Elwha Ecosystem and Fisheries Restoration Permit Coordination Package

Pre-Application Information Package

Lead Agency

National Park Service

Cooperating Agencies

Lower Elwha S'Klallam Tribe
U.S. Army Corps of Engineers
U.S. Bureau of Indian Affairs
U.S. Bureau of Reclamation
U.S. Fish and Wildlife Service

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INTRODUCTION

Two hydropower dams, Elwha Dam at River Mile (RM) 4.9 completed in 1912 and Glines Canyon Dam at RM 13.5 built in 1926, were constructed on the Elwha River. The dams have blocked all 10 species of anadromous salmon and trout from over 70 miles of quality river habitat for the past 84 years and seriously degraded the spawning and rearing habitat to the undammed portion of the river. The dams originally supplied power for the City of Port Angeles; now they supply only about one-third of the power used for the Diashowa paper mill. The U.S. Department of Interior (DOI) proposes to fully restore the Elwha River ecosystem and native anadromous fisheries by decommissioning and removing the Elwha and Glines Canyon Dams. This would involve removing all necessary structures (including all or part of both dams), powerhouses, reservoirs created by dam construction, and associated facilities.

Those actions directly required to remove structures and trapped sediment along the river and restore anadromous fisheries are termed *restoration* activities. Those actions required to mitigate impacts from restoration activities are termed *mitigation* activities.

The proposed actions associated with the restoration of the Elwha River ecosystem and native anadromous fisheries include the following:

- allow a portion of trapped river sediments downstream
- construct a slurry pipeline
- revegetate reservoir land
- distribute project lands to other parties
- outplant anadromous fish on the upper river and tributaries
- expand the Elwha Tribal Hatchery

Mitigation for impacts associated with the restoration process would include the following:

- construct new water supply intake structures on the river
- off-river fish rearing
- provide flood protection
- monitor resources

Removing the dams and sediment will impact the river system during and after dam removal. Impacts to water quality and water users will result from transporting trapped sediment in the river water column. Impacts to the river location and flood stages will result from increased river bed elevation (aggradation) caused by transporting sediment in the water column. Short-term aggradation may cause higher flood stages in the period immediately following dam removal. In the longer term, the river would return to natural conditions and only minor changes to riverbed elevations would occur.

Mitigation would be required to protect users of river water from short- and long-term impacts. Impacts include increased suspended sediment (SS) concentrations, river meander, and aggradation. Mitigation for domestic and industrial water users would include providing new intake structures, treating water, and providing flood protection. Flood protection would also be provided for residential homes near the river.

Short-term impacts to river aquatic life, in general, would be severe. Much of the river's aquatic life might be destroyed during dam removal. In the long term, aquatic communities would benefit from dam removal. Removal would increase nutrient supplies in the river, return supplies of spawning gravel to the lower river, and return natural temperature regimes to the river. Mitigation for the short-term effects would include creating windows of low suspended sediment concentration to allow returning adult fish migration and removal from the river system during the dam removal process. Rearing of juvenile anadromous fish would occur in a hatchery near the mouth or off river.

Preliminary analysis indicates that no cumulative impact to wetlands would occur. Trumpeter swans which utilize Lake Aldwell habitat would be displaced by reservoir removal. Mitigation would include providing offsite easements that would remove conflicting usage from an area that has already been used by swans.

