls. Soils range from light-colored soils, with thin "A" horizons poor in organic matter, and calcium accumulations high in the profile; to thick, very dark-brown to black soils with "A" horizons rich in organic matter, but with calcium carbonate accumulations that may be deep in the profile or absent. Soils with high accumulations of salt (Solonchak) and large amounts of exchangeable sodium (Natragids or Solonetz) are also present (Franklin and Dyrness 1984).

Vegetation in the mid-Columbia region consists mainly of steppe and shrub-steppe vegetation, and forest vegetation is generally confined to mountain slopes with sufficient precipitation (Franklin and Dyrness 1984). Much of the area has been cultivated with a variety of crops or is grazed by domestic and wild livestock. Natural vegetation communities in the plan area consist of a shrub layer dominated by artemesia (*Artemesia tridentata*) along with a variety of perennial grasses. Moister sites, such as areas along streams or rivers, may be inhabited by hawthorn/snowberry (*Crataegus douglasii/Symphoricarpos albus*) and hawthorn/cow parsnip (*Crategus douglasii/Heracleum lanatum*). Other habitats with distinct vegetation communities include those with gravelly or sandy soils, shallow, stony sites; and sand dunes near the Columbia River (Franklin and Dyrness 1984).

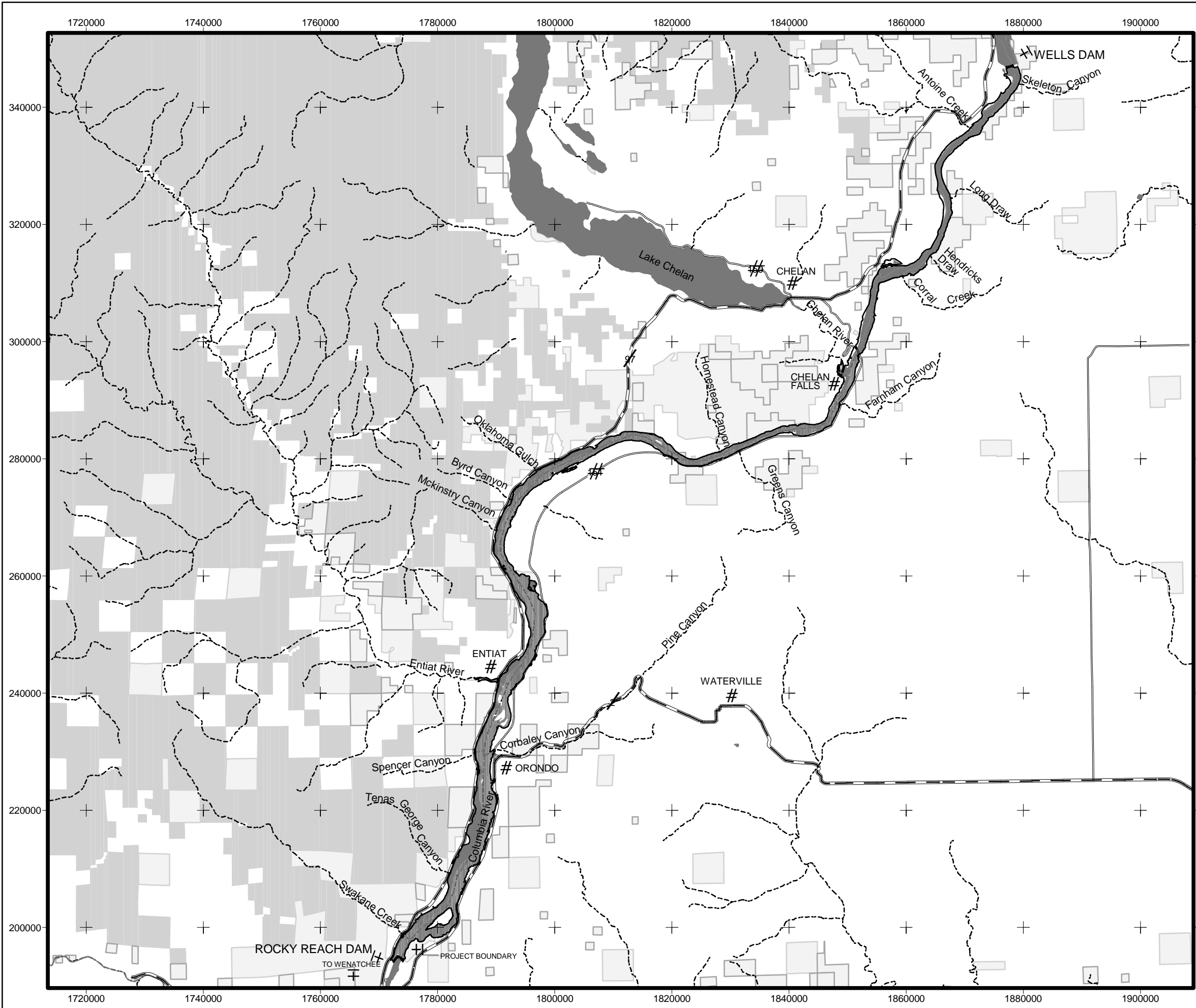
Located in the rain shadow of the Cascade Range, the mid-Columbia region is classified as arid to semi-arid and experiences low precipitation, dry summers, with warm to hot temperatures, and relatively cold winters. Some marine influences are still felt, but continental-type climate conditions prevail. Most of the Columbia basin receives less than 20 inches of precipitation annually, with much of this precipitation occurring in winter. Deep snow may accumulate over the mountainous areas, where water is held as natural storage until the runoff in the spring.

