Yale Hydroelectric Project
FERC Project No. 2071

APPLICATION FOR NEW LICENSE FOR MAJOR PROJECT
Volume II

Exhibit E

PacifiCorp
Portland, Oregon
April 1999

CONTENTS

CONTENTS (continued)

CONTENTS (continued)

CONTENTS (continued)

APPENDICES

FIGURES

FIGURES (continued)

TABLES

TABLES (continued)

TABLES (continued)

ACRONYMS AND ABBREVIATIONS

4WD	4-wheel drive
ACS	Aquatic Conservation Strategy
ADA	Americans with Disabilities Act
ADAAG	Americans with Disabilities Act Accessibility Guidelines
APE	area of potential effect
APEA	Applicant Prepared Environmental Assessment
ATBCB	U.S. Architectural and Transportation Barriers Compliance Board
ATV	all-terrain vehicle
BBQ	barbecue
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BOR	Bureau of Outdoor Recreation
BP	Before Present
BPA	Bonneville Power Administration
CFR	Code of Federal Regulations
cfs	cubic feet per second
CO2	carbon dioxide
COUGM	Cougar Creek near mouth
CRGNSA	Columbia River Gorge National Scenic Area
CRMP	Cultural Resources Management Plan
CWA	Clean Water Act
dbh	diameter at breast height
DNR	Washington State Department of Natural Resources
DO	dissolved oxygen
DPS	Distinct Population Segment
ECPA	Electric Consumers Protection Act
EFSEC	Energy Facilities Site Evaluation Council
EIS	Environmental Impact Statement
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
FPC	Federal Power Commission
FR	Federal Register
FSCD	First Stage Consultation Document
FTR	Final Technical Report
GIS	geographical information system
GMA	Growth Management Act
GPNF	Gifford Pinchot National Forest
HCP	Habitat Conservation Plan
HEP	Habitat Evaluation Procedure
HRA	Heritage Research Associates

ACRONYMS AND ABBREVIATIONS (continued)

HSI	Habitat Suitability Index
IAC	Interagency Committee for Outdoor Recreation
IFIM	Instream Flow Incremental Methodology
ILM	Integrated Landscape Management
IP	International Paper
ITR	Interim Technical Report
kcfs	thousand cubic feet per second
l	litre
LAC	Limits of Acceptable Change
LRMP	Land and Resource Management Plan
LWD	large woody debris
m	meter
MERTR	Merwin powerhouse tailrace
mg	milligram
Monument	Mount St. Helens National Volcanic Monument
MSHNVM	Mount St. Helens National Volcanic Monument
msl	mean sea level
MW	megawatt
MWHMA	Merwin Wildlife Habitat Management Area
MWHMP	Merwin Wildlife Habitat Management Program
N	nitrogen
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NID	National Inventory of Dams
NMFS	National Marine Fisheries Service
NO2	nitrogen dioxide
NPPC	Northwest Power Planning Council
NPS	National Park Service
NR	National Register
NRF	nesting, roosting, and foraging
NRHP	National Register of Historic Places
NTU	nephelometric turbidity unit
O&M	operations and maintenance
OAHP	Office of Archaeology and Historic Preservation
OLECM	Ole Creek near mouth
OP	ortho-phosphorus
ORV	Off-road vehicle
OSU	Oregon State University
PAOT	persons at one time
PCBs	polychlorinated biphenyls
PDEA	Preliminary Draft Environmental Assessment
PHS	Priority Habitats and Species
PL	Public Law

ACRONYMS AND ABBREVIATIONS (continued)

