WELLS HYDROELECTRIC PROJECT
FERC PROJECT NO. 2149

PRE-APPLICATION DOCUMENT (PAD)

VOLUME 1: SECTIONS 1-7

Prepared by:

Public Utility District No. 1 of Douglas County
1151 Valley Mall Parkway
East Wenatchee, WA 98802
www.douglaspud.org/relicensing

December 2006

For copies of this Pre-Application Document, contact:

Public Utility District No. 1 of Douglas County
Attention: Relicensing
1151 Valley Mall Parkway
East Wenatchee, WA 98802-4497
Phone: (509)884-7191
E-Mail: relicensing@dcpud.org

Table of Contents

List of Tables

List of Figures

AGENTS FOR DOUGLAS PUD

The exact name, business address and telephone number of each person authorized to act as an agent for this application pursuant to 18 CFR § 5.6(d)(2)(i) are listed as follows:

William C. Dobbins
Manager
Public Utility District No. 1 of Douglas County
1151 Valley Mall Parkway
East Wenatchee, WA 98802
(509) 884-7191

Robert W. Clubb, Ph.D.
Chief of Environmental & Regulatory Services
Public Utility District No. 1 of Douglas County
1151 Valley Mall Parkway
East Wenatchee, WA 98802
(509) 884-7191

Shane A. Bickford
Supervisor of Relicensing
Public Utility District No. 1 of Douglas County
1151 Valley Mall Parkway
East Wenatchee, WA 98802
(509) 884-7191

ACRONYMS AND ABBREVIATIONS

Federal Agencies

ACHP	Advisory Council on Historic Preservation
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BOR	Bureau of Reclamation
COE	US Army Corps of Engineers
DOA	Department of Agriculture
EPA	Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
USFS	USDA Forest Service
USFWS	Fish and Wildlife Service
NMFS	National Marine Fisheries Service
NPS	National Park Service
OEP	Office of Energy Projects

State Agencies

DAHP	Department of Archaeology and Historic Preservation
IAC	Washington State Interagency Committee on Outdoor Recreation
State Parks	Washington Parks and Recreation Commission
WDA	Washington Department of Agriculture
WDOE	Washington Department of Ecology
WDFW	Washington Department of Fish & Wildlife
WDNR	Washington Department of Natural Resources

Utilities

BPA	Bonneville Power Administration
Chelan PUD	Public Utility District No. 1 of Chelan County
Douglas PUD	Public Utility District No. 1 of Douglas County
Grant PUD	Public Utility District No. 2 of Grant County
Okanogan PUD	Public Utility District No. 1 of Okanogan County
PSE	Puget Sound Energy, Inc.
PGE	Portland General Electric Company
Avista	Avista Corporation

Additional Interested Parties

CCT	Confederated Tribes of the Colville Reservation
YN	Confederated Tribes and Bands of the Yakama Nation
CUR	Confederated Tribes of the Umatilla Indian Reservation
ODFW	Oregon Department of Fish and Wildlife
SHPO	State Historic Preservation Officer

Acronyms

APE	Area of Potential Effect
BO	Biological Opinion
BTMMP	Bull Trout Monitoring and Management Plan
CBE	Columbia Basin Environmental
CFR	Code of Federal Regulations
DART	Data Access in Real Time Website
DEM	Digital Elevation Model
DPS	Distinct Population Segment
ESA	Endangered Species Act
ESU	Ecologically Significant Unit
FCRPS	Federal Columbia River Power System
FPA	Federal Power Act
HCP	Anadromous Fish Agreement and Habitat Conservation Plan
ILP	Integrated Licensing Process
ITP	Incidental Take Permit
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NNI	No Net Impact
NRHP	National Register of Historic Places
NWCO	Nuisance Wildlife Control Operator
NOI	Notice of Intent to File Application for New License
PAD	Pre-Application Document
PNCA	Pacific Northwest Coordination Agreement
PIT	Passive Integrated Transponder
PME	Protection, Mitigation and Enhancement
QC/QA	Quality Control and Quality Assurance
RTE	Rare, Threatened and Endangered
RCW	Revised Code of Washington
SCORP	Statewide Comprehensive Outdoor Recreation Plan
TCPs	Traditional Cultural Properties
THPO	Tribal Historic Preservation Officer
TDG	Total Dissolved Gas
UCR	Upper Columbia River
US	United States
WAC	Washington Administrative Code
WNHP	Washington State Natural Heritage Program
WWA	Wells Wildlife Area

SUMMARY

Public Utility District No. 1 of Douglas County (Douglas PUD) is the owner, operator and licensee of the 774.3 Megawatt (MW) Wells Hydroelectric Project (Wells Project), located on the Columbia River in central Washington. The Wells Project's current Federal Energy Regulatory Commission (FERC) license expires on May 31, 2012. Douglas PUD is seeking a new 50-year FERC license to continue to operate the Wells Project.

Douglas PUD has prepared this Pre-Application Document (PAD) along with its Notice of Intent to File Application for New License (NOI) to commence the formal process of relicensing under the relevant regulations of FERC's Integrated Licensing Process (ILP). The Project has operated safely and reliably throughout its initial license term and Douglas PUD is proposing to continue to operate the Wells Project as it has historically. No major modifications to the Wells Project are being contemplated under the new license.

As an integral part of developing the PAD, Douglas PUD made a significant effort to obtain all reasonably available existing information pertinent to the Wells Project. This process included contacting hundreds of entities to request documents, data, and reports of relevance to the Wells Project and surrounding environment. Douglas PUD conducted baseline studies, including RTE species inventories, in an effort to define the existing environment of the Wells Project. These studies, together with historical data, form the basis of the information contained within this document.

The PAD consists of Volumes 1-3. Volume 1 is the primary component of the PAD. It includes the following: Introduction (Section 1), Process Plan and Schedule (Section 2), Project Location, Facilities, Agreements and Operations (Section 3), General Description of the River Basin (Section 4), Description of Existing Environmental Resource Impacts (Section 5), Preliminary Issues and Study Plan Summaries (Section 6) and References Cited (Section 7).

Volume 2 is a collection of appendices. It includes the following: Distribution List (Appendix A), Summary of Consultation and Contacts (Appendix B), Process Plan and Schedule (Appendix C), Current License Articles (Appendix D), Maps of Project (Appendix E), Baseline Studies and Monitoring Activities (Appendix F), Wells Habitat Conservation Plan (Appendix G), Study Plans (Appendix H) and Known Cultural Resource Sites (Appendix I).

Volume 3 contains non-public Critical Energy Infrastructure Information (CEII). It includes a collection of diagrams and schematics eligible for CEII submission in accordance with FERC Order No. 630 and 18 CFR § 5.30. Procedures for obtaining acess to CEII may be found at 18 CFR § 388.113. Requests for access to CEII should be made to FERC's CEII Coordinator.

1.0 INTRODUCTION

Douglas PUD filed the NOI and PAD with FERC in order to obtain a new license for the existing 774.3 MW Wells Project (FERC No. 2149). The Wells Project was constructed between 1963 and 1967. The Wells Reservoir extends 29.5 miles up the Columbia River, from RM 515.8 to the tailrace of Chief Joseph Dam at RM 545.3. Douglas PUD utilizes the Wells Project to provide electric service to more than 17,000 local customer accounts in Douglas County. Output from the Wells Project serves the greater Pacific Northwest region as it is also sold to Puget Sound Energy Inc. (PSE), Portland General Electric Company (PGE), PacifiCorp, Avista Corporation (Avista), Public Utility District No. 1 of Okanogan County (Okanogan PUD) and the Confederated Tribes of the Colville Reservation (CCT). Douglas PUD is not proposing to add capacity or make any major structural modifications to the Wells Project or change its operations under the new license.

Douglas PUD's current license for the Wells Project expires on May 31, 2012. Douglas PUD is using the ILP established by FERC Order 2002 and subsequent amendments. In accordance with these regulations, the PAD and NOI are being filed simultaneously and distributed to federal and state resource agencies, local governments, Indian tribes, members of the public and other interested parties.

The PAD follows the content and form requirements of Title 18 §§ 5.6(c) and (d) of Title 18 of the Code of Federal Regulations (CFR). The purpose of the PAD is to provide substantial background information related to the engineering, operational, economic, and environmental aspects of the Wells Project, as well as to identify and define issues and potential study needs. Douglas PUD intends to also use the PAD as the first step in developing appropriate protection, mitigation and enhancement (PME) measures, which in turn may lead to a formal agreement or agreements with stakeholders in support of a new 50-year FERC license.

Starting in early 2005 and prior to filing the PAD in December 2006, Douglas PUD implemented an aggressive stakeholder outreach program and initiated baseline environmental studies. Baseline studies conducted by Douglas PUD, prior to the initiation of the formal Wells ILP, included the following studies and assessments: (1) Aquatic Macroinvertebrate Inventory and RTE Assessment, (2) Bathymetric Mapping, (3) Bull Trout Monitoring Program, (4) Botanical Resources: Cover Type Mapping, RTE Plant Surveys, and Invasive Plant Species Surveys, (5) Effects of Water Level Fluctuations on Natural Resources within the Wells Project: A Review of Existing Information, (6) Limnological Investigation, (7) Macrophyte Identification and Distribution Study, (8) Recreation Visitor Use Assessment, (9) Temperature Monitoring, (10) Total Dissolved Gas (TDG) Study, (11) White Sturgeon (*Acipenser transmontanus*) Population and Life-History Assessment, Wells Reservoir, and (12) Wildlife Inventory and RTE Assessment: Avian, Amphibian, Reptile, and Small Mammal Surveys.

In addition to the baseline studies program and as part of the stakeholder outreach program, Douglas PUD conducted 31 stakeholder outreach meetings, hosted 28 separate Resource Work Group meetings and has posted extensive licensing information on the relicensing website at www.douglaspud.org/relicensing (Appendix B).

Through both the stakeholder outreach and Resource Work Group meetings, Douglas PUD has actively engaged in relicensing discussions with various federal, state and local resource agencies, interested Indian tribes and local government agencies. Goals of the outreach process included providing stakeholders with relevant background information related to Project operations, environmental resources and ongoing Project-related management activities. In addition, these meetings have helped Douglas PUD identify and scope issues and develop study plans to be incorporated into the PAD.

Douglas PUD has incorporated into this PAD the results of its early stakeholder outreach program, including a list of issue statements, issue determination statements and study plan summaries (Section 6), initial draft Study Plans for studies identified (Appendix H) and a summary of discussions with stakeholders prior to filing this document (Appendix B).

2.0 PROCESS PLAN AND SCHEDULE

In December 2006, Douglas PUD filed this PAD and the NOI to seek a new license for the Wells Project utilizing the ILP. Pursuant to 18 CFR Part 5, the filing of the NOI commences the relicensing proceeding and initiates the scheduling for subsequent relicensing activities. The FERC will issue a notice of commencement of the proceeding and National Environmental Policy Act (NEPA) scoping document within 60 days of receiving Douglas PUD's PAD and NOI.

FERC conducted an initial tribal consultation meeting with the CCT on June 20, 2006. A detailed Process Plan and Schedule outlining specific timeframes, deadlines, and responsibilities has been attached to this document as Appendix C. The Process Plan and Schedule was developed in accordance with 18 CFR Part 5, and will be updated over time as the Wells Project relicensing effort proceeds.

The initial stages of the formal ILP timelines, listed in Appendix C, can be fast paced and demanding on all participants including stakeholders, FERC staff and the licensee. By regulation, Douglas PUD must adhere to these regulatory deadlines for meetings and filings throughout the ILP. Douglas PUD intends to work in good faith with stakeholders to successfully resolve issues. In October 2005, Douglas PUD began a series of voluntary Pre-PAD Resource Work Group meetings to develop an agreed upon list of issues and mutually acceptable study plans.

Once the study plans are approved and studies are underway, there are additional opportunities for consultation on resource issues, particularly during the development of PME measures and settlements. In the following Process Plan, Douglas PUD is proposing a consultation meeting structure that will meet the demands of the ILP regulatory timeframes while allowing time for development of PME measures. The added flexibility will be especially important during the settlement discussions leading up to the issuance of a new FERC license.

2.1 Site Visit and Scoping Meetings

FERC will hold a site visit and scoping meetings prior to March 1, 2007. Typically, FERC holds two scoping meetings: one meeting will be held during the day and will focus on soliciting comments from resource agencies and tribes. The second scoping meeting will be scheduled in the evening for the convenience of the public and non-governmental organizations. All interested parties are invited to attend and participate in both meetings and the site visit.

In order to accommodate the expected number of interested parties, both scoping meetings will be held at the Douglas PUD's Auditorium located at 1151 Valley Mall Parkway, East Wenatchee, Washington. Driving directions and specific instructions for attending the scoping meetings and/or site visit can be found on the relicensing website at www.douglaspud.org/relicensing. Additional information may also be obtained by contacting Bob Easton with FERC at (202) 502-6045 or Robert.Easton@ferc.gov.

2.2 Participation in the ILP

Representatives of agencies, local governments, non-governmental organizations and members of the general public that have been identified as likely participants in the Wells Project ILP are listed in Appendix A. Any interested parties that desire to be added to the distribution list should submit a written request to:

Shane A. Bickford
Supervisor of Relicensing
Douglas County PUD
1151 Valley Mall Parkway
East Wenatchee, Washington 98802-4497
Fax: 509-884-0553
email: sbickford@dcpud.org

2.3 Communication Protocol

During the course of the Wells Project relicensing process, correspondence will take place through public meetings, Resource Work Group and stakeholder meetings, telephone communication and written communications. All phases of formal correspondence require adequate documentation to establish the formal consultation record. The Communication Protocol is intended to provide a flexible framework for the dissemination of information and for documenting consultation among all parties involved in the Wells Project ILP. The Communication Protocol will remain in effect until a new long-term FERC license is issued.

2.3.1 Distribution of Relicensing Material

Douglas PUD will encourage all interested parties to receive written relicensing materials in electronic format through email or the relicensing website. Douglas PUD will also give all customer/owners the opportunity to be included on the relicensing distribution list. Unless otherwise specified, Douglas PUD will use the following procedures to distributed documents:

Documentation	Primary	Secondary
Meeting notices	Web with email notice	Hard copy (by request)
Meeting minutes	Web with email notice	Hard copy (by request)
Major documents	Web/CD	Hard copy (by request)
Study Plans/Reports	Web with email notice	Hard copy (by request)
General Correspondence	Email	Hard copy (by request)
Correspondence to FERC	Email/E-file	Hard copy (by request)
Contact logs	Web	Hard copy (by request)
Status reports	Web with email notice	Hard copy (by request)

All the material listed in the above table will be posted on the relicensing website (www.douglaspud.org/relicensing) and will be used to document the consultation record for relicensing.

Certain documents may be restricted from publication on the relicensing website in accordance with FERC's regulations protecting Critical Energy Infrastructure Information (CEII) (18 CFR 388.113) or in cases where the document contains privileged information (e.g., sensitive species locations, cultural resource sites, etc.). Douglas PUD will address requests for access to this information on a case-by-case basis, in accordance with Washington State law as needed during the relicensing consultation process.

2.3.2 Information Requests

Douglas PUD will make public records available at the District's headquarters building in East Wenatchee. There are no costs associated with viewing documents in person at Douglas PUD's Relicensing Library. Requests to inspect public records shall be made in writing and directed to:

Meaghan Vibbert
Public Information Officer
Douglas County PUD
1151 Valley Mall Parkway
East Wenatchee, Washington 98802-4497
Fax: 509-884-0553
email: mvibbert@dcpud.org

All requests for public records should clearly indicate the document name, publication date (if known) and FERC Project No. 2149. Hard copies, including those distributed by request as part of the consultation process, will be available for a reproduction cost of $0.15 per page. Documents that need to be scanned to convert to electronic format at a citizen's request are subject to the copy charge noted above. There will be no charge for hard copies requested by federal, state or tribal entities.

2.3.3 Meeting Notices and Minutes

Douglas PUD will hold both public and Resource Work Group meetings at various times throughout the relicensing process. For public meetings, written notification will be provided to all parties on the relicensing distribution list and will be published in newspapers of regional or state circulation at least 15 days in advance of the meeting date. In addition, FERC will likely publish notice in the Federal Register announcing the date for the formal ILP meetings that it is responsible for scheduling in its effort to obtain public comment.

For all Resource Work Group meetings, Douglas PUD will post the meeting information on the relicensing website calendar and provide email notice and a preliminary agenda at least 10 days prior to scheduled meetings. A final agenda will be posted to the calendar and distributed at least one week prior to the meetings. Parties may submit proposed agenda changes to Douglas PUD within 5 days of receipt of the preliminary agenda or may suggest changes to the final agenda at the meeting. Written materials that need to be reviewed prior to the meetings will be provided to stakeholders at least one week prior to scheduled meetings, except under exceptional circumstances.

Draft minutes of all meetings will be prepared and circulated by Douglas PUD within one week of each meeting. Comments on the draft minutes must be submitted to Douglas PUD within one week of distribution. Only active participants in the ILP may provide comments on meeting minutes. After the one week review period, Douglas PUD will distribute a red-line version of the revised meeting minutes, based on comments and corrections received. Any comments received, together with final versions of such minutes, will be included in the consultation record maintained on the relicensing website at www.douglaspud.org/relicensing.

2.3.4 FERC Communications

FERC has assigned Bob Easton of its staff to serve as an advisor during the Wells Project ILP. Mr. Easton will participate in relicensing meetings and is expected to provide guidance during the process. The role of the FERC advisor will be in accordance with the rules and regulations for the ILP. Any FERC staff member may participate in a meeting without prior notice to other participants provided that minutes are written and placed into the public record. For questions related to FERC Communications please contact Bob Easton at Robert.Easton@ferc.gov or at 202-502-6045.

Communications with FERC staff that address the merits of the proceeding will be included in the public record. In order to have written communications with FERC staff made a part of the record for the Wells Project, they must be formally filed with the FERC Secretary as follows:

The Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

All written communications to the Commission must include an original and eight copies and have the following clearly displayed on the first page:

Wells Hydroelectric Project (FERC No. 2149) – Application for New License

The sub-docket number assigned after the NOI is filed by Douglas PUD should also be included.

FERC is strongly encouraging stakeholders to file their comments electronically via the Internet instead of submitting comments by paper. Instructions for e-Filing are provided at www.ferc.gov under the eLibrary link. Additional information on this program can be found in the regulations at 18 CFR 385.2001(a)(1)(iii). Filing comments electronically with FERC also eliminates the need for filing an original and 8 copies.

2.4 Relicensing Meetings

2.4.1 Public Meetings

The purpose of the public meetings will be to provide information to the community and interested parties at milestone stages of the relicensing process. These meetings will primarily focus on updating the general public on the status of the Wells Project ILP. These meetings will provide members of the public an opportunity to ask questions regarding the process.

2.4.2 Resource Work Groups

Resource Work Groups will review study plans, study results and develop PME measures for specific resource areas that have been identified as being affected by ongoing operations of the Wells Project. The Resource Work Groups will address the following resource areas:

- Terrestrial Work Group
  Wildlife and Botanical Resources
  RTE Wildlife and Plants
  Wetlands
  Geology and Soils

- Aquatic Work Group
  Fish
  Water Quality
  Aquatic Habitat
  Aquatic Invertebrates
  RTE Aquatic Species

- Cultural Work Group
  Cultural and Historical Resources
  Archaeology
  Traditional Cultural Properties (TCPs)

- Recreation and Land Use Work Group
  Recreation
  Aesthetics
  Socioeconomics
  Land Use

The Resource Work Groups will meet on an as-needed basis as determined collectively by members of each of the Resource Work Groups.

2.5 Consultation Guidelines

Douglas PUD is proposing the following consultation guidelines for the formal Wells Project ILP:

2.5.1 Participation in the Formal Relicensing Process

Various state and federal resource agencies, tribes, local government agencies, non-government organizations and the general public will be participants in the Wells Project ILP. Douglas PUD will maintain a distribution list during the course of the Wells relicensing process. Anyone included on the distribution list for the Wells Project ILP is considered an interested party. Interested parties can subscribe to the distribution list on the relicensing website at www.douglaspud.org/relicensing. Interested parties can either monitor or participate in the relicensing process. Those that participate in the process can do so through attendance at public or Resource Work Group meetings or by filing written comment with FERC.

2.5.2 Conduct of Meetings

Douglas PUD is proposing the following ground rules as a guide for all Wells relicensing meetings:

- Listen and respect each person's right to speak
- Commit to be part of a successful process
- Express concerns and interests (not positions)
- Focus on issues as they relate to the Wells Project rather than issues in general
- Assure that the process is solution oriented
- Meeting participants will read background materials and be prepared for meetings
- Organizations will designate an individual as their spokesperson
- Spokespersons will be responsible for informing members of their own organization
- Spokespersons are empowered to make and/or deliver decisions for their organizations
- Interested parties will adhere to the overall relicensing schedule
- Interested parties will try to resolve disputes
- Interested parties will try to reach an agreement

2.5.3 Structure of Meetings

Meetings will generally be held in close proximity to the Wells Project (e.g., East Wenatchee, Wells Dam, Pateros, Brewster or Bridgeport). Douglas PUD may provide a facilitator during certain meetings. Meeting participants may at any time request short breaks for the purpose of a caucus. Stakeholders are encouraged to caucus outside the regularly scheduled meetings.

3.0 PROJECT LOCATION, FACILITIES, AGREEMENTS AND OPERATIONS

3.1 Project Location

Wells Dam is located at river mile (RM) 515.8 on the Columbia River in the United States, approximately 30 river miles downstream of Chief Joseph Dam, which is owned and operated by the United State Army Corps of Engineers (COE), and 42 miles upstream of Rocky Reach Dam, which is owned and operated by the Public Utility District No. 1 of Chelan County (Chelan PUD). The nearest town to Wells Dam is Pateros, Washington, located approximately 8 miles upstream of Wells Dam.

The Wells Reservoir formed by Wells Dam is 29.5 miles long. The Methow and Okanogan rivers enter into the Columbia River within the Wells Reservoir. The Wells Project Boundary extends 1.5 miles up the Methow River and 15.5 miles up the Okanogan River. At the Wells Project, the Columbia River forms the boundary between Douglas County and three other governmental jurisdictions: Okanogan County, Chelan County and the Colville Indian Reservation (Figure 3.1-1 and Appendix E).

Visitors may access the Wells Project from a variety of directions. From Wenatchee, visitors can access the Wells Project via US Highway 97. Access from the greater Seattle area is most common via Interstate 90 over Snoqualmie Pass to US Highway 97 over Blewett Pass. From British Columbia, Canada, visitors can access the Wells Project by traveling south on US Highway 97. Other routes from western Washington include US Highway 2 over Stevens Pass and summer access via State Route 20 (also known as the North Cascades Highway). Visitors to the Wells Project area from eastern Washington typically travel via US Highway 2 from Spokane. Roads parallel both sides of the Wells Reservoir with the exception of the east side of the shoreline from Wells Dam to an area immediately across the Columbia River from Pateros.

The overall climate of the Wells Project area is semi-arid, averaging approximately 10 inches of precipitation a year. In the summertime, the Wells Project area is hot and dry, typical of the central region of the state. The Wells Reservoir provides numerous recreational opportunities including boating, fishing, hiking and camping. In addition, many sportsmen visit the area during the fall season to hunt for waterfowl, upland birds and deer. Developed reservoir access points are located in the cities of Pateros, Brewster and Bridgeport. Additional formal and informal access sites and usage areas exist along both sides of the Wells Reservoir and along the Methow and Okanogan rivers.

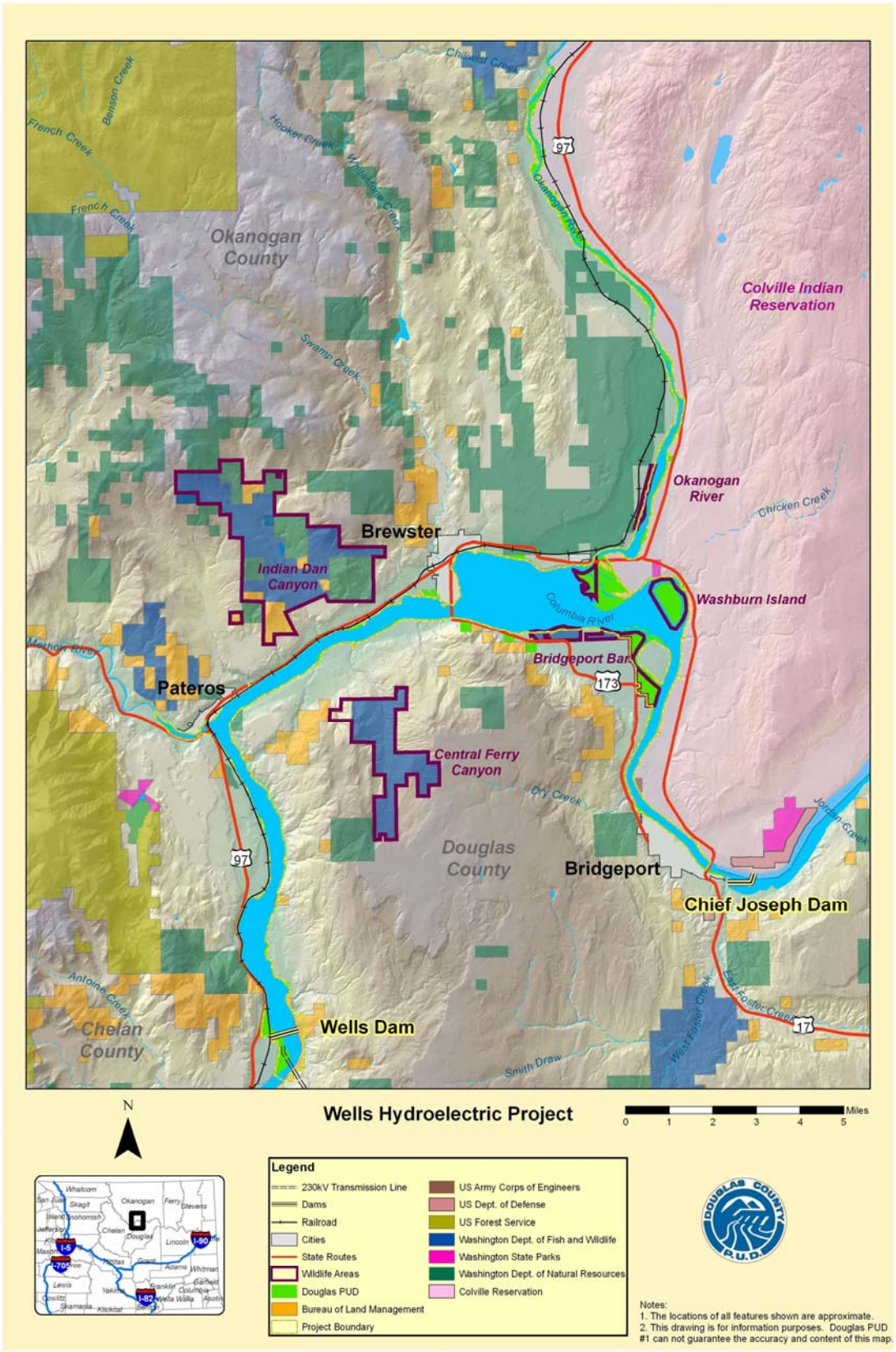

Figure 3.1-1 Map of the Wells Project area.