Anadromous salmonid fish species present in the Rocky Reach Project area include: spring, summer and fall chinook salmon (*Oncorhynchus tshawytscha*), sockeye salmon (*O. nerka*), summer steelhead (*O. mykiss*), and coho salmon (*O. kisutch*). Coho salmon were historically present, but the endemic stock was extirpated from the mid-Columbia region by the 1940's (Mullan 1984). Pacific lamprey is another non-salmonid anadromous fish species present in the project area.

Upper Columbia steelhead (*Oncorhynchus mykiss*) were listed as endangered by the National Marine Fisheries Service (NMFS) on August 18, 1997 (62 FR 43937). Upper Columbia Bull trout (*Salvelinus confluentus*) were listed as threatened on June 12, 1998 (63 FR 111 – pp. 31647-74). Upper Columbia spring chinook salmon were listed as endangered on March 16, 1999 (63 FR 11482). No other aquatic plant or animal species in the mid-Columbia River reach is currently listed as threatened or endangered under either the ESA or Washington State laws or regulations. Summer/fall chinook salmon in the mid-Columbia River were petitioned for listing in 1993. A listing was found to be not warranted by the NMFS in 1994 and reaffirmed in 1998, 63 FR 11482 (March 9, 1998). NMFS has determined that listing of the two sockeye ESUs in the mid-Columbia is also not warranted. The listing of any of these species could substantially affect operation of the Rocky Reach and other hydropower facilities throughout the basin.

Native resident fish species include white sturgeon, mountain whitefish, rainbow trout, bull trout, northern pikeminnow, peamouth chub, chiselmouth chub, largescale sucker, bridgelip sucker, redbside shiner, sculpins, and threespine stickleback. Common introduced resident species include carp, tench, largemouth and smallmouth bass, pumpkinseed sunfish, walleye, yellow perch, and brown bullhead. A list of fishes known or thought to occur in the Rocky Reach reservoir is contained in **Table 1** attached.

Rocky Reach reservoir currently has extensive rearing habitat for ocean-type (sub-yearling chinook salmon and resident species such as suckers, pikeminnows, chubs, shiners, and stickleback (Chelan PUD 1991c). Ocean-type chinook salmon tend to use the edge waters in late spring and early summer. Larger chinook fingerlings and stream-type (yearling) chinook use pelagic waters in the spring and summer for rearing and as a migration corridor. Juvenile ocean-type chinook in the Snake River use shallow areas with sandy substrate between the shoreline and aquatic plant beds (Chelan PUD 1991c).






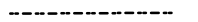




PROJECT BOUNDARY & LOCATION MAP
 ROCKY REACH HYDROELECTRIC PROJECT

PUBLIC UTILITY DISTRICT NO. 1
 CHELAN COUNTY WENATCHEE, WASHINGTON

FERC PROJECT NO. 2145

MAY 27, 1999

LEGEND

- PROJECT BOUNDARY 
- US HIGHWAY 
- STATE HIGHWAY 
- TRIBUTARIES 
- STATE OF WASHINGTON 
- BUREAU OF LAND MANAGEMENT 
- US FOREST SERVICE 
- CITY / TOWN 



Miles

1:200,000



1.2 General Description of the Relicensing Process

The Public Utility District No. 1 of Chelan County (Chelan PUD) owns and operates the Rocky Reach Hydroelectric Project (Project). Chelan PUD is permitted to operate the Project according to terms and conditions contained in an existing Federal Energy Regulatory Commission (FERC) license, No. 2145, that was issued on July 12, 1956. On September 1, 1966, the Chelan PUD filed an application with the Federal Power Commission (FPC) to amend the Project license for the addition of four generating units. The FPC, later FERC, issued the license amendment on May 23, 1968. The existing license expires on June 30, 2006.