PNRRC	Pacific Northwest Recreation Resource Commission
PP&L	Pacific Power and Light (i.e., PacifiCorp)
PUD	Public Utility District
PWC	personal watercraft
QA/QC	quality assurance/quality control
RCW	Revised Code of Washington
RM	River Mile
ROS	Recreation Opportunity Spectrum
ROW	right-of-way
rpm	revolutions per minute
RV	recreation vehicle
RVD	Recreation Visitor Day
SCORP	State Comprehensive Outdoor Recreation Plan
SEPA	State Environmental Policy Act
SHPO	State Historic Preservation Officer
SIOUX	Siouxon Creek near mouth
SMMP	Shoreline Management Master Program
SMP	Shoreline Management Plan
SPLYL	Speelyai Creek at hatchery intake
SPLYU	Speelyai Creek upstream of diversion
SW2BL	Downstream end of Swift No. 2 bypass
SW2BU	Upstream end of Swift No. 2 bypass
SW2TR	Swift No. 2 powerhouse tailrace
SWRES	North Fork Lewis River inflow to Swift Reservoir
TCP	traditional cultural properties
TDG	total dissolved gas
TEC	threatened, endangered, or candidate
TES	threatened, endangered, or sensitive
TKN	total Kjedahl nitrogen
TP	total phosphorus
TPN	total persulfate nitrogen
U.S.C.	United States Code
USDI	U.S. Department of the Interior
USFS	United States Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator
VRM	Visual Resource Management
WAC	Washington Administrative Code
WDF	Washington Department of Fisheries (now the WDFW)
WDFW	Washington Department of Fish and Wildlife
WDOE	Washington Department of Ecology
WMZ	Wetland Management Zone

ACRONYMS AND ABBREVIATIONS (continued)

WNHP	Washington Natural Heritage Program
WSA	Watershed Studies Approach
WSDOT	Washington State Department of Transportation
WSPRC	Washington State Parks and Recreation Commission
WWSP	Washington Wild Salmonid Policy
WY	water year
YALTR	Yale powerhouse tailrace
YIN	Yakama Indian Nation
YRESL	Yale Lake lower station
YRESU	Yale Lake upper station

1.0 INTRODUCTION

Pursuant to requirements of 18 CFR (Sections 4.51 and 16.8), PacifiCorp has prepared this Exhibit E (Environmental Report) to address non-power resources associated with the Yale Hydroelectric Project (Federal Energy Regulatory Commission [FERC] Project No. 2071). This introduction presents the overall objectives of the relicensing process for the Yale Project.

PacifiCorp's primary objective in preparing the Yale License Application is to balance protection and enhancement of natural resources in the project-affected study area with hydropower generation. PacifiCorp believes that aquatic, terrestrial, recreation, and other natural resources are compatible with hydropower, and that these resources should be considered equally to the renewable water resource available in the North Fork Lewis River. To help achieve this balance, PacifiCorp established and is adhering to the following principles during the relicensing process:

- PacifiCorp strictly observed FERC regulations (18 CFR 16), which consider baseline conditions to be existing project conditions. These conditions were evaluated through numerous studies, from which mitigation and enhancement measures will be based.

- PacifiCorp investigated methods to further develop and maximize the efficient and economic use of available hydrologic resources for power generation purposes pursuant to FERC requirements.

- PacifiCorp evaluated the compatibility with existing and draft federal and state resource goals and plans.

Based on these principles, PacifiCorp has prepared this final License Application that provides a reasonable balance between power and nonpower values contained within the Yale Project study area. The Yale License Application is the initial component in the overall approach for relicensing all 4 hydroelectric projects on the North Fork Lewis River. This approach is discussed below.

1.1 ALTERNATIVE APPROACH TO RELICENSING NORTH FORK LEWIS RIVER PROJECTS

The Yale Project is 1 of 4 hydroelectric projects on the North Fork of the Lewis River. Three of the hydroelectric projects (Yale, Merwin, and Swift No. 1) are owned and operated by PacifiCorp. The fourth project, Swift No. 2, is owned by Public Utility District (PUD) No. 1 of Cowlitz County and is operated and maintained by PacifiCorp for the PUD.

During First Stage Consultation for the Yale Project relicensing, numerous agencies suggested that PacifiCorp combine all 3 of its projects into a single license and address their cumulative operational and environmental impacts. To accomplish this, PacifiCorp