3.2 Project Facilities

On July 12, 1962, the Federal Power Commission (FPC), predecessor to the FERC, granted Douglas PUD a 50-year license to construct and operate the Wells Project. The initial design and license for the Wells Project called for the installation of seven turbine-generator units. Construction of the Wells Project began in the fall of 1963. On February 2, 1965, the FPC approved Douglas PUD's application to amend the original license to include three additional generating units. Commercial operation of the originally-designed seven-unit Wells Project began on September 1, 1967. The three additional units were in commercial operation by January 24, 1969.

Wells Dam consists of a west embankment, a central concrete structure and an east embankment. The central concrete structure, referred to as a "hydrocombine," includes the generating units, spillways, switchyard and fish passage facilities, uniquely integrated into a single structure. The Wells Project also includes a forebay, reservoir, tailrace, switchyard, high-voltage transmission lines, recreation facilities and lands within the Wells Project Boundary.

Descriptions of the major Wells Project facilities and components are listed below.

3.2.1 Wells Dam

The design of Wells Dam is unique to the Columbia River with the generating units, spillways, switchyard and fish passage facilities combined into a single structure referred to as the hydrocombine. Fish passage facilities are located on both ends of the hydrocombine structure. The hydrocombine itself is 1,130 feet long and 168 feet wide with a crest elevation at 795 feet above Mean Sea Level (MSL). Its design includes a series of eleven spillway bays and ten separate generating units. The generating units are isolated in individual silo-like structures and were designed so that the spaces between the units serve as spillway bays. The turbine water passages are located below the spillway bays (Figure 3.2-1).

Earth embankments extend from the hydrocombine to the west and east abutments. The west embankment is 2,300 feet long and 40 feet high, with a crest elevation of 797 feet. The west embankment consists of a central impervious core with a filter zone on each side and gravel shells. The core extends to a trench below which provides an impervious cut-off to bedrock.

The east embankment is 1,030 feet long with a maximum height of 160 feet above the riverbed. The east embankment also has a crest elevation of 797 feet. It extends from the hydrocombine to the east abutment. The east embankment consists of a central impervious core extending down to the riverbed materials with filters and gravel and rockfill shells placed on each side.

Figure 3.2-1 Wells Dam looking to the northwest.

3.2.2 Turbines/Generators

Wells Dam has ten generating units with an installed nameplate capacity of 774,300 kilowatts (kW) and a maximum generating capability of 840,000 kW. The synchronous speed of the generators is 85.7 revolutions per minute (rpm). The average annual energy production for water years 2001 through 2005 was 3,870,169 Megawatt hours (MWh) and the average monthly energy production during this same time frame ranged from 250,742 MWh in September to 398,796 MWh in June (Table 3.8-1).

Each generating unit is housed in a concrete structure 95 feet wide and 172 feet long. Each structure contains a vertical-shaft Kaplan turbine originally supplied by Allis Chalmers. The original turbine runners were replaced with Fuji Electric turbine runners during the period from 1988 to 1990. Each turbine is rated at 120,000 Horsepower (HP) at 64 feet net head with an operating speed of 85.7 rpm and a maximum discharge of 19 thousand cubic feet per second (kcfs) of water. The generating units are rated at 81,500 kilovolt Amperes (kVA), 0.95 Power Factor and 14.4 kilovolts (kV). The turbines are controlled by governors manufactured by Woodward Governor Company and equipped with digital controls manufactured by Sulzer, Inc. The digital controls were installed during the period from 1998 to 2000. Each unit includes its own local governor control system which is integrated into the overall plant control system.

3.2.3 Reservoir

The body of water formed by Wells Dam is known as the Wells Reservoir (Figure 3.2-2). The Wells Reservoir consists of 29.5 miles of the Columbia River, 1.5 miles of the lower Methow River and 15.5 miles of the lower Okanogan River. The normal maximum water surface elevation of Wells Reservoir is 781 feet. At this elevation, the Wells Reservoir surface area is 9,740 acres, the total storage capacity is 331,200 acre-feet (ac-ft) and the usable storage capacity is 97,985 ac-ft. Most of the Wells Reservoir shoreline has a relatively steep topography with banks rising sharply to an elevation of 20 to 40 feet above the Wells Reservoir. Exceptions to this include the shoreline area in Pateros, near Brewster, near the mouth of Okanogan River, at Washburn Island and at Bridgeport Bar. Lands located within the Wells Project Boundary are generally owned in fee title by Douglas PUD.

Figure 3.2-2 Wells Reservoir looking upstream.

3.2.4 Tailrace

The Wells Tailrace, as defined in the Wells Habitat Conservation Plan (HCP), is the body of water from the base of Wells Dam to a point 1,000 feet downstream of the dam. The Wells Project Boundary extends beyond the HCP defined Wells Tailrace to a point 1.2 miles downstream of the dam. The width of the tailrace at the downstream face of the powerhouse is 1,000 feet. The tailrace width is approximately 1,900 feet at its widest point.

The tailrace begins at the exit of the draft tubes and consists of natural riverbed. Rock riprap lines the immediate left and right banks of the tailrace to prevent erosion caused by currents produced during larger spill events. An excavated rock trap, approximately 13 feet deep and 30 feet wide, runs the length of the hydrocombine, immediately downstream of the draft tube exit

sill. The trap was excavated into bedrock during construction of the dam based on the results of hydraulic model testing of tailrace scour during operation of the spillways. High spill volumes during early operations of the project filled the rock trap with riverbed materials as predicted by the model studies. The trap was re-excavated in 1967 to remove the deposited materials. The trap is cleaned out from time-to-time as part of normal operations of the Wells Project.

The tailwater of the Wells Project is influenced by the reservoir of the Rocky Reach Project, located 42 miles downstream. The tailwater level of the Wells Tailrace is a result of both the flow of water through Wells Dam and the forebay elevation maintained by the Rocky Reach Project. For example, a discharge of 200 kcfs from Wells Dam and a Rocky Reach Reservoir elevation at its normal elevation of 707 feet would result in an approximate tailwater elevation of 718 feet. A lesser discharge of 100 kcfs from Wells Dam and a Rocky Reach Reservoir elevation of 707 feet would result in an approximate tailwater elevation of 711 feet.

3.2.5 Switchyard

The Wells Project switchyard is located atop the hydrocombine deck at elevation 795 feet. The switchyard primarily consists of five power transformers and 10 circuit breakers in addition to insulators, disconnect switches, grounding switches, current transformers, potential transformers and a three-phase bus system.

The three lines of each bus are comprised of 3-inch tubular aluminum and are connected to a series of symmetrical steel towers. The towers are 71 feet tall, have a T-type cross member and function as the main structural component of the bus system. The bus system consists of parallel lines separated into three segments (Main Bus 1, Main Bus 2 and a Transfer Bus). Main Bus 1 is connected to 4 generating units and transports power to one of the Wells Project's two 230 kV transmission lines. Main Bus 2 is connected to 6 generator units and transports power to the other 230 kV transmission line. The transfer bus configuration allows the powerhouse output to be carried on either of the transmission lines or shared by both lines. Each main transformer and outgoing line is connected to the main bus through a circuit breaker which can be isolated by means of two 230 kV disconnect switches.

Five main power transformers manufactured by General Electric Company are located on the deck of the hydrocombine underneath the aluminum bus lines. Each transformer is connected to two generating units. The power transformers, rated at 187,500 kVA, convert power generated from the units at 14.4 kV to 230 kV for transport on the two 230 kV Wells Project transmission lines.

The switchyard also includes ten 230 kV circuit breakers manufactured by Alstom. The breakers are three-phase, puffer type, Sulfur Hexafluoride (SF6) gas breakers installed from 2002 to 2003. Five of the ten circuit breakers are tied to each of the 5 main power transformers at the 230 kV side of the transformer. Three of the ten circuit breakers serve as transmission line breakers and are tied to the 230 kV transmission lines. Of the remaining two breakers, one ties the two main bus lines together, which is referred to as the tie-breaker, and the other serves as a transfer breaker to be used when any one of the other breakers is out of service.

The switchyard also includes nine transfer bus disconnect switches, which switch power to the transfer bus and through the transfer breakers; three main grounding switches (connected to the transmission lines); six current transformers (three for each main bus line) and six potential transformers that reside atop metal pedestals mounted to the hydrocombine deck.

3.2.6 Transmission System

The Wells Project includes two 230 kV single-circuit transmission lines (Figure 3.2-3 and Figure 3.2-4). Each of the 230 kV transmission lines is capable of transmitting the entire output of the Wells Project. The lines run 41 miles in length from the switchyard atop the hydrocombine to the Douglas Switchyard operated by Douglas PUD. The lines run parallel to each other on 45-85 foot steel towers along a common 235-foot wide right-of-way. The Douglas Switchyard is located in close proximity to the Rocky Reach Switchyard, operated by Chelan PUD and the Sickler Substation, operated by the Bonneville Power Administration (BPA). The 230 kV lines connect to the regional transmission grid at BPA's Sickler Substation. A 115 kV non-project transmission line was constructed by Douglas PUD in 1976. This line extends approximately 10 miles from Wells Dam to the Foster Creek Substation near the City of Bridgeport.

Figure 3.2-3 Wells Project transmission lines.

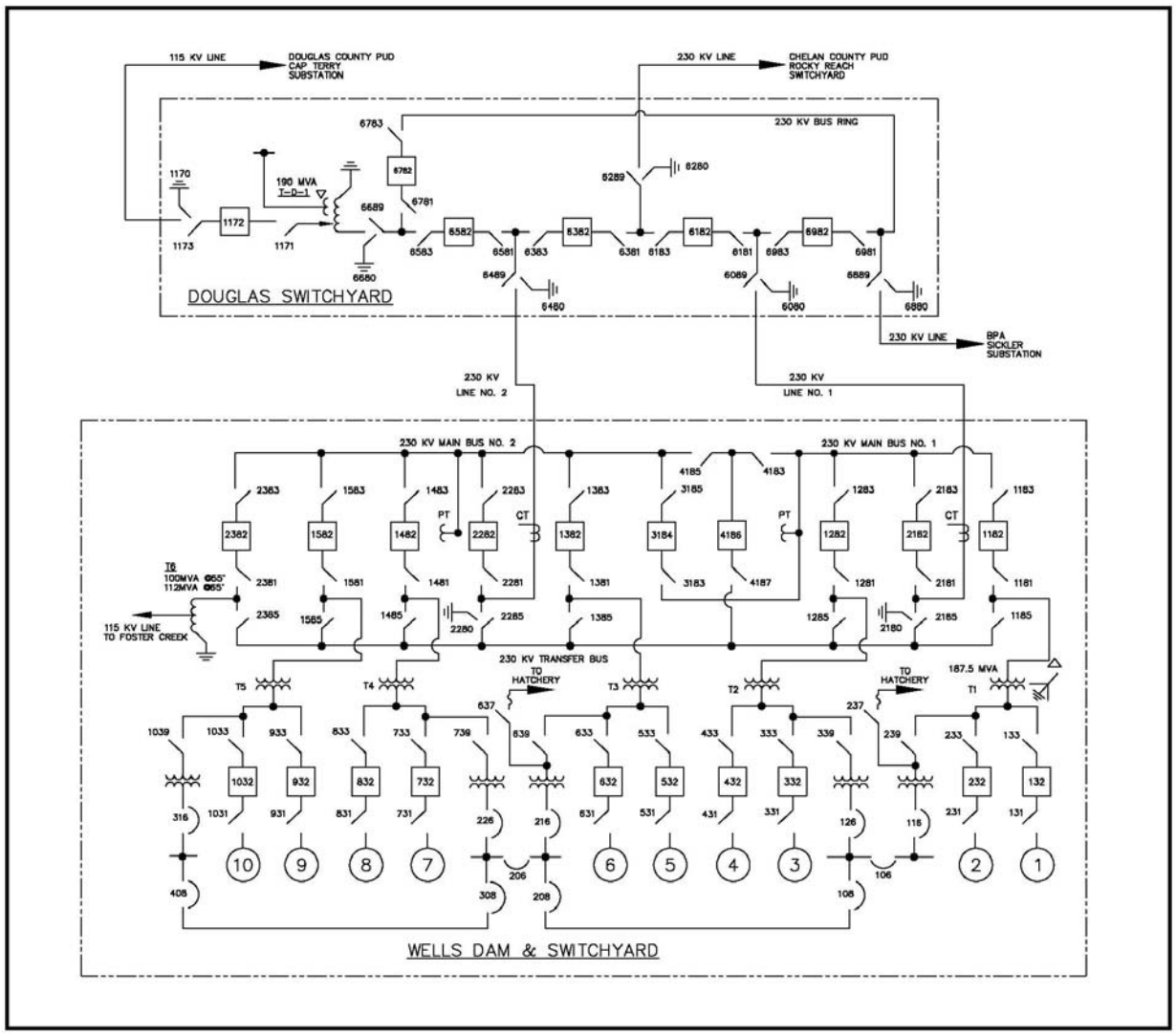

Figure 3.2-4 Single-line diagram showing the Wells Project switchyard and transmission facilities.

3.2.7 Spillway

Wells Dam contains eleven 46-foot wide gated spillways capable of passing a total of 1,180 kcfs. The forebay elevation is controlled by fixed wheel vertical lift gates located in the spillway bays. Each spillway gate is 65 feet in height and composed of two sections, an upper and a lower section. The upper section or leaf is approximately 35 feet in height. The lower leaf is approximately 30 feet in height. The upper leaf has a rubber seal on the bottom and the lower leaf has a rubber seal on its top. This sealing design minimizes leakage from the forebay when the gates are closed.

The lower leaf of each spillway gate can be raised to release water from the Wells Reservoir when needed. The lower leaf can be raised to any increment from zero up to a maximum of 34 feet-6 inches. The lower leaves of gates 3, 4, 5, 6, 7, 8 and 9 are attached by cable to stationary hoists. Raising the seven lower gate leaves to their fully opened position can accommodate passage of 340 kcfs. The hoists that raise these lower gate leaves can be operated by push button from a control cabinet located next to each gate on the hydrocombine deck or from Wells Dam's main control room. The lower leaves of gates 1, 2, 10 and 11 are not raised by stationary hoists but rather by gantry cranes located on the hydrocombine deck. Raising the four lower gate leaves to their fully opened position can accommodate passage of 194 kcfs. Dogging brackets along the sides of each gate provide support for the gates when raised. The upper gate leaves of spillways 2 and 10 are equipped with an automatic hoist for opening two sluiceways. These sluiceways are used to pass ice and debris.

For the handling of larger flows, the upper leaves of the spillway gates can be removed using the gantry cranes. Raising the upper gate leaves requires the removal of the stationary hoists and steel railings above the spillway gates. The eleven lower gate leaves can accommodate all but the most extreme spill events.

In the case of a power loss at the dam, spillway gates 3 through 9 can be operated through a backup power supply system. This system consists of a 300 kW diesel generator which is located atop the hydrocombine deck at elevation 795. The generator is connected to an emergency transfer switch and a standby generator power panel equipped with spillway power supply breakers. This arrangement will provide power to the stationary hoists for spillway gates 3 through 9.

3.2.8 Juvenile Fish Bypass System

Construction of the Wells Project's juvenile fish bypass system was completed in 1989. The bypass system was developed to guide downstream migrating fish away from the turbines and through the spillways. The bypass system has a fish passage efficiency rate of 92.0 percent for spring migrating salmon and steelhead and 96.2 percent for summer migrating Chinook salmon (Skalski et al., 1996). The Wells Project fish bypass system is the most efficient system on the mainstem Columbia River. The system was developed by Douglas PUD and uses a barrier system to modify the intake velocities on spillways 2, 4, 6, 8 and 10.

Each spillway intake has three sections. The bypass system modifies the spillway intake sections with fabricated steel barriers. The two outside barriers prevent flow from entering the spillway while the middle slotted barrier allows water to enter at a higher velocity than the unmodified spillway intake. The slotted barrier has an opening that is 16 feet wide and 72 feet deep. During bypass operations, the lower leaf on spillways 2, 4, 6, 8 and 10 are opened approximately one foot when an adjacent generating unit is operating. Spillways 2 and 10 are also configured to allow passage through either the sluiceways or through the bottom spill gates. Since most juvenile salmon and steelhead migrate near the surface, with the help of the bypass system, they successfully pass Wells Dam and avoid the turbine intakes located deeper in the forebay. The bypass system is in operation annually from mid April until late August. Because all 11 spillways may be needed during periods of extreme flows, the bypass barriers are designed to collapse when the spillway gates are opened more than six feet (Figure 3.2-5).

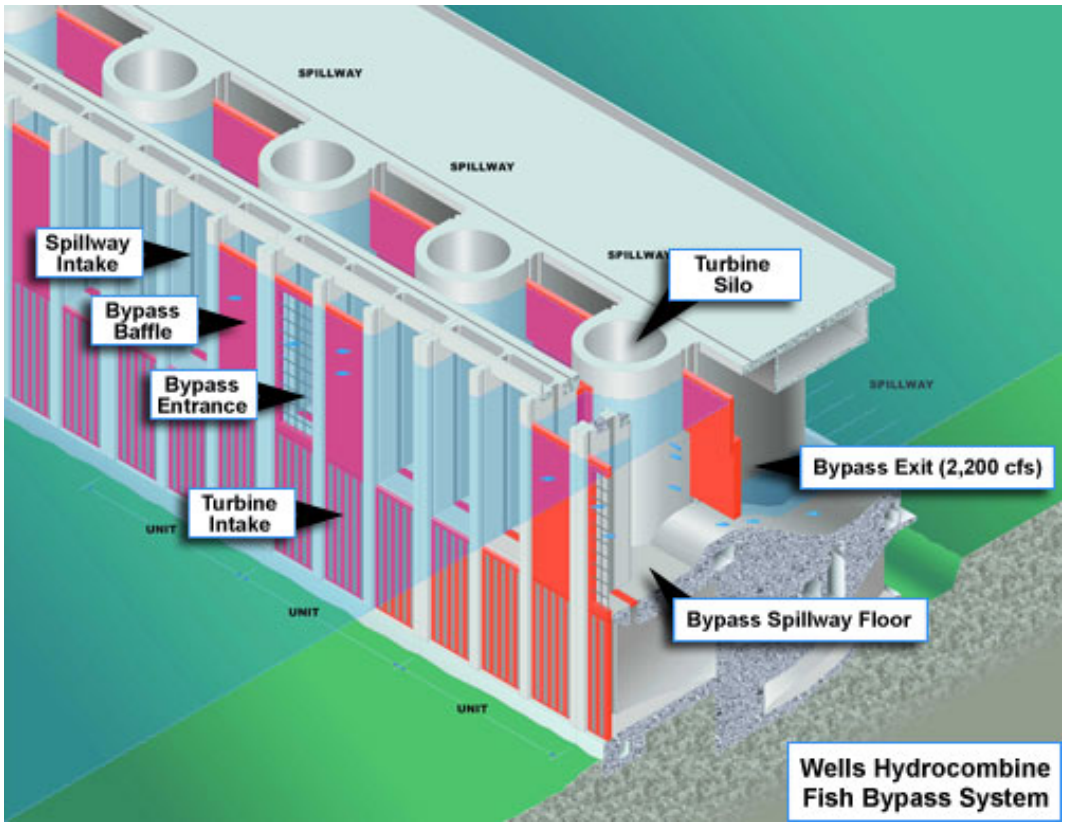

Figure 3.2-5 Wells Juvenile Fish Bypass System.

3.2.9 Adult Fish Ladders

Wells Dam has two adult fish ladders, located on the east and west ends of the hydrocombine (Figure 3.2-6). These ladders facilitate the upstream movement of fish through Wells Dam. The two fish ladders at Wells Dam are conventional staircase type fish ladders with 73 pools. At each pool, the water drops approximately one foot until this water reaches the level in the collection gallery. Supplemental water can be added at each inundated pool at the upper end of the collection gallery. The upper pools in the adult fishway, Pools 73 - 56, discharge water from one pool to another through orifice openings in the fishway weirs. Each weir in the upper portion of the adult fishways also contains two orifice openings. These orifices are located one foot from the base of the weir. This design provides a sanctuary pool between each of the upper fishway weirs. From Pool 56 downstream to the collection gallery, water passes from one pool to the next via orifice openings and weir overflow.

To accommodate 10 feet of reservoir operating range, the drop between the upper 17 pools varies from one foot at a full reservoir to six inches at normal minimum reservoir level. The flow through the upper 17 ladder pools consequently varies from 44 cfs at full reservoir to about 31 cfs at minimum reservoir level. To increase the flow to the 48 cfs required in the lower ladder pools, supplementary water is introduced into Pool 56 through a pipeline from the reservoir.

Pools 67 and 68 of both fish ladders are equipped with adult Passive Integrated Transponder (PIT) tag detection devices. These devices are used to passively interrogate each fish for a PIT-tag while the fish are passing upstream through the fish ladder. Once a tag is detected, the system records the presence and unique tag code for that fish as it ascends the fish ladder. Pool 64 of both fishway ladders contains facilities for counting fish. The main features of the counting facility include a counting room, an observation window into the fish ladder, a telescoping gate to guide the fish closer to the observation window, a light panel and a bypass gate to control the flow and velocity past the observation window. Video records of fish passage are collected 24 hours-per-day starting on May 1 and continuing through November 15. The videos are then reviewed and counts of fish by species and by ladder are made available on a daily basis through coordination with the COE adult fish counting program and the University of Washington's DART website.

At Pool 40, each of the two fish ladders has provisions for sorting and trapping various species of fish. In recent years, these trapping facilities have been fitted with adult PIT-tag detection devices. The west ladder sorting facility allows for selected fish to travel through a flume to a holding pond at the Wells Hatchery. The east ladder sorting facility allows for fish to travel to a holding container where they can be anesthetized, netted and placed in transportation containers to be moved to appropriate hatchery facilities or where the fish can be sampled and released back into the ladder upstream of the trap. The fisheries agencies and tribes currently develop species-specific broodstock collection protocols at the beginning of each season in consultation with the HCP Hatchery Committee (Appendix G).

At the bottom of each fish ladder, projecting downstream from the line of the hydrocombine is the portion of the endwall structure that incorporates the functions of fish attraction and collection. Two turbine pumps on each ladder deliver 800 to 2500 cfs (depending upon tailwater elevation) of fish attraction flow to the water supply chamber located immediately adjacent to the collection

gallery. Supply chamber water flows into the upper sections of the collection gallery where it is used to maintain an attraction velocity of 2 feet per second and also flows into the main collection gallery at the foot of the ladder through diffusion gratings. The total fishway flow from the turbine pump(s) and the 48 cfs coming down the ladder from the forebay is discharged into the tailrace through a gated fish entrance at the downstream face of each collection chamber. Modification to ladder operations can only take place following approval by the Wells HCP Coordinating Committee.

The fish attraction system is operated to provide a 1.5 foot differential between the main collection gallery and tailwater by constantly adjusting the output of the fish pumps. Under normal conditions, the fish pumps operate automatically to maintain a pre-set differential level between the water supply chamber and the main collection chamber. Fishways are inspected daily to ensure debris accumulations are removed, automated fishway instruments are calibrated properly and lights in the fishway are functioning.

Figure 3.2-6 Wells Adult Fish Ladder.

3.2.10 Station Service

Wells Dam's station service power system consists of five unit substations. Each substation includes one transformer, one main circuit breaker and multiple feeder breakers. Each of the five substations is located on elevation 776 feet of Wells Dam and is connected to two generating units. Of the five substations, only Substation 5 was placed as a single, stand-alone unit. The other 4 substations consist of two pairs placed as double-ended units. Substations 1 and 2 are located adjacent to each other with their respective transformers at the ends and circuit breakers in between. The same arrangement applies for Substations 3 and 4.

The five substations are connected to the bus systems for generators 1-2, 3-4, 5-6, 7-8, 9-10. Each pair of generators provides power to one substation. The substations are connected together via a main bus system, a transfer bus system and multiple tie breakers. This design allows any substation to provide power to any other substation if the need arises. Each substation includes a 2,000 kVA, 3-phase, 60-cycle transformer manufactured by Federal Pacific Electric Company. The transformers convert 14.4 kVA power supplied from their respective pair of generators to 480-Volt (V) power for the substations. This 480-V power is then supplied from the substations to 5 voltage regulators located on elevation 776 and to 20 motor control centers located within Wells Dam's 10 units.