Chelan PUD intends to seek a new federal license to operate the Rocky Reach Project and has begun preparation for the process referred to as “relicensing.” The FERC relicensing process is based on laws and regulations that require years of extensive planning, including environmental studies, agency consensus and public involvement. The process to obtain a new license has changed considerably since the existing licensee was issued in 1956. The Federal Power Act (FPA) was amended in 1986 by the Electric Consumers Protection Act (ECPA). The amendment requires the FERC, in addition to power and development purposes, to give equal consideration to the purposes of enhancement of fish and wildlife, the protection of recreational opportunities, and the preservation of other aspects of environmental quality.

1.3 Need Statement

Chelan PUD intends to evaluate the project reservoir for existing fish presence and habitat use. Limited information is currently available about the amount, location and physical characteristics of anadromous and resident fish presence and habitat use in the main-stem Columbia River.

SECTION 2: STUDY GOAL

The specific objectives and goals of the present study are to: 1) determine the presence/absence, habitat utilization, life stage and season of use for the principal habitat types found in the project area; 2) determine habitat use by species; and 3) in combination with Aquatic Habitat Survey data, predict habitat use and production of fish in other areas of the reservoir.

SECTION 3: STUDY AREA

The study area will consist of the project boundary and areas likely to be impacted by project operations. The project boundary extends from the tailrace of Rocky Reach dam (River Mile – RM 473.5) upstream to the tailrace of Wells dam (RM 516.5). The project boundary varies in elevation along the Rocky Reach reservoir and corresponds to the water surface elevation associated with the probable maximum flood. (Rocky Reach Project Periodic Safety Inspection Report, 1997.)

SECTION 4: METHODOLOGY

Approach Overview

A descriptive inventory of fish populations and habitats utilized, employing seasonal sampling at index locations, supplemented by additional synoptic sampling, will form the basis of the proposed fish presence and habitat use program. Spatial distribution of sampling effort will be dictated by the extensive size of the study area (i.e., 43 miles), therefore substrate and cover data collected during the Aquatic Habitat Survey (precursor to the Fish Presence and Habitat Use Survey) will be used to assist in the selection of index sampling sites. Synoptic sample sites will be established to ensure full coverage of the study area. This includes bias sites to ensure that special habitats (i.e., the confluence of the Entiat and Chelan Rivers) are considered. Fish species composition and relative abundance can vary considerably within different zones of a reservoir. This variability results in the need for a substantial degree of sampling effort to adequately characterize fish distribution, composition, relative abundance, and habitat selection within the study area.

Multiple sampling techniques for fish and habitat data collection with a significant seasonal effort has been proposed to ensure successful completion of field investigations. Both near-shore and pelagic zone sampling will be conducted. The need to sample seasonally also is based on substantial temporal differences in the fish species assemblage recorded in similar environments and the anticipated seasonal variations in physical characteristics and fish uses of various habitats within the study area.

4.1 Determine the Presence and Absence of Anadromous and Resident Fishes in the Rocky Reach Project Area

Reservoir Characterization

Near-shore habitats in reservoir environments typically exhibit relatively low habitat diversity. However, run-of-the river reservoirs such as Rocky Reach exhibit a diversity of offshore habitats changing from a riverine to a lacustrine condition in a longitudinal downstream direction. Fish distribution and species utilization are often directly influenced by these habitat gradations. As a result, our approach is to divide the reservoir into five definable zones.

The section of the reservoir that encompasses the forebay area of the Rocky Reach dam will represent the forebay zone. Low water velocities, steep banks, deep-water areas, and minimal littoral habitat typically characterize this zone. Lacustrine conditions usually dominate and fish present generally prefer low velocity or pelagic habitats, or seasonally are downstream migrant salmonids (i.e. salmon smolts).

The areas immediately below Rocky Reach and Wells dams will comprise the tailrace zone. Tailrace areas are typically characterized by a relatively narrow, confined, channel. Water velocities tend to be substantially higher in this zone relative to downstream areas, and are used by fish species or life history stages preferring high velocity habitats. These areas are also often used by species requiring riverine spawning conditions.