Figure 1. *Location Map*

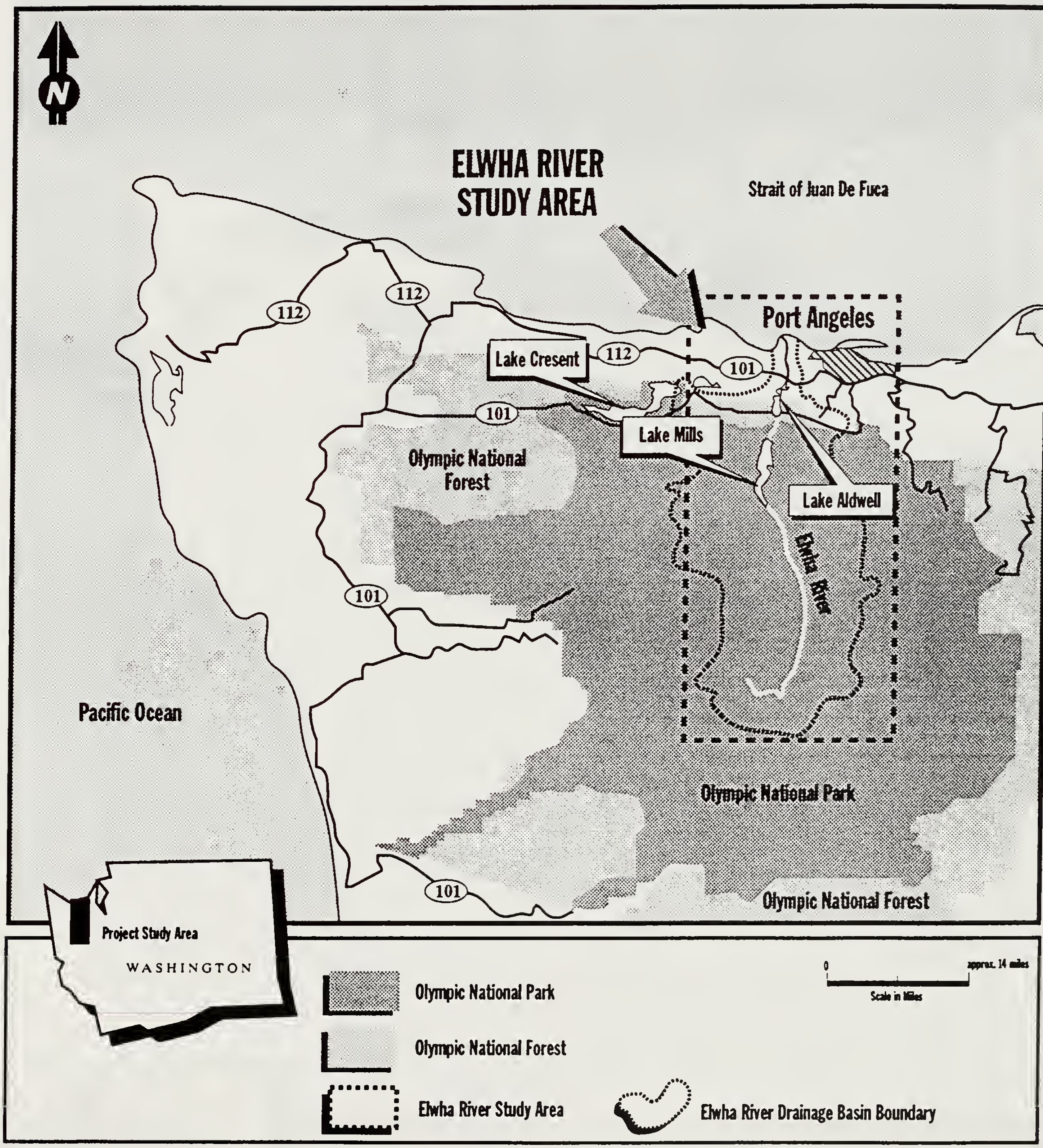


Figure 2. *Elwha River System and Watershed*

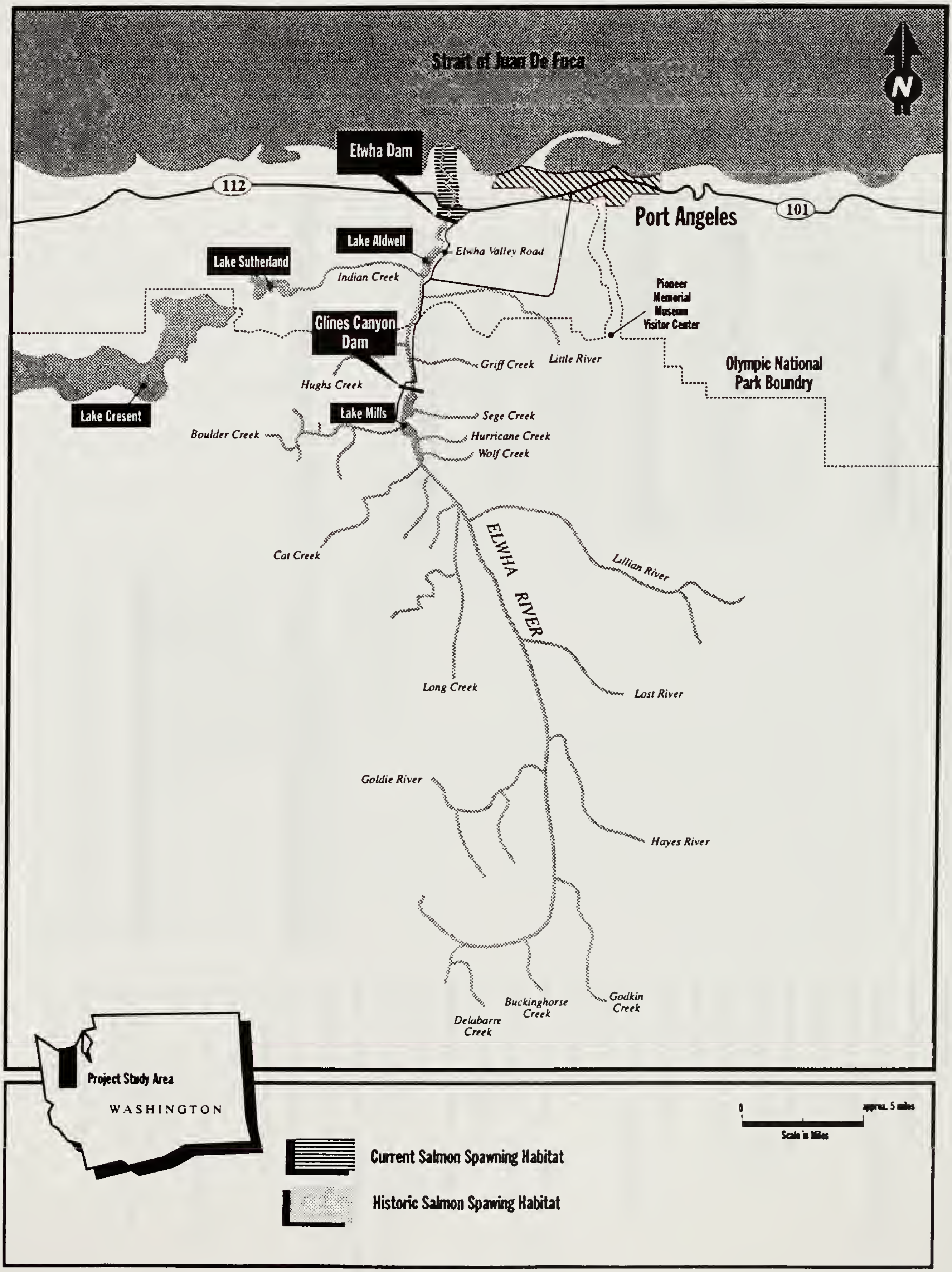
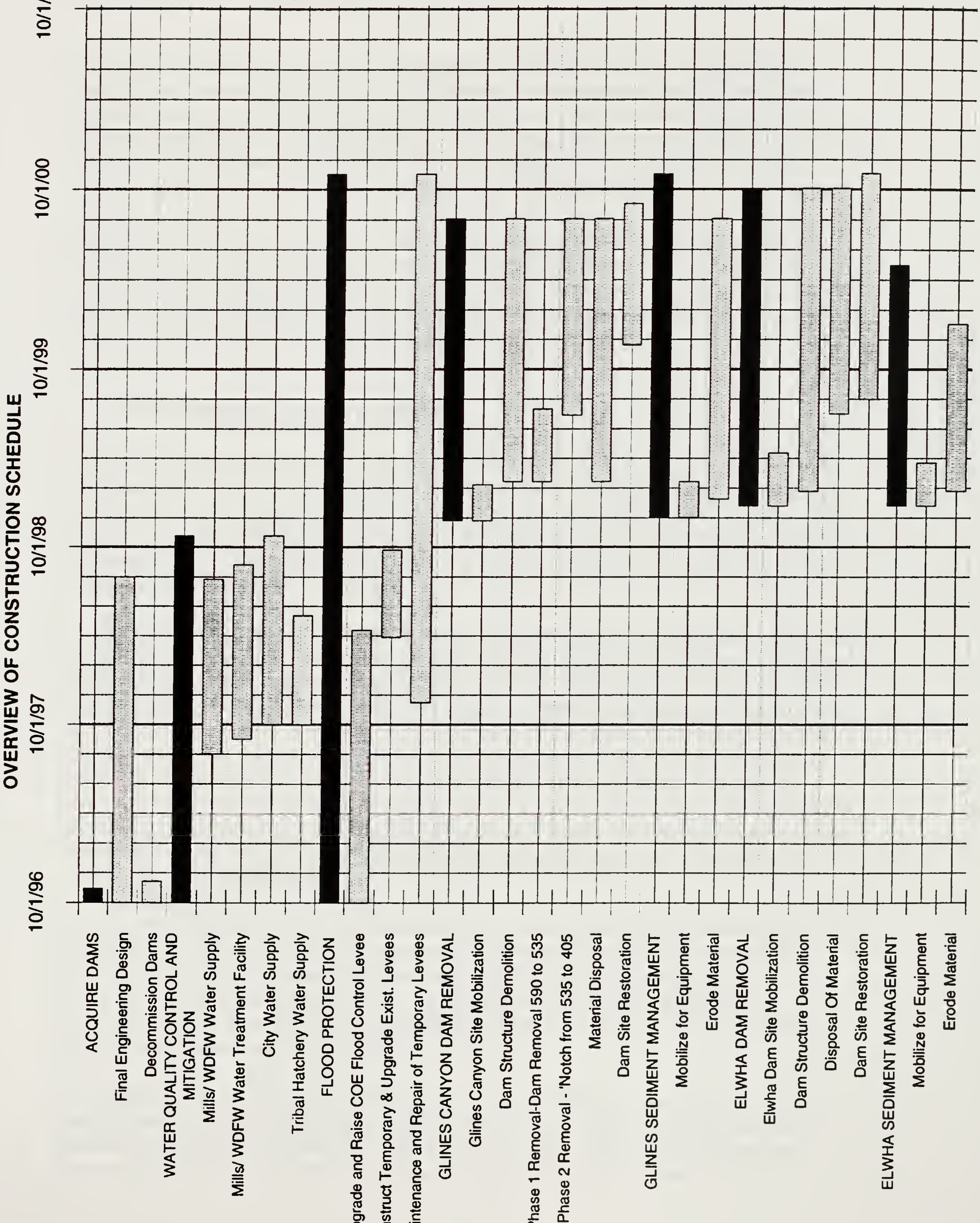


Figure 3. *Overview of Construction Schedule*



1 PURPOSE AND NEED

The purpose of this pre-application document is to provide permitting agencies and interested parties with a summary of the proposed restoration actions and mitigation programs associated with the restoration of the Elwha River ecosystem and native anadromous fisheries. This document provides a listing and description of the proposed actions with anticipated schedules. It is also the purpose of this document to inform agency staff of the current status and direction of the Elwha River Restoration project.

By meeting with permitting agencies prior to submitting applications for permits, the Elwha River Restoration Team hopes to determine the nature and extent of actions which regulatory agencies believe will require further development. It is the purpose of this document, and meetings with agency staff, to ensure that agency requirements are fully understood and addressed in the EIS and design processes.

1.1 History and Current Status

In 1968 the owner and operator of the dams (then Crown Zellerbach Corporation; now James River II) submitted an application to license the Elwha Dam to the Federal Energy Regulatory Commission (FERC). In 1975 an application to relicense the Glines Canyon Dam was also submitted to FERC. Licensing was controversial and a number of parties challenged FERC's jurisdiction to relicense the Glines Canyon Dam primarily due to its location in the Olympic National Park.

Before FERC could take action, it had to comply with the National Environmental Policy Act (NEPA). In 1991 FERC published a draft environmental impact statement (DEIS) and circulated it for public review. Congress responded to the controversy in October 1992 by enacting Public Law 102-495, the Elwha River Ecosystem and Fisheries Restoration Act (Act). The goal of the Act is the "full restoration of the Elwha River ecosystem and native anadromous fisheries." Under the Act, the secretary of the DOI was directed to study ways to restore the native anadromous fisheries and ecosystem of the Elwha River. A comprehensive report to Congress was prepared in 1994 by the DOI entitled *The Elwha Report, Restoration of the Elwha River Ecosystem & Native Anadromous Fisheries* (*Elwha Report*, DOI, 1994). The Act stayed FERC's licensing process until the Congressional mandate could be completed.

In early 1994 the *Elwha Report* was submitted to Congress. The report concluded that full restoration of the fisheries and ecosystem would be possible only if both dams were removed. The secretary determined that removing the dams was both feasible and necessary to restore the fisheries and ecosystem and to promote the federal trust responsibility for affected Indian tribes. The *Elwha Report* also presented an overview of dam removal alternatives and potential river impacts.

The DOI currently is preparing two EIS documents. One document will incorporate much of the FERC Draft Staff Report, and the *Elwha Report* and its appendixes. It is the decision document for dam removal. The draft document, "Elwha River Ecosystem Restoration EIS," recommended dam removal as the only means to restore the

ecosystem. A second EIS document, referred to as the *Implementation EIS*, will investigate specific restoration approaches and impacts in detail.

The *Elwha Report* presented various dam removal and sediment management approaches. For sediment management these included mechanical removal of the material from the basin, stabilization of the material near the river on the overbanks, and erosion of material down river. Both mechanical removal and in-place stabilization have been subsequently rejected because of associated negative impacts to the environment and extremely high costs. Only the river erosion approach has been investigated in detail in the *Implementation EIS*. The river erosion approach uses natural processes to restore the river and was considered to have the least cost and minimal impacts to the environment.

Several approaches were considered for dam removal and river diversion during the demolition process at both dam sites. To divert flow during demolition at Glines Canyon Dam, consideration was given to tunneling around, boring through, and notching the dam structure from the top. Tunneling around and boring through the dam are more expensive approaches to diversion and were dropped from further consideration. A detailed investigation of notching the dam from the top down has been developed in the *Implementation EIS*.

At Elwha Dam, tunneling was also considered but rejected based on cost and construction requirements. River diversion initially would be through the penstock or over the existing spillway. Cofferdams would be used to divert water away from the construction during dam demolition. The existing spillway would be excavated as the reservoir is drawn down and filled back after dam removal.

Numerous approaches to provide water quality mitigation have been investigated. These approaches include new wells, new river diversion structures, water treatment, and consolidation of water supply systems. Surface water diversion were dropped from consideration because of fish passage restrictions. Construction of large well fields was dropped from further consideration because ground water supply was unavailable. Proposed water use impact mitigation is described, by user, in the following section.