The five voltage regulators receive output directly from the substations and are connected to distribution panels that distribute regulated voltage to Wells Dam's lighting system. The 20 motor control centers also receive 480-V output directly from the substations. Each of Wells Dam's 10 units is equipped with two motor control centers, located at elevation 720 and elevation 764. The control centers are equipped with a reactor, 120/208-V distribution panel and breakers. The control centers supply 480-V power to a variety of ancillary equipment and devices in each generating unit.

All substations were manufactured by Federal Pacific Electric Company and installed during construction of Wells Dam. The substations were upgraded in 2004 and the Federal Pacific Electric Company circuit breakers and breaker panels in each substation were replaced with breakers manufactured by Asea Brown Boveri Ltd (ABB).

3.2.11 Dedicated Back-up Power Supply

Wells Dam is currently developing a dedicated backup power supply source for the station service system. Plans include the installation of two 1.8 MW 480-V CAT diesel generators. The purpose of these generators is to provide a dedicated backup power supply to Wells Dam and the Wells Hatchery. This project is scheduled to be completed in 2007.

3.2.12 Pressurized Draft Tube Gate Gallery

Wells Dam includes a pressurized draft tube gate gallery. The turbine draft tube gates in Wells Dam are stored in a continuous gallery running the length of the hydrocombine. The gallery is located within the concrete structure because the spillway location does not allow the draft tube gates to be installed in the normal fashion at the downstream end of the draft tubes. Air pressure is maintained in the gallery to balance the tailwater pressure and permit the gates to be stored and

moved horizontally in the dry. Two sets of three gates each are suspended from hoists that travel horizontally on embedded rails to be positioned for vertical lowering of the gates into draft tube gate slots of units to be dewatered for maintenance. Personnel and material air locks and a medical lock are operated to allow operation and maintenance of the gates and hoists. Gallery pressure is maintained by sequentially controlled air compressors.

3.2.13 Gantry Cranes

Wells Dam is equipped with two steel gantry cranes located on the deck of the hydrocombine (elevation 795). The cranes were supplied by Yuba Manufacturing Company and were used during construction of Wells Dam. The cranes are used for moving equipment and for lifting parts during maintenance and repairs. Each crane is approximately 120 feet in length, 80 feet in height and 35 feet wide and equipped with 4 legs and 4 upper connecting beams. The cranes move both east and west on wheeled tracks that run the length of the dam. Trolleys atop the cranes are capable of moving north and south across the width of the dam – from the forebay toward the tailrace.

One crane is rated at 450 tons and has two trolleys which can move independently of each other. Each trolley has two 112.5-ton main hooks and one 30-ton auxiliary hook. Since the two trolleys on the 450-ton crane move along the same track, their hooks can function together to raise heavy equipment such as generator rotors. The second crane is rated at 300 tons and has a single trolley capable of moving horizontally along the length of the upper beam. The single trolley is equipped with two 150-ton main hooks and one 30-ton auxiliary hook. It is equipped for general use and is capable of handling turbine parts. Both cranes are used for handling the spillway gates and intake gates. The cranes can be fully operated from within their lower control cabinets or via a remote controlled device. The cranes can also be operated remotely from Wells Dam's control room to raise certain spillway gates.

3.3 Fish Mitigation Facilities

3.3.1 Hatchery Facilities

Douglas PUD owns and provides funding for the operation and maintenance of two hatchery facilities. The Wells Fish Hatchery is located immediately adjacent to Wells Dam on the west tailrace embankment. The Methow Fish Hatchery is located approximately 51 miles upstream of the mouth of the Methow River near the town of Winthrop, Washington. Both hatchery programs are funded by Douglas PUD and operated by the Washington Department of Fish and Wildlife (WDFW). The hatchery programs annually produce approximately 3 million juvenile salmon and steelhead that are released into the Methow, Okanogan and Columbia rivers.

3.3.2 Wells Hatchery

Original construction of the Wells Hatchery was completed in 1967. The hatchery produces summer Chinook, summer steelhead and rainbow trout (Figure 3.3-1). It was originally developed to compensate for the loss of fish production resulting from the inundation of the Columbia River above the dam. The Wells Hatchery consists of a 6,100 foot long channel with

portions of the channel modified to hold adults and juveniles, numerous above ground and in ground raceways, four large earthen rearing ponds, a centralized incubation, early rearing, cold storage and administration building, vehicle storage building, steelhead spawning building and a separate set of residences for hatchery personnel.

The Wells Hatchery's four earthen rearing ponds vary in size and purpose. Pond 1 is used for rearing yearling summer Chinook and is connected to the main hatchery outfall channel via a gate and outlet structure. When acclimated and ready for release, the juvenile summer Chinook are allowed access to the main hatchery outfall channel and are volitionally released into the Columbia River below Wells Dam. Pond 2 is the largest pond and has historically been used to raise yearling summer steelhead. Ponds 3 and 4 are used each year for the rearing of yearling summer steelhead. All of the earthen steelhead rearing ponds have volitional collection and transportation facilities located downstream of their outlet structures. The summer steelhead raised at the Wells Hatchery are either transported and released by truck or acclimated in the Methow and Okanogan rivers. No juvenile steelhead are released through the hatchery outfall channel.

The Wells Hatchery is operated to provide compensation for both inundation and passage losses as described in the Wells HCP. The inundation compensation is related to Wells Project construction and includes the production of 300,000 yearling steelhead, 320,000 yearling summer Chinook and 484,000 subyearling summer Chinook. The passage loss compensation provided by the Wells Hatchery is currently set at 48,858 yearling steelhead (3.8 percent).

Figure 3.3-1 Wells Fish Hatchery.

3.3.3 Methow Hatchery

Construction of the Methow Hatchery was completed in 1992 and is the result of a long-term Fish Settlement Agreement dated October 1, 1990 (1990 Settlement Agreement) to mitigate for passage losses at the Wells Project (Figure 3.3-2). In 2004, the Wells HCP was approved by FERC and superseded the 1990 Settlement Agreement. As a result, the terms of the HCP now guide activities at the Methow and Wells hatcheries. The Methow Hatchery produces yearling spring Chinook and is dedicated to enhancing spring Chinook salmon in the Methow, Twisp and Chewuch river basins. The Methow Hatchery consists of 12 covered production raceways, three covered adult raceways, a centralized incubation, early rearing, administrative and hatchery maintenance building, one on-site acclimation pond, two satellite acclimation ponds and a separate set of residences for hatchery personnel.

All 12 of the production raceways and the on-site Methow acclimation pond are equipped with an outlet channel to the Methow River for releasing juvenile spring Chinook. The Twisp Acclimation Pond is located at RM 11 on the Twisp River, and the Chewuch Acclimation Pond is located at RM 7 on the Chewuch River. The Methow Hatchery program currently raises up to 550,000 yearling spring Chinook each year with fish of equal numbers released at each of the three acclimation ponds. Douglas PUD's current passage loss obligation for spring Chinook is 61,071 smolts (3.8 percent). Remaining fish are provided to Chelan PUD and Public Utility District No. 2 of Grant County (Grant PUD) toward compliance with their passage loss obligations.

Figure 3.3-2 Methow Fish Hatchery.

3.4 Project Lands

The shoreline of the Wells Reservoir is approximately 93 miles long. Douglas PUD owns approximately 89 miles of shoreline in fee title and federal and local agencies own approximately 4 miles of shoreline. In addition to the Wells Reservoir, Douglas PUD owns over 2,140 acres of land within the Wells Project Boundary. Lands within the Wells Project Boundary include shrub steppe, irrigated agriculture, wildlife habitat, such as the Wells Wildlife Area (WWA) and recreation lands, including parks in Pateros, Brewster and Bridgeport. Appendix E contains detailed maps showing lands and waters within the Wells Project Boundary.

3.5 Current Operation

The Wells Project is a "run-of-the-river" hydroelectric project meaning that on average, daily inflow to the Wells Reservoir equals daily outflow. The limited active storage capacity is only sufficient to regulate flow on a daily basis. Reservoir fluctuations and power generation are largely driven by the discharge of water from Chief Joseph Dam and Grand Coulee Dam.

The Wells Project has a water right for 220 kcfs for power production with an impoundment right of 331,200 acre-feet per year. The Wells Project is authorized to maintain its reservoir level between elevation 781 and 771 feet for power and non-power purposes. Under conditions that existed during the last five years, reservoir elevations below 774 feet have been observed four times. Figures 3.5-1 shows the headwater duration curves for Wells Dam from January 2001 through December 2005.

The daily operation of the Wells Project is influenced by the following factors: (a) FERC license requirements; (b) natural stream flows; (c) regulation of upstream storage reservoirs in the United States (US) and Canada; (d) regulation of water releases from upstream power projects on an hourly basis to meet changing power demands; (e) actions in response to fish, wildlife and other environmental regulations; and (f) variable power demands for use within Douglas and Okanogan counties and under the long-term power sales contracts with PSE, PGE, PacifiCorp and Avista.

The Wells Project is operated in a coordinated manner with other regional hydroelectric projects. The regulation of upstream reservoirs in the US and Canada has been governed increasingly over the past decade to meet federal objectives for protecting and enhancing fish and wildlife. The regulation of the upstream reservoirs in the US and Canada is also governed by the 1997 Pacific Northwest Coordination Agreement (PNCA), the Columbia River Treaty between the US and Canada relating to the cooperative development of the Columbia River and its tributaries, and numerous other multi-purpose functions authorized by law such as power, flood control, navigation, recreation and water quality. The Wells Project benefits from the storage dams located in the US and Canada by virtue of its location downstream of those projects.

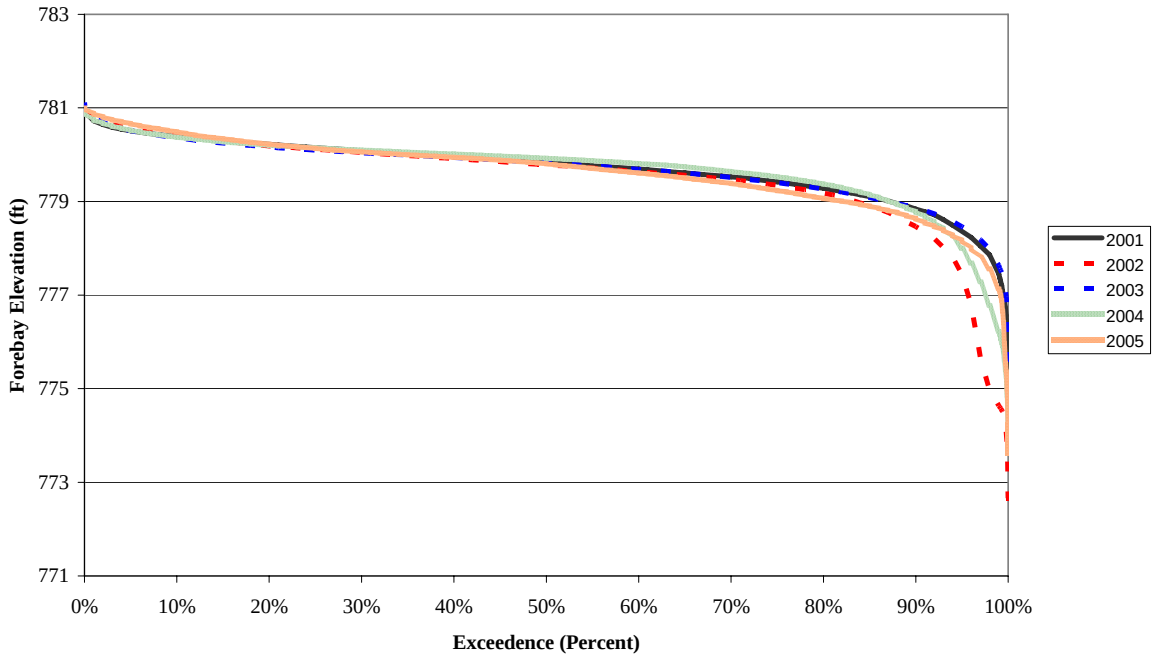

Figure 3.5-1 Headwater duration curves, Wells Forebay (hourly data) 2001-2005.

The purpose of the PNCA is to optimize the firm load carrying capability of resources coordinated under the agreement, including Wells Project resources and to produce optimal amounts of usable "secondary" energy from those resources. Importantly, the PNCA also sets forth a procedure approved by FERC for apportioning costs to be borne by the Wells Project for purposes of headwater benefits compensation. This compensation addresses the benefit of improved stream flow regulation provided by the upstream storage reservoirs in the US, consistent with Article 47 of the Wells Project license.

Douglas PUD is required by Article 38 of the Wells Project license to use the improved stream flow resulting from Canadian storage for power production purposes and to make available to the federal system for delivery to Canada the Wells Project's share of coordinated system benefits resulting from such improved stream flow. Consistent with this requirement, Douglas PUD entered into agreements in 1964 (now expired) and 1997 with the BPA setting forth the share of Canadian benefits apportioned to the Wells Project until September 15, 2024 in the form of power and associated energy deliveries.

Douglas PUD is also a party to an agreement with the operators of six other federal and non-federal dams located both upstream and downstream of Wells for a 20-year term through June 30, 2017, known as the Mid-Columbia Hourly Coordination Agreement. The Hourly Coordination Agreement was orginally conceived in response to finding a means of protecting Wells and other downstream projects from adverse effects of "peaking" operations at the upstream federal projects. The primary objective of the agreement is to optimize the amount of

energy produced from available water consistent with power and non-power needs. The regulation of the seven projects to meet the changing hourly load has an effect on the operation of the Wells Project.

The construction of the Wells Project increased the tailwater elevation at the Chief Joseph Project, which reduced the hydraulic head available for its generation. Douglas PUD entered into an agreement in 1968 with the COE to compensate the federal system for power loss due to Wells Project encroachment (Encroachment Agreement, 1968), consistent with Article 32 of the Wells Project license. The agreement was supplemented in 1982 when FERC approved raising the elevation of the Wells Reservoir from elevation 779 to elevation 781 (Supplement Agreement, 1982).

Additional agreements affecting operation of the Wells Project include the Vernita Bar Settlement Agreement approved by FERC on December 9, 1988 and its successor, the Hanford Reach Fall Chinook Protection Program Agreement, which was submitted to FERC by Grant PUD on April 19, 2004 and is awaiting approval. Specifically, the Hanford Reach Fall Chinook Protection Program states that under certain circumstances Douglas PUD will release a limited amount of water from the Wells Project, in cooperation with prescribed federal upstream and non-federal downstream project water releases, to help adult spawning, incubation, and emergence of fall Chinook salmon downstream of the Priest Rapids Project.

3.6 Proposed Operations

Douglas PUD is not proposing any changes to how the Wells Project may be operated.

3.7 New Facilities or Components to be Constructed

Douglas PUD is not proposing any major changes to Wells Project facilities or components.

3.8 Other Project Information

3.8.1 Settlements and Agreements

Douglas PUD has entered into a number of settlements and agreements associated with the management and operation of the Wells Project. A brief summary of the major settlements and agreements is provided below.

3.8.1.1 Acquisition of Lands within Colville Indian Reservation (1962)

On April 25, 1962, Douglas PUD submitted a Letter of Intent to the Colville Tribal Business Council to acquire certain lands within the Colville Indian Reservation or other Indian Trust Lands within the Wells Project Boundary of the proposed Wells Project. The proposal dealt with the following Wells Project issues: (1) construction costs of the Monse Irrigation Project, (2) payment to the tribe for damaged fishing rights, (3) relocation of tribal graves affected by the backwaters of the Wells Project, (4) irrigation water available to landowners, (5) retaining fishing and hunting rights within boundaries of Colville Indian Reservation, (6) consulting with

the tribe for future land planning adjacent to Wells Reservoir, (7) right to use freeboard land within the Colville Indian Reservation and (8) the CCT's agreement to not intervene in the original application for the Wells Project license. The proposal was accepted by the Colville Tribal Business Council on May 8, 1962.

3.8.1.2 Power Sales Contracts (Power Purchasers)

On September 18, 1963, Douglas PUD entered into power sales contracts with four Power Purchasers to sell 62 percent of the output from the Wells Project at the full cost of production through August 31, 2018 or such later date as all bonds pertaining to the original construction financing are paid in full. These contracts were amended in 1965 to provide for the purchase of power from three additional generating units. The four Power Purchasers are PSE (31.3 percent), PGE (20.3 percent), PacifiCorp (6.9 percent), and Avista (3.5 percent). According to the contracts, each purchaser is obligated to pay its share of Wells Project Annual Power Costs whether or not the Wells Project is operable or operating. On January 17, 1997, FERC issued an order granting approval of the power sales contracts under Section 22 of the Federal Power Act (FPA). Section 22 of the FPA allows, with FERC approval, for the sale and delivery of power for periods extending beyond the expiration date of a project's license.

3.8.1.3 Power Sales Contract and Memorandum of Understanding with Okanogan PUD

On September 18, 1963, Douglas PUD entered into a power sales contract with Okanogan PUD for the sale of a portion of the Wells Project output that Douglas PUD's distribution system purchases. Currently, this is equivalent to 8 percent of the Wells Project output. This contract was amended in 1965 to provide for the sale and purchase of power from three additional generating units. The contract with Okanogan PUD incorporates certain provisions of the Power Sales Contracts with the four Power Purchasers, such as paying Annual Power Costs and making payments whether or not the Wells Project is operable or operating. The contract expires when "all of the costs incurred by Douglas PUD for the acquisition and construction of the Wells Project, including all other indebtedness properly chargeable to the Wells Project, have been discharged in full" (anticipated to be August 31, 2018).

On August 5, 1991, Douglas PUD entered into a Memorandum of Understanding (MOU) with Okanogan PUD that resolved a lawsuit brought by Okanogan PUD concerning Wells Project output made available by Douglas PUD as contemplated in the Power Sales Contract of 1963. Under the terms of the MOU, Douglas PUD granted to Okanogan PUD a right of first refusal to any power and energy which Douglas PUD makes available for sale after first meeting (1) all power and energy needs within Douglas County and (2) all of Douglas PUD's contractual commitments in place on the date of the execution of the MOU. The right of first refusal shall exist for the term of the Okanogan PUD Contract. Okanogan PUD and Douglas PUD further agreed to commence negotiations toward a formal power sales contract with a commencement date of September 1, 2018 whereby Douglas PUD will make available to Okanogan PUD from Douglas PUD's 92 percent share of output of the Wells Project an additional 22 percent of the output on a "take or pay" basis priced at the lesser of two times each year's annual power cost or the price charged to a third party for a block of firm power sold as a Project share. The additional 22 percent of output is contingent upon each of the following: (1) Douglas PUD successfully relicenses the Wells Project and obtain 100 percent of the output of the Wells

Project; 2) the new license entitles Douglas PUD to 92 percent of the output of the Wells Project and Okanogan PUD to 8 percent of the output of the Wells Project; and 3) Okanogan PUD's and Douglas PUD's full compliance with the right of first refusal granted to the Power Purchasers under the Power Sales Contracts between Douglas PUD and each of the Power Purchasers.

3.8.1.4 Power Loss from Wells Project Encroachment on Chief Joseph Dam (1968)

On August 26, 1968, Douglas PUD entered into an agreement with the COE for Power Loss from Wells Project Encroachment on Chief Joseph Dam. This agreement, referred to as the Encroachment Agreement, was necessary since the construction of the Wells Project increased the tailwater elevation at Chief Joseph Dam, reducing its generation capabilities. Douglas PUD entered into this agreement to compensate the federal system for its power loss. The term of this agreement extends for the duration of the Wells Project license (May 31, 2012). The agreement was supplemented on September 27, 1982 when FERC approved raising the elevation of the Wells Reservoir from elevation 779 to elevation 781. This document is referred to as the Supplement Agreement.

3.8.1.5 Agreement Relating to the Operation of Salmon Mitigative Facilities at Wells Dam (1969)

On June 16, 1969, Douglas PUD entered into an "Agreement Relating to the Operation of Salmon Mitigative Facilities at Wells Dam" with the State of Washington Department of Fisheries. This agreement formalized previous discussions concerning the Wells Project's responsibility for the mitigation of lost salmon spawning grounds in the Wells Reservoir. This agreement addresses Article 41 of the Wells Project license and details responsibilities for items such as fish passage facilities, fish-culture facilities, staff housing, equipment and supplies, operations, species replacement, maintenance, costs and reporting. The agreement was amended on February 1, 1982. This amendment stated that a conventional hatchery approach, as opposed to the use of a spawning channel, which was part of the original Wells Hatchery design, would be a more efficient use of the hatchery facilities and discussed the annual release of salmon smolts. The term of this agreement extends for the duration of the Wells Project license (May 31, 2012).

3.8.1.6 Agreement between Douglas PUD and the CCT for Fish and Wildlife Mitigation (1970)

On January 26, 1970, Douglas PUD entered into an agreement with the CCT on fish and wildlife mitigation. This agreement compensated the CCT for losses due to inundation of lands by the Wells Reservoir. Under the terms of the agreement, Douglas PUD provided payments for fishery mitigation ($213,000) and wildlife mitigation ($168,000). The agreement states, "This agreement constitutes full compensation by the District to the Tribe for any and all damage to wildlife and/or fishery upon the Colville Indian Reservation and the Columbia and Okanogan Rivers adjacent thereto as a result of the development of the Wells Hydroelectric Project."

3.8.1.7 Agreement between Douglas PUD and Ervin and Loretta Wolley and the CCT Regarding Use of Freeboard Lands (1970)

On May 4, 1970, Douglas PUD entered into an agreement with Ervin D. and Loretta M. Wolley and the CCT regarding use of freeboard lands, owned by Douglas PUD and located within the Colville Indian Reservation. This agreement resolved issues between the parties related to the use of these lands located in the Monse Irrigation District, the Colville Indian Reservation and owned by Douglas PUD. The agreement designated an area on Cassimer Bar for the benefit of wildlife, referred to as the Game Management Area. It also further clarified that the "reasonable use" of these lands was a non-exclusive right and that the lands would remain open to the public for full utilization. On November 1, 1971, Douglas PUD entered into an option to purchase approximately 137 acres of rights to freeboard land from the Wolleys and exercised the purchase option on October 30, 1972.

3.8.1.8 Agreement with the State of Washington Department of Game for Mitigation of Gamefish Losses in Connection with the Wells Project (1972)

On July 17, 1972, Douglas PUD entered into an agreement with the State of Washington Department of Game (WDG) for mitigation of game fish losses in connection with the Wells Project. This agreement formalized discussions concerning the Wells Project's responsibility for mitigation of game fish losses associated with the Wells Project. This agreement addresses Article 41 of the Wells Project license and defines responsibilities for items such as the fish hatchery, rearing pond, program activities, operation and maintenance costs, residence facilities and streambank access. The agreement has been amended in recent years and currently covers the rearing of 300,000 yearling steelhead and 20,000 pounds of "catchable rainbow trout". The term of this agreement extends for the duration of the Wells Project license (May 31, 2012).

3.8.1.9 Agreement between Douglas PUD and the State of Washington Department of Game for Wildlife Mitigation (1974)

On July 15, 1974, Douglas PUD entered into an agreement with the WDG to address the Wells Project's effects on wildlife. This agreement addresses Article 41 of the Wells Project license. Included in the agreement was one time cash payment of $1,250,000 to be used for wildlife resources in Douglas and Okanogan counties in close proximity to the Wells Reservoir. The agreement also transferred properties to the WDG to establish the WWA, consisting of the Central Ferry Canyon, West Foster Creek, Indian Dan Canyon, Okanogan River, Washburn Island and Bridgeport Bar units of the WWA. The Washburn Island Unit and portions of the Bridgeport Bar Unit reside within the Wells Project Boundary and are owned by Douglas PUD. The term of this agreement extends for the duration of the Wells Project license (May 31, 2012).

3.8.1.10 Agreement between Douglas PUD and the State of Washington Department of Game for Mitigation of Wildlife Impacts in Connection with the Proposed Forebay Elevation Raise at the Wells Project (1982)

On July 19, 1982, Douglas PUD entered into an agreement with the WDG for mitigation of wildlife impacts associated with its amendment to the Wells Project license to raise the elevation of the Wells Reservoir. This agreement addresses Article 41 of the Wells Project license. This

agreement included island restoration and mitigation measures for waterfowl, upland game birds and bald eagles. Mitigation measures included the protection of goose nesting islands, preserving pheasant wintering habitat, establishing a waterfowl feeding area, constructing raptor perch poles, replacing riparian vegetation and planting additional wildlife habitat. The term of this agreement extends for the duration of the Wells Project license (May 31, 2012).

3.8.1.11 Memorandum of Agreement – Cultural Resources Management Program (1983)

On April 11, 1983, Douglas PUD entered into a Memorandum of Agreement (MOA) with the Washington State Office of Archaeology and Historic Preservation (renamed the Department of Archaeology and Historic Preservation (DAHP) in 2005). The MOA was developed in conjunction with Douglas PUD's application for amendment to the Wells Project license to raise the elevation of the Wells Reservoir. The MOA defined a data recovery plan in accordance with the guidelines of the Advisory Council of Historic Preservation (ACHP), including the curation of artifacts. It also addresses the physical recovery and monitoring of any archaeology sites uncovered by future erosion. On August 16, 2004, Douglas PUD entered into a Memorandum of Understanding (MOU) for Curatorial Services with the CCT to formalize its current curatorial activities. The MOU satisfies the obligations established in the 1983 MOA.