Rocky Reach Reservoir will be divided into three additional zones, the lower, middle and upper, to further evaluate spatial differences in fish species composition, relative abundance and habitat selection. The lower zone, typically defined by lower water velocities that may be similar to the forebay zone but bank characteristics and littoral habitat availability may be noticeably different. The middle zone usually represents a transition area between the predominately lacustrine habitat in the lower zone and the riverine habitat in the upper zones. The middle zone will likely exhibit water velocities intermediate to the upper and lower zones. The upper zone, between the middle and tailrace zones, is usually more typical of a slow-flowing riverine environment with localized areas of depositional and littoral habitats and generally well armored banks.

Fish Rearing Investigations

Sampling will be conducted to obtain seasonal information on presence, relative density, abundance, distribution and habitat utilization of fish species within each zone of the Rocky Reach reservoir and from the tailwater zone of Rocky Reach and Wells dams project area. The presence of ESA-listed species in the study area may eliminate or restrict the use of some potentially lethal methods, such as electrofishing or gillnetting. To avoid this problem other, less invasive, sampling methods will be employed. The primary fish capture methods to be used in the study area are beach seining, minnow traps, floating trap nets, cast nets, and angling. Identification, enumeration, and description of fish in near-shore and littoral habitats will also be conducted by snorkel swim transect surveys.

These methods are efficient at capturing all species of fish that utilize nearshore areas and when properly conducted, avoids mortalities of captured fish. Since most fish species in the Columbia River system exhibit inshore movements at night for feeding and cover, sampling during this period can result in substantially higher catch-rates or observations of a greater variety of species than sampling during the day. Where safety permits, night sampling will therefore be scheduled as part of the collection program.

The proposed study will involve intensive sampling in the fall of 1999 and the spring and summer periods of 2000. Within each sample session, approximately two weeks of field sampling have been initially scheduled.

Fall Session (October to early November 1999)

This period will be sampled to identify fish use of reservoir habitats, prior to winter; including potential overwinter use/selection by anadromous (i.e., chinook juveniles) and resident species.

Spring Session (late March to early April 2000)

This period will be sampled to determine fish use of nearshore rearing areas as the river and reservoir warm up; including investigations of habitat use by resident fish spring spawners and rearing use by anadromous (i.e., chinook juveniles) and resident species such as suckers, pikeminnow, chubs, bass, etc.

Summer Session (late June to early July 2000)

The late summer period typically represents periods of maximum water temperatures and will identify use of reservoir shoreline habitats both for adult feeding and juvenile rearing activities.

Fisheries Inventory

The descriptive inventory of fish populations will be conducted primarily with conventional active and passive sampling techniques, such as beach seining and minnow/small fish traps and trap nets. Underwater observation (primarily snorkel surveys) will also be employed. Due to the likely presence of ESA-listed species in the study area, federal protocols may not permit electrofishing.

To avoid potential injury or unnecessary disturbance of ESA listed or proposed species (e.g., adult steelhead and salmon), these species will not be targeted for capture and will be avoided to the extent possible while conducting surveys for other species. The potential for encountering these fish will be minimized through physical avoidance. Boat electrofishing, (if permitted), is only effective in relatively shallow water (i.e., less than 3 m) and as such will be restricted primarily to littoral areas, whereas migrating steelhead and salmon will likely be moving through the thalweg or deeper areas of the study area. Strategies for avoiding encounters with endangered fish species will be developed further in the Section 10 permit application/consultation process. The composition, abundance, and distribution of these species in the project area will be determined from substantial mid-Columbia fish passage data and literature, from results of studies on travel and residence time of adults and juveniles in the Columbia and through the Rocky Reach project area, and through interviews with agency biologists, fisherman, and other persons knowledgeable of fisheries resources in the study area.

Life History and Sampling Data

Information collected from fish captured or encountered will include species and life stage, numbers, fork length, weight, and sex and maturity (when determinable by external examination). Sampling data will include location (geo-referenced), water temperature, sample type and effort, and other applicable habitat parameters.

Fish sampling will be conducted in each zone of the study area at selected sample sites that are representative of habitat types available. A proposed sample method and tentative distribution of effort in each study zone is provided below; however this is provided for reference only as sample locations, number, techniques employed at individual sites, etc. will not be finalized until completion of Tasks 1 & 2.

Sample Method

Sample Locations

Seining

Five sample locations in each lower and middle zones, and two in each upper zone and tailrace zone, depending on the availability of suitable shallow-water habitats; at each location, a minimum of three hauls of 30 to 50 m in length will be conducted.