and Cowlitz PUD (hereafter referred to as the Licensees) have proposed an alternative collaborative approach to relicensing all 4 projects. Use of this alternative approach was submitted to FERC and approved on April 2, 1999 (letter from J. Mark Robinson, Director of Licensing and Compliance, FERC to Dave Leonhardt, PacifiCorp). In approving this approach, FERC issued an order accelerating the expiration of the Merwin license to coincide with that of Swift No. 1 and Swift No. 2 (Order Accelerating License Expiration Date, issued April 1, 1999). The expiration date of each North Fork Lewis River project is listed in Table 1.1-1. Because the Yale Project license, which will expire in April 2001, cannot be extended without an Act of Congress, PacifiCorp requested that FERC defer processing the Yale License Application. This request was granted by FERC in its April 2, 1999 letter because a processing delay will allow concurrent environmental review of all 4 projects. FERC further explained that it would initially review the Yale License Application for adequacy and process it only as far as an acceptance notice. The analysis of the Yale Project presented herein ultimately will be incorporated into the Applicant-Prepared Environmental Assessment (APEA) that will address all 4 of the Lewis River projects. In addition, FERC's April 2, 1999 letter granted a waiver from Section 16.8(f)(7)(i) of its regulations requiring evidence that a Water Quality Certification had been requested from the Washington Department of Ecology (WDOE). This action will enable WDOE to provide comprehensive water quality terms and conditions for all 4 Lewis River projects through a single certification process.

Table 1.1-1. Hydroelectric projects on the North Fork Lewis River.

Project	Project Owner	FERC License No.	License Expiration	License Capacity
Yale	PacifiCorp	No. 2071	April 30, 2001	134 MW
Swift No. 1	PacifiCorp	No. 2111	April 30, 2006	240 MW
Swift No. 2	Cowlitz PUD	No. 2213	April 30, 2006	70 MW
Merwin	PacifiCorp	No. 935	April 30, 2006	136 MW

The Licensees' goal in using an alternative collaborative approach to relicense the North Fork Lewis River projects is to obtain new licenses that ensure each project operates profitably and addresses environmental effects associated with their operation.

The Licensees are proposing to prepare a preliminary draft environmental assessment (PDEA) for the projects as part of the collaborative process to:

- Consolidate and streamline the licensing proceedings;
- Comprehensively assess environmental effects; and
- Promote early, comprehensive settlement discussions.

The Licensees, in cooperation with participating agencies, have agreed to use a watershed studies approach (WSA) to evaluate potential cumulative effects of the 4 projects on natural, recreational, and cultural resources. The WSA will serve as the scientific basis for the APEA, and will encompass the pre-filing consultation and scoping of environmental issues under the National Environmental Policy Act (NEPA). It will also

be used to support the Licensees' applications for new licenses and to facilitate comprehensive settlement negotiations.

Through the watershed studies, cumulative project effects will be assessed and a comprehensive, single settlement agreement will be negotiated that includes enhancement measures for all 4 projects. The proposed approach is consistent with the FERC's new rule (18 CFR, Section 4.34[i]), establishing an alternative administrative process during which pre-filing consultation and environmental review procedures may be combined in a single collaborative relicensing process. The Licensees have obtained the support of key agencies and interests for the collaborative approach.

1.2 THE YALE APPLICATION AS PART OF THE ALTERNATIVE APPROACH FOR RELICENSING THE NORTH FORK LEWIS RIVER PROJECTS

The Yale License Application assesses both existing conditions and the effects that would be induced by continued operation of the Yale Project. It precedes the formal adoption by FERC of the APEA for all of the Lewis River projects. Because the basin-wide APEA process will be ongoing for the next several years, upon receipt of the Yale final License Application, FERC has agreed to defer processing to coincide with receipt of the APEA for Merwin, Swift No. 1, and Swift No. 2. Accordingly, this License Application identifies only those enhancement measures proposed for implementation during the current license period, and those which do not "pre-judge" results of watershed studies, or future settlement negotiations for addressing impacts related to all 4 projects. Different enhancement measures may be proposed for Yale based on the results of the watershed studies.

To facilitate this consolidated evaluation process, FERC has approved PacifiCorp's request to accelerate relicensing of the Merwin Project to coincide with Swift Nos. 1 and 2. Such a schedule would allow the Licensees and stakeholders to assess the cumulative effects of all 4 North Fork Lewis River projects and to prepare a comprehensive basin settlement agreement.

The settlement agreement will contain measures related to the continuing impacts of all 4 hydroelectric projects. These will be defined and examined as part of the ongoing basin watershed studies. The measures contained within this Exhibit E reflect only Yale Project-specific enhancements. PacifiCorp will implement these measures prior to issuance of a new license in accordance with schedules indicated for each resource. The measures contained herein are not intended to prejudge the outcome of the basin watershed studies nor any agreement that may derive from settlement negotiations.