3.8.1.12 Partial Settlement Re: Cultural Resources Mitigation Prior to Forebay Elevation Increase (1983)

On July 25, 1983, Douglas PUD accepted an Offer of Partial Settlement regarding Cultural Resources Mitigation with the CCT. This settlement was associated with Douglas PUD's amendment to the Wells Project license to raise the elevation of the Wells Reservoir. The partial settlement addressed concerns expressed by the Tribes pertaining to the impact on cultural resources. The settlement included clarification and funding of data recovery activities at specific archeological sites near the Wells Reservoir.

3.8.1.13 Interlocal Agreement for Chief Joseph State Park (1983) and Memorandum of Understanding (2003)

On August 29, 1983, Douglas PUD and the Washington State Parks and Recreation Commission (State Parks) signed an interlocal agreement pertaining to a proposed Chief Joseph State Park as mitigation for the Wells Reservoir elevation increase. Under the terms of the agreement, Douglas PUD agreed to pay State Parks a lump sum of $125,000 and $25,000 annually through 2012 to assist in the future development of the park. The site, however, was later determined to be unsuitable as a high-density recreation facility. This determination was made in conjunction with State Parks based on an analysis funded by the 1997 Recreation Action Plan Update. Douglas PUD fulfilled its commitment from the 1983 agreement by making a discounted, lump sum payment to State Parks in lieu of the remaining $25,000 annual payments through 2012. A Memorandum of Understanding (MOU) with State Parks regarding the proposed Chief Joseph State Park was later adopted on January 21, 2003. This MOU acknowledged Douglas PUD's 1997 Recreation Action Plan Update that identified the need for protection of natural areas and wildlife habitat and also raised concerns regarding the incompatibility of intense recreation development of the proposed Chief Joseph State Park adjacent to highly valued wildlife habitat on the Bridgeport Bar. The MOU provided for the sale of the Chief Joseph State Park land back

to Douglas PUD, identified unspent funds from the 1983 agreement, required payment of the future obligation of Douglas PUD under the 1983 Interlocal Agreement and allowed that these monies be used to secure a substitute property. In 2005, this land was provided in fee title to the CCT as part of a FERC-approved settlement between the CCT and Douglas PUD.

3.8.1.14 Partial Settlement Re: Wildlife Habitat Mitigation for Forebay Elevation Increase (1984)

On April 2, 1984, Douglas PUD entered into an Offer of Partial Settlement regarding Wildlife Habitat Mitigation with the CCT. This settlement was associated with Douglas PUD's amendment to the Wells Project license to raise the elevation of the Wells Reservoir. The partial settlement addressed concerns expressed by the Tribes pertaining to the impact on wildlife resources. The settlement included specific efforts to stabilize the water level and preserve habitat in the three sloughs at Cassimer Bar, a schedule for completion of mitigation measures described in the agreement of July 17, 1972, assurances of consultation to protect cultural resource associated with the mitigation efforts and the monitoring and maintenance of structures placed as part of the mitigation effort until the expiration of the Wells Project license (May 31, 2012).

3.8.1.15 Agreements with Pateros, Brewster and Bridgeport regarding additional recreation facilities (1987)

On June 15, 1987, Douglas PUD entered into separate agreements with the cities of Pateros, Brewster and Bridgeport regarding additional recreation facilities. The agreements summarized the cooperative arrangement between Douglas PUD and the cities toward the construction and maintenance of specific recreation facilities within the city parks. The agreements included an expenditure of up to $250,000 by Douglas PUD to each city for construction of the recreation facilities. They also formalized a commitment by the cities to administer, operate and maintain the new facilities. These agreements provided mitigation for the Wells Reservoir elevation increase, were based on the 1987 Recreation Action Plan Update and specifically addressed the requirements of Article 51 of the Wells Project license.

3.8.1.16 Vernita Bar Settlement Agreement (1988) and Hanford Reach Fall Chinook Protection Program Agreement (2004)

On February 16, 1988, Douglas PUD entered into the Vernita Bar Settlement Agreement between and among Grant PUD, Chelan PUD, BPA, NMFS, WDFW, Oregon Department of Fish and Wildlife (ODFW), Confederated Tribes and Bands of the Yakama Indian Nation (YN), the Confederated Tribes of the Umatilla Indian Reservation (CUR) and the CCT. The agreement resulted from extensive negotiations with the aforementioned fisheries agencies and tribes in an effort to protect salmon spawning on the Vernita Bar in the Columbia River downstream of the Priest Rapids Project. The agreement attempts to achieve an appropriate balance between power production and the protection of fall Chinook salmon by identifying certain minimum flow scheduled to be maintained below Priest Rapids Dam during adult spawning, incubation and emergence. The term of the Vernita Bar Settlement Agreement is for the remainder of the current license period for the Priest Rapids Project plus the term(s) of any annual license(s) issued thereafter.

The successor agreement to the Vernita Bar Agreement, the Hanford Reach Fall Chinook Protection Program Agreement, was submitted to FERC by Grant PUD on April 19, 2004 and is awaiting approval. The parties to this agreement include Grant PUD, Chelan PUD, Douglas PUD, NMFS, USFWS, WDFW, CCT and the BPA. The agreement is designed to extend until the end of the new license term for the Priest Rapids Project. It requires that the three PUDs and BPA provide acceptable protection for fall Chinook salmon at Vernita Bar, similar to the previous agreement. Additions to the successor agreement address juvenile outmigration and juvenile stranding issues in the Hanford Reach Area. The Wells Project is the uppermost non-federal project participating in these agreements.

3.8.1.17 Settlement Agreement with Wells Project Power Purchasers (1989)

On May 15, 1989, Douglas PUD entered into a settlement agreement with its four Power Purchasers (PSE, PGE, PacifiCorp and Avista). This agreement was negotiated to settle an arbitration relating to the sale of Wells Project output. The agreement is effective through August 31, 2018. Under the agreement, Douglas PUD must offer certain temporarily available, non-firm energy to the Power Purchasers under pricing structures which are subject to annual adjustments. Pursuant to the agreement, power returned to Douglas PUD under a 1983 supplemental agreement with Okanogan PUD was returned to the Power Purchasers except for power needed for Douglas PUD's load. Power actually returned to the Power Purchasers was subsequently withdrawn by Douglas PUD in accordance with the terms of the agreement.

3.8.1.18 Memorandum of Understanding with USFWS and State of Washington Department of Fisheries (1990)

On July 2, 1990, Douglas PUD entered into a Memorandum of Understanding (MOU) with the USFWS and the WDFW (formerly Washington State Department of Fisheries). The MOU was established in connection with construction of the Methow Fish Hatchery. The MOU provided for the following: 1) Douglas PUD's use of the Foghorn Ditch intake facilities and ditch, located near the proposed site of the Methow Hatchery, 2) coordination between the Methow Hatchery and the Winthrop National Fish Hatchery located near Winthrop, Washington, 3) Douglas PUD's use of 7 cfs of the USFWS 50 cfs water right for the Winthrop National Fish Hatchery during January - April, 4) Douglas PUD's funding up to $500,000 of repairs and improvements to portions of the Foghorn Ditch and facilities, including reconstruction of the diversion dam, water intake, repair of the existing fish ladder and 5) Douglas PUD's reimbursement to WDFW of 25 percent of the annual operation and maintenance costs associated with maintaining the Foghorn Ditch facilities. On March 27, 1995, the MOU was amended to increase Douglas PUD's maximum funding obligation for repairs and improvements to portions of the Foghorn Ditch facilities from $500,000 to $603,000. This increase was necessary to cover costs associated with construction delays due to a lengthy permit appeal process.

3.8.1.19 Memorandum of Understanding with State Parks and WDFW (1991)

On March 18, 1991, Douglas PUD entered into a Memorandum of Understanding (MOU) with State Parks and WDFW (formerly the Washington Department of Wildlife) concerning land management conflicts at the proposed Chief Joseph State Park site and the Bridgeport Bar Unit of the Wells Habitat Management Area. This MOU set forth the management responsibilities of both agencies for the Chief Joseph Park site, established a 200-foot buffer surrounding the island and confirmed Douglas PUD's obligations to both agencies.

3.8.1.20 Memorandum of Agreement with the WDFW (1995)

On June 19, 1995, Douglas PUD entered into a Memorandum of Agreement (MOA) with the WDFW for additional funding for the WWA. This MOA was necessary because the interest income received from the WDFW's investment of the original Douglas PUD $1,250,000 cash payment (July 15, 1974 Agreement) was no longer adequate to fund the annual operations of the WWA. In order to maintain the present level of operations for the WWA, it was determined by the parties that additional funds were necessary. Under the terms of the MOA, Douglas PUD agreed to provide additional funding required to maintain the WWA through the end of the Wells Project license (May 31, 2012). The additional funding varies by year but was $101,600 for the 2005-06 fiscal year. Through this MOA, WDFW also agreed to be supportive of the Douglas PUD's relicense application.

3.8.1.21 Canadian Entitlement Allocation Extension Agreement (1997)

On April 7, 1997, Douglas PUD entered into the Canadian Entitlement Allocation Extension Agreement with BPA. This agreement determined a portion of Canadian Entitlement allocated to the Wells Project through 2024, which is the minimum remaining term of The Columbia Treaty. The Columbia Treaty between the US and Canada was signed in 1961 to help ensure the cooperative development of the Columbia River Basin by regulating seasonal flows that enable downstream projects to produce additional power. Since the Wells Project benefits from the storage dams and improved stream flow authorized under The Columbia Treaty, compensation in the form of capacity and energy is made to Canada. The Canadian Entitlement Allocation Extension Agreement is a successor of the original agreement, entered into in 1964.

3.8.1.22 Pacific Northwest Coordination Agreement (PNCA) (1997)

On April 7, 1997, Douglas PUD entered into the 1997 PNCA between and among numerous federal agencies and northwest utilities. Operations under this agreement began on August 1, 2003, and its term extends until September 15, 2024. The 1997 PNCA helps manage reservoir systems by maintaining the independence of each hydroelectric facility while achieving maximum beneficial use of the river. The various projects work cooperatively toward meeting overall load requirements by mutually supporting each other's operations. The 1997 PNCA maintains the value of the water by responding to non-power requirements, as well as power requirements, when moving water downstream. Payments are made in accordance with this agreement to the owners of the upstream reservoirs. The 1997 PNCA is a successor to the PNCA that Douglas PUD entered into in 1964.

3.8.1.23 Mid-Columbia Hourly Coordination Agreement (1997)

On June 23, 1997, Douglas PUD entered into the 1997 Agreement for the Hourly Coordination of Projects on the mid-Columbia River (Hourly Coordination Agreement). The Wells Project is one of seven hydroelectric projects with operations coordinated under the Hourly Coordination Agreement. Under this agreement the Wells Project is coordinated with upstream and downstream projects for the most efficient use of the river. The Hourly Coordination Agreement includes the owners and operators of Grand Coulee, Chief Joseph, Wells, Rocky Reach, Rock Island, Wanapum and Priest Rapids dams. The agreement includes 16 total entities (13 non-federal and 3 federal entities). The Hourly Coordination Agreement was originally conceived to protect Wells and other downstream projects from the adverse effects of operations at upstream federal projects. Objectives of the current agreement include optimizing hydraulic operation of the projects, providing flexibility and ease of generation scheduling and minimizing changes in project generation including unit starts and stops. The Wells Project has formally participated in hourly coordination since 1972. The current 20-year agreement is effective through June 30, 2017.

3.8.1.24 Hatchery Sharing Agreement with Chelan PUD (2002)

On August 26, 2002, Douglas PUD entered into a Hatchery Sharing Agreement with Chelan PUD. This agreement superseded a 1988 Species Trade Agreement between Douglas PUD and Chelan PUD which formalized a cooperative arrangement for mitigation responsibilities pertaining to the 1990 Settlement Agreement and the 1987 Rock Island Settlement Agreement. Under the 1988 Species Trade Agreement, Douglas PUD assumed all of Chelan PUD's Twisp River spring Chinook hatchery responsibilities in exchange for Chelan PUD assuming all of Douglas PUD's Methow River summer Chinook hatchery responsibilities. Authorization of the Wells HCP prompted modifications to the arrangement through the 2002 Hatchery Sharing Agreement. The Wells and Rock Island HCPs reduced the obligation for juvenile salmonid passage loss from 14 percent (under the 1990 Settlement Agreement and the 1987 Rock Island Settlement) to a maximum hatchery obligation of 7 percent. The HCP also provided Douglas PUD with the ability to reduce its hatchery program depending upon the results of survival studies designed to measure the actual passage rates for juvenile fish migrating through Wells Dam. Based upon the results of three years of survival studies, the three-year average survival rate for the Wells Project is 96.2 percent for yearling Chinook and steelhead. The results of the three years of studies allowed Douglas PUD to reduce its obligation for yearling Chinook and steelhead to 3.8 percent. The 2002 Hatchery Sharing Agreement was formalized to better reflect implementation of the HCP and the associated reduction in maximum mitigation responsibility. The agreement terminates on June 21, 2054.

3.8.1.25 Anadromous Fish Agreement and Habitat Conservation Plan (HCP) (2004)

On June 21, 2004, FERC approved the Wells HCP. This agreement superseded the 1990 Settlement Agreement. The Wells HCP represents the culmination of over 10 years of negotiations between Douglas PUD, NMFS, USFWS, WDFW, the CCT, the YN, the CUR and American Rivers. The HCP is the first hydropower Habitat Conservation Plan for anadromous salmon and steelhead. The HCP is a 50-year agreement included as an amendment to the Wells Project license. The HCP addresses project-related impacts to spring Chinook, summer/fall

Chinook, steelhead, sockeye and coho, collectively referred to as Plan Species. With respect to Plan Species, the HCP parties have agreed to be supportive of Douglas PUD's long-term relicensing efforts. The HCP also provides Endangered Species Act (ESA) coverage for all of the permit species (spring Chinook, summer/fall Chinook, sockeye and steelhead). The HCP also is intended to constitute the parties' terms, conditions and recommendations for Plan Species under Sections 10(a), 10(j) and 18 of the FPA, the Fish and Wildlife Conservation Act, the Essential Fish Habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act, the Pacific Northwest Electric Power Planning and Conservation Act and Title 77 of the Revised Code of Washington (RCW) of the State of Washington.

3.8.1.26 Interlocal Cooperative Agreement with Grant PUD (2004)

On August 9, 2004, Douglas PUD entered into an Interlocal Cooperative Agreement with Grant PUD regarding fish rearing. Under the terms of the agreement, Douglas PUD will allow Grant PUD to utilize its Wells and Methow hatcheries to raise five different groups of fish. In exchange for utilizing these facilities, Grant PUD agrees to compensate Douglas PUD. Compensation includes prorated reimbursement from Grant PUD for past facility development costs, annual operation and maintenance costs, any monitoring and evaluation costs and any future capital improvements made to the hatchery facilities. The agreement authorizes Grant PUD to purchase annually up to 200,000 summer Chinook smolts, 131,000 summer steelhead smolts and up to 389,000 spring Chinook smolts from the Douglas PUD hatcheries. This arrangement will assist Grant PUD in addressing its mitigation responsibilities for unavoidable fish passage losses at the Priest Rapids Project.

3.8.1.27 Settlement Agreement with CCT (2005)

The FPC order issuing the license stated that the Project will be "affecting tribal lands of the Colville Indian Reservation….," and that the issuance of the license "will not interfere or be inconsistent with the purpose for which any reservation was created or acquired." The order also stated: "The amount of annual charges to be paid under the license … for the purpose of recompensing the Indians for the use, occupancy, and enjoyment of tribal lands within the Colville Indian Reservation, should be determined later as hereinafter provided." Article 46 of the license states in relevant part: "The Licensee shall pay to the United States the following annual charges… (iii) For the use of tribal lands embraced within the Colville Indian Reservation, such reasonable charge (which may include electric service) as may hereafter be specified by the Commission, subject to the approval of the Indian tribe having jurisdiction over such lands as provided by law."

Notwithstanding Article 46, between 1964 and 1967 Douglas PUD acquired fee title to all of the property on the Colville Reservation that is within the Wells Project Boundary. Some of this land was allotted land that was purchased from allottees or heirs and the sale was approved by the BIA. Other land was tribal land that was sold pursuant to resolution of the Business Council of the CCT and was authorized by the BIA.

In 1969 Douglas PUD informed the Commission that it had "acquired all the property necessary for our reservoir from the Colville Indian Reservation by Fee Title." This was in response to the Commission's statement for annual charges for 1968 that contained the notation: "Charge for

Colville [sic] Indian Lands to be later determined." Douglas PUD proposed that this line item for annual charges for Colville lands could be deleted from future annual charge statements because the land had been acquired by Douglas PUD. The Commission responded that Douglas PUD's proposed change could be requested through a license amendment when Douglas PUD filed revised Exhibits F and K.

In 1970 Douglas PUD filed a revised Exhibit K and advised the Commission that "[t]he entire project was acquired in fee title," with two exceptions, one of which involved the railroad, and the other was "[t]he acquisition of State riverbed and shoreline is still under negotiation." The Wells Project Exhibit F, which was also filed with the Commission in 1970, lists the acquisition of Project property through both deeds to restricted Indian land and purchases by warranty deed from the BIA.

In a July 7, 1971 letter to the BIA, the Commission stated that its staff, pursuant to section 10(e) of the FPA, "is preparing to set annual charges to be paid" by Douglas PUD for the Project. The letter cited to Article 46, Paragraph (iii) of the license that required the licensee to pay annual charges for the use of tribal lands embraced within the Colville Reservation. The letter also referred to a letter dated June 11, 1971 from Douglas PUD that stated its belief that Article 46, Paragraph (iii) "now has no significance since the land was acquired in fee title and the Indians received full remuneration for their property prior to any use by the District." The Commission requested BIA's comments "regarding the acquisition and remuneration of tribal lands."
In response, the BIA sent a letter to the Commission dated July 18, 1971 that stated that their records disclosed that 900 acres of Indian-owned lands were acquired by Douglas PUD as part of the Wells Project. Further, the letter stated, "As a result of the purchase of the lands, the trust title thereto was extinguished and the United States henceforth had no further authority over, or responsibility for, these former Indian-owned lands." The letter referred to a Federal Register notice of the termination of federal responsibility for a unit of the Colville Indian Irrigation Project based on the fact that all lands had been purchased for the Wells Project, "as a result of which Indian title to such lands has been extinguished, the lands being no longer held in trust by the United States." 34. Fed. Reg. 8714 (June 3, 1969). Since the 1970's, the Commission has not sought to collect, and Douglas PUD has not paid, any annual charges for use of Tribal lands.

In early 2003, the CCT presented Douglas PUD with a claim for past and future annual charges from the Project. The CCT claim was based on its position that some or all of the land purchases by Douglas PUD were not valid, and in addition, that the CCT owns the riverbeds of the Columbia and Okanogan rivers that run along the Reservation and that are used by the Project. Douglas PUD took the position that the Article 46 obligation to pay annual charges for Colville land was discharged by the acquisition in fee by Douglas PUD of those lands in the 1960's. Douglas PUD also maintained that the State of Washington owns the bed of the Columbia and Okanogan rivers and that it acquired appropriate occupancy rights over the riverbeds in question.

By letter dated March 26, 2003, to Douglas PUD, the Commission's Director of the Office of Energy Projects (OEP) stated that it was recently brought to his attention that an annual charge for use of Colville Indian Reservation lands had never been determined for the Wells Project, and that was a situation that "needs to be corrected." Douglas PUD responded to the Director on

April 24, 2003, supplying documentation disputing the basis for the Tribe's claim for annual charges.

Douglas PUD and the CCT held a number of meetings to discuss a resolution of the issues and thereafter executed a Settlement Agreement dated November 1, 2004, to settle certain claims between them, including all claims regarding any section 10(e) payments to the CCT for the term of the original license and any new FERC license arising from the use of lands within the Wells Project Boundary. Pursuant to the Settlement Agreement, Douglas PUD and the CCT also executed a Power Sales Contract and a Power Sales Service Agreement.

On November 23, 2004, Douglas PUD, the CCT and the Power Purchasers filed a request for approval of (1) the Settlement Agreement resolving all claims involving annual charges for the use of Indian land for the Wells Project, and (2) the Power Sales Contract that extends beyond the license term pursuant to section 22 of the FPA. On February 11, 2005, the Commission issued an order approving the Settlement Agreement, amending the license and approving the Power Sales Contract for the period extending through the term of any new license issued upon expiration of the existing license. Article 46 was amended to provide that compensation to the CCT pursuant to the terms of the Settlement Agreement and the Power Sales Contract constitutes payment in full for the use of tribal lands embraced within the Colville Reservation. In addition, the order provides that for the purposes of any new license issued upon expiration of the existing license, all annual charges under section 10(e) of the FPA that accrue during the term of the new license for the use of tribal lands, to the extent such lands were included in the Wells Project Boundary on the effective date of the Settlement Agreement, shall be deemed satisfied by fulfillment of the applicable terms of the Settlement Agreement and the Power Sales Contract.

The terms of the settlement include the following: (1) The CCT grants and affirms all land rights previously conveyed by the CCT to Douglas PUD; (2) The CCT grants to Douglas PUD overflow rights to the bed of the Okanogan and Columbia rivers; (3) The CCT agrees not to compete for a license for the Wells Project and further agrees to support Douglas PUD's relicensing application; (4) The CCT grants Douglas PUD certain water rights in connection with the Wells Project; (5) Beginning April 1, 2005, Douglas PUD is obligated to offer to the CCT 4.5 percent of the output of the Wells Project through August 31, 2018, and 5.5 percent thereafter, at Wells Project cost, for so long as the District holds a license for the Wells Project; (6) Douglas PUD will pay the CCT $13,500,000 by August 11, 2005 (payment was made on July 6, 2005); and (7) Douglas PUD will transfer directly to the CCT certain real properties totaling about 466 acres, which has occurred.

3.8.2 Current License Requirements

The original License for the Wells Project was issued by the FPC on July 12, 1962 for a period of 50 years (effective June 1, 1962) (28 FPC 128). This License was issued "for the construction, operation, and maintenance of Project No. 2149 upon the Columbia River, Washington, and affecting tribal lands of the Colville Indian Reservation and other lands and navigable waters of the United States," subject to the terms and conditions of the FPA. FPC Form L-6, issued December 15, 1953, formed the basis for the Wells Project license Articles 1-

27. The July 12, 1962 order deleted Articles 23, 24 and the last sentence of Article 17 and added Articles 28 – 47.

Article 41 of the Wells Project license pertaining to mitigating losses of fish and wildlife resources was modified per FPC Order Amending License (Major) issued on September 18, 1962. The FPC issued an order on August 16, 1963 that modified Article 28 to extend time for commencement and completion of Wells Project construction. The FPC also issued an order on April 17, 1964 modifying Article 46(i) of the license to show 723,000 HP as the authorized installed horsepower capacity of the Wells Project for annual charges.

The initial license for the Wells Project called for the construction of seven turbine generating units. On February 2, 1965, the FPC approved an application to amend the original license to include three additional generating units and further modified Article 46(i) to show 1,032,000 HP as the authorized installed horsepower of the Wells Project. On January 5, 1979, FERC adopted significant changes to Article 46 pertaining to annual charges.

On July 15, 1974, Douglas PUD and the WDG signed a Settlement Agreement for Wildlife Mitigation in accordance with Article 41 of the existing license. On May 12, 1975, FERC issued an order approving the settlement with a modification requiring the two parties to file an annual progress report for the wildlife mitigation program with FERC. This annual progress report must be filed no later than October 1 of each year, in accordance with the FERC Order Modifying License Article issued February 24, 1989.

Article 48 pertaining to granting permission for use and occupancy of project lands and waters was incorporated into the Wells Project license in 1981. This article was accepted by Douglas PUD through Resolution No. 81-4, approved January 5, 1981, in response to a letter from FERC offering the additional article. On April 26, 1981, Douglas PUD filed an application for a license amendment to raise the elevation of the Wells Reservoir from 779 to 781 feet. On September 23, 1982, FERC issued an order amending the License and added Articles 49-58 in response to this application.

On November 24, 2003, Douglas PUD filed an Application for Approval of the Wells Project's HCP with FERC. Approval of the HCP was granted by FERC on June 21, 2004 and discussed in the Master Order 107 FERC ¶ 61,280. A Wells Project specific order, 107 FERC ¶ 61,283, was also issued on June 21, 2004, which amended the Wells Project license to implement the terms of the HCP. The Wells Project specific order amended the License to include Articles 59-63.

FERC clarified through its Order on Rehearing, issued November 23, 2004, that the orders approving the HCP removed the 1990 Settlement Agreement from the Wells Project license. This agreement, pertaining to anadromous fish issues, was approved by FERC on January 24, 1991 but has been superseded in the Wells Project license by the HCP and its respective orders. The Order on Rehearing also stated that the USFWS Reasonable and Prudent Measures and associated Terms and Conditions regarding bull trout were "inadvertently appended to the master order" (107 FERC ¶ 61,280) and have been deleted per paragraph D, page 11 of the Order of Rehearing.

On February 11, 2005, FERC issued an order approving the Colville Settlement Agreement and the Colville Power Sales Contract. This order also amended Article 46 of the License related to compensation for the use of tribal lands.

On April 19, 2005, FERC issued an Order Modifying and Approving the Bull Trout Monitoring and Management Plan (BTMMP) under Article 61. This order added a paragraph to Article 61 regarding reporting requirements.

A description of license articles as amended during the license term is provided in Appendix D.

3.8.3 Summary of Project Generation and Outflow

The Wells Project normally generates its maximum output during May through August, which corresponds with periods of higher river flows. Regional electric loads typically peak during the winter months for heating and lighting purposes and during the summer months for home air conditioning and irrigation pump usage. The average annual energy production for water years 2001 through 2005 is 3,870,169 Megawatt hours (MWh) and the average monthly energy production, during this same time frame, ranged from 250,742 MWh in September to 398,796 MWh in June (Table 3.8-1). Wells Project mean monthly outflow for water years 2001-2005 is provided in Table 3.8-2.