Gee minnow traps	Five double sets in near-shore sites in each zone. The primary purpose of these traps will be to collect juvenile fish; therefore only effective baits (i.e. roe) will be used.
Floating traps/nets	One set in each of the lower, middle and upper zones. Only expected to be effective for moving/migrating fish. Modified traps will be placed in the tailwater areas during spring and summer in attempts to collect lamprey.
Cast nets/traps	Used primarily in areas of aquatic macrophyte growth, to encircle areas where techniques such as seines are not effective(i.e., Wegener Ring nets; AFS 1996)
Angling	Restricted to areas in each reservoir not efficiently sampled by other means (e.g., tailrace and forebay areas). Only barbless hooks will be used to minimize potential damage to the fish.
Snorkel/Swim Surveys	Transects will be established in nearshore and littoral sample areas for visual identification and assessment of fish species and description of habitat preferences. Five transects will be established in each section, using two-person swim teams.

Fish Spawning Investigations

Areas with potential spawning habitat for resident fishes will be identified based on maps and habitat description developed from the Aquatic Habitat Survey team. Spawning habitat suitability will be based on Probability-of-use criteria developed by Bovee (1978), Washington Department of Fish and Wildlife (1994) and other sources found within the literature. Areas with potential spawning habitat will be mapped as part of the Aquatic Habitat Survey study and will be field verified in the fall and spring spawner surveys.

Brown trout and bull trout potentially residing within Rocky Reach Reservoir spawn during the fall period, while those rainbow trout, cutthroat trout and bass potentially residing within the reservoir would spawn in the springtime period. Spawner surveys will be conducted in concert with the rearing surveys at one-week intervals in the fall of 1999 from mid-October through November and in the spring of 2000 from April through June. The surveys will be conducted with an underwater remote video camera towed from a boat. A video recorder will be interfaced with a Trimble Pathfinder Pro XRS differential GPS receiver so that the video image will be recorded with geographic coordinates. Depths and velocity will be measured with an Acoustic Doppler Current Profiler (ADCP), which is also interfaced with the GPS receiver. This system will provide a database of information, which will be developed.

The Fisheye underwater video camera is designed to tow below a boat and has been adapted to give a clear and steady view of the river bottom with a scale at the bottom of the view screen. The video image is recorded on a Hi-8 video recorder that is interfaced with the Trimble Pathfinder Pro XRS and the position is recorded with the video image. In this way, the locations

of observations will be recorded for reference. The observations of fish habitat will also be recorded as attributes into the Trimble TSC1 data logger for mapping. The attributes will include substrate type, fish utilization, large woody debris (LWD), presence of redds and other pertinent information.

The Trimble Pathfinder Pro XRS receivers signals from both the Global Positioning Satellite network and a signals from a commercial GPS network available by subscription. This provides real-time map-grade positioning without reliance on locations of the GPS satellites or differential beacons. The Trimble software allows the data to be manipulated on a desktop PC for creating maps and the data can also be exported to autoCAD and GIS compatible files. Attributes of fish habitat such as substrate and utilization observed with the underwater camera will be recorded on the data logger for mapping purposes.

4.2 Determine Habitat Preferences for Anadromous and Resident Fishes in the Rocky Reach Project Area

A significant portion of the Fish Presence and Habitat Use survey is the determination of those habitat features utilized most widely by the species of interest in the Rocky Reach study area. Depths, velocities, substrates, and cover will be quantified at the sampling sites for the species of interest. This information will then be provided to the Aquatic Habitat Mapping Team to assist in more global characterizations of the habitat which could potentially be used by the species and life stages of interest.

In order to measure and collect large volumes of fish habitat variables efficiently and cost-effectively in large rivers, streams, reservoirs and estuary habitats, an Acoustic Doppler Current Profiler (ADCP), manufactured by RD Instruments, Inc., in combination with GPS, electronic survey gear, and underwater video equipment will be used. The ADCP data in combination with RHABSIM, written by Thomas R. Payne & Associates to measure, model and analyze fish habitat availability will be used.