1.3 YALE EXHIBIT E

Much of the information contained in the Exhibit E is the result of over 2 years of studies conducted during the second stage of consultation. PacifiCorp initiated relicensing studies in spring of 1996 with the issuance of the First Stage Consultation Document (FSCD) (PacifiCorp 1996). The FSCD provided the following:

- Described existing environment and significant resources in the project vicinity, based on information derived from resources agency reports, literature, and personal communications;

- Described the project components and the current project operation; and

- Described various studies that PacifiCorp proposed to conduct during relicensing of the Yale Project.

Results of 1996 studies were presented in the Interim Technical Report (ITR) distributed for agency and tribal review and comment in early 1997 (PacifiCorp 1997). Some studies continued and several new studies were initiated in 1997, in response to comments on the ITR. Results of both 1996 and 1997 studies were presented in 4 Final Technical Reports (FTR), one each for Aquatic, Terrestrial, Cultural, and Recreation Resources, distributed in early 1998 (PacifiCorp 1998a-d). Studies for some resource areas (e.g., water quality) continued into early 1998. Study results have been updated in the FTRs and are also included in this final Exhibit E.

Cultural resources consultation is ongoing; PacifiCorp will prepare a separate Cultural Resource Management Plan (CRMP) that will be submitted to appropriate agencies for review when complete, and subsequently filed with the FERC.

Due to the sensitive nature of cultural resources, information regarding the specific locations of archaeological sites and finds is not available for general distribution. This information is contained in the Final Technical Report (PacifiCorp 1998c) and has been made available to appropriate agencies and tribes only.

Information presented in the Exhibit E is derived chiefly from data presented in the FTRs. Supplemental material used to prepare the Exhibit E is included in several appendices. All letters and memoranda related to agency consultation are included in Appendix 1.3-1. The introduction to this appendix contains a log of all written comments received to date.

1.3.1 Organization of Exhibit E

Exhibit E is organized into 2 volumes. The first Exhibit E volume (Volume 2 of the License Application) contains the following sections: Introduction (this section); General Description of the Locale (Section 2.0); and individual resource reports found in Sections 3 through 9. These reports cover the following topics:

- Water Use and Quality (Section 3.0)
- Aquatic Resources (Section 4.0)
- Terrestrial Resources (Section 5.0)
- Cultural Resources (Section 6.0)
- Recreation Resources (Section 7.0)
- Land Use and Management (Section 8.0)
- Aesthetics/Visual Resources (Section 9.0)

Literature cited is presented in Section 10.0.

The resource reports focus on the existing environment and potential impacts to resources within the Yale project vicinity, as defined in the General Description of the Locale in Section 2.0.

Each report contains the following information:

- Description of existing resources;
- Factors (either project-related or environmental) affecting resource conditions;
- Description of the Licensees' existing and proposed measures for resource enhancement and mitigation;
- Summary of the agency consultation process;
- Description of any continuing effects; and
- Discussion of costs and schedule associated with implementing proposed project-specific enhancements.

Included as Volume 3 of this License Application are the appendices to Exhibit E.

2.0 GENERAL DESCRIPTION OF THE LOCALE

The Yale Hydroelectric Project is located in the North Fork Lewis River basin on the western flanks of the Cascade Mountains in southwest Washington State, approximately 45 miles northeast of the City of Portland, Oregon, and 20 miles south of Mount St. Helens (Figure 2.1-1). The project is upstream of Lake Merwin on the North Fork of the Lewis River, approximately 35 miles from its confluence with the Columbia River. Figure 2.1.2 shows the location of the project features, the primary of which are Yale Dam and the adjacent Saddle Dam. These 2 structures create Yale Lake, a 3,800-acre reservoir.

The Yale Project study area focuses intensively on an area extending approximately 0.5 mile beyond the FERC project boundary in the reservoir vicinity, and 0.125 mile on either side of the Yale-Merwin transmission line. This boundary also extends eastward to encompass the North Fork Lewis River channel downstream of Swift Dam and PacifiCorp ownership in that vicinity. In response to agency comments received on the FSCD and the draft License Application, a much broader area will be examined to assess the cumulative effects of the Yale Project in relation to the other hydroelectric projects in the basin. This watershed boundary, depicted on Figure 2.1-1, extends from Mount Adams at the eastern-most point, to the confluence of the North Fork Lewis River with Cedar Creek as the western-most point. The northern and southern boundaries are defined by the crests of the drainage basin. Within this broader study area lie 4 hydroelectric facilities, Yale, Merwin, Swift No. 1, and Swift No. 2.