3.8.4 Current Net Investment

Douglas PUD's net investment (book value) in the Wells Project is $175,907,321 as of August 31, 2005.

3.8.5 Compliance History

Douglas PUD has demonstrated an excellent record of compliance with the terms of the existing license articles and associated agreements for the Wells Project. There have been no recurring instances of non-compliance throughout the term of the Wells Project license.

Since obtaining its license to operate the Wells Project, to the best of its knowledge, Douglas PUD has received only one letter from FERC regarding a license violation. In a letter dated August 31, 1988, FERC notified Douglas PUD of a violation of Article 41 of the license which requires an annual progress report of the Wells Wildlife Mitigation Program. Douglas PUD replied to FERC on September 13, 1988 to emphasize that the WDFW, who prepares the report for Douglas PUD, has "found it very difficult to complete these reports prior to June 1 of each year." In response to this letter, FERC responded on February 16, 1989 to notify Douglas PUD that "the language in the article may not necessarily require that an annual report be filed by June 1 of each year." On February 24, 1989, FERC issued an Order Modifying License Article "requiring the filing of an annual progress report of the licensee's wildlife mitigation program no later than October 1 of each year." Therefore, this instance of alleged non-compliance has been clarified and the issue related to filing of the annual report has been resolved.

Table 3.8-1 Wells Project monthly generation (MWh) water years 2001 – 2005.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total
2001	277,705	330,879	379,351	350,509	293,324	276,623	219,098	192,501	284,302	186,868	241,413	231,215	3,263,788
2002	215,280	257,756	294,368	334,973	305,351	250,571	352,148	441,295	457,038	484,710	388,704	267,607	4,049,751
2003	297,642	345,646	344,316	284,038	238,389	303,578	355,735	430,019	424,537	348,918	321,790	232,762	3,927,370
2004	279,807	312,941	380,640	353,335	280,492	262,142	284,505	384,039	421,316	340,704	328,033	275,691	3,903,645
2005	290,184	325,972	398,742	374,532	342,645	343,345	289,514	394,853	406,788	434,255	358,976	246,433	4,206,239
Avg	**272,124**	**314,639**	**359,483**	**339,477**	**292,040**	**287,252**	**300,200**	**368,541**	**398,796**	**359,091**	**327,783**	**250,742**	**3,870,169**

Table 3.8-2 Wells Project monthly mean outflow (kcfs) water years 2001 – 2005.

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Avg
2001	73.82	93.14	104.44	96.46	88.19	73.84	62.80	55.19	84.54	53.38	70.40	62.48	76.56
2002	56.03	70.89	79.09	90.99	91.92	66.12	117.00	135.04	205.64	176.53	115.04	73.22	106.46
2003	79.43	96.60	93.30	75.70	69.87	82.22	106.51	130.72	137.56	106.17	96.41	64.01	94.88
2004	74.67	87.69	105.51	96.21	80.47	70.02	87.16	114.21	132.29	101.46	95.75	75.75	93.43
2005	79.31	90.95	112.05	101.96	104.42	94.90	85.30	122.12	130.79	136.78	107.91	67.64	102.84
Avg	**72.65**	**87.85**	**98.88**	**92.26**	**86.97**	**77.42**	**91.75**	**111.46**	**138.16**	**114.86**	**97.10**	**68.62**	**94.83**

4.0 GENERAL DESCRIPTION OF RIVER BASIN

4.1 Columbia River Watershed

Wells Dam is located at RM 515.8 on the Columbia River in north central Washington State (Figure 4.1-1). The Columbia River is one of the largest rivers in North America and is the dominant water system in the Pacific Northwest Region. The Columbia River Basin is bounded principally by the Rocky Mountain system on the east and north, the Cascade Range on the west, and the Great Basin on the south.

The mainstem of the Columbia River originates in Columbia Lake on the west slope of the Rocky Mountain Range in Canada. After flowing a circuitous path for approximately 1,200 miles, 415 miles of which are in Canada, the Columbia River joins the Pacific Ocean near Astoria, Oregon. The Columbia River enters Washington State in its northeastern corner, along the state's border with British Columbia, Canada. Upon entering Washington, the Columbia flows south, then west into central Washington State, and then south again toward its confluence with the Snake River near Richland, Washington. The Columbia River then turns westward, forming the Washington-Oregon border for 320 miles before entering the Pacific Ocean.

Most of the annual precipitation in the Columbia River Basin occurs in the winter months with the bulk of the precipitation falling as snow in the higher elevations of the Rocky and Cascade mountains. Snowfall is heaviest between November and February. Natural winter stream flows are generally low with high sustained runoff flows occurring in the spring and early summer. Roughly 60 percent of the natural runoff of the Columbia occurs during May, June and July.

The Columbia River has an average annual runoff at its mouth of 198 million acre-feet or 275 kcfs (BPA et al., 2001) and drains an area of approximately 219,000 square miles of the US including the states of Washington, Oregon, and Idaho, and the northwestern portion of Montana and small areas of Wyoming, Nevada and Utah. An additional 39,500 square miles of the Columbia Basin, or about 15 percent, is contained within Canada, principally draining the southern portion of British Columbia (COE, 2005).

Within the US, the farthest upstream hydroelectric project on the mainstem Columbia River system is Grand Coulee Dam located at RM 597. Grand Coulee Dam is federally owned and operated by the Bureau of Reclamation (BOR). It has extensive storage capacity (5.19 million acre-feet) and has the largest installed capacity of any dam on the Columbia River with a nameplate capacity of 6,809 MW, making it a significant point-of-control for regulating flows and project operations throughout the entire downstream Columbia River system. Coordinated water releases from Grand Coulee Dam arrive first at Chief Joseph Dam which is federally owned and operated by the COE. Chief Joseph Dam (RM 545.3) is a run-of-river project, i.e., a project with limited storage capacity. It has a nameplate capacity of 2,069 MW.

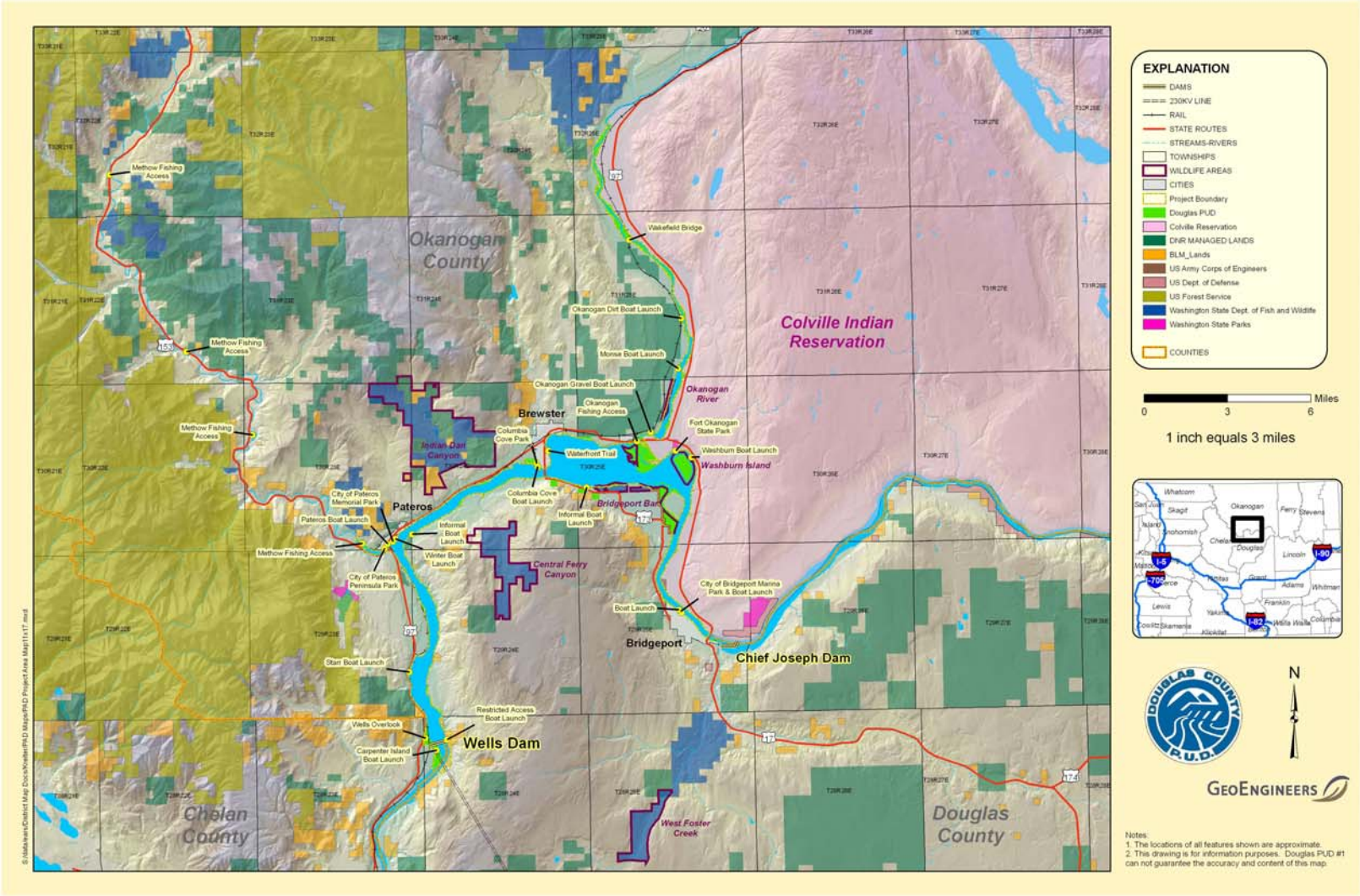

Figure 4.1-1 Wells Project vicinity map.

From Chief Joseph Dam, the next five downstream dams are owned and operated by the Public Utility Districts (PUDs) and are all run-of-river dams. At RM 515.8, Wells Dam is owned and operated by Douglas PUD and has a nameplate capacity of 774.3 MW. The next two projects are Chelan PUD's Rocky Reach and Rock Island dams, which are located at RM 473.7 and RM 453.4, and have nameplate capacities of 865.8 MW and 622 MW, respectively. The next two dams are Grant PUD's Wanapum (RM 415.8) and Priest Rapids (RM 397.1) dams, which have nameplate capacities of 831.3 MW and 788.5 MW, respectively.

Below Priest Rapids Dam, the Columbia River joins with the Snake River before flowing west through the four Lower Columbia River projects to the Pacific Ocean. These COE owned and operated run-of-river projects are McNary (RM 292, nameplate capacity 980 MW), John Day (RM 215.6, nameplate capacity 2,160 MW), The Dalles (RM 191.5, nameplate capacity 1,779.8 MW), and Bonneville (RM 146.1, nameplate capacity 1,050 MW) dams.

In order to accommodate all of the authorized purposes of the Columbia River system and those contemplated in the Columbia River Treaty between the United States and Canada, a number of agreements, such as the PNCA, have been enacted. The PNCA established processes that coordinate the use of planned Canadian storage operations with federal and non-federal hydroelectric project and thermal generation operations in the Pacific Northwest. This enables the region's power producers to optimize dependable power production (referred to as "firm load carrying capability") and usable secondary energy consistent with individual project and "system" non-power objectives to serve multiple river uses. The PNCA was revised in 1997 and has been approved by FERC for extension through 2024.

Spurred by the development of the Third Powerhouse at Grand Coulee Dam, the owners, operators and purchasers of power from seven dams that include both federal (Grand Coulee and Chief Joseph) and non-federal (Wells, Rocky Reach, Rock Island, Wanapum and Priest Rapids) dams of the mid-Columbia River have entered into a series of operating agreements since 1972. These agreements are intended to mitigate the potential adverse impacts of federal peaking operations on the downstream non-federal dams and achieve other power and non-power benefits through the coordinated operation of the seven projects. The primary objective of the current Mid-Columbia Hourly Coordination Agreement, signed in 1997, is to coordinate the hydraulic operation of the projects to optimize the amount of energy from the available water consistent with power needs and operation within all parties' power and meeting all power and non-power requirements. The other stated objectives of the agreement are to provide ease and flexibility of generation scheduling and to minimize unnecessary generation changes, including generator starts and stops.

4.2 Project Geography

The Wells Project lies in a north-south trending valley between two significantly different physiographic areas: the North Cascade Mountains to the west and the Columbia Plateau to the east. The North Cascade Mountains are characterized by rugged peaks averaging approximately 5,000 feet and reaching elevations of over 10,000 feet. Annual precipitation in the North

Cascades is over 100 inches and heavy snow accumulations are common. The Columbia Plateau is characterized by desert and shrub steppe conditions, averaging approximately 10 inches of precipitation a year. The Columbia River in the area of the Wells Project lies in a relatively narrow valley and is joined by three tributaries and a multitude of large, but dry, side canyons. The tributaries to the Columbia River within the Wells Project are the Methow River and Okanogan River. Foster Creek is a tributary outside the Wells Project Boundary but is within the Wells Project area.

The Wells Reservoir extends from Wells Dam upriver 29.5 miles to the tailrace of the Chief Joseph Dam. The Wells Reservoir has 93 miles of shoreline and a surface area of 9,740 acres at the normal reservoir elevation of 781 feet. The Wells Reservoir is between 1,300 and 8,000 feet wide, with an average width of 2,700 feet, and contains a total storage volume of 331,200 acre-feet with 97,985 acre-feet of usable storage within its 10-foot operating range. The Wells Reservoir also extends 1.5 miles and 15.5 miles up the Methow and Okanogan rivers, respectively. The Wells Project drains an area of 85,300 square miles and has an annual average runoff of 79 million acre-feet or roughly 109 kcfs.

4.3 Tributary Information

4.3.1 Methow River

The Methow River enters the Columbia River at RM 524 near the City of Pateros, Washington, approximately 8 miles upstream of Wells Dam. The Methow River has a watershed of 1,791 square miles. The northern portions of the Methow Basin are located in the Pasayten Wilderness and the Okanogan National Forest. The western portion of the basin is formed by the North Cascade Mountains with the middle and lower portions of the river basin defined by a U-shaped, moderately confined, alluvial valley. Elevations range from 781 feet at the river mouth to just under 9,000 feet at the highest upper watershed peaks. Principal tributary watersheds are the 245-square-mile Twisp River and the 525-square-mile Chewuch River. Annual precipitation in the Methow River Basin ranges from 15 to 80 inches per year.

4.3.2 Okanogan River

The Okanogan River originates near Armstrong, British Columbia and flows south through a series of lakes entering the Columbia River at RM 534, approximately 18 miles upstream of Wells Dam. The Okanogan watershed covers an area of approximately 8,200 square miles, 2,342 square miles (29 percent) of which occurs in the US. The northern portion of the watershed is in the Okanogan Highlands of the US and Canada. The southern part of the basin, near the river mouth, is in the northwest corner of the Columbia Plateau. Elevations range from 781 feet at the river mouth to over 8,400 feet at the highest upper watershed peaks. The principal tributary of the Okanogan River is the Similkameen River which accounts for approximately one-half of the drainage area of the entire Okanogan watershed. Annual precipitation in the Canadian portion of the Okanogan Basin ranges from 30 to 40 inches and from 10-15 inches in the US portion the basin.

4.3.3 Foster Creek

Foster Creek originates in eastern Douglas County and flows west through the Columbia Plateau where it enters the Columbia River near Bridgeport, Washington at RM 545. Foster Creek enters the Columbia River 30 miles upstream of Wells Dam and immediately downstream of the Chief Joseph Project. Foster Creek is an intermittent stream with some perennial reaches sustained by groundwater. High flows occur during the spring whereas flows during the rest of the year may cease altogether. Elevations in the Foster Creek drainage range from 790 feet at the river mouth to 2000 feet. There are no major tributaries to Foster Creek. The Foster Creek watershed drains an approximate 334 square mile catchment and annual precipitation ranges from 4 to 24 inches.

4.4 Land Use, Demographics and Water Use

4.4.1 Land Use

The Wells Project is situated in three counties of Washington State – Douglas, Okanogan, and Chelan (Figure 4.4-1). The mid-channel of the Columbia River is the dividing line between Douglas County and Okanogan and Chelan counties. All lands situated south and east of the reservoir are located in Douglas County. All lands situated north and the vast majority of lands situated west of the Wells Reservoir are located in Okanogan County. Lands within the Wells Project Boundary located in Chelan County consist of a relatively small area west of Wells Dam extending one mile upstream and downstream of the dam.

In general, land ownership in the Wells Project area is a mixture of local, state, tribal, federal and private interests. Douglas PUD owns approximately 89 miles of shoreline in fee title and approximately 5 miles of shoreline is owned by federal agencies and local governments. In all three counties, the majority of land adjacent to the Wells Project Boundary is privately owned and used for agriculture, rangeland, and residences. Agricultural uses include pasture, orchards, nurseries, and dry and irrigated lands used to grow crops. Natural meadow areas and the dry shrub steppe areas are largely used as rangeland. Residential areas are found primarily around the incorporated cities of Bridgeport, Brewster and Pateros.

Douglas PUD owns approximately 2,140 acres of land within the Wells Project Boundary. These lands are open and available for “full public utilization of such lands” as required by Article 7 of the FERC License for the Wells Project. However, there are locations within the Wells Project where full utilization is restricted, including restrictions for dam safety and cultural and environmental protection. Recreational facilities have been constructed in all three counties as part of the implementation of the Wells Recreation Plan (1967), Public Use Plan (1982) and Recreation Action Plans (1987, 1992, 1997 and 2002). Some of these facilities are located within the Wells Project Boundary while most of the city managed facilities are located immediately adjacent to Wells Project Boundary.

Recreation facilities located along the Wells Reservoir consist of riverfront trails, interpretive areas, picnic shelters, swimming areas, restrooms, fish cleaning stations, boat docks and boat launches. The facilities located within the three cities are maintained by each of the three respective city governments. Douglas PUD is responsible for implementing infrastructure improvements and major maintenance once those improvement and maintenance items have been incorporated in the Recreation Action Planning process.

Douglas PUD purchased 5,755 acres of land outside of the Wells Project Boundary in fee title and deeded these lands to the WDFW which manages them for the enhancement of wildlife and migratory birds in Okanogan and Douglas counties. In accordance with the 1974 Wildlife Mitigation Agreement, these deeded lands are operated by WDFW as wildlife areas. Additionally, WDFW manages lands within the Wells Project Boundary that are owned by Douglas PUD (except for Tribal lands) pursuant to the 1974 agreement. Similar to the recreational facilities, all of these wildlife areas are available for public use.

Within the Wells Project Boundary, there are small, scattered parcels of federal land. Currently, the Bureau of Land Management (BLM) holds title to eight tracts of land totaling roughly 224 acres within the Wells Project. The COE also owns 3 land parcels totaling less than 5 acres within the Wells Project. The BOR owns roughly 4 acres of land within the Wells Project. There are no USDA Forest Service (USFS) or USFWS lands within the Wells Project Boundary. In total, Douglas PUD pays annual charges for 232.7 acres of federal lands that are located within the Wells Project Boundary (See Figure 4.1-1).

4.4.2 Demographics

4.4.2.1 Douglas County

Douglas County is located near the geographical center of the state. The population of Douglas County was estimated to be 34,200 in 2004 (Washington State Office of Financial Management). Between 1990 and 2000, the population of Douglas County grew 24.4 percent, adding a total of 6,398 people to the population of the county (CensusScope, 2006). As of 2004, the population for the incorporated areas of Douglas County includes: East Wenatchee (8,255), Waterville (1,170), Bridgeport (2,075), Rock Island (870), Mansfield (325) and a portion of Coulee Dam (1,025). East Wenatchee is located 140 miles east of Seattle and 163 miles west of Spokane. The City of Bridgeport is the only community in Douglas County located along the Wells Reservoir. Bridgeport is located approximately 28 miles upstream of Wells Dam and approximately one mile downstream of Chief Joseph Dam. Douglas PUD helped fund and develop Marina Park, located in Bridgeport. Three units of the six-unit WWA are within Douglas County (West Foster Creek, Bridgeport Bar and Central Ferry Canyon).

In general, Douglas County is largely rural and agriculturally-based. The county is lightly populated outside the greater East Wenatchee area. Large areas of the County are developed for dry-land wheat farming. Areas with access to irrigation water are developed for fruit production. The transportation system serving Douglas County has been built to serve an agricultural economy. There are no large industrial developments in Douglas County. Agricultural activities employ approximately 26 percent of the county's working population (Access Washington,

2003). Lands in the Wells Project area are well-suited for various types of agriculture. Douglas County lands within the Wells Project are zoned 42 percent river-water irrigated agriculture, 30 percent dry land agriculture, 20 percent commercial agriculture, and 8 percent rangeland-conservation (NMFS, 2002).

4.4.2.2 Okanogan County

Okanogan County borders Douglas County to the north and extends to the border of Washington State and Canada. The Colville Indian Reservation occupies a large portion of the eastern part of Okanogan County. The population of Okanogan County was estimated to be 39,600 in 2004. Between 1990 and 2000, the population of Okanogan County grew 18.6 percent, adding a total of 6,214 people to the population of the county (CensusScope, 2006). In 2004, the population of the incorporated areas of Okanogan County includes: Omak (4,700), Okanogan (2,435), Brewster (2,195), Conconully (190), Coulee Dam (1,025), Elmer City (265), Nespelem (210), Oroville (1,670), Pateros (610), Riverside (320), Tonasket (1,005), Twisp (960) and Winthrop (360). The cities of Pateros and Brewster are the only communities in Okanogan County located along the Wells Reservoir. Pateros is located approximately 8 miles upstream of Wells Dam and Brewster is located approximately 15 miles upstream of Wells Dam. Douglas PUD helped fund and develop Columbia Cove Park in Brewster and Memorial Park and Peninsula Park in Pateros. Three units of the six-unit WWA reside within Okanogan County (Okanogan River, Washburn Island, and Indian Dan Canyon).

Like Douglas County, Okanogan County is largely rural and lightly populated with a dependence on agriculture and natural resources. Major land uses are associated with the agricultural and forestry industries. These industries employ approximately 27 percent of the county's working population (Access Washington, 2003). Only 30 percent of the land within the county is in private ownership due to the large amounts of state and federal land in the county. Okanogan County land, in the Wells Project area, consists of two incorporated cities (Pateros and Brewster), the southern border of the Colville Indian Reservation, and large expanses of open land which are zoned minimum requirement district for all uses that are generally unrestricted. Incorporated cities are zoned consistent with public use. The Methow and Okanogan river watersheds are both within Okanogan County. Agriculture, pasture, and residential ranches are some of the chief uses found in the unincorporated areas of the Methow and Okanogan river valleys (NMFS, 2002).

4.4.2.3 Colville Indian Reservation

The Colville Indian Reservation is located in the southeast corner of Okanogan County. Reservation lands cover 1.4 million acres (2,100 square miles) with approximately 700,000 acres in Okanogan County. The Colville Indian Reservation has a population of over 5,000 people (CCT, 2005). Reservation lands consist of tribally owned lands held in federal trust status for the CCT, land owned by individual Tribal members, most of which is held in federal trust status, and land owned by others, described as fee property and taxable by counties (CCT, 2005). Colville reservation lands in the Wells Project area have zoning ordinances and land use codes determined by tribal government. Tribal lands in the Wells Project area are zoned special requirement, rural, and game reserve. Lands zoned special requirement consist of residential,

commercial, industrial and agricultural use whereas lands zoned rural are designated for low density and agricultural development. Game reserve lands, including a portion of the Cassimer Bar, are designated for game management and protection.

4.4.2.4 Chelan County

Chelan County borders Douglas County to the east and Okanogan County to the southeast. The population of Chelan County was estimated to be 68,400 in 2004. Between 1990 and 2000, the population of Chelan County grew 27.5 percent, adding a total of 14,366 people to the population of the county (CensusScope, 2006). In 2004, the population of the incorporated areas of Chelan County includes: Cashmere (2,980), Chelan (3,645), Entiat (1,010), Leavenworth (2,165) and Wenatchee (28,760). There are no communities in Chelan County located along the Wells Reservoir. Only a small area adjacent to the Wells Project on the west side of the Columbia River is within Chelan County. Similar to both Douglas and Okanogan counties, major land uses are associated with the agricultural and forestry industries. These industries employ approximately 20 percent of the county's working population (Access Washington, 2003). Land use in the Wells Project is a mix of agriculture, rangeland, and residential use for hatchery personnel. The Wells Dam Overlook is located in Chelan County and is both owned and maintained by Douglas PUD. The Wells Fish Hatchery, owned by Douglas PUD and located immediately west of Wells Dam, is located in Chelan County.

4.4.3 Water Use

Snowmelt is the primary water supply source for the Columbia River and its tributaries. Water from the Wells Reservoir is utilized or withdrawn at various locations for consumptive and non-consumptive uses. Orchards with fruit trees represent the primary agricultural activity throughout the area and are dependent upon a reliable source of irrigation water. Irrigation withdrawals constitute the largest segment of consumptive water use in the Wells Project area. The irrigation season begins in late March or April and continues through October. Peak irrigation use occurs in June, July and August when temperatures in the region are highest. The majority of consumptive water use within the Wells Project Boundary is non-Project related. Fish hatcheries and other artificial propagation facilities within the Wells Project area withdraw water primarily for non-consumptive uses. Because the water from these facilities is returned close to the point of withdrawal, there is a negligible effect on instream flow. Douglas PUD holds water rights for Wells Project purposes. These uses are considered non-consumptive uses.