1.2 Restoration and Mitigation Actions

Restoration of the Elwha River ecosystem involves two types of actions. Those actions directly required to remove structures and trapped sediment along the river and restore anadromous fisheries are termed *restoration* activities. Those actions required to mitigate impacts from restoration activities are termed *mitigation* activities.

The proposed actions associated with the restoration of the Elwha River ecosystem and native anadromous fisheries include the following:

- decommission and remove both dams
- remove trapped sediment (sediment management)
- revegetate reservoir land
- distribute project lands to other parties
- outplant anadromous fish

- expand the Elwha Tribal Hatchery
- remove a water supply check dam

General actions required to mitigate the temporary and long-term effects of restoration include the following:

- provide water use protection
- engage in off-river fish rearing
- provide flood protection
- monitor resources
- provide mitigation for species of special concern

No vegetation or wetlands mitigation is anticipated. Overall gains in wetlands and vegetation would offset losses.

A list of probable activities associated with restoration, mitigation, and flood protection is provided in Table 1.

Table 1. ***Probable Activities Associated with Restoration, Mitigation, and Flood Protection***

RESTORATION
DAM REMOVAL
Concrete Cutting
Concrete Blasting
Road Construction
Road Maintenance
Crane Pad Construction
Load and Haul Material Off Site
Structure Demolition - Mechanical Excavation
Machinery Storage
Install Emergency Generator Equipment Housing
Install Construction Power Generating Equipment
Pumping Equipment Assembly
Separated Material Disposal
ROCK DIVERSION DAM REMOVAL
Excavation in River
Material Removal and Hauling
SEDIMENT MANAGEMENT - RIVER EROSION ALTERNATIVE
Erode Trapped Material
Construct Launching Pier
Regrade Exposed Reservoir Surfaces
Remove Large Woody Material
Plant on Exposed Reservoir Surfaces
Drill through Concrete
Truck Equipment to Site
Construct Cofferdam in River

Table 1. ***Probable Activities Associated with Restoration, Mitigation, and Flood Protection (cont'd)***

SEDIMENT MANAGEMENT - SLURRY PIPELINE ALTERNATIVE

Erode Trapped Material
Construct Launching Pier
Transport and Erect Dredge Plant
Dredge Lakes
Pipeline Construction
Pipe Fusing
Buried Pipe in Roadway
Road Construction
Place Lateral Restraints in River
Place Pipe in River and Lakes
Construct Staging Areas
Construct Material Separators
Construct Pumping Station

FISHERIES RESTORATION

Aerial Outplanting of Fry
Acclimation Pond Construction

TRIBAL HATCHERY EXPANSION

Well Construction
Water Supply Pipe Construction
Upgrade Electrical Supply System
New Cistern
Building Construction
Rearing Pond Construction
New Emergency Generation Equipment Installation
New Access Road Construction
New Fencing

MAJOR MITIGATION ACTIVITIES
Water Use Protection for Quantity and Quality

INDUSTRIAL INFILTRATION GALLERY CONSTRUCTION

Excavation in Riverbed and Cofferdam Construction
Placing Pipe in River and Backfilling
Concrete Vault Construction
New Road Construction
Electrical Power Line Extension

INDUSTRIAL WATER QUALITY TREATMENT

Excavate Existing Sediment Channel
Construct Concrete Mixing and Flocculation Chambers
Construct Berm and Road Along Center of Channel
Improve Existing Access Roads
Construct Sludge Removal and Disposal Equipment
Dispose of Sludge in Elwha River or at Approved Landfill

Table 1. ***Probable Activities Associated with Restoration, Mitigation, and Flood Protection (cont'd)***

CITY OF PORT ANGELES
- Drill Caisson
- Construct Pumphouse
- Install Piping Beneath River
- New Access Road
- New Electrical Hook-up

TRIBAL FISH HATCHERY
- Excavation in Riverbed and Cofferdam Construction
- Placing Pipe in River and Backfilling
- Concrete Vault Construction
- New Road Construction
- Electrical Power Line Extension

TRIBAL SEPTIC SYSTEMS
- Construct Mound System

DRY CREEK WATER ASSOCIATION
- Drill One New Well
- Pumphouse Construction
- New Piping
- New Chlorination Facility
- Seal Existing Wells

ELWHA PLACE HOME OWNERS ASSOCIATION
- Pumphouse Construction

PRIVATE WELLS
- In-line Filter Systems

FLOOD PROTECTION

LOWER ELWHA FLOOD CONTROL LEVEE
- Raise Levee Elevation
- Armor Inside Face with Rip-Rap
- Extend Levee to the Strait of Juan de Fuca

PRIVATE FLOOD CONTROL LEVEE WEST BANK
- Raise Levee Elevation
- Armor Inside Face with Rip-Rap

CITY OF PORT ANGELES DOMESTIC WATER SUPPLY (RANNEY COLLECTOR)
- Raise Caisson Elevation

WDFW FISH REARING CHANNEL, INDUSTRIAL SETTLING CHANNEL, AND LOCAL WELLS
- Provide Adjacent Road at Higher Elevation
- Raise Well Heads

PRIVATE RESIDENCES
- Raise or Floodproof Structures
- Bank Erosion Protection (Rip-Rap)

Table 1. ***Probable Activities Associated with Restoration, Mitigation, and Flood Protection (cont'd)***

DRY CREEK WATER ASSOCIATION WELLS

Provide Adjacent Road at Higher Elevation

TRAINING DIKE AT PARK ENTRANCE

Raise Levee Elevation

Armor inside Face with Rip-Rap

OLYMPIC HOT SPRINGS ROAD

Provide Road at Higher Elevation

2 RESTORATION ACTIONS

2.1 General

Restoration actions would be those actions required to restore the ecosystem and native anadromous fisheries to natural conditions. Removal of manmade structures and accumulation of material behind dams would be required to restore the ecosystem system. Fish restoration would occur naturally after dam removal. The restoration plan calls for accelerating natural restoration by outplanting juvenile fish into the upper river. Natural Elwha stocks and physically and genetically similar stocks would be used for the restoration process. Expansion of the Lower Elwha Hatchery facility would be required for production and maintenance of juvenile fish for outplanting.

2.1.1 Decommission Dams

The decommissioning of both dams includes final project shutdown, removal of hazardous material from the dams, and removing the turbine runners from service. In the case of Elwha Dam, equipment, buildings, electrical power lines, and all other project related material will be removed as part of the dam demolition process. Much of the equipment can be resold or recycled. Non-structural building materials that cannot be recycled will be delivered to an approved construction waste landfill.

2.2.2 Dam Removal

Dam demolition would involve removing structural components of the dam, electrical, mechanical, and support facilities. Dam removal activities will be coordinated with sediment management and fish restoration activities. Dam structure removal will involve controlled blasting and mechanical excavation. Flows at the Elwha River will be controlled through notches in the dams or by surface diversion. Tunnel construction is not anticipated at either dam.

2.2.2.1 Elwha Dam Demolition

The Elwha dam was constructed originally as a gravity dam within a narrow, rock-walled canyon. Insufficient understanding of the riverbed material composition resulted in a blowout which allowed the river to flow below the concrete structure. Subsequent efforts to plug the river resulted in dumping large quantities of fill immediately behind the gravity concrete structure.

All structures at the Elwha Dam site will be demolished. Material will be removed from the site by truck and disposed of at an approved fill site or used as fill and buried on site. Restoration of landscapes will require some imported top soil. Concrete from dam or powerhouse structure may be used as fill. Hazardous material will be removed from the site and disposed of at an appropriate landfill.

Dam structure demolition will require that the following actions be taken:

- construct cofferdams in the reservoir forebay to divert the river so that construction activities can be conducted in the "dry"
- erect a crane and supporting pad to move material
- improve the existing access road from Highway 112 to the dam
- construct access roads in the forebay to remove material adjacent to the dam

Dam and powerhouse demolition will be accomplished by controlled blasting and other mechanical excavation techniques. Forebay fill will be will be removed by excavation equipment. Transportation across the forebay will be by existing bridge and barge. Upon completion of demolition and removal activities, the area will be landscaped and revegetated.

2.2.2.2 Glines Canyon Dam Removal

The Glines Canyon Dam was constructed as a concrete arch dam in a narrow, rock canyon. The dam is comprised of a west spillway section, a concrete arch section, a concrete thrust block, an east bank concrete gravity wall, and embankment sections on both abutments. Also at the site are power generating equipment, a concrete and steel powerhouse, a steel penstock and concrete-lined tunnel, and intake structure and gate house, two houses, a maintenance shed, and a surge tank.

All power generating equipment, supply penstocks, housing units, spillway section, and the powerhouse would remain. The concrete-lined tunnel would be filled, plugged, and landscaped on the surface. The main arch of the dam, the surge tanks, the intake structure, and the gate structure would be completely removed. The concrete right abutment section would remain as a view point and interpretive center. Hazardous material would be disposed of at an approved disposal site.

The river would be diverted by notching sections of the dam to allow passage during normal flow while demolition of the remaining sections would be demolished in the "dry." Demolition would use blasting and cutting techniques. Removal of material would be accomplished by construction of a fixed crane supported on a crane pad. Over-the-road haul vehicles would be used to transport material to an approved disposal site.

Access to the left abutment would be provided by improving the Olympic Hot Springs Road as required along the length from US highway 101 to the site. Upon completion of activities, the road would be upgraded. Sections of the road would be elevated for flood protection during the final upgrade.