2.1 TOPOGRAPHY

The topography around Yale Lake ranges from approximately 3,000 feet mean sea level (msl) on the surrounding hills to approximately 500 feet msl at the valley floor. Slopes in the area are generally steep, resulting from the incision of numerous streams and rivers into the geologically young landscape. A few miles to the west (downstream) of the project, the Lewis River enters a terrain of rolling hills, downstream of which it transitions to the essentially flat "Woodland Bottoms."

2.2 GEOLOGY AND SOILS

The region surrounding the project has a complex geologic history, having undergone Tertiary volcanism, several glaciations, and interglacial erosion and deposition. Bedrock surrounding Yale Lake and along the route of the transmission line from Yale Dam to the Merwin switchyard is predominantly comprised of younger Eocene to older Oligocene volcanic lava flows, Oligocene volcaniclastic rocks, and Quaternary volcaniclastic deposits. Alpine glacial deposits overlay older bedrock but underlay the younger Quaternary volcaniclastic deposits.

The volcanic rocks have undergone regional compressional deformation; rock strata are folded by a major southeast plunging anticline and a southeast plunging syncline. The syncline crosses the area of the transmission line about 8 miles west of Yale Dam. While

no faults are mapped in the project vicinity, an east-northeast trending fault zone is mapped about 2 miles south of Yale Dam.

Soils in the project vicinity are formed from volcanic materials. Their erosion hazard is dependent on slope and vegetation cover.

2.2.1 Yale Lake Geology, and Lewis River from Swift Dam to Yale Lake

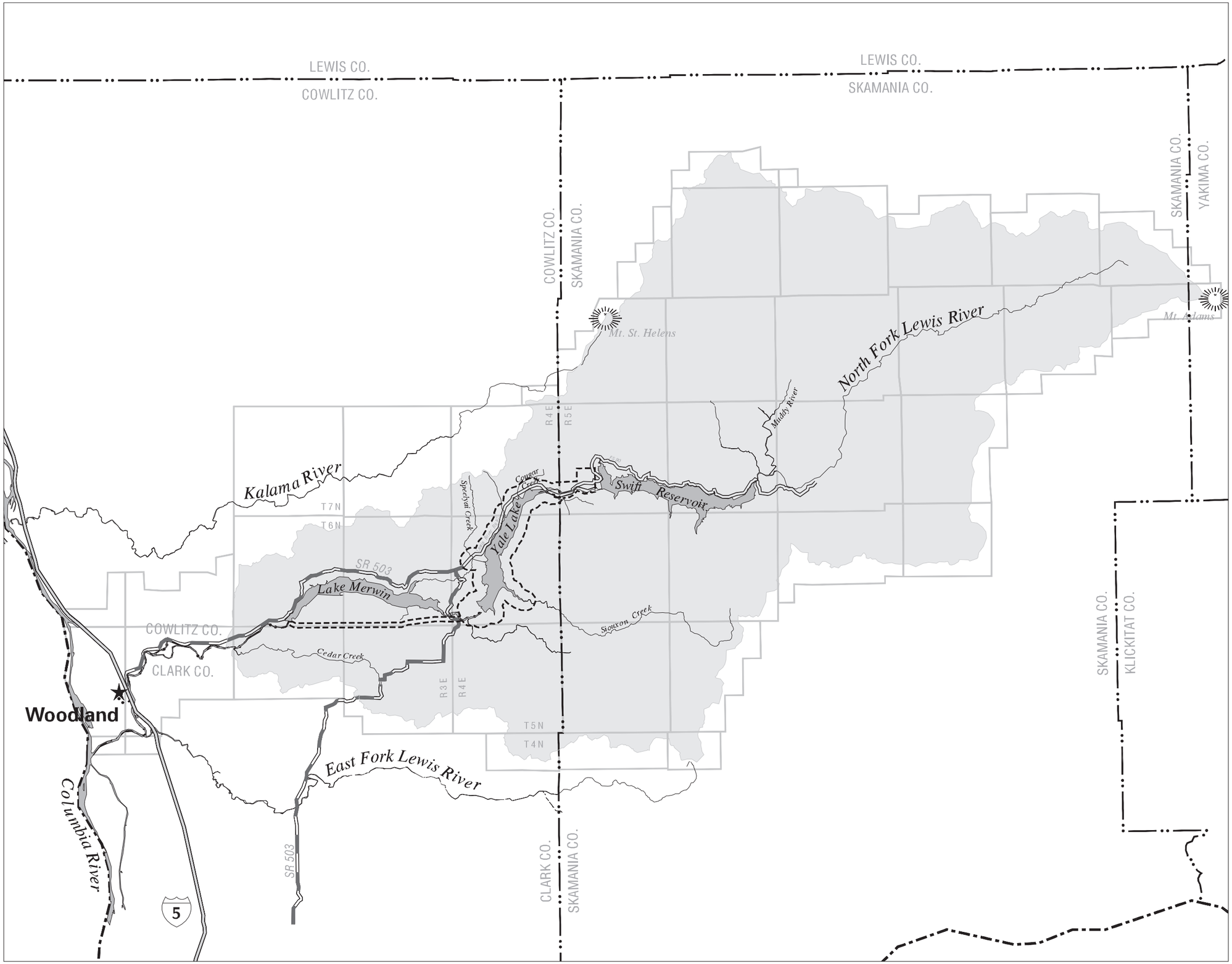
Rocks exposed around Yale Lake are predominantly volcanic in origin and vary in age from about 38 million years to 1,900 years (Phillips 1987a, 1987b; Walsh et al. 1987). The oldest rocks are Eocene-Oligocene basaltic-andesite lava flows (about 38 to 35 million years old) that occur on the western shore of Yale Lake between Cougar and Speelyai Canal. These lava flows include flow breccia with thin interbeds of siltstone, sandstone, conglomerate, and tuff. Volcaniclastic sedimentary and volcanic rocks of about the same age (37 to 34 million years) define much of the eastern shore north of Siouxon Creek. These rocks are typically thick bedded and poorly exposed. At Yale Dam the rock is overlain by andesite and basaltic-andesite lava flows of about 33 million years ago. These overlying rocks typically form massive, blocky- to platy-jointed flows, and extend from the dam north to Siouxon Creek.