5.0 DESCRIPTION OF ENVIRONMENTAL RESOURCES AND IMPACTS

5.1 Geology and Soils

5.1.1 Geology

The geologic units that are exposed in the Wells Project area reflect the complex geologic history of north central Washington State over the past 200 million years of earth history. The oldest exposed bedrock units include metamorphic rocks such as schist and gneiss and related intrusive igneous rocks that date from pre-Jurassic to late Cretaceous time. These older rocks were intruded by granite and other plutonic igneous rocks during the early to middle Eocene (Chatters 1986; Miller 1975; Alt and Hyndman, 1984; Stoffel, et al., 1991). The hills and mountains of the Okanogan Highlands to the west, north and northeast are comprised largely of these igneous and metamorphic rocks. They also appear as localized outcrops along the Columbia River near Bridgeport and in the east canyon wall below Pateros. The igneous and metamorphic rocks are capped by Miocene-age flood basalt high above the valley floor (Figure 5.1-1).

The entire Wells Project area was buried under a thick sheet of glacial ice on several occasions during approximately the past two million years. These Pleistocene-age ice sheets developed in Canada and flowed southward across the Wells Project area as far south as the Waterville area. At the glacial maximum, more than two thousand feet of ice existed in the Wells Project area, extending higher than the valley walls and blocking the flow of the Columbia River. The most recent ice sheet melted and receded northward from the area about 13,000 years ago (Waitt and Thorson, 1983). Glacial deposits, lake sediments and river terraces associated with the waning glaciation cover the bedrock in much of the Wells Project area. These glacial, lacustrine and alluvial deposits form much of the valley floor of the Wells Reservoir area, as well as the floor of the Methow and Okanogan River valleys.

The valley floor is about 4,000 feet wide at the location of Wells Dam. The east side (left bank) of the valley consists of a series of narrow terraces. The west side (right bank) consists of a terrace at elevation 720 feet that is about 2,000 feet wide, followed by a 2,000-foot-wide terrace extending from elevation 750 feet to 775 feet , where it meets a steep bedrock face that serves as the west abutment for Wells Dam. The valley bottom continues with another glacial-age terrace at an elevation of 880 feet and another at 1,200 feet that meets the bedrock west valley wall.

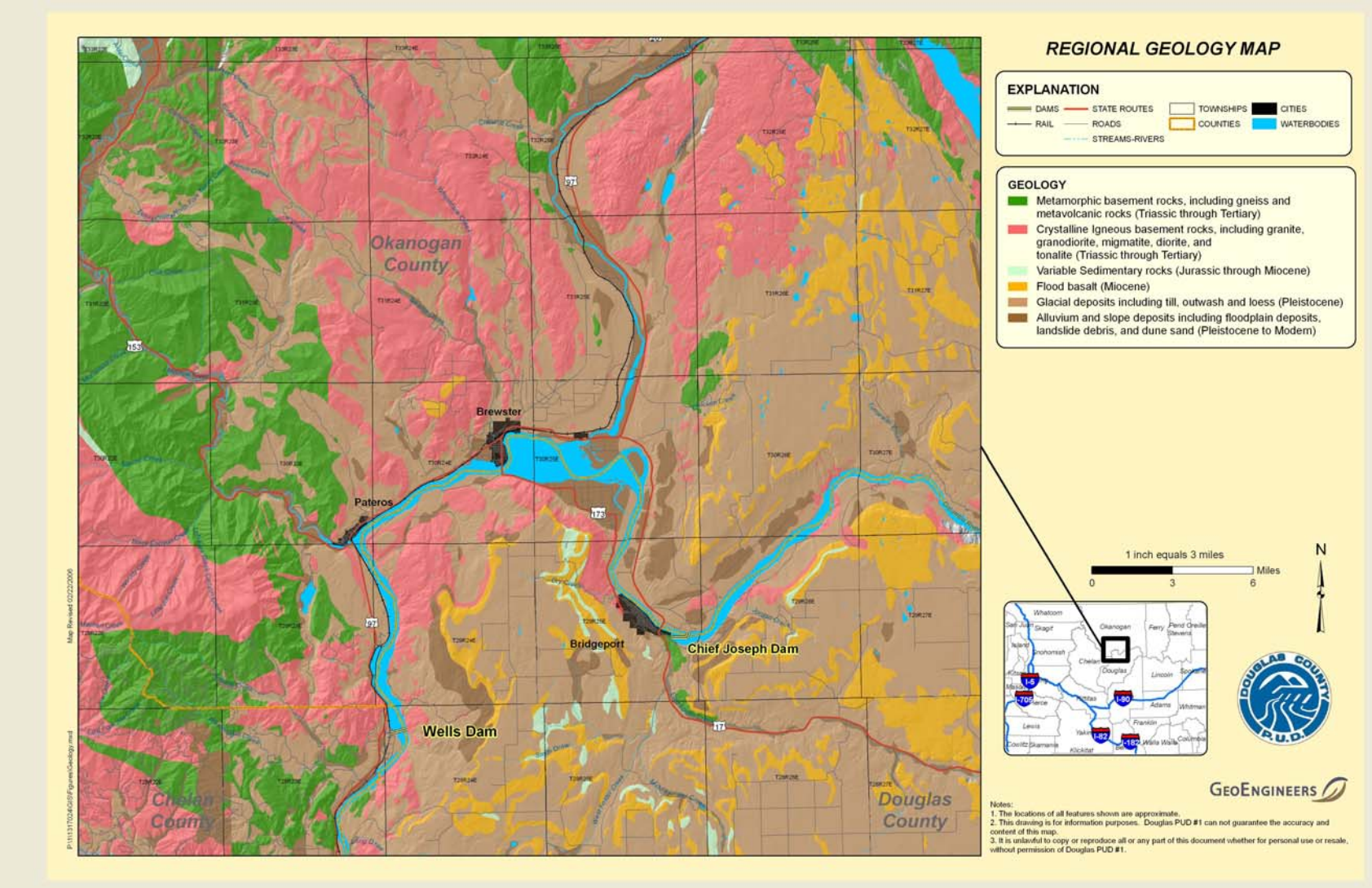

Figure 5.1-1 Wells Project geology.

5.1.1.1 Dam Site and Reservoir

The site for Wells Dam was selected because of the presence of bedrock on either side of the valley. Prior to construction, the river channel was 700 feet wide located against the east valley wall (Figure 3-2) (Galster, 1989; NMFS, 2002). The east side of the dam is an embankment 1,030 feet long, with underlying glacial and alluvial sediments that rest on granitic bedrock. The west side of the dam is an embankment 2,300 feet long, with underlying layers of glacial and alluvial sediments as thick as 200 feet to granitic bedrock. The concrete portions of the dam (spillway, powerhouse and fish ladders) are constructed on an irregular surface of granitic bedrock that is cut by north-trending basic igneous dikes. The dam site and reservoir valley floor are underlain by a sequence of glacial and fluvial deposits consisting of gravel and sand with local cobble and boulder units, and silty, sandy gravel with lenses of fine sand and silt (lacustrine) deposits (Galster 1989; NMFS 2002).

A deep ancestral channel of the Columbia River is present west of the west abutment of Wells Dam. This ancient channel is filled with alluvial and lacustrine deposits that include mixtures of clay, silt, sand, gravel, cobbles and boulders. The base of the ancestral channel is at approximately elevation 354 feet, which is about 220 feet lower than the bedrock floor of the channel directly beneath Wells Dam.

5.1.1.2 Methow River

The Methow River is located in a fault-bounded graben underlain with highly folded sedimentary and volcanic rocks of Tertiary age (NMFS, 2002). The Methow valley lies between the Gardner Mountain Fault and the Pasayten Fault. The sedimentary rocks within the graben weather easily compared to the older igneous and metamorphic rocks and are typically covered by a thick section of glacial and alluvial deposits. Upper valley areas are steep and mountainous and occur within the Chelan/Colville granitic complex. The Lower Methow River Basin occurs within hills underlain by igneous and metamorphic rocks. The Methow River occupies a U-shaped, confined alluvial valley from near Carlton to RM 6.5 and a U-shaped, moderately confined alluvial valley from RM 6.5 to the mouth.

5.1.1.3 Okanogan River

The Okanogan River valley is a part of the Colville complex of granitic and metamorphic rocks. The Omak Lake Fault runs up the Okanogan valley. West of the fault is a mix of igneous plutons, gneiss, and metamorphosed deep ocean sediments of the Okanogan trench deposit. These include argillite, phyllite, volcanic rocks, limited carbonate rocks and greenstone. On the east side of the basin, east of the Omak Lake Fault, the rocks are part of the Okanogan metamorphic core complex, generally consisting of an intrusive granitic dome and surrounding metamorphic gneiss. The Okanogan valley has a thick deposit of glacial deposits that covers the bedrock in most areas.

All of the of the Okanogan valley in the Wells Project area was modified by glaciation. This area has steep to rolling hills along the valley walls, with flat to moderate slopes on ancient terraces and along the valley bottoms (NMFS, 2002).

5.1.2 Soils

Soil types in the Wells Project area are variable and reflect a diversity of parent materials and slope conditions that surround Wells Reservoir (Figure 5.1-2). All of the surface soils are relatively youthful, having formed after deglaciation about 13,000 years ago. The local soil units are developed in a variety of glacial and alluvial deposits, in weathered bedrock and in slope deposits (colluvium). Along the river terraces in the Wells Project area, well-drained soils have formed in deposits of loess, which is a mixture of wind-blown silt and fine sand. Soils have also formed in volcanic ash deposits and ancient lake bottom sediments (NMFS, 2002).

5.1.2.1 Dam Site and Reservoir

Dominant soil types at the Wells Dam site includes the Peoh soil series, formed in old alluvium with a surface layer of loess and volcanic ash; and the Cashmont soil series, formed in alluvial and colluvial materials. The Peoh soils are a gravelly, fine, sandy loam with slopes of 3 to 15 percent on the river terraces. They have moderately rapid permeability, slow to moderate runoff potential, and a water erosion susceptibility of slight to none. The Cashmont soils are a sandy loam with slopes of 3 to 8 percent at the edges of the terraces and near the valley walls. They have moderately rapid permeability, slow to medium runoff potential, slight to moderate water erosion susceptibility, and slight to moderate wind erosion potential (NMFS, 2002).

5.1.2.2 Methow River

The terraces of the Methow valley have Pogue-Cashmont-Cashmere soils downstream of the town of Carlton. These soils formed in glacial deposits at elevations from 700 to 1,050 feet. They are typically deep, somewhat excessively drained or well drained with moderately rapid permeability. Their runoff potential is slow on low-gradient slopes and medium to rapid on steep slopes. Water erosion susceptibility is none to slight on low-gradient slopes and moderate to high on steep slopes. The Cashmont and Cashmere soils have moderate wind erosion potential. Surface erosion is not considered a major issue in the Methow basin (NMFS, 2002).

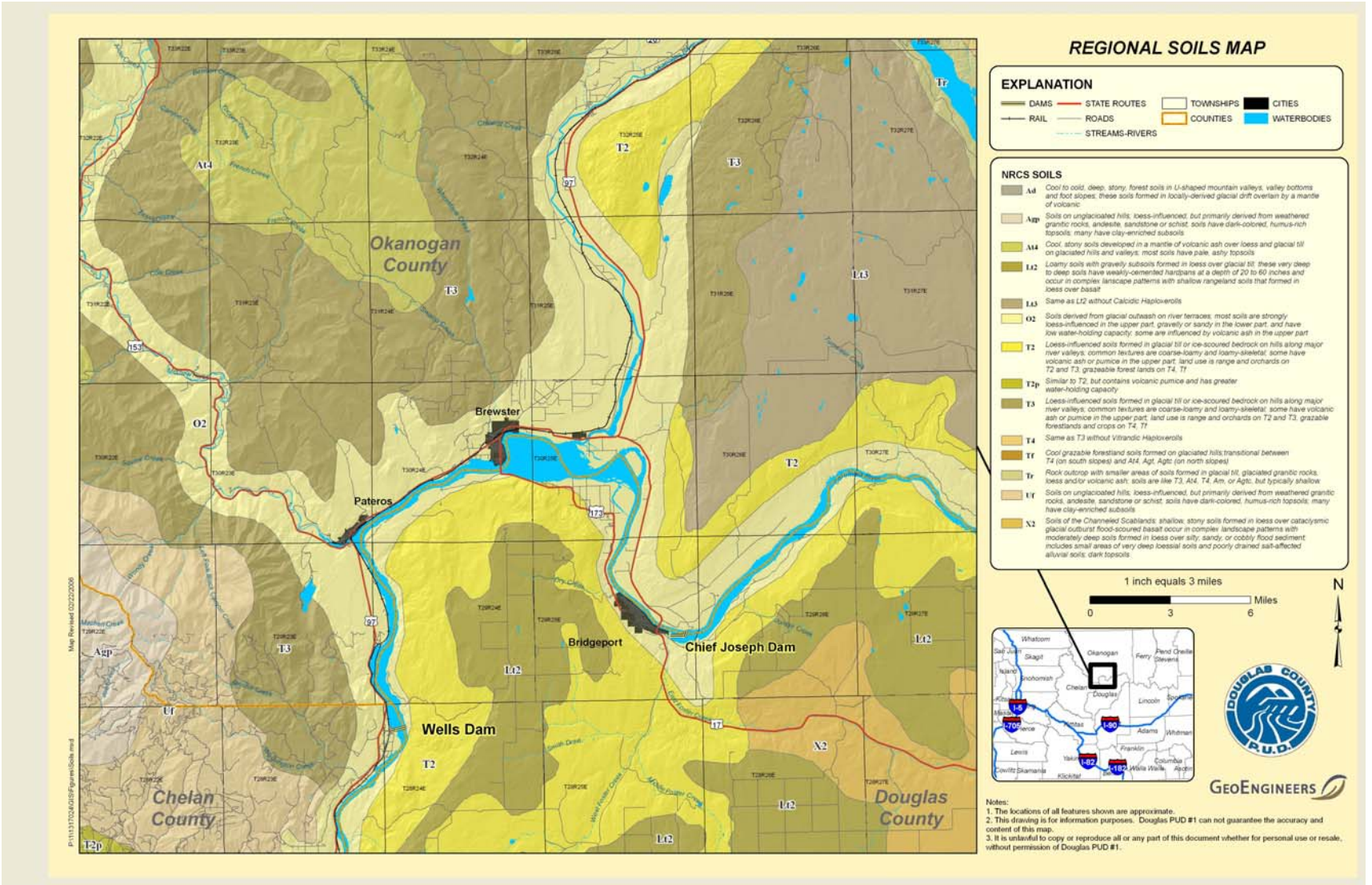

Figure 5.1-2 Wells Project area soil types.

5.1.2.3 Okanogan River

On the terraces, ridges, hillsides and glacial till plains, the common Okanogan Basin soils include the Nighthawk-Conconully-Lithic Xerochrepts and Disanutel-Conconully-Nespelem associations. These are deep to very shallow soils formed on grasslands, rock outcrops, terraces and dissected upland plains (NMFS, 2002).

The Nighthawk-Conconully-Lithic Xerochrepts association soils formed in glacial deposits and weathered granite. Most of the association soils are on ridges and hillsides. The ridges are gently rounded and the hillsides are steep. They have moderate to moderately rapid permeability, and their runoff potential is slow to rapid on low-gradient slopes and rapid to very rapid on steep slopes. Their susceptibility to water erosion is slight to high on low-gradient slopes and high to very high on steep slopes. Nighthawk-Conconully-Lithic Xerochrepts soils occur at elevations from 700 to 3,000 feet.

Common soil associations along the valley bottoms of the Okanogan River and tributaries include the Pogue-Cashmont-Cashmere and Colville-Okanogan associations. These are deep, mostly grassland and meadow soils on terraces and floodplains. The terraces along the valleys consist of Pogue-Cashmont-Cashmere association soils as described for the Methow Basin. The Colville-Okanogan association soils are found along the valley bottom floodplains that are subject to flooding. They are deep, somewhat poorly drained or well-drained soils formed in alluvium. They have moderately slow to moderate permeability, and their runoff potential is very slow. Their susceptibility to water erosion is none to slight. These soils occur at elevations from 700 to 2,000 feet.

Much of the floodplain on the Okanogan is used for crops and winter livestock; during the summer, livestock graze the uplands. Some of the tributaries support year-round ranching. High runoff and erosion rates deliver sediment to ditches and creeks during rainstorms and periods of rapid snowmelt.

Surface erosion on bottom lands and mass wasting on adjacent hillslopes were serious problems in the 1970s, when clean cultivation and rill irrigation were common in the basin. This erosion source has been reduced somewhat by a switch to alfalfa and seed production and by adoption of Best Management Practices.

5.1.3 Reservoir Shoreline and Streambank Conditions

Shoreline conditions vary throughout Wells Reservoir. The majority of shoreline is stable and vegetated (Figure 5.1-3), while other areas have varying degrees of erosion ranging from active (Figure 5.1-4), nearly stabilized (Figure 5.1-5), exposed bedrock (Figure 5.1-6) and riprap (5.1-7). Varying amounts of erosion of the Wells Reservoir banks have occurred throughout the reservoir perimeter since the Wells Project was constructed. The greatest amount of erosion occurred along the left bank (looking downstream) of the Columbia River between Pateros and Wells Dam, on the left bank downstream from the Brewster Bridge, on the right bank

downstream from the mouth of the Okanogan River and along the banks of the lower Okanogan River (Bechtel 1970).

Erosion is an ongoing natural process, making the influence of the Wells Project difficult to determine. However, ongoing Wells Project operations may have modified the rate and location of shoreline erosion. Most of the shorelines along the Wells Project appear to be stable and any ongoing erosion appears to be progressing relatively slowly. Most eroding areas are gaining some protection from riparian vegetation and armoring by cobbles along the toe of eroding faces.

The lower Okanogan River both within and upstream of the limits of Wells Reservoir has experienced considerable erosion and recent attempts to control it have been only partially successful. The banks are composed of fine alluvial material which is easily eroded by wave and current action, making the formation of a stable beach a difficult and sometimes lengthy process. Erosion along the Okanogan River, as is customary for alluvial streams, likely occurs primarily as a result of flood flows when tractive forces exceed the shear forces necessary to begin to mobilize the alluvial deposits.

Douglas PUD has studied reservoir erosion in the lower Okanogan River (Jacobs, 2003) and has evaluated the extent of erosion over the next 50 years throughout the Wells Reservoir. Douglas PUD has addressed erosion issues on a case-by-case basis through a combination of shoreline erosion protection methods or through acquisition of the affected property.

Figure 5.1-3 Example of typical shoreline conditions on Wells Reservoir.

Figure 5.1-4 Example of actively eroding shoreline on Wells Reservoir.

Figure 5.1-5 Example of vegetated and stable shoreline on Wells Reservoir.

Figure 5.1-6 Example of exposed bedrock shoreline on Wells Reservoir.

Figure 5.1-7 Example of riprapped shoreline on Wells Reservoir.

5.2 Water Resources

This section summarizes the existing water resources (drainage area, water quantity, water quality, water rights and water use) and applicable water quality standards in the Wells Project area. This section also addresses Project effects on water resources and management plans that have been implemented to address such impacts.

5.2.1 Drainage Area

The drainage area of the Columbia River Basin upstream of the Wells Project is approximately 85,300 square miles. The Wells Dam is located at RM 515.8 on the Columbia River in north central Washington State. The Wells Project Boundary encompasses 29.5 miles of the mainstem Columbia River extending upstream to the tailrace of the Chief Joseph Project at RM 545.1. The Wells Reservoir has riverine characteristics in the upper 5-mile section located below the Chief Joseph Dam tailrace. The middle 10-mile section is more characteristic of a lacustrine environment. The lowermost 15-mile section is relatively narrow and fast flowing, compared to the middle section, but eventually slows and deepens as it nears the Wells Forebay (Beak, 1999).

The two tributaries within the Wells Project are the Methow and Okanogan rivers. The Methow River enters the Columbia River (RM 524) at the City of Pateros, Washington, approximately 8 miles upstream of Wells Dam. The Methow River watershed has a drainage area of 1,791 square miles. The Wells Project Boundary extends 1.5 miles up the lower Methow River. The Okanogan River originates near Armstrong, British Columbia, and flows south through a series of lakes to the Columbia River. It enters the Wells Reservoir at RM 534, approximately 18 miles upstream of Wells Dam. The drainage area of the Okanogan River is approximately 8,200 square miles, 2,342 square miles (29 percent) of which are located in the United States (US). The Wells Project Boundary extends 15.5 miles up the lower Okanogan River.

5.2.2 Morphometric Data for Existing Reservoir

Table 5.2-1 summarizes the relevant morphometric characteristics of the Wells Reservoir including surface area, volume, maximum depth, mean depth, flushing rate, shoreline length and substrate composition.

Table 5.2-1 Morphometric characteristics of the Wells Reservoir.

Morphometric Characteristics	Wells Reservoir
Surface Area	9,740 acres
Volume	331,200 acre-feet
Maximum Depth	>100 ft.
Mean Depth	34 ft.
Flushing Rate	0.48-2.98 days[1]
Shoreline Length	93 miles
Substrate Composition	N/A

[1] Flushing rate varies seasonally with average flushing rates of 0.48 days in June and 2.98 days in January.

In March, 2005, Douglas PUD conducted a detailed bathymetric survey of the Wells Project waters using multibeam sonar and GPS technology. Contour maps of the reservoir bottom were produced at 1-foot contour intervals (Appendix E) and a digital elevation model (DEM) was produced at a pixel resolution of 10-feet. The DEM provides a seamless representation of the reservoir bottom.

5.2.3 Gradient of Downstream Reaches

In the river reach downstream of Wells Dam, water surface elevations do not remain constant and can fluctuate measurably. The variation in water surface elevation through the reach is determined by the operations of both Wells Dam and Rocky Reach Dam and the river flow. Therefore, the gradient of the river reach downstream of Wells Dam is more appropriately reported as a range of values determined by a variety of dynamic factors. As an example, with a headwater elevation at Rocky Reach Dam of 707 feet and a flow of 100 kcfs, the tailwater elevation at Wells Dam is approximately 4 feet higher, or at elevation 711 feet. The Columbia River reach from Wells Dam to Rocky Reach Dam is 43 miles long. Therefore, the gradient from the Wells Tailrace to the Rocky Reach forebay is .093 feet/mile at a river flow of 100 kcfs.

5.2.4 Water Quantity

The Columbia River system is primarily fed by snowmelt. Numerous dams and impoundments developed for hydropower and flood control alter the natural flow regime in the basin. The inflow to the Wells Reservoir is primarily determined by operations of the Federal Columbia River Power System (FCRPS), which is managed for a number of purposes, including flood control, irrigation, power production, protection of fish resources and recreation. In general, the FCRPS is operated to fill upstream storage reservoirs by the end of June, provide augmented summer flows for fish passage and power production through the summer, draft storage

reservoirs to meet power demand and salmon spawning requirements through the fall and winter and, depending on snow accumulations and runoff forecasts, draft for flood control and fill to meet the June refill target through the spring (Chelan PUD, 2005). The FCRPS manages for these objectives using releases from storage at Grand Coulee, adjusted for inflow from tributary streams above the Wells Project (Okanogan and Methow rivers) and below the Wells Project (Entiat, Wenatchee, Yakima and Snake rivers).

The Wells Reservoir has a surface area of 9,740 acres at a maximum reservoir elevation of 781 feet and is between 1,300 feet and 8,000 feet wide, with an average width of 2,700 feet. Total Wells Reservoir storage volume is 331,200 acre-feet with 97,985 acre-feet of usable storage (based on the 10-foot operating range from 781 feet to 771 feet). The Wells Project is considered a run-of-river facility, meaning that on average, daily inflow to the Wells Reservoir equals daily outflow. The amount of usable storage and the ability to modify river flows is limited. River flows in excess of powerhouse capacity are spilled when reservoir elevations approach the forebay elevation of 781 feet.

Douglas PUD records daily measurements of flow through turbines plus spillway flow, when occurring, at Wells Dam. The average flow in the Columbia River at Wells Dam from 1968 to 2005 was 110.8 kcfs and average monthly flows ranged from 51.9 kcfs to 348.7 kcfs (Table 5.2-2). Columbia River flow duration curves based on Douglas PUD flow records for Wells Dam from 1968-2005 are provided in Figures 5.2-1 through 5.2-12.

Table 5.2-2 Monthly average flows (kcfs) of the Columbia River at Wells Dam from 1968 to 2005.

	Jan*	Feb*	Mar*	Apr*	May*	Jun*	Jul	Aug	Sep	Oct	Nov	Dec
Min	67.4	69.9	56.0	51.9	55.2	73.7	53.4	63.9	57.2	56.0	63.8	72.6
Mean	109.5	111.1	108.5	113.3	146.8	158.7	131.4	105.2	78.0	78.1	88.7	102.2
Max	159.2	180.7	193.9	184.9	262.6	348.7	221.9	181.3	123.0	108.9	110.0	149.0

* Discharge data for 1968 were not available.