The ADCP measures depths and velocities down to 100 ft and 55 ft/sec, respectively; calculates real-time discharge; replicates discharge measurements within 2 percent; and measures velocity to +/- 0.033 ft/sec. The ADCP with bottom tracking accurately measures depth and velocity along a course while simultaneously indexing each measurement relative to the point of origin. The bottom tracking and depth stratification features make the instrument compatible with the "transect method" of measuring hydraulic variables and fish habitat availability. The water column can be stratified into as many as 128 depth bins. Velocities can be examined anywhere within the water column so that both mean column and nose velocity can be determined. Bottom Tracking corrects for variability in boat course and direction, reconciling the data to reflect an accurate transect across a given body of water. The ADCP is interfaced with a portable microcomputer, which is used to program the instrument, monitor its operation, and collect and store the data. Output can be converted to spreadsheet matrices of station, depth, and velocity. Because the ADCP will not measure in depths less than approximately 1.5 feet, shallow measurements near shore and at other locations will be taken manually using a digital, Swoffer brand, propeller-type velocity meter mounted on a standard top-set USGS wading rod.

Data collection of habitat variables associated with the targeted species and life stages will occur simultaneously with field efforts to characterize the fisheries assemblages for the Rocky Reach Project, using the techniques described above. These techniques will be used seasonally to characterize and describe habitat at sample locations within the reservoir. Seasonal sampling is required to characterize differences in habitat conditions resulting from different flow regimes. This sampling will also assist in determining whether changes in fish use or selection of various habitats is due to changes in habitat conditions or other factors such as growth or changes in maturity.

Substrate and cover parameters also will be recorded using WDFW substrate and cover codes (WDFW 1994). Substrate will use the WDFW convention of *xy.z* where:

- x* = the dominant substrate
- y* = the subdominant substrate
- z* = the percentage of the dominant substrate as compared to the subdominant substrate.

For example, a substrate coded 36.8 would denote a dominant substrate of small gravel, the subdominant substrate of small cobble, with 80 percent of the two substrates being small gravel.

A series of cross-sectional transects will be established within areas assigned a preliminary “Index Site” rating. These preliminary assignments of sites as Index will be revisited during subsequent field sessions, as additional information becomes available through the course of the program. Flows through Rocky Reach Reservoir will be recorded; habitat variables of depth, mean column velocity and substrate will be gathered from select sites using an ADCP, underwater video, and GPS.

SECTION 5: TASK LIST

Task 1: Project Management/Meetings

- C Client/Agency Consultation
- C Client Meetings
- C Budget/Contract
- C Task/Team Coordination
- C Secure stakeholder approval for Study Plan
- C Acquire necessary permits from WDFW, NMFS/USFWS

Task 2: Develop Sampling Strategy

- C Acquire preliminary data from Aquatic Habitat Mapping Team
- C Stratify Reservoir into Sampling Units
- C Select preliminary sites for sampling
- C Select gear types and sampling strategies

Task 3: Field Investigations

- C Coordinate studies with Chelan PUD and interested parties.

- C Conduct field investigations per approved study plan. As presented in the RFP, these include:
 - 1. Fish presence/absence surveys
 - C Target species/life stage abundance/distribution within habitat types
 - C Length, weight information
 - C Surveys conducted in fall (1999), spring and summer (2000)
 - 2. Habitat Utilization Surveys
 - C Depth, velocity, substrate, cover information
 - C Relate utilization to Rocky Reach flows
 - C Data collected concurrent with fish presence/absence surveys

Task 4: Analysis

- C Fish presence/absence surveys
 - 1. Catch information for the various sample methods
 - 2. Raw data summaries for each sample method will be provided in the final report.
 - 3. Data output will include a printout of individual life history data, as well as combined length-frequency, weight-frequency, length-weight regression, and condition factor data for each species.
- C Habitat Utilization Surveys
 - 1. Habitat utilization data (depth, velocity, substrate, and cover) will be tabulated for each species and life stage of interest.
 - 2. Raw data summaries for each sample method will be provided in the final report.
 - 3. Frequency histograms will be developed to show the range of depths, velocities, substrates and covers utilized by the target species and life stages.

Task 5: Interpretation of Results

- C Results of presence/absence/distribution surveys
- C Results of habitat utilization analysis, including range of depths, velocities, substrates and covers used by target species and life stages.
- C Results will be presented to the Aquatic Habitat Mapping Team to: 1) determine distribution of target species and life stages within the Rocky Reach project; and 2) identify areas which have the same characteristics as the known fish utilization sites which could potentially support other fish populations.

Task 6: GIS Database

- C Identify sampling sites for target anadromous and resident fish species/life stage utilization within Rocky Reach Reservoir.
- C Identify and locate known populations of target species and life stages

Task 7: Report

- C Produce draft reports for submission to Chelan PUD for internal review.
- C Produce draft reports for resource agencies, tribes and other stakeholders, incorporating Chelan PUD edits.
- C Produce final reports, incorporating agency, tribal and other stakeholder comments to draft report.