Other deposits around the Yale Lake area are much younger. Quaternary pyroclastic flows and lahar material of Mount St. Helens were deposited between about 40,000 and 2,500 years ago. These rocks consist of valley-filling deposits up to 65 meters thick, and are associated with terrace-like structures. They occur along the eastern shore for a short distance north of Siouxon Creek, in the vicinity of Yale Dam, along the western lake shore at the Speelyai Canal area and Cougar area, and along the northern side of Lewis River between Swift Dam and Yale Lake. A small area on the north side of the Lewis River near the inlet to Yale Lake has deposits of basalt lava flows that were erupted from the southwest base of Mount St. Helens about 1,900 years ago. This deposit, known as Cave Basalt, is generally hummocky or flat over broad areas and contains vertical and horizontal tree molds and some lava tubes (including Ape Cave).

2.2.2 Transmission Line Geology

The transmission line extends east from Yale Dam 10.5 miles to the Merwin switchyard near Merwin Dam. Bedrock exposed along the transmission line includes the same deposits of Eocene-Oligocene basaltic-andesite lava flows and volcaniclastic sedimentary and volcanic rocks that occur around Yale Lake. These are located on the upland areas. Along the lowland areas from Yale Dam across Lewis River are the same pyroclastic flows and lahar deposits of Mount St. Helens as described around Yale Lake.

Alpine glacial deposits of till and outwash sand and gravel are mapped along the south side of Lewis River, adjacent to the Quaternary pyroclastic flows. These were deposited between 40,000 and 140,000 years ago and currently form dissected terraced deposits.