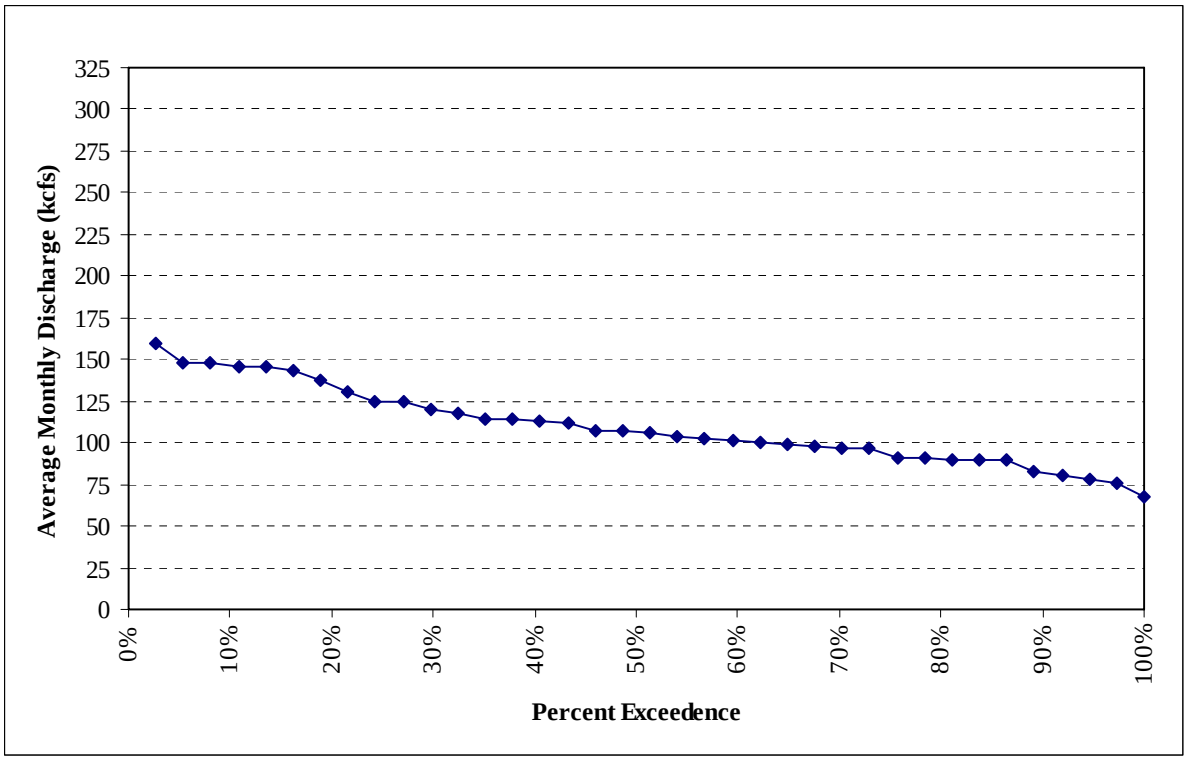

Figure 5.2-1 Flow duration curve for January 1969-2005 at Wells Dam.

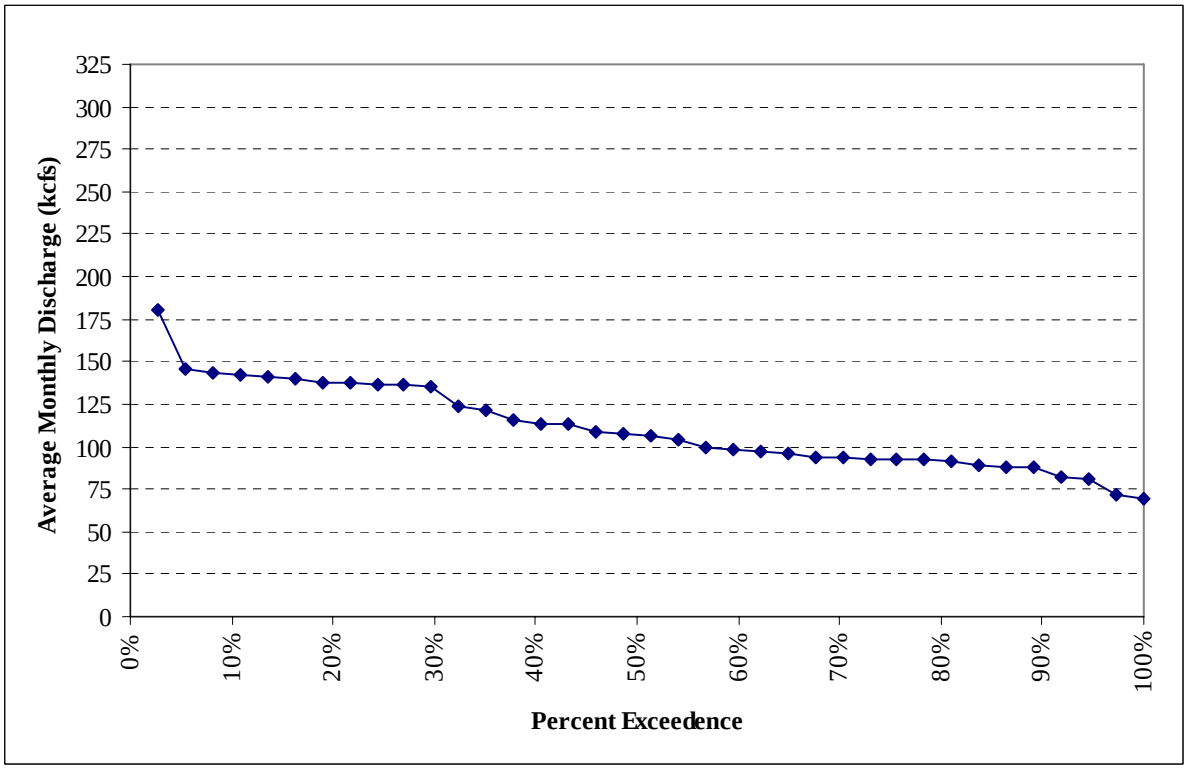

Figure 5.2-2 Flow duration curve for February 1969-2005 at Wells Dam.

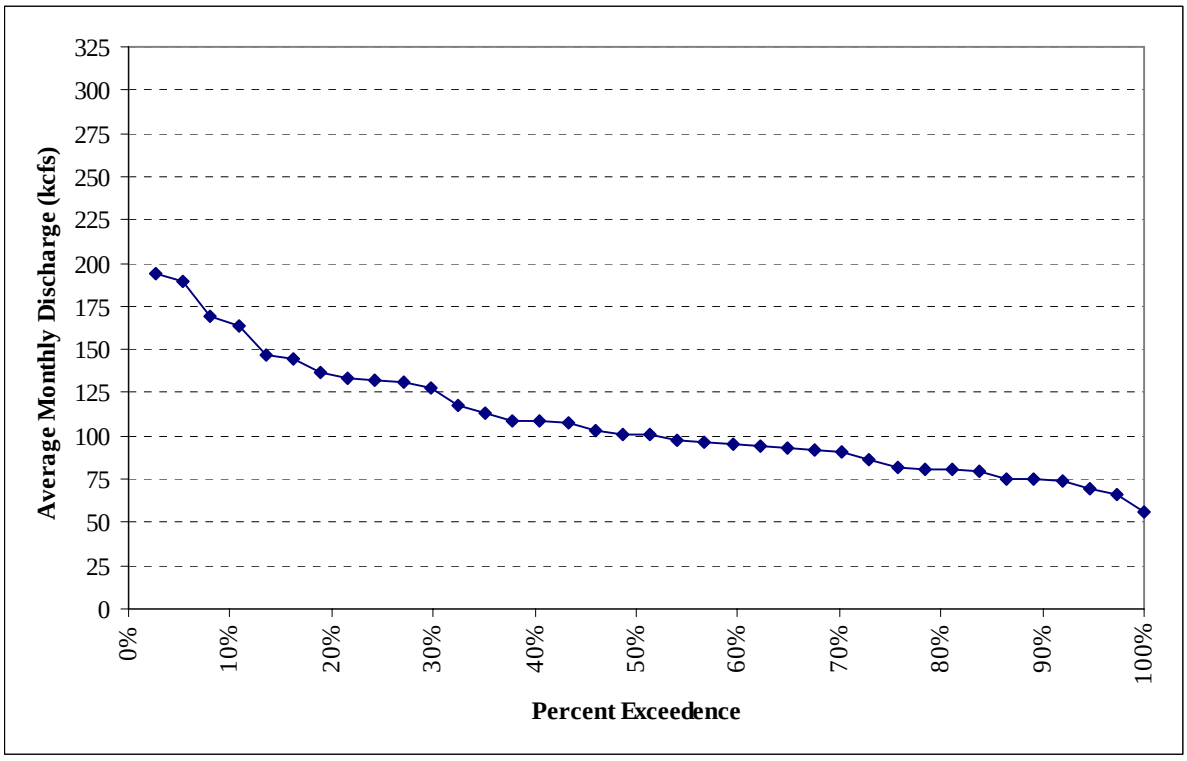

Figure 5.2-3 Flow duration curve for March 1969-2005 at Wells Dam.

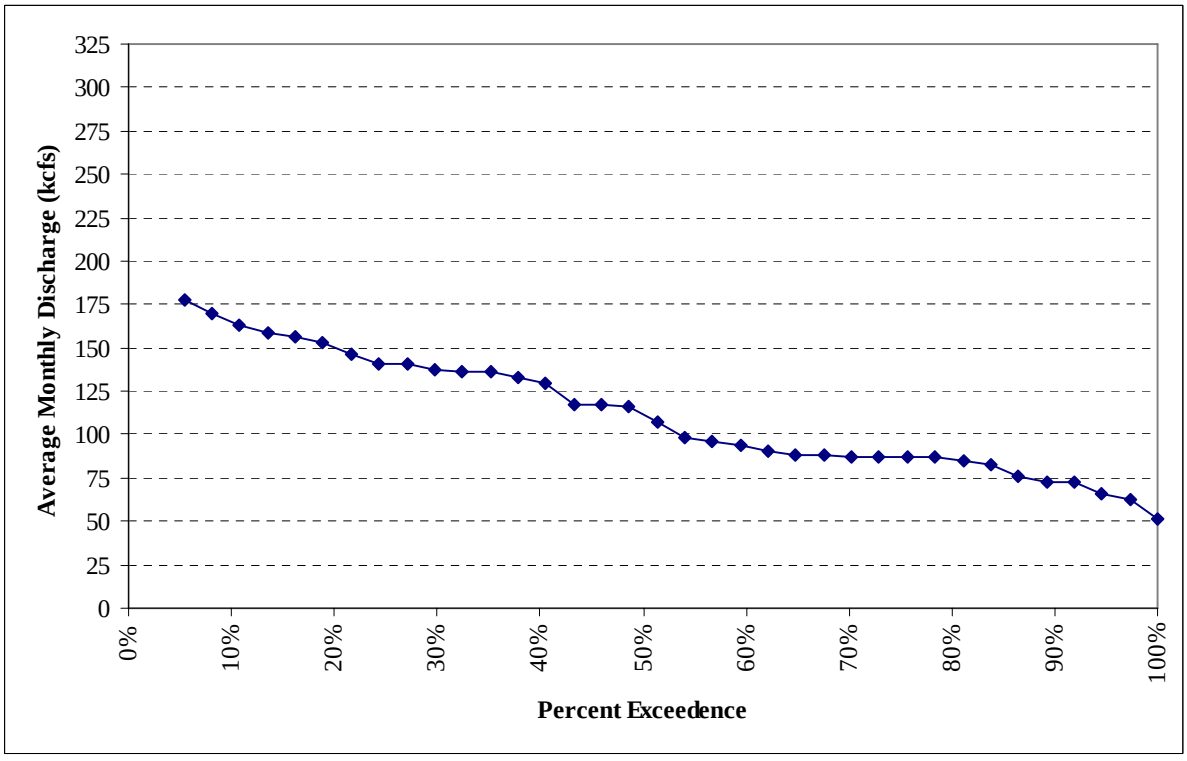

Figure 5.2-4 Flow duration curve for April 1969-2005 at Wells Dam.

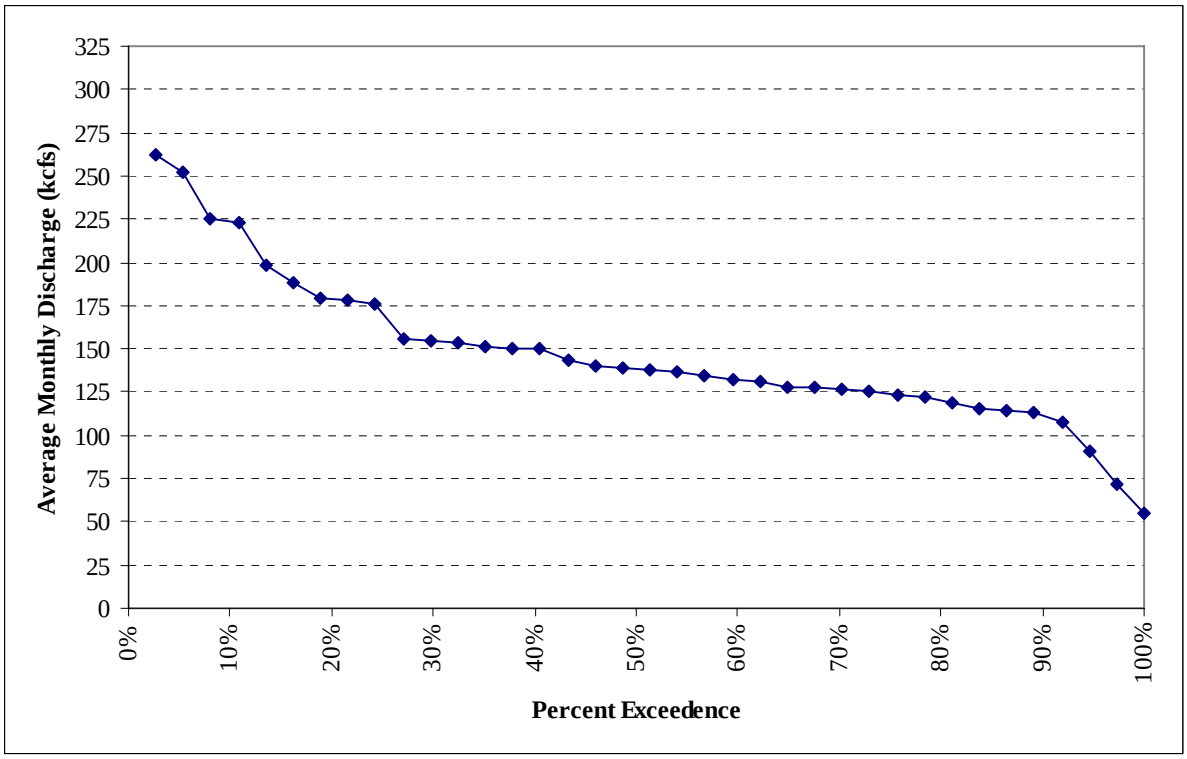

Figure 5.2-5 Flow duration curve for May 1969-2005 at Wells Dam.

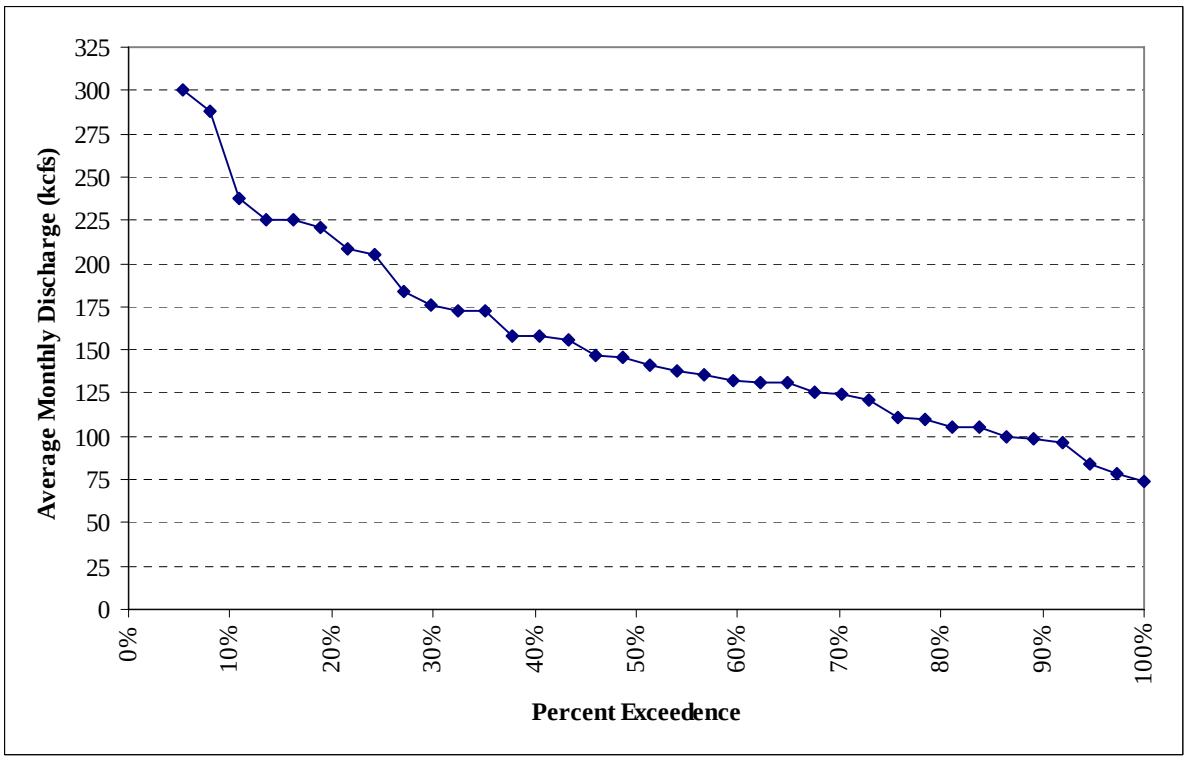

Figure 5.2-6 Flow duration curve for June 1969-2005 at Wells Dam.

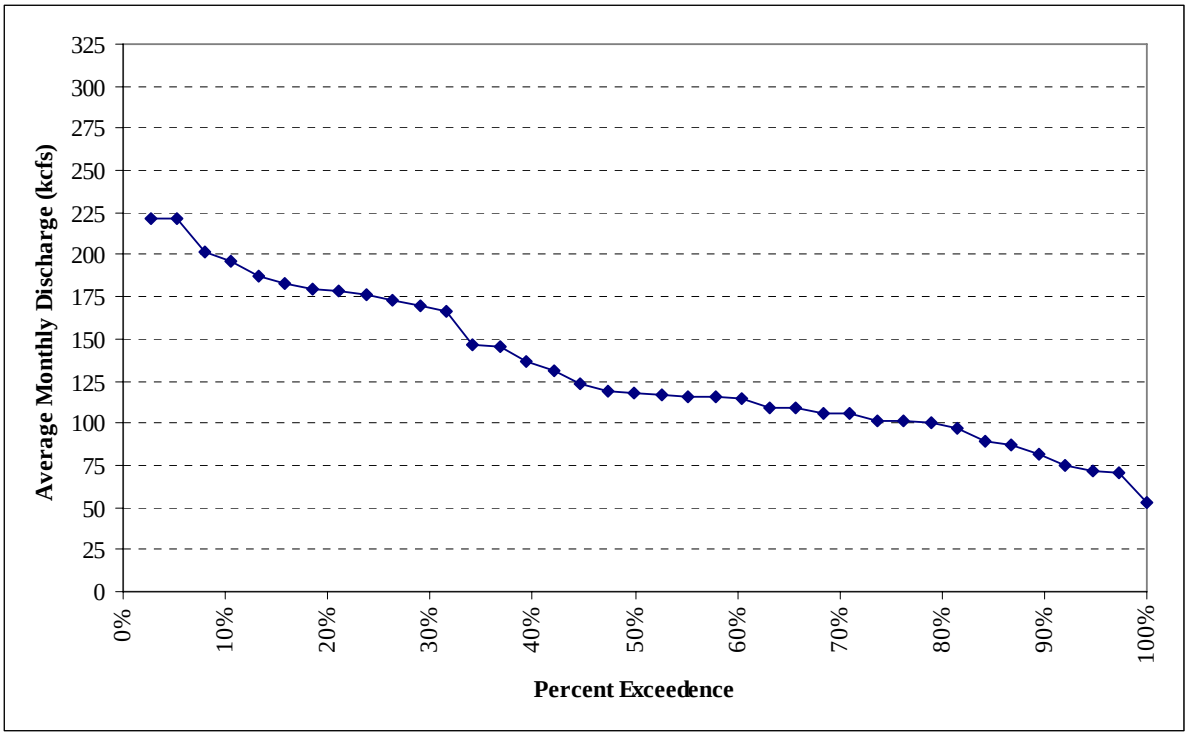

Figure 5.2-7 Flow duration curve for July 1968-2005 at Wells Dam.

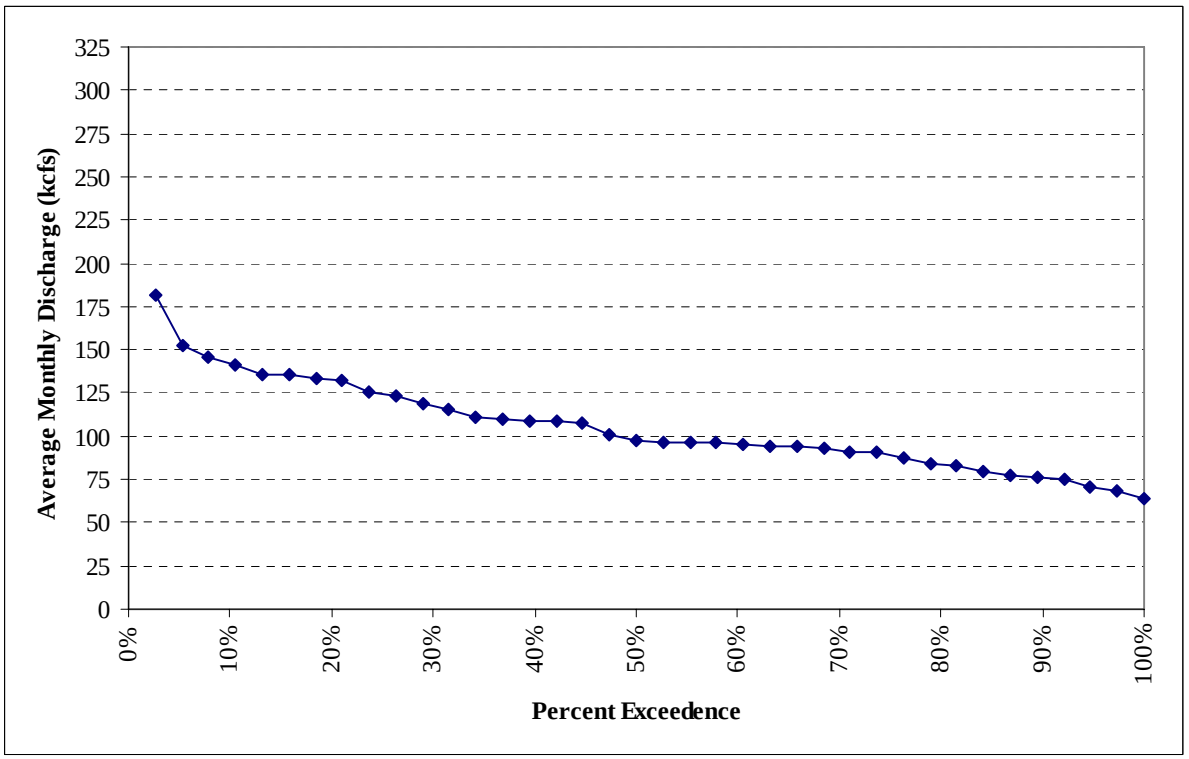

Figure 5.2-8 Flow duration curve for August 1968-2005 at Wells Dam.

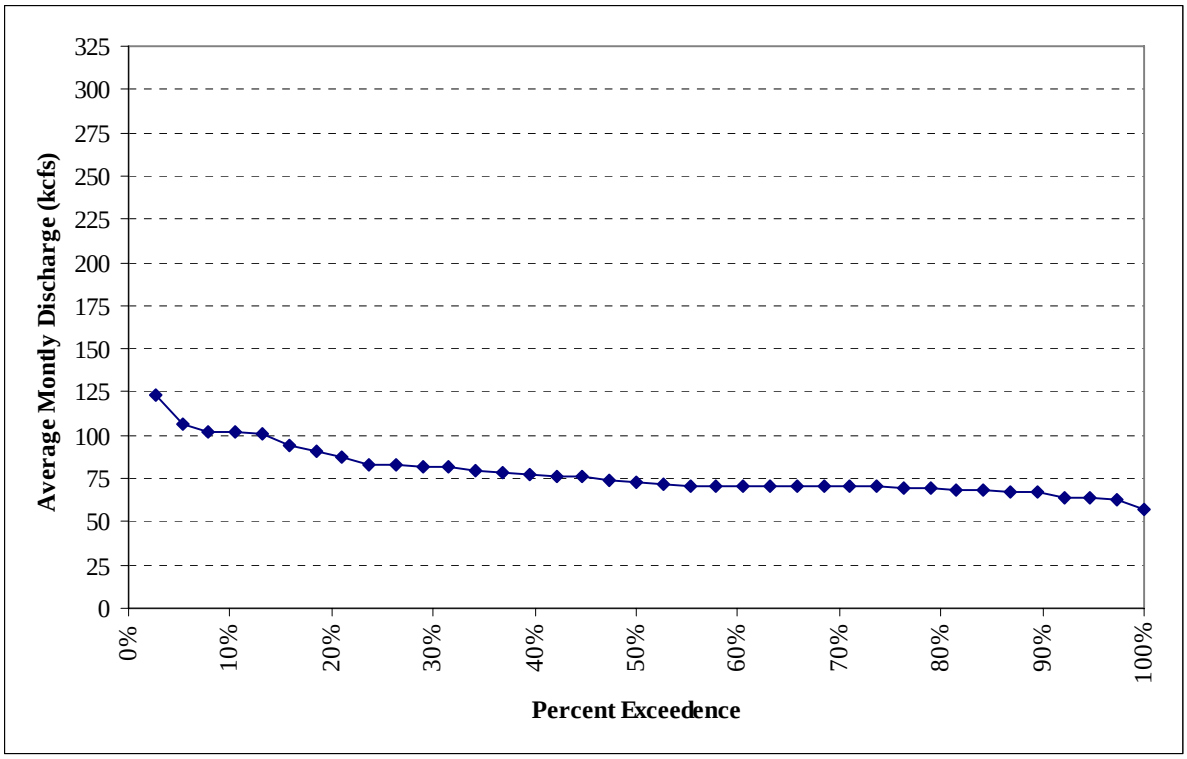

Figure 5.2-9 Flow duration curve for September 1968-2005 at Wells Dam.