2.2.3 Sediment Management

Numerous approaches to managing the sediment trapped in the reservoirs have been investigated in the FERC EIS and the *Elwha Report*. These approaches include mechanical removal, stabilization in-place, erosion using river flow, and combinations of elements from each. Current estimates indicate that a combined total of approximately 18 million cubic yards (mcy) of sediment have been trapped in Lake Aldwell (4 mcy) and Lake Mills (14 mcy). Sediment is commonly classified by average grain size with *coarse* sediment (sand, gravel cobbles, and boulders) sized larger than 0.0625 mm. Fine

sediment (silt and clay) is smaller than 0.0625 mm. Coarse sediment is, generally, transported along the river bed (bed load) and moves comparatively slowly downstream. Fine sediment would be carried in suspension along with the water.

This sediment would lie in the path of the river if not removed. Using river erosion to remove the sediment would be the least expensive and have the least overall environmental effects. Two variations on this approach were investigated.

2.2.3.1 Erosion Approach Alternative

The "erosion" approach would allow the river to naturally erode sediment in the path of the flow. Not all sediment in the reservoirs would be in the path of the river. As the dams are removed and the reservoir elevations are drawn down, the river would create a path through trapped sediments. Material outside of the river path would remain in place. Vegetation would be planted on exposed areas. Some grading may be conducted in unstable regions.

Material sizes found in the reservoir range from clay (0.004 mm and smaller) to cobbles. Material of all sizes would be eroded. Suspended material concentration would vary. Notches cut in the dams would release large quantities of highly erodible fine sediment in "slugs" with concentration peaks between 10 and 50 parts per million (ppm). Concentrations would decrease in periods after notches in the dam were created. Water users would require mitigation to remove suspended material before use.

Coarse sediment would move more slowly downstream. Some material would be deposited on the river bed increasing material available for spawning. Initially, more coarse material would be transported from the reservoirs than could be transported by the river to the Strait causing the river bed elevation to rise (aggrade). Current estimates indicate that coarse material would cause an increase in bed elevation. Scour holes and pools would fill with sand and gravel. Most locations along the river would experience only small increases in bed elevation of 3 feet or less. This might cause river surface elevations to increase by approximately 6 inches to 3 feet for the 100-year flood. Structures along the river would require flood protection to mitigate short- and long-term effects of aggradation.

2.2.3.2 Slurry Pipeline Approach Alternative

The "slurry pipeline" approach varies from the erosion approach in the manner in which fine sediment is removed from the basin. Mitigation measures required to remove suspended sediments (SS) from the water column for fisheries and industrial use would be reduced using this method. The slurry pipeline approach would place most of the erodible fine sediment in a pipeline extending from the reservoirs to Strait of Juan de Fuca.

Compared to the erosion approach, SS concentrations would be greatly reduced but high concentrations (compared to fish tolerances and user requirements) would not be eliminated. Fine sediment would be removed from the reservoirs by suction dredging techniques. Dredging techniques could remove only part of the fine material in the river

path. Peak concentrations would be approximately 10 to 20 percent of those anticipated for the erosion approach.

The slurry lines would start at a material separation chamber close to the dams that would remove large material which is not easily transported in a pipe. From the Glines Canyon Dam to the Olympic Park boundary, the pipe would be located next to or beneath the Olympic Hot Springs roadway. The pipe would be located in the river and on Lake Aldwell from the Park boundary to the Elwha Dam. Another separation chamber would be used at the Elwha Dam to add material from dredging of Lake Aldwell.

Two alternatives for pipeline alignment from the Elwha Dam to the Strait are considered. Alternate A would be located along the Elwha River from the Elwha Dam to the Strait. Alternate B would be located beneath county, state and Tribal roadways from Elwha Dam to approximately river mile (RM) .5. From RM .5 to the Strait the pipe would be located along the river.

Construction of the pipe would occur at staging areas along the river. Pipe material would be high density polyethylene (HDPE) except at locations which required high strength. Connections would be made at staging areas by heat fusing sections of pipe. Pipe would be dragged from staging areas to final locations. Pipe would be dragged back to staging locations for removal. Temporary electrical generation equipment would be used for fusing and staging locations.

2.2.4 Revegetation

During removal of the dams and the draining of the lakes the un-vegetated reservoir bottoms would be exposed. Both lakes are expected to have large woody debris and other organic material. A revegetation program is anticipated to control dust, surface runoff, erosion, and to restore wildlife habitat and aesthetic land values. No hydromulching, soil amendments, or broadcast fertilizers would be used.

Revegetation activities would include the following:

- collect sediments, seeds, coarse woody debris and plant material from ONP and other lands
- propagate plants from seeds and cuttings
- remove exotic species
- use helicopters and other machinery within ONP for aerial dispersal of seeds
- plant transplanted or propagated plants

2.2.5 Distribution of Project Lands

Ownership of lands associated with both the Glines Canyon and Elwha projects would be transferred from James River Corporation before beginning construction activities. Pursuant to PL 102-495, lands associated with the Glines Canyon Project would be managed in accordance with National Park Service requirements. Lands associated with the Elwha project cold be included in the Olympic National Park, National Wildlife

Refuge System, held in trust for the Lower Elwha S'Klallam Tribe, or provided for use by Washington state.

2.2.6 Fish Restoration Program

Fish restoration plans call for outplanting fish along the river to accelerate fisheries recovery. The Tribal Hatchery located near the mouth of the river would be the primary means of juvenile production for outplanting. Hatchery facilities would be expanded to meet production goals.

2.2.6.1 Outplanting

Outplanting during and prior to dam removal will help initiate establishment of fish runs in the upper river above Lake Mills. Outplanting will involve aerial planting, truck outplanting, feeding, and construction of acclimation ponds.

The following activities for anadromous species are anticipated:

- Chinook — Aerial outplanting above RM 34. No acclimation site required. Fry at 180/lb planted at approximately 25 percent above carrying capacity. Planting to occur at 12 sites.
- Coho — Aerial outplanting in side channels at two mid-river sites at 25 percent above carrying capacity. Plants to be delivered to 12 sites.
- Steelhead — Aerial outplanting of fry during early summer in side channels at two mid-river sites; total number of sites not to exceed 12. Truck outplanting of pre-smolts during early spring at two mid-river acclimation sites near Little River and Lake Sutherland. The fish to be held and fed for two months then allowed to volitionally release.

2.2.6.2 Lower Elwha Tribal Hatchery Expansion

The Elwha Tribal facility would be the major facility used in the recovery program for juvenile production. This facility is located in the lower 0.5 miles of the river and is currently used for coho and steelhead production. New facilities would be required to supply restoration production goals, and construction would occur on Tribal lands at the existing hatchery site.

To expand Hatchery facilities, the following actions would be undertaken:

- upgrade two existing production wells
- construct two new production wells
- install new supply piping
- construct aeration towers and equipment
- construct a new surface water supply cistern

- install new site drains
- construct four new holding ponds and spawning sheds
- construct a new 4,000 square foot incubation building
- construct eight new intermediate raceways
- install new electrical system
- upgrade utility and service entrances
- provide new standby power generation system
- install new alarm, control and monitoring systems
- construct a new storage shed
- upgrade existing facilities

3 MITIGATION ACTIONS

3.1 OVERVIEW

Temporary and permanent changes to river water quality, river stage and location changes, and changes in ground water elevation resulting from river elevation changes would require mitigation to protect property owners and water users. PL 102-495 requires that current water users be provided water quality, both during and after dam removal, that is consistent with current conditions.

Mitigation measures would provide water quality and quantity to current Elwha River water users equivalent to current conditions. Flood protection would be provided by increasing levee heights, building new levees, and raising critical structures. River aggradation would raise ground water elevations near the mouth of the river, causing impacts to septic systems. A new communal system would be provided for the land owners near the mouth of the river.

Without mitigation, high turbidity and SS concentration levels during dam removal would seriously impact anadromous fish populations using the lower river. Turbidity levels would also impact paper mill production capabilities, City of Port Angeles water quality, Dry Creek Water Association water quality, and Tribal and WDFW fish rearing capabilities.

Mitigation measures would protect fish stocks and water supplies during and after dam removal.

3.2 WATER SUPPLY IMPACTS

River aggradation and increased turbidity for both long and short terms would require mitigation to protect water quality and quantity for the following users:

- City of Port Angeles domestic supply system
- industrial and WDFW rearing channel use supplied by a diversion dam at approximately RM 3.5
- Lower Elwha S'Klallam fishery infiltration gallery located at RM 1
- two private domestic supply systems
- several private wells

Without mitigation, removal of the check dam which diverts water at RM 3.5 into the supply system for industrial and fisheries use would decrease water quantities available to these users. River aggradation would reduce water quantities available to the Tribal Hatchery by increasing outfall elevations and river alluvium thickness at the infiltration gallery. Aggradation and meander would potentially impact supply capabilities for the City of Port Angeles Ranney Collector and the Dry Creek Water Association wells.

3.2.1 Water Supply Mitigation

Water supply mitigation measures would include providing new intake structures and wells to increase or stabilize withdrawals. An infiltration gallery would replace the existing diversion dam at RM 3.5 for industrial and WDFW fisheries use. A new infiltration gallery would be constructed near the existing gallery to provide continued flow into the Tribal Hatchery. Aggradation at the Tribal Hatchery outfall which impacts flows from the hatchery would be removed by dredging. An additional Ranney Collector would be constructed near RM 3.7 to augment City of Port Angeles domestic use and compensate for reduced flow from the existing collector.