SECTION 6: ANALYSIS AND REPORTING

Fish Presence and Absence

Following the completion of each seasonal sample session, field data will be transferred from field forms and field notes to electronic databases. Data will be reviewed and checked for accuracy to detect entry errors or outliers. Catch information for the various sample methods will be tabulated in spreadsheet form to facilitate entry of data for subsequent field sessions. Raw data summaries for each sample method will be provided in the final report. Life history data analysis will be conducted using the Microsoft Windows™ computer software package SYSTAT™. Data output will include a printout of individual life history data, as well as combined length-frequency, weight-frequency, length-weight regression, and condition factor data for each species.

Fish Habitat Utilization

Data collected in the Fish Presence and Habitat Use Survey will also provide information on the utilization of suitable rearing and spawning habitat in the Project Area. For spawning utilization, the number on redds will be accurately enumerated and time, depth, substrate, nose velocity and mean column velocity will be measured for each observed redd. A report of findings will summarize the methods and results of this study. The report will include: 1) GIS map of rearing and spawning locations; and 2) development of habitat utilization criteria for spawning and rearing habitat within the reservoir.

After the completion of each field season, habitat utilization data (depth, velocity, substrate, and cover) will be tabulated for each species and life stage of interest. Data will be reviewed and checked for accuracy to detect entry errors or outliers. Raw data summaries for each sample method will be provided in the final report. Frequency histograms will be developed to show the range of depths, velocities, substrates and covers utilized by the target species and life stages.

It is important to note that Chelan PUD is not collecting fish preference data, but rather fish ***utilization*** data. Preference data are time consuming and expensive to collect. Preference data examines the amount that a target species and life stage utilizes habitats in relation to that habitat's availability; results are then calculated as a ratio of utilization/availability, and normalized to values ranging from 0.0 to 1.0. Utilization data examines the habitats actually used by the target species and life stages of interest, and assesses a range of habitat values where one would expect the target species to occupy.

Utilization data will be summarized and provided to the Aquatic Habitat Mapping Team. The data will be used to: 1) indicate those habitats presently being occupied and utilized by the target species and life stages; and 2) identify areas which have the same characteristics as the known fish utilization sites which could potentially support other fish populations.

SECTION 7: STAFFING AND EQUIPMENT NEEDS

Chelan PUD will hire a consultant(s) to assist in conducting 1999 field investigations and data gathering efforts. Chelan PUD staff will oversee contracting and deliverable schedule for the selected consultant(s). Consultant(s) conducting the contracted investigations will be required to provide equipment and staff to conduct the contracted investigations with minimal field support from the PUD. PUD involvement will be primarily in the form of study plan development and implementation, project oversight, providing input to the consultant(s) regarding decisions made by parties involved in the relicensing process, and promoting discussion among stakeholders regarding study results.

SECTION 8: SCHEDULE

A number of tasks will be completed during this study, several of which are contingent upon permitting restrictions due to the ESA listings in the mid-Columbia River. This schedule reflects conditions as described in the RFP. DE&S assumes the schedule is flexible and will be modified to reflect a final study plan and weather/fishery conditions outside of our control. All dates are preliminary, since final study plans have not been approved by Chelan PUD.

Event	Begin Date	End Date
Finalization of Study Plans	July 1999	August 1999
Develop Sampling Strategy	July 1999	Sept 1999
Acquire preliminary data from Aquatic Habitat Mapping Team*	Sept. 1999	Sept. 1999
Fish presence/absence and habitat utilization surveys	Oct 1999	Nov 1999
Preliminary data reduction and analysis	Nov 1999	March 2000
Fish presence/absence and habitat utilization surveys	late Mar 2000	May 2000
Preliminary data reduction and analysis	Apr 2000	May 2000
Fish presence/absence and habitat utilization surveys	June 2000	July 2000
Final data reduction and analysis	Aug 2000	Sep 2000
Interpretation of results	Aug 2000	Sep 2000
Utilization data to Aquatic Habitat Mapping Team	Sep 2000	Oct 2000
Draft report written and submitted to the PUD	Aug 2000	Sep 2000

Revise report and submit draft report to FWG	Sep 2000	Oct 2000
Fish Work Group Review	Oct 2000	Oct 2000
Revise draft report; prepare final report	Nov 2000	Nov 2000
* Dependent on timing of mapping surveys		

SECTION 9: BUDGET

To be determined based on contractor selection.

SECTION 10: NEXT STEPS

Fish sampling will commence once substrate information from the aquatic habitat survey is available. Anadromous and resident fish presence and habitat use surveys will begin during the late fall, 1999 and spring and summer, 2000.