Legend

- Study Area
- Lewis River Watershed Assessment Unit
- Public Land Survey

ADMINISTRATIVE BOUNDARIES

- County Line
- State Line

HYDROGRAPHY

- Water
- Stream

TRANSPORTATION

- Primary Road
- Secondary Road
- Light Duty Road

NORTH

0 5 10 Miles

Scale 1:325000

Yale Hydroelectric Project

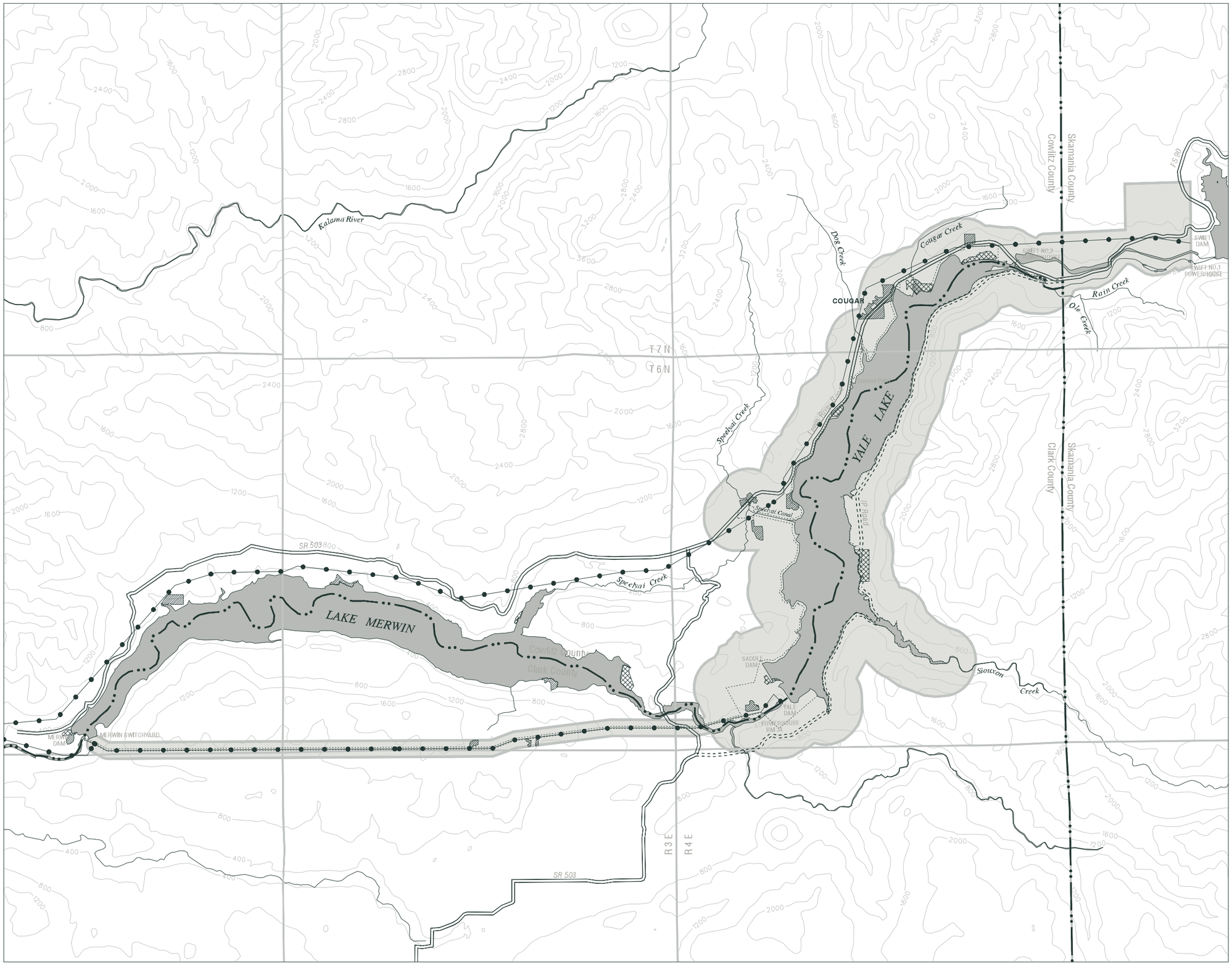
Figure 2.1-1
Project Vicinity

PACIFICORP

Created by VESTRA Resources for PacifiCorp

/p1/proj_map/projects/yale/license/exe/general/project_vicinity.map

February 24, 1999



Legend

- Study Area
- FERC Project Boundary
- Transmission Line
- Public Land Survey
- County Line
- Topography
- Recreation
- Residential