3.2.2 Industrial and WDFW Supply

Water supplies for industrial and Washington Department of Fisheries rearing channel use is currently diverted from the river by a low head check dam located at RM 3.5. The dam diverts water into a 6-foot-diameter concrete tunnel. At the end of the tunnel, water is distributed between industrial and fisheries use. Generally, more water is diverted than is used. From the distribution well, industrial water is directed through a grass-lined canal before entering the main supply pipeline to the mills. At the pipeline entrance a screen house removes large material. Water in excess of the pipe capacity is directed into the rearing channel outfall leading back to the river.

Water demand might equal the water right of 150 cfs held by the City of Port Angeles. The City sells its water to two paper mills and WDFW. The diversion dam represents a passage block for some anadromous species and must be removed to fully restore the river.

The proposed mitigation for water volume reductions due to check dam removal at this site would be installation of an infiltration gallery beneath the river alluvium upstream of RM 3.5. Water would be withdrawn through perforated pipes buried beneath the river. The system would involve constructing a concrete pumping vault on the left river bank. From the vault, a supply pipe would direct water into the existing supply tunnel. From the tunnel, supply would be by existing facilities.

3.2.3 Tribal Hatchery Supply

The current Tribal infiltration gallery, located at approximately RM 1, collects water from beneath the river bed in a perforated pipe. Water is delivered to the hatchery by a buried, non-perforated pipe. To provide increased water volume and mitigate for reduced flow due to aggradation, additional perforated pipe would be installed and an additional supply pipe would deliver water from the river to the hatchery.

The expansion or addition to this water line would involve some instream work that may include bottom disturbance for many yards into the current river channel. It is likely this work would be done during the low flow period of the year. Typical construction may include a temporary small dike around the pipeline installation area to reduce turbidity input to the river and to allow “in the dry” installation. This modification to the intake should be completed in one dry season. Some increase in stream turbidity is likely

to occur from this action, but restriction on season of activity would greatly reduce impacts to water quality. There are no downstream users of water below this site.

Aggradation in Bosco Creek and surrounding riverbed elevations would affect the ability to pass water through the hatchery. Mitigation would involve periodic dredging of the portion of the river which allows water to flow from the hatchery.

3.2.4 City of Port Angeles Supply

The City of Port Angeles removes water from the aquifer immediately (approximately 44 feet) beneath the river near RM 3.0 by means of a Ranney Collector. The Ranney Collector consist of a large diameter caisson with horizontal laterals projecting beneath the river bed. Demonstrating the connection of the aquifer to the river, the capacity of the Ranney Collector has decreased as the flow of the river in the immediate vicinity of the collector has diminished.

Analysis indicates that river bed aggradation and lateral migration potential exist in the vicinity of the Ranney Collector. Aggradation and migration would both contribute to reduction of the Ranney Collector capacity.

Proposed mitigation for reduced short- and long-term water quantity impacts would be construction of an additional Ranney Collector upstream of the existing near RM 3.5. Construction may include a new caisson, horizontal laterals, and supply piping beneath the river to connect with the existing collector. Pumps, electrical supply lines, housing for the caisson and pumps, chlorinating facilities, and access roads also would be required.

3.2.5 Private Wells

Removing Lake Aldwell will affect ground water levels only near the upper (south) end of the lake. Geology at the north end of Lake Aldwell is composed primarily of bedrock, which limits water migration. Therefore, lowering the lake will have no impact on ground water elevations downstream of the lake.

Mitigation for lower water levels in affected wells near the upper end of Lake Aldwell would be new well construction for the impacted wells. Existing wells would be sealed and abandoned.

3.3 Water Quality Impacts

Water quality impacts would occur to users which require the extremely high water quality currently provided by the river. During the removal process, SS levels may exceed 10,000 ppm for extended periods (weeks). Currently SS levels rarely exceed 1,000 ppm. Longer term after dams are removed, SS may be higher than current levels for similar types of events because dams would no longer trap fine sediments. Estimates

indicate levels of SS may increase as much as five times current levels during storm events.

Mitigation measures would include filtering, flocculating, and settling to reduce SS concentrations to current levels.

3.3.1 Industrial and WDFW Supply

Currently, SS concentrations for water delivered to the industrial supply pipe line average approximately 11 ppm (the range is from 0 to approximately 1,000). During dam removal, water supplied through the infiltration gallery may reach levels as high as 7,500 ppm. Peaks during storm events currently may reach levels of 1,000 ppm.

Mitigation for the industrial and fisheries use would include flocculation and settling facilities at the current grass-lined channel site immediately downstream of the supply tunnel. Rapid mixing of flocculants and incoming water would occur at the tunnel upwell. Flocculation would occur immediately downstream in two, 35-foot-by-535-foot, concrete chambers. Sedimentation of flocculated material would occur in the remaining portion of the channel. Construction would involve two new concrete flocculation chambers, a concrete rapid mixing chamber, widening the channel for sedimentation, and an access road in the middle of the sedimentation chamber.

Total volume of flocculated material would be between 2 and 3 million cubic feet of dry solids. Flocculants would be standard, drinking-water-approved materials.

Flocculated material would be placed back into the river. Sediment would be continuously pumped from the basin and deposited in the river. Placing the flocculated material back into the river would have only negligible effects on SS levels and river water quality since material would be flocculated and pumped into the river when SS concentrations in the river were high (during the dam removal process).

3.3.2 Dry Creek Water Association

The Dry Creek Water Association (DCWA) is a private, group water provider with four wells located near the river at approximately RM 3.7. Water pumping facilities are currently used on only three of the four wells. Wells no. 1 and no. 2 are shallow older wells located nearer the river. These wells are hydraulically connected to the river. Suspended sediment levels in the wells are influenced by SS in the river. Wells no. 3 and no. 4 are deeper wells constructed more recently, and are farther away from the river. Two mitigation options are possible: upgrade the existing DCWA system, or connect it to the City of Port Angeles system.

Connection to the city system would involve upgrading the existing pumphouse to provide the connection and installing approximately 1,500 feet of no more than 8-inch-diameter pipe along the east river bank from the city's Ranney system to the existing pumphouse. All DCWA wells would be abandoned and permanently sealed with concrete.

Upgrading DCWA's water system would involve drilling one new well and providing a pumping system for existing well no. 4 and the new well. Existing wells no. 1 and no. 2 would be abandoned. The existing pumphouse is located over well number one. Wells no. 1 and no. 2 would be permanently sealed with concrete. The pumphouse would be raised to provide flood protections. A new chlorinating system would be installed. In-line filtration would also be installed to protect against increased river turbidity for the short- and long-term water quality changes.

3.3.3 Elwha Home Owners Association

The Elwha Place Homeowners Associations (EPHA) wells are located in the flood plain at approximately RM 1.4 on the west bank. At this time, water from these wells is not treated.

Mitigation for short-term turbidity levels includes construction of an in-line filter system to remove iron, manganese, and particulate matter. Construction would include a new pumphouse and raising well heads.

3.3.4 Private Wells

Private wells along the river may experience increased turbidity levels during the dam removal process. In-line filter systems and bottled water would be provided for wells at risk for impacts.

3.3.5 Lower Elwha S'Klallam Tribal Septic Systems

To protect groundwater quality, 10 new mound systems would be provided. Existing individual systems would be retrofit into a mound system. Construction would involve building a new covered drain field above existing ground, piping, and a lift station package which includes a 4-foot-diameter manhole pump well, electrical system, and plumbing to mound.

3.4 Flood Protection

Flood protection now exists at several location along the river, primarily near the mouth. Levees exist on both the east and west banks of the river at the mouth. In addition, a small training levee is located above Lake Aldwell.

River aggradation would increase flooding frequency, especially in the short term. Structures and water withdrawal devices might be over topped in high flow events. Mitigation would include raising levees, constructing new levees, and raising well head elevations to levels above the 100-year event.

3.4.1 Industrial Supply System

The industrial water treatment canal currently is slightly above the flood plain. Short- and long-term aggradation in this vicinity may cause increased flooding frequency.

Mitigation would include construction of a levee along the east river bank in this reach. Construction would include placing, grading, and compacting imported fill material. The river side surface would be lined with large-diameter rip-rap material.

3.4.2 Lower Elwha Flood Control Levee

This levee is a federally authorized project constructed in 1988. The levee is 8,000 feet long, starting near the mouth of the river, and extending on the east bank to approximately RM 1.5. To retain the current flood protection level, the levee would be raised 2 feet along the entire length. Approximately 1,000 feet of the levee near the mouth of the river would require rip-rap to protect against scour caused by future river meander. To provide flood protection near the mouth of the river, the levee would be extended from its present terminus to the Strait of Juan de Fuca.

Construction would involve placing and compacting fill material along the river bank.

3.4.3 Private Levee near Mouth of River on West Bank

A 900-foot-long private levee provides flood protection to houses near the mouth of the river on the west bank. This levee provides a lower level of flood protection than is provided by the east bank levee. To retain the present level of protection, the levee would be raised 2 feet along the approximately 900-foot length.

3.4.4 City of Port Angeles Ranney Collector

Flood stage changes caused by river aggradation would increase the frequency of flooding adjacent to the Ranney Collector. Without mitigation, flooding might cause river water to flow over the top of the caisson and contaminate filtered water in the Ranney Collector. The Ranney Collector consists of housing, a large-diameter caisson, and a pumphouse. Mitigation for flooding would involve constructing a dike around the perimeter of the pumphouse building above the 100-year flood level. Construction would involve placing and compacting fill material.