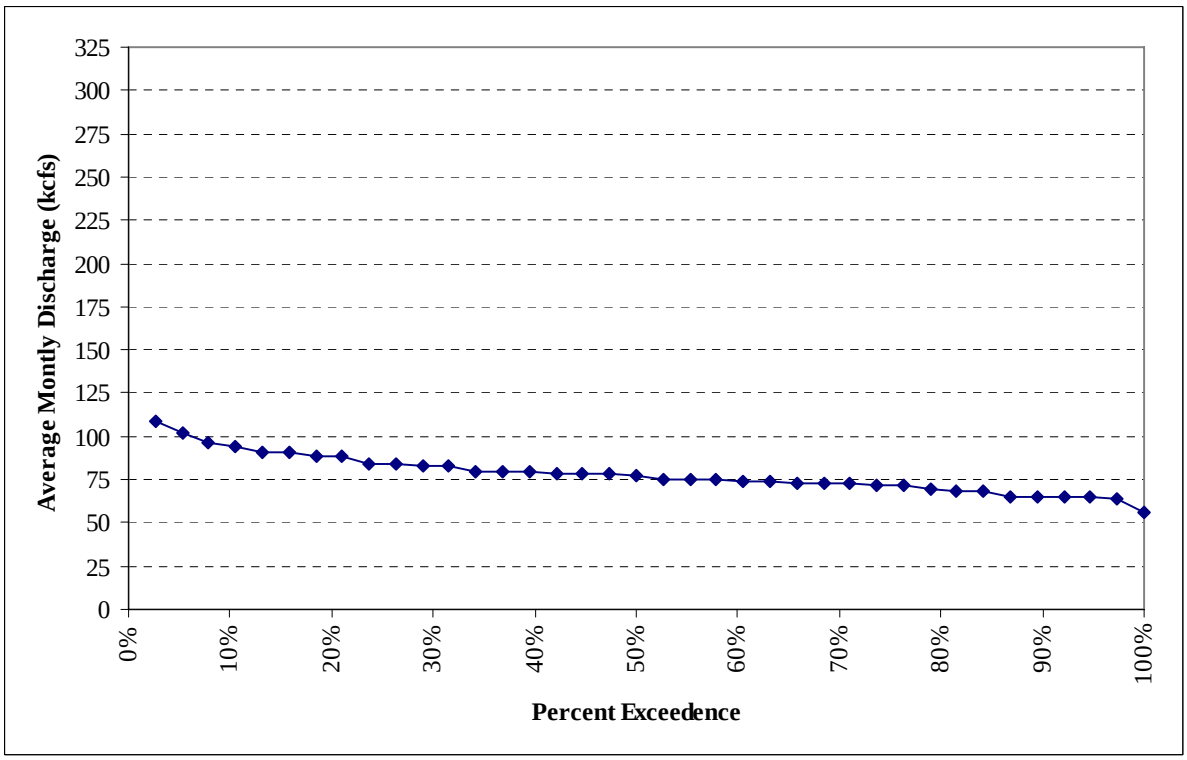

Figure 5.2-10 Flow duration curve for October 1968-2005 at Wells Dam.

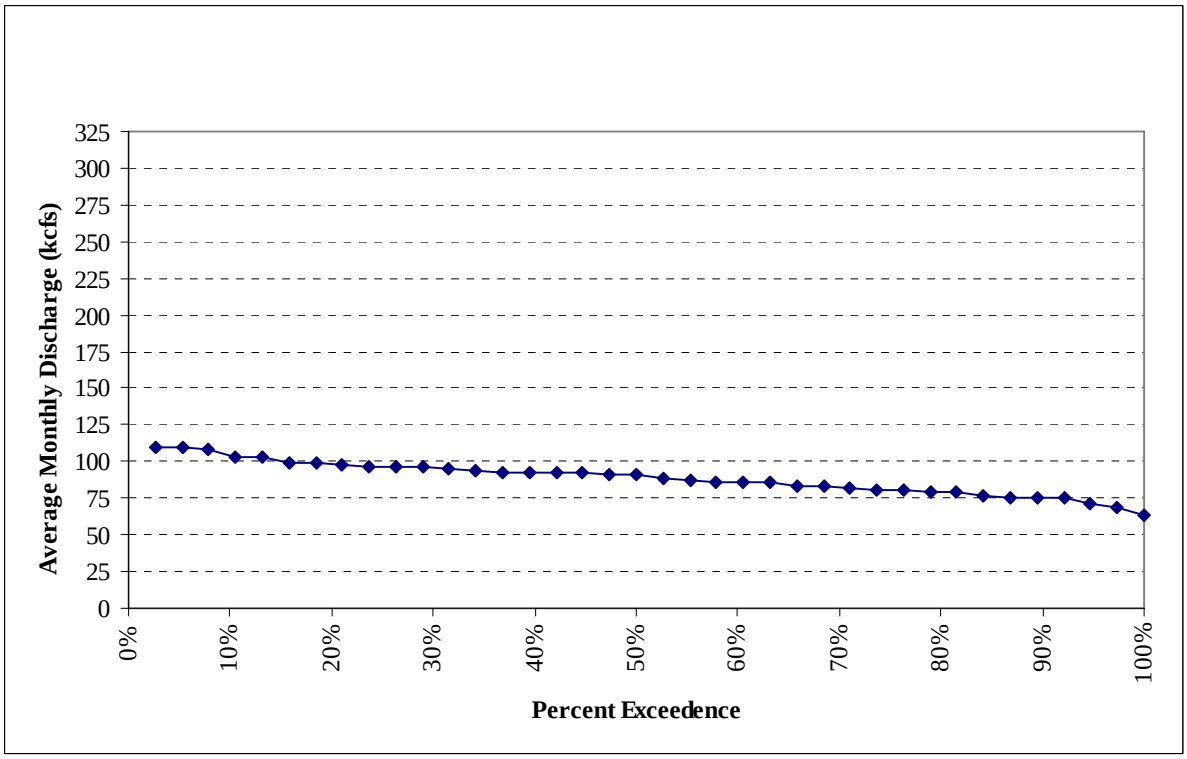

Figure 5.2-11 Flow duration curve for November 1968-2005 at Wells Dam.

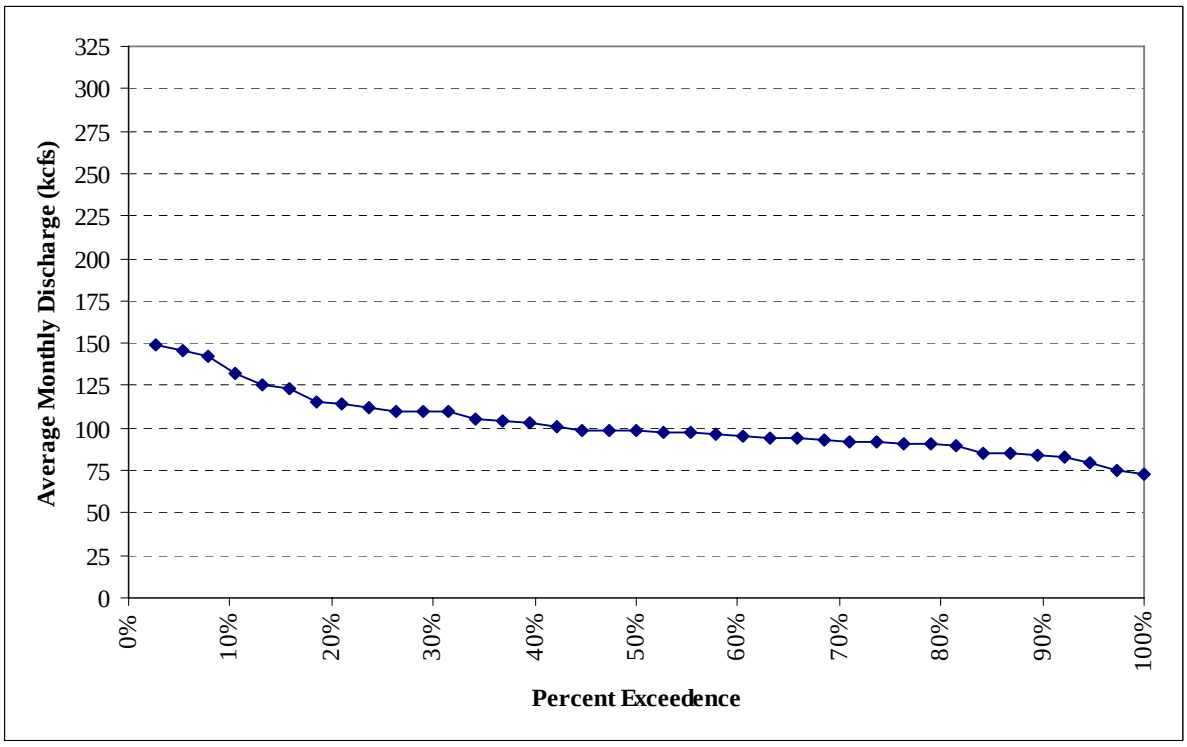

Figure 5.2-12 Flow duration curve for December 1968-2005 at Wells Dam.

A gage station located near Pateros measures flow in the Methow River (USGS Gage No. 12449950). Average discharge at the Methow River gage station for years 1959-2005 was 1,533 cfs with average monthly flows ranging from 422 cfs in February to 5,743 cfs in June. Table 5.2-3 provides mean, minimum and maximum monthly flows for the entire period of record at the Methow River gage station.

A gage station located near Malott measures flow in the Okanogan River (USGS Gage No. 12447200). Average discharge at the Okanogan River gage station for years 1966-2005 was 3,013 cfs with average monthly flows ranging from 1,143 cfs in September to 9,822 cfs in June. Table 5.2-3 provides mean, minimum and maximum monthly flows for the entire period of record at the Okanogan River gage station.

Table 5.2-3 Monthly average flows (cfs) at USGS gauging stations for the Methow (12449950) and Okanogan (12447200) rivers for their respective periods of record (data available to December 2005).

Month	Methow River (1959-2005)			Okanogan River (1966-2005)		
	Mean	Min	Max	Mean	Min	Max
January	426	248	938	1,265	540	3,013
February	422	262	803	1,422	569	2,979
March	604	237	1,407	1,685	601	3,946
April	1,595	309	3,363	2,869	928	7,015
May	4,847	1,414	9,768	8,436	4,319	16,420
June	5,743	1,583	13,150	9,822	2,625	29,290
July	2,089	471	4,960	3,994	938	10,990
August	683	283	1,860	1,607	390	4,150
September	436	235	1,196	1,143	372	2,963
October	482	293	1,458	1,156	605	1,847
November	533	273	1,327	1,455	574	4,747
December	476	270	1,361	1,300	565	4,402

5.2.5 Existing Water Uses and Water Rights

5.2.5.1 Existing Water Uses in the Wells Project Boundary

Types of use associated with water rights issued within the Wells Project area consist of irrigation, domestic, commercial and industrial, fish and natural resources, maintenance and power production (Table 5.2-4).

Table 5.2-4 Summary of water rights issued in the Wells Project by WDOE.

Type of Water Right[1]	Type of Use	Number of Water Right Holdings	Total Allocated Annual Diversion (ac-ft)
Certificate	Irrigation	89	30,292
	Industrial	1	274
	Domestic	1	2
	Maintenance	1	1,328
	Fish Propagation	2	6,567
	Mixed Use[2]	27	22,906
Permit	Irrigation	26	14,806
	Power Generation	1	220[3]
	Impoundment	1	331,200
	Mixed Use[2]	9	5,036
Claim	Irrigation	20	7,890
	Domestic	1	32
	Stock Watering	2	6
	Mixed Use[2]	2	6

[1]Information based on WDOE's water rights records.
[2]Water rights with mixed-use descriptions consist of a combination of any of the following: irrigation, power, fish propagation, wildlife, domestic, industrial, frost protection, stock watering, and erosion.
[3]Thousand cubic feet per second (kcfs).

Irrigation

The primary consumptive use of water withdrawn from the Wells Reservoir is for orchard irrigation. Orchards with apple, cherry, pear, peach, apricot and other fruit trees represent the primary agricultural activity in the Columbia River Valley and the surrounding tributary valleys throughout North Central Washington. All orchards throughout the area are dependent upon a reliable source of irrigation water for their existence. The irrigation season begins in late March or April and continues through October. Peak irrigation use occurs in June, July and August when temperatures in the region are highest. The majority of consumptive water use within the Wells Project area is non-Project related.

Domestic Water Supply

Domestic water supply withdrawals from the Wells Reservoir are limited. Some withdrawals are for use in irrigating yards and gardens. Water withdrawals for drinking water are primarily from groundwater sources and are concentrated in the towns located around the reservoir such as Brewster, Bridgeport and Pateros.

Commercial and Industrial Use

Commercial and industrial uses are limited and account for a maximum of 7.87 cfs of surface water withdrawals in the Wells Reservoir. Similar to domestic water withdrawals, commercial

and industrial use are concentrated in the cities adjoining the Wells Reservoir. Stock watering use is also limited to approximately 1.56 cfs.

Fisheries and Natural Resources

Douglas PUD holds seven water rights for the Wells Project that include fish propagation as part of the water right description, one surface water right for approximately 500 cfs and six ground water rights for a total of 21,587 acre-feet/year. These water rights are associated with the Wells Fish Hatchery and Wells Project operations.

Alta Lake Level Maintenance

State Parks holds a surface water right to use 2.22 cfs resulting in a water withdrawal of 1,328 acre-feet/year to maintain water levels at Alta Lake, located northwest of Wells Dam.

Power Production

As described earlier, the Wells Project holds a surface water permit to use 220 kcfs for power production purposes. A reservoir permit allows impoundment of up to 331,200 acre-feet of water within the Wells Reservoir.

Currently, there are no new proposed uses of the Wells Reservoir and with much of the water already allocated in Washington State, new water rights are increasingly difficult to obtain.

5.2.5.2 Instream Flow Uses

Currently, Wells Project operations occur in concert with all other existing instream flow uses within the Wells Reservoir, as discussed in Section 5.2.3.1. The only instream flow restriction for the Wells Project arises under Article 33 of the FERC license. Article 33 requires Douglas PUD to operate Wells Dam in a manner that does not prevent Grant PUD from complying with Article 45 of the Priest Rapids Project license. Currently, Article 45 of the Priest Rapids license requires Grant PUD to maintain a minimum instream flow below Priest Rapids Dam of 36 kcfs. This operation is conducted to ensure that sufficient water is available for the cooling water intake at the Columbia Generating Station owned by Energy Northwest.

5.2.5.3 Water Rights

In western states, water rights are based on the principle, “first in time, first in right,” meaning older claims have precedence over newer ones. A water right is a legal authorization to use a pre-defined quantity of public water for a designated purpose. In the State of Washington, the WDOE has jurisdiction over the issuance of water rights on the Columbia River.

Currently, there are a total of 183 unique water rights claims, permits, or certificates issued within the Wells Reservoir area by WDOE (Table 5.2-4). Water rights claims filed under the Water Rights Claims Registration Act (RCW 90.14) are not confirmed water rights but are possible rights based on pre Water Code appropriations. Twenty-five claims are filed with the

WDOE for water rights in the Wells Project area. The holder of a water right permit has a particular period of time to put the amount of water referenced in the permit to beneficial use. After the time has elapsed, the water permit holder is issued a water right certificate for the amount actually put to beneficial use. The holder of a water right certificate has the right to beneficially use the amount of water referenced in the certificate. Thirty-seven water rights permits and 121 water rights certificates have been issued by WDOE for water rights in the Wells Project area. There are no practical means of determining the level to which these rights might be exercised in a given year.

The CCT is responsible for issuing water permits on the Colville Indian Reservation. In total, there are 14 active permits for water use on Colville Reservation lands that are outside the Wells Project Boundary. Four out of the 14 active permits are for surface water withdrawals. Three of these surface water permits allow withdrawals of water from the Wells Reservoir in amounts ranging from 400-700 gallons per minute (gpm). The fourth surface water permit allows 1 gpm to be withdrawn from the Okanogan River. All four of these permits are for irrigation purposes.

Currently, Douglas PUD holds surface water rights from the State of Washington for the use of 220 kcfs for power purposes (Permit No. 13425). A reservoir permit (No. R4-26075) for the Project, allows 331,200 acre-feet of water to be impounded. Douglas PUD also holds several other surface and ground water rights for fish propagation, wildlife, hydro operations, domestic supply, and irrigation within the Wells Reservoir.

5.2.6 Water Quality Standards

The WDOE is responsible for the protection and restoration of the state's waters. WDOE has adopted water quality standards that set limits on pollution in lakes, rivers, and marine waters in order to protect water quality. On July 1, 2003, WDOE completed the first major overhaul of the state's water quality standards in a decade. A significant revision presented in the 2003 water quality standards classifies fresh water by actual use, rather than by class as was done in the 1997 standards. These revisions were adopted in order to make the 2003 standards less complicated to interpret and provide future flexibility as the uses of a water body evolve. Categories of use for the 2003 water quality standards are based upon aquatic life, recreation, water supply and other miscellaneous uses (Table 5.2-5).

Congress passed the Clean Water Act in 1972, and designated the US Environmental Protection Agency (EPA) as the administering federal agency. This federal law requires that a state's water quality standards protect the surface waters of the US for beneficial uses, such as recreation, agriculture, domestic and industrial use, and habitat for aquatic life. Any state water quality standards, or amendments to these standards, do not take regulatory effect for purposes of the Clean Water Act until they have been approved by EPA. EPA is currently reviewing the water quality standards adopted by the State of Washington in 2003 and partial approval has occurred. Full approval is expected before Douglas PUD files its license application (2010) and Section 401 certification is issued (2012). Since the 2003 state standards have not yet been fully approved by EPA, both the 1997 and 2003 standards as they apply to Wells Project waters are discussed below.

Table 5.2-5 Summary of categorical uses based on the 2003 Washington State Water Quality Standards.

Use Designation	General Categories[1]
Aquatic Life	Char
	Core Salmon/Trout
	Noncore Salmon/Trout
	Non-anadromous Interior Redband Trout
	Indigenous Warm Water Species
Recreation	Extraordinary Primary Contact Recreation
	Primary Contact Recreation
	Contact Recreation
Water Supply	Domestic
	Agricultural
	Industrial
	Stock Watering
Miscellaneous	Wildlife Habitat
	Harvesting
	Commerce and Navigation
	Boating
	Aesthetics

[1] General categories specific to each designated use.

5.2.6.1 Water Quality Standards for the Wells Project

Under the 1997 standards, the section of the mid-Columbia River that encompasses the Wells Reservoir has been designated a "Class A," or excellent quality water body (Chapter 173-201A of Washington Administrative Code, WAC). Water quality standards for Class A waters (Chapter 173-201A WAC) include limits for fecal coliform organisms (geometric mean less than 100 colonies per 100 milliliters), dissolved oxygen (DO) (minimum requirement of 8.0 milligrams per liter), and TDG (maximum of 110 percent saturation). Other applicable water quality standards also apply to the Wells Reservoir including standards for temperature (maximum of 64.4°F (18.0°C) due to human activities), pH (acceptable range of 6.5 to 8.5), and turbidity (no increase of 5 nephelometric turbidity units (NTUs) if background is less than 50 NTU, or less than a 10 percent change if background is greater than 50 NTU) (NMFS, 2002). There are also established limits to concentrations of toxic, radioactive or deleterious material below levels that have the potential to adversely affect water use, biota or public health. Further, aesthetic values should not be impaired, excluding those of natural origin, which offend the senses of sight, smell, touch or taste (NMFS, 2002).

The 2003 standards designated aquatic life use classification in the Wells Reservoir as noncore salmon/trout (salmon and trout spawning, noncore rearing and migration). As a result of the new classification, some of the numerical criteria for specific water quality parameters will change. For example, the water temperature that triggers a 0.3°C limitation of human-caused increases will change from 18°C to 17.5°C. Criteria for parameters such as DO, turbidity, TDG, and pH for the noncore salmon/trout designation remain similar to the 1997 standards. Other identified uses for the Wells Reservoir include recreation (primary contact), water supply uses (domestic, industrial, agricultural, and stock watering) and miscellaneous uses such as wildlife habitat, harvesting, commerce/navigation, boating and aesthetics.

Every two years, the EPA, as specified in section 305(b) of the Clean Water Act, requires WDOE to compile an assessment of the state's waterbodies. This assessment is called the 305(b) report. The report evaluates and assigns each waterbody into five categories based upon WDOE's evaluation of the water quality parameters collected from within each waterbody. Category 1 states that a waterbody is in compliance of the state water quality standard for the parameter of interest. Category 2 states a waterbody of concern. Category 3 signifies that insufficient data is available to make an assessment. Categories 4a-4c indicate an impaired waterbody that does not require a Total Maximum Daily Load (TMDL) for one of three reasons. Category 4a indicates a waterbody with a finalized TMDL. Category 4b indicates a waterbody with a Pollution Control Program and category 4c indicates a waterbody impaired by a non-pollutant. Category 5 represents all waterbodies within the state that are considered impaired and require a TMDL. The 303(d) list consists of only waterbodies with category 5 listings.

Water temperature and TDG levels sometimes exceed state standards in the Wells Reservoir based on measurements reported by the COE (NMFS, 2002). The reach of the Columbia River within the Wells Project is on the State's 2004 303(d) list for temperature impairment and was also on the 303(d) list for TDG impairment in 1998. WDOE is currently developing a temperature TMDL for the mainstem Columbia River, including that portion of the Columbia River contained within the Wells Project. In 2004, WDOE submitted a TDG TMDL for the mid-Columbia River and as such, this reach of the Columbia River which includes the Wells Project, is no longer on the 303(d) list for TDG.

5.2.6.2 Water Quality Standards for Wells Project Tributaries

The Methow River is within the Wells Reservoir from its confluence with the Columbia River to RM 1.5. Under the 1997 standards, this segment of the Methow River meets the Class A (excellent) water quality standard. WDOE has put portions of the Methow River upstream of the Wells Project Boundary on the 303(d) list as an impaired water body for temperature; however, DO and pH generally are in compliance with state standards. Fecal coliform, suspended solids, ammonia, turbidity and nitrate generally have low levels, while phosphorous concentrations may stimulate algal growth (WDOE, 1998). The 2003 standards designate the portion of the Methow River within the Wells Reservoir as noncore salmon/trout (salmon and trout spawning, noncore rearing and migration) aquatic life use. Other identified uses include recreation (primary contact), water supply uses (domestic, industrial, agricultural and stock watering), and miscellaneous uses (wildlife habitat, harvesting, commerce/navigation, boating and aesthetics).

The Okanogan River is within the Wells Reservoir from its confluence with the Columbia River to RM 15.5. Under the 1997 standards, this segment of the Okanogan River meets the Class A (excellent) water quality standard. In 1998, WDOE put portions of the Okanogan River upstream of the Wells Project boundary on the 303(d) list for DO, temperature, and fecal coliform organisms. The Okanogan River within the Project boundary was put on the 303(d) list for 4,4'-DDE, 4,4'-DDD, PCB-1254, and PCB-1260 concentrations above standards in edible carp tissue during 1984 (WDOE, 1998a). In 2004, WDOE completed the Lower Okanogan River DDT and PCB TMDL and as such, this reach of river is no longer on the 303(d) list for these parameters. In 2005, WDOE submitted to the EPA a completed Washington State Water Quality Assessment for 2002/2004 to meet the Clean Water Act requirements of sections 305(b) and 303(d). In addition to removing the Lower Okanogan River within the Wells Project boundary from the 303(d) list for DDT and PCB, WDOE listed a portion of the river within Project boundary as Category 1 (waters that meet tested standards) for both DO and pH. A study in 1997 by the Pacific Northwest River Basins Commission concluded that water quality problems have been attributed to irrigation return flows, livestock impacts on bank vegetation and stability, erosion from non-irrigated cropland, and forest harvest practices, such as road construction (NMFS et al., 1998).

The 2003 standards designate the Okanogan River within the Wells Reservoir as noncore salmon/trout (salmon and trout spawning, noncore rearing, and migration) aquatic life use. Other identified uses include recreation (primary contact), water supply uses (domestic, industrial, agricultural, and stock watering), and miscellaneous uses (wildlife habitat, harvesting, commerce/navigation, boating, and aesthetics).

5.2.7 Water Quality Data

The water quality of the Wells Reservoir is primarily influenced by the water quality arriving from upstream sources. The sources of water for the Wells Reservoir are Lake Rufus Woods (Chief Joseph Dam reservoir), the Methow River, and the Okanogan River. The primary influence on water quality from Lake Rufus Woods is the limnology of Lake Roosevelt, which is formed by Grand Coulee Dam. Lake Roosevelt is a major storage reservoir with a mean retention time of well over one month. The operation of Lake Roosevelt has a major influence on the physical, chemical, and biological water quality parameters of downstream reservoirs in the mid-Columbia River Hydro System (Parametrix, Inc., 2001).

Douglas PUD and state and federal agencies have implemented monitoring programs to collect water quality information within the Wells Reservoir. Historically, Douglas PUD's water quality monitoring efforts have focused on parameters associated with compliance of state and federal Water Quality Standards (Table 5.2-6). Parameters that exceed water quality standards in the Wells Reservoir such as temperature and TDG, are monitored during seasonal periods in which environmental conditions exacerbate these measures (spring and summer). Data collected by state and federal monitoring programs are varied in scope and frequency. Various ongoing monitoring programs by other agencies in the Wells Reservoir are summarized in Table 5.2-7.

Table 5.2-6 Water quality monitoring conducted by Douglas PUD.

Parameter	Monitoring Location	Monitoring