- Task 1 - Coordinate with aquatic habitat survey personnel to identify the substrate and cover types and locations.
- Task 2 - Develop sampling strategy (stratified random) for fish sampling techniques and collecting utilization data within Rocky Reach Reservoir.
- Task 3 - Conduct field investigations for determining fish populations and collecting utilization data.
- Task 4 - Analysis.
- Task 5 - Interpretation of Results.
- Task 6 - Develop a database for production of GIS habitat use map layers for important species.
- Task 7 - Report

SECTION 11: REFERENCES

Bonneville Power Administration, U.S. Army Corps of Engineers, U.S. Department of the Interior and Bureau of Reclamation. 1994a. Columbia River System Operation Review-Draft Environmental Impact Statement. SOR Draft EIS. DOE/EIS 0170. Bonneville Power Administration, Portland, OR. Main report, summary and appendices.

Bonneville Power Administration, U.S. Army Corps of Engineers and U.S. Bureau of Reclamation. 1994b. Supplemental biological assessment on federal Columbia River power operations. Submitted to the National Marine Fisheries Service, Seattle, WA and the U.S. Fish and Wildlife Service, Portland, OR. 1-72 pp.

Chelan County Public Utility District No. 1. 1991a. Rocky Reach hydroelectric project. Chelan County Public Utility District, Wenatchee, WA. 18 pp.

Chelan County Public Utility District No. 1. 1991c. Application for raising pool elevation from 707' to 710'. Rocky Reach Hydroelectric Project No. 2145. Chelan County Public Utility District, Wenatchee, WA.

Chelan County Public Utility District No. 1. 1991c. Application for raising pool elevation from 707' to 710'. Rocky Reach Hydroelectric Project No. 2145. Chelan County Public Utility District, Wenatchee, WA. Appendices.

Franklin, J.F. and C.T. Dyrness. 1984. Natural vegetation of Oregon and Washington. Oregon State University Press, Corvallis, OR. 452 pp.

Mullan, J.W. 1984. Overview of artificial and natural propagation of coho salmon (*Oncorhynchus kisutch*) on the mid-Columbia River. U.S. Fish and Wildlife Serv. Rep. No. FRI/FAO-84-4. 37 pp.

Washington Department of Fish and Wildlife (WDFW) 1994. Instream Flow Guidelines.

Table 1: Scientific names of fishes known or thought to occur in Rocky Reach Pool

Common Name	Scientific Name
Chinook salmon	<i>Oncorhynchus tshawytscha</i>
Sockeye salmon	<i>O. nerka</i>
Steelhead	<i>O. mykiss</i>
Coho Salmon	<i>O. kisutch</i>
Mountain whitefish	<i>Prosopium williamsoni</i>
Rainbow trout	<i>O. mykiss</i>
Walleye	<i>Stizostideon vitreum</i>
Yellow perch	<i>Perca flavescens</i>
White sturgeon	<i>Acipenser transmontanus</i>
Largemouth bass	<i>Micropterus salmoides</i>
Smallmouth bass	<i>M. dolomieu</i>
Black crappie	<i>Pomoxis nigromaculatus</i>
Bluegill sunfish	<i>Lepomis macrochirus</i>
Pumpkinseed	<i>L. macrochirus</i>
Bull trout	<i>Salvelinus confluentus</i>
Kokanee	<i>O. nerka</i>
Cutthroat trout	<i>O. clarki</i>
Brown trout	<i>Salmo trutta</i>
Chiselmouth	<i>Acrocheilus alutaceus</i>
Carp	<i>Cyprinus carpio</i>
Peamouth	<i>Mylocheilus caurinus</i>
Northern pikeminnow	<i>Ptychocheilus oregonensis</i>
Dace	<i>Rhynchithys sp.</i>
Red shiner	<i>Richardsonius balteatus</i>
Tench	<i>Tinca tinca</i>
Longnose sucker	<i>Catostomus catostomus</i>
Bridgelip sucker	<i>C. columbianus</i>
Largescale sucker	<i>C. macrocheilus</i>
Mountain sucker	<i>C. platyrhynchus</i>
Channel catfish	<i>Ictalurus punctatus</i>
Bullheads	<i>Ictalurus sp.</i>
Sand roller	<i>Percopsis transmontana</i>
Burbot	<i>Lota lota</i>
Threespine stickleback	<i>Gasterosteus aculeatus</i>
Cottids	<i>Cottus sp.</i>