3.4.5 Washington State Fish Rearing Facilities

The WDFW rearing facilities near RM 2.9 consist of concrete rearing ponds constructed adjacent to the river on the east bank. Mitigation for increased flood levels would require raising a road parallel to and west of the ponds by 2 feet along the entire length of the levee. Well heads for wells used to augment river flow for fish production also would be raised by approximately 2.5 feet to provide flood protection.

3.4.6 Private Residences

Private residences are located in the 100-year-flood plain near RMs 3.5, 8.4, and 9.7. Residential structures in the lower reach, near RM 3.5, would be raised above the flood plain. The structures in the upper reach, near RM 8.4, would be protected by raising Olympic Hot Springs for a distance of approximately 2,000 feet in the vicinity of the structures. The property for the residence near RM 9.7 would be susceptible to erosion without mitigation. Mitigation would include placing rip-rap along the river bank.

3.4.7 River Training Dike

A 300-foot-long training dike near RM 3.5 would be increased by approximately 2 feet to maintain the dike's capability to direct high velocity water away from nearby residences. The dike does not provide flood protection but helps protect the bank near the residence from erosion.

3.4.8 Olympic Hot Springs Road

The Olympic Hot Springs Road parallels the river along the east bank and is used for access to the park. Portions of the road flood at the annual 5-year frequency. Construction activities associated with dam removal would impact the condition of the road and require road repair and maintenance during and after dam removal. To protect against increased flood frequency associated with river aggradation, the roadway would be elevated by approximately 1.5 to 2.5 feet. Additional rip-rap protection would also be provided along portions nearest the river.

3.5 Species of Special Concern

Construction activities associated with dam removal might affect species of special concern. Mitigation would include monitoring construction activities and might involve arranging construction schedules whenever possible to lessen impacts.

Trumpeter Swans that utilize Lake Aldwell habitat would be displaced by reservoir removal. Mitigation would include providing offsite easements that would remove conflicting usage from an area that has already been used by swans. This action would increase habitat area and make it more suitable for swan use.

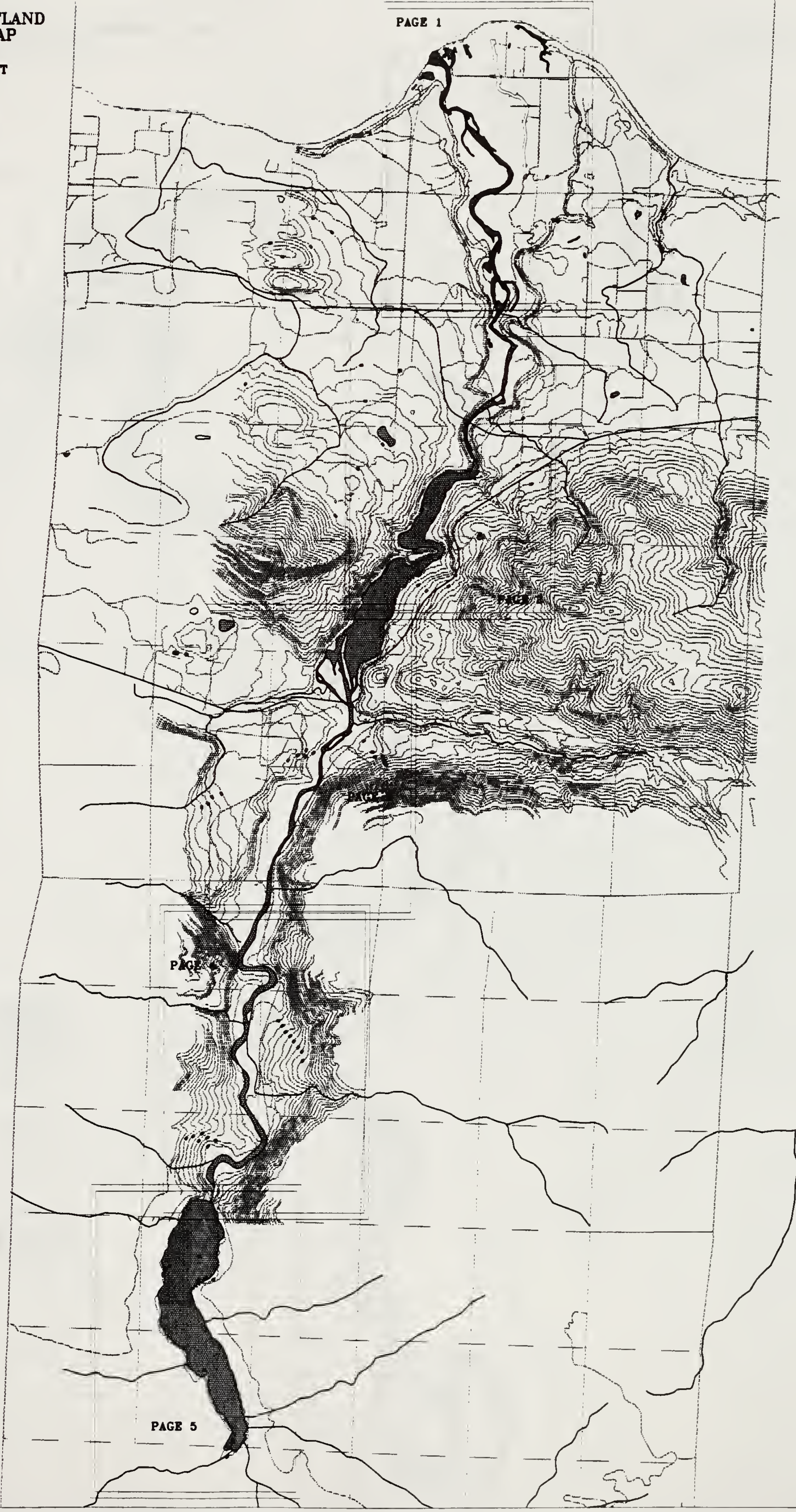
Monitoring, which would occur during dam removal and in subsequent years, would involve looking for animals in distress. Monitoring activities would involve putting human observers in the impacted area to monitor potential disturbance of listed species.

Monitoring in the marine environment would involve surface observation of the extent of suspended sediment flume displacing species utilized by the Marbled Murrelet.

Appendix:

National Wetland Inventory Map

NATIONAL WETLAND
INVENTORY MAP
ELWHA RIVER
RESTORATION PERMIT
COVER / VICINITY



The data contained herein was obtained from the B.I.A., Wa D.N.R., D.O.E., Clallam County Planning, Fisheries Engineering and the U.S. Census Dept.

No warranty is made for the use of these data beyond the purposes intended by the Elwha S'Klallam Tribe.