HYDROGRAPHY

- Water
- Stream

TRANSPORTATION

- Primary Road
- Secondary Road

NORTH

0 1 2 3 Miles

Scale 1:90000

Yale Hydroelectric Project

Figure 2.1-2 Study Area

Created by VESTRA Resources for PacifiCorp

/p1/proj_map/projects/yale/license/ftr/aquatics/studyarea.map

February 09, 1999

2.2.3 Soils

Soils in the project area are predominantly well drained and medium-textured, and were derived from volcanic ash or were formed in sediments derived from mixed volcanic rocks and ash. Slopes, which are variable from gentle to steep, range from flat to more than 70 percent. Soil erosion hazard is dependent on slope and vegetation cover; the erosion hazard increases with increasing slope and extent of bare soil.

Soils along the transmission line from Yale Dam to the Merwin switchyard and along the eastern shoreline of Yale Lake are predominantly well drained silt loam or stony silt loam (USDA 1972). Slopes are variable from 3 to 70 percent along the transmission line, and moderately steep (30 percent) to steep (greater than 70 percent) along the slopes of the eastern side of Yale Lake.

Soils along the western and northern shore of Yale Lake from Yale Dam to Cougar are well drained silt loam and gravelly silt loam that formed in wind-laid silts and volcanic ash (USDA 1974). Most slopes are variable from about 8 to 50 percent. Terraces that are generally flat have silt loam soils that are sometimes gravelly. These terraces occur near Yale Dam, in the vicinity of Speelyai Canal, and at Cougar.

A terrace that is bisected by Panamaker Creek uplake of Cougar has a soil cover of excessively drained gravelly loam formed in sediments derived from mixed volcanic rock and ash. Most of the rest of the shoreline along the northern shore of Yale Lake to the Lewis River inlet are excessively drained soils formed in pumice and andesite mud flow material, except for the occurrence of some rock outcrop near the inlet.

Soils along the north shore of the Swift No. 2 canal are mostly very deep, somewhat excessively drained soils on terrace escarpments (USDA 1989). The escarpments vary in slope from about 65 to 120 percent. This soil has formed in pyroclastic flow and lahar material with a thin mantle of volcanic ash and pumice. The hazard of water erosion is severe. On the south shore of the channel are deep, somewhat excessively drained soils formed in alluvium derived from construction activities on the terrace. Alluvial soils are formed on either side of the Lewis River between Swift Dam and Yale Lake.

2.3 CLIMATE

The climate in the project vicinity is influenced by the Pacific Ocean to the west and the Cascade Range to the east. The Pacific Ocean provides a moderating influence on temperatures in the basin. Storms from the Pacific encounter the Cascade Range, forcing the air masses to rise, cool, and drop large volumes of precipitation. Levels of precipitation increase with elevation in this area. Average annual precipitation varies from 45 inches near Woodland, to over 140 inches on nearby Mount Adams. The majority of the precipitation occurs during the rainy fall and winter months, with snow falling at higher elevations of the basin. Summers (July through mid-October) are generally drier.

2.4 VEGETATION AND WILDLIFE

The majority of the Lewis River basin near the Yale Project is forested, typical of the Southern Washington Cascades Province. Most of this province is within the western hemlock vegetation zone (Franklin and Dyrness 1988). Although the Lewis River drainage has been affected by timber harvest, it is estimated that 70 percent of the study area is forested, of which coniferous stands cover 34 percent.

Study area lands provide winter range for deer and elk; mink and beaver are common in study area wetlands. Large numbers of amphibians were observed primarily in wetland and riparian/riverine habitats. Over 100 species of birds were observed, including waterfowl, raptors, and numerous species of passerines. More detailed information regarding terrestrial resources is presented in Section 5.0.

2.5 LAND DEVELOPMENT AND POPULATION

The majority of the North Fork Lewis River basin is managed as commercial forest, and as such is undeveloped except for logging roads. In recent years, these lands have experienced increased recreation use. Other land uses include farming in the lower elevation areas, residential, hydropower, parks, and the Mount St. Helens National Volcanic Monument (MSHNVM, or the Monument). These are described in Section 8.0.

Population densities in the Yale project vicinity are low. The small communities of Cougar, Chelatchie, and Amboy are near the project, along with scattered private homes and recreational properties. The largest town near the project is Woodland, located 23 miles to the west, with a population of 3,600.