Projection Wa-N
Nad-27

0

Scale in Feet

Elwha S'Klallam Tribe
Lower Elwha Rd.
Port Angeles, Wa

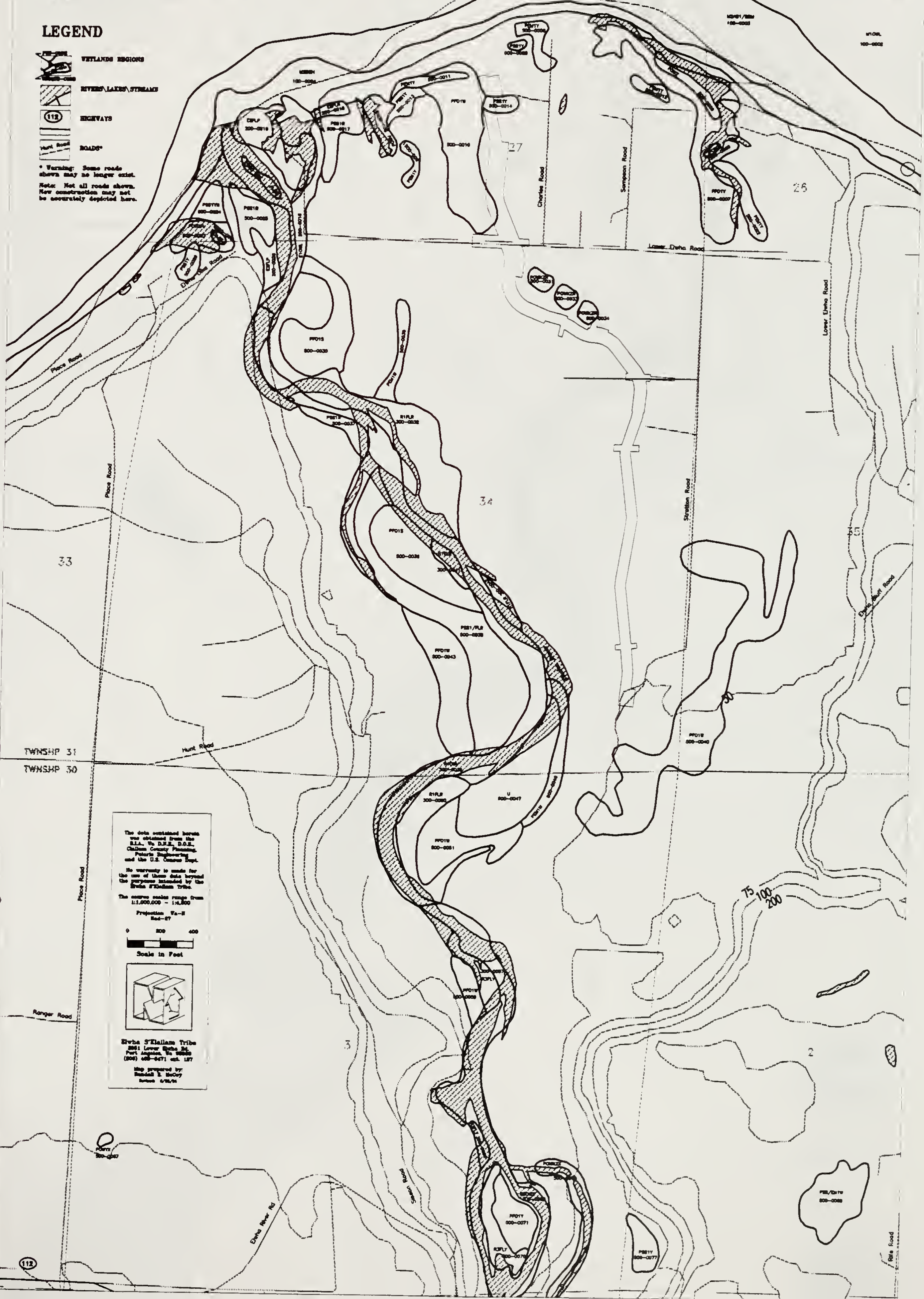
Map prepared by:
Randall E. McCoy

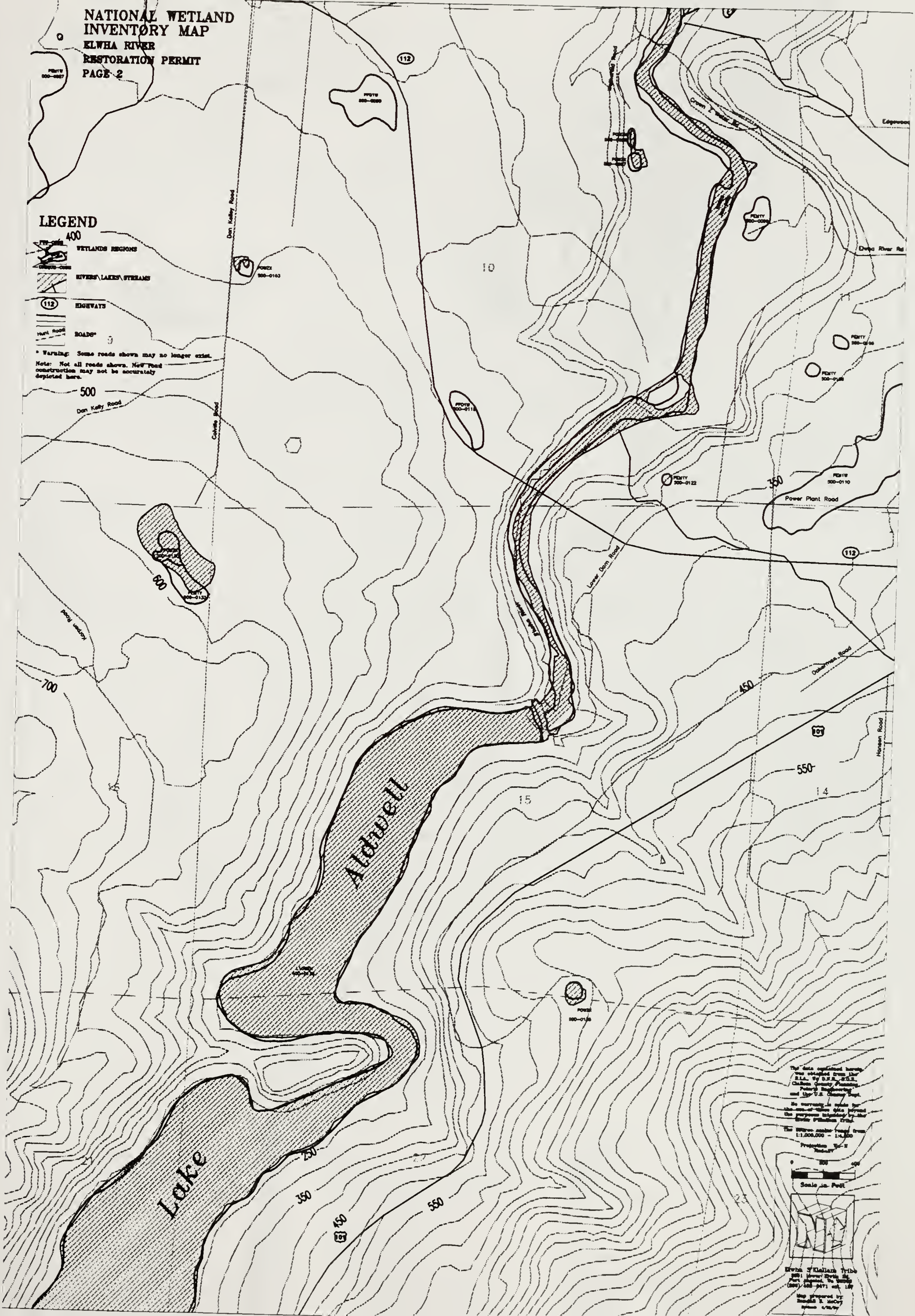
NATIONAL WETLAND INVENTORY MAP

ELWHA RIVER RESTORATION PERMIT

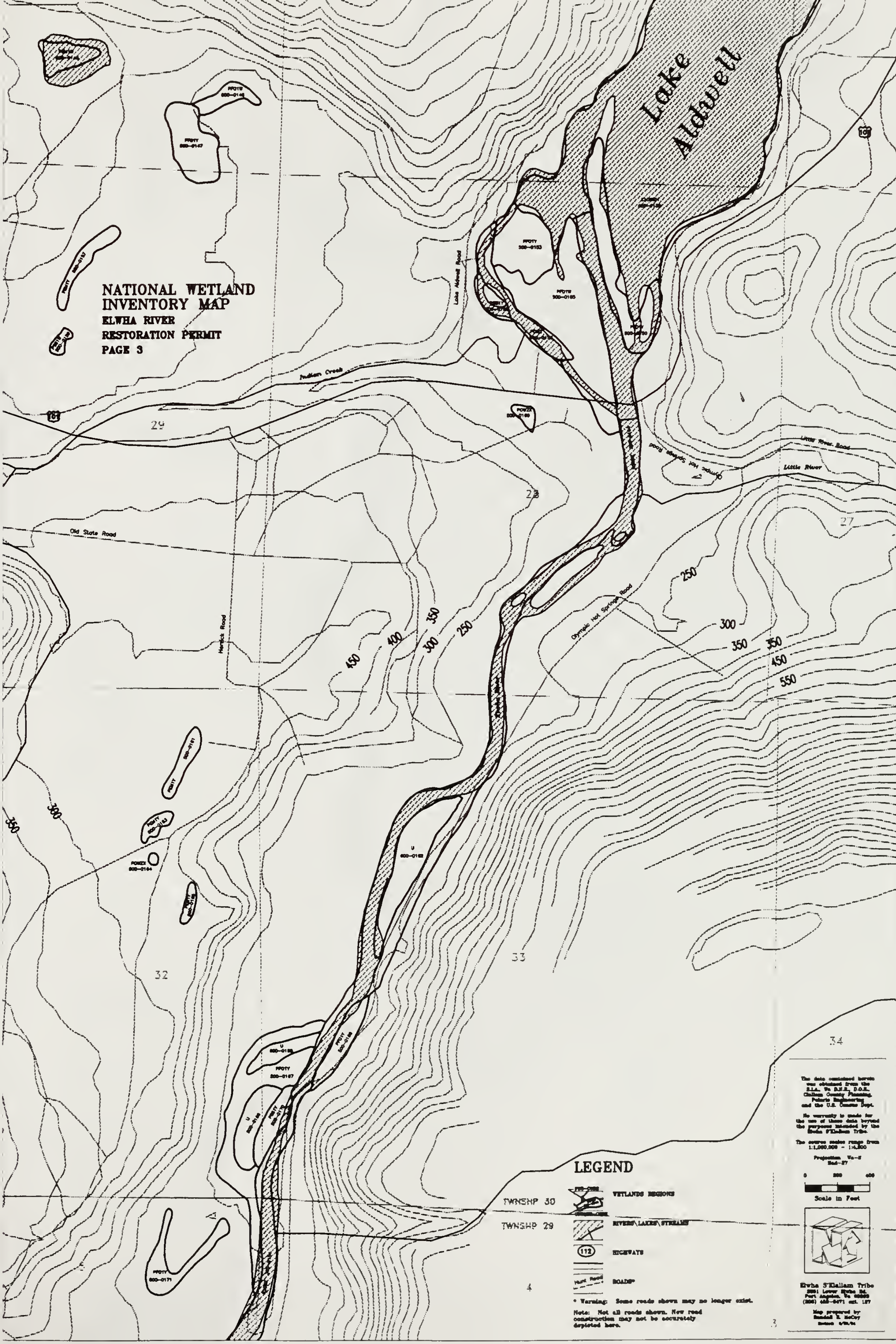
PAGE 1

STRAIGHT OF JUAN DE FUCA





NATIONAL WETLAND INVENTORY MAP
ELWHA RIVER
RESTORATION PERMIT
PAGE 2
LEGEND
WETLANDS REGIONS
RIVERS\LAKES\STREAMS
112
HIGHWAYS
Hunt Road
ROADS*
* Warning: Some roads shown may no longer exist.
Note: Not all roads shown. New road construction may not be accurately depicted here.
Dan Kelly Road
Colville Road
Karpen Road
Crown Z Water Rd
Edgewood
Elwha River Rd
Power Plant Road
Lower Dam Road
Elwha River
Doberman Road
Hansen Road
Lake Aldwell
400
500
600
700
350
450
550
250
10
15
14
23
Scale in Feet
Elwha S'Klallam Tribe



NATIONAL WETLAND INVENTORY MAP
ELWHA RIVER
RESTORATION PERMIT
PAGE 3
Lake Aldwell
Lake Aldwell Road
Indian Creek
Little River Road
Little River
Olympic Hot Springs Road
Old State Road
Herrick Road
29
28
27
32
33
34
4
3
250
300
350
400
450
550
TWNSHP 30
TWNSHP 29
LEGEND
WETLANDS REGIONS
RIVERS\LAKES\STREAMS
112
HIGHWAYS
ROADS*
* Warning: Some roads shown may no longer exist.
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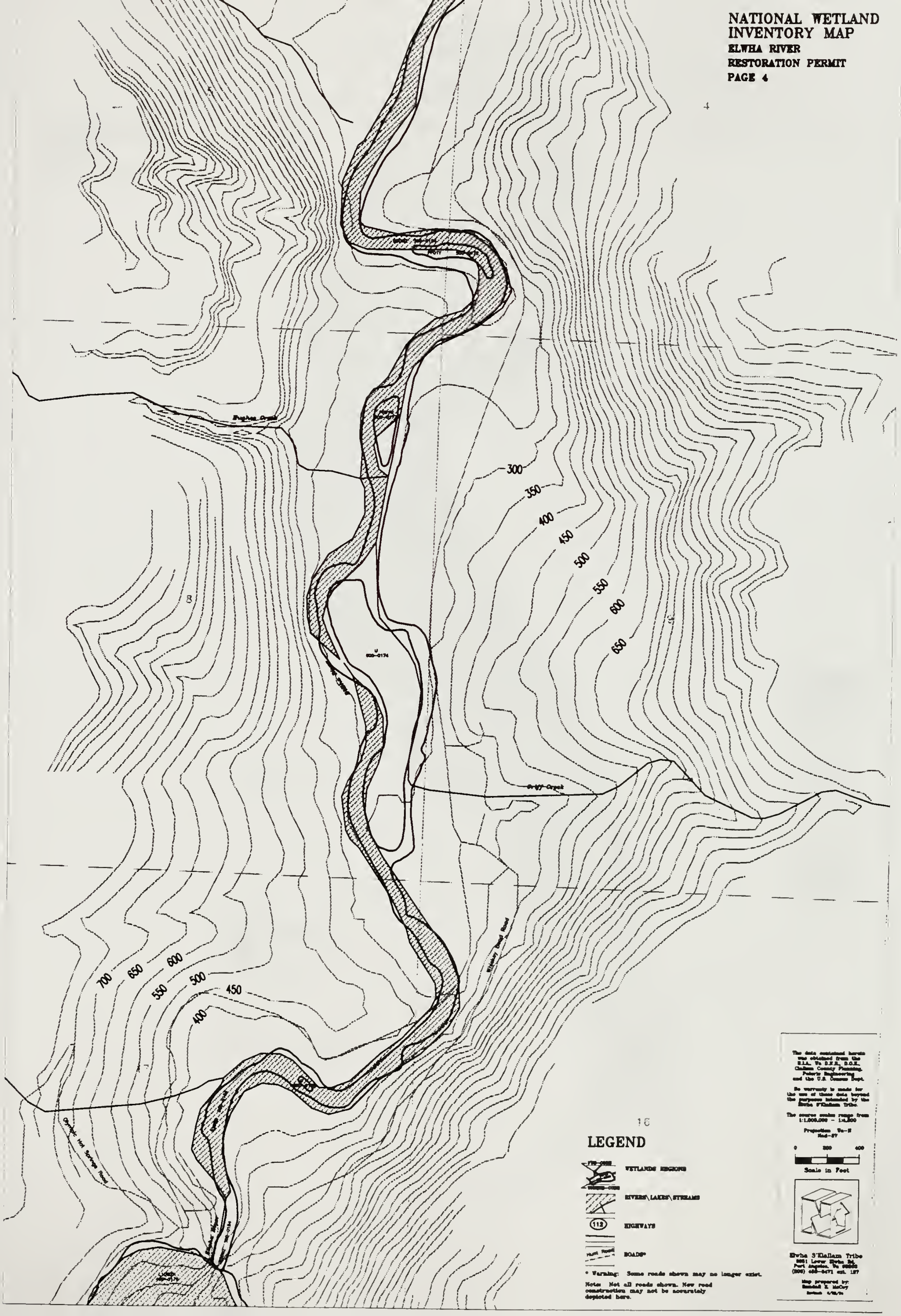
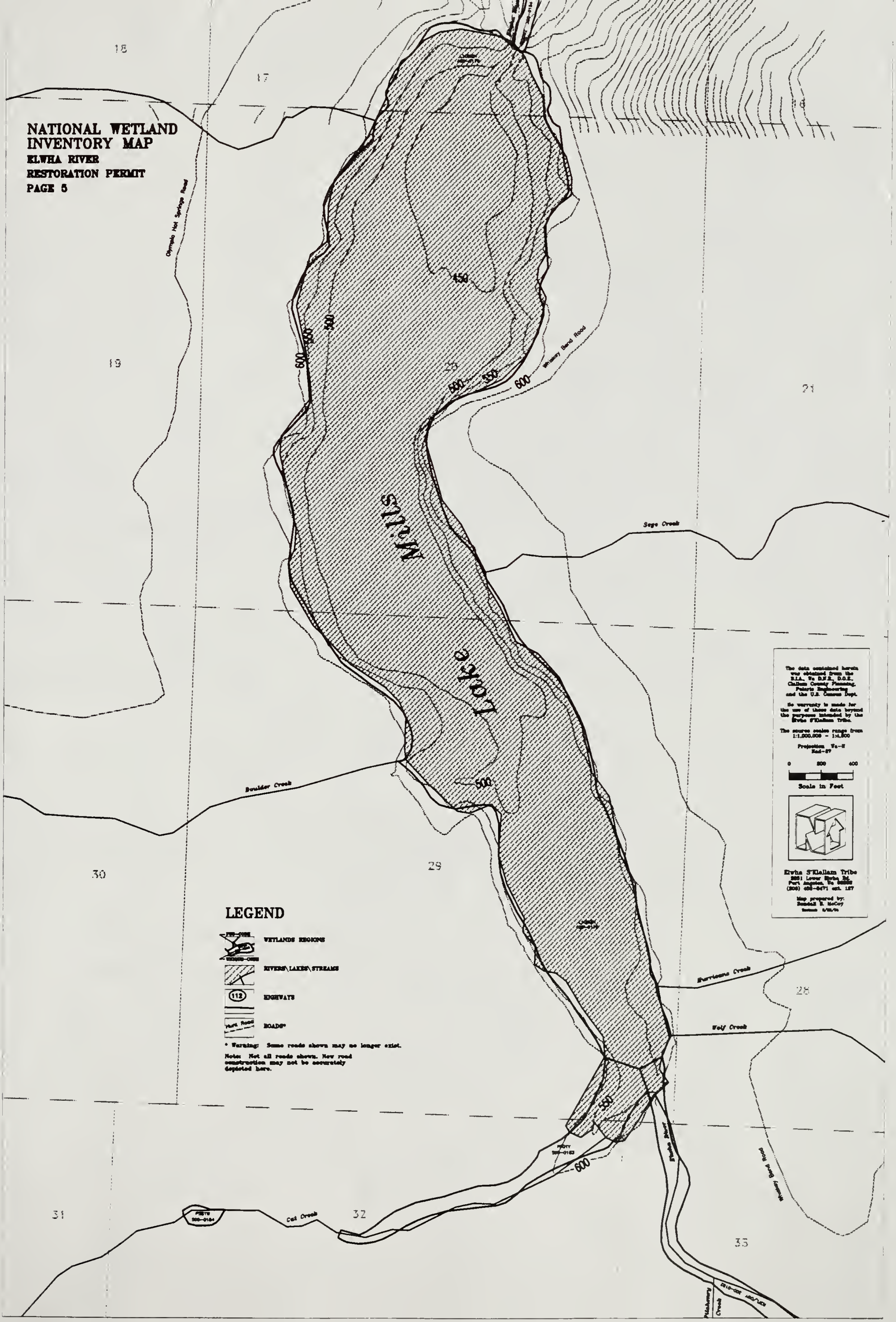
Scale in Feet
Elwha S'Klallam Tribe


NATIONAL WETLAND INVENTORY MAP
ELWHA RIVER
RESTORATION PERMIT
PAGE 4
Hughes Creek
Griff Creek
300
350
400
450
500
550
600
650
700
Olympic Hot Springs Road
LEGEND
WETLANDS REGIONS
RIVERS\LAKES\STREAMS
112
HIGHWAYS
ROADS*
* Warning: Some roads shown may no longer exist.
Note: Not all roads shown. New road construction may not be accurately depicted here.
Scale in Feet
0
200
400
Elwha S'Klallam Tribe


NATIONAL WETLAND INVENTORY MAP
ELWHA RIVER
RESTORATION PERMIT
PAGE 5
Olympic Hot Springs Road
Whiskey Bend Road
Mills
Lake
Sage Creek
Boulder Creek
Hurricane Creek
Wolf Creek
Cat Creek
Elwha River
450
500
550
600
16
17
19
20
21
28
29
30
31
32
33
LEGEND
WETLANDS REGIONS
RIVERS\LAKES\STREAMS
112
HIGHWAYS
ROADS*
* Warning: Some roads shown may no longer exist.
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The data contained herein was obtained from the
The source scales range from
Scale in Feet
Elwha S'Klallam Tribe
Map prepared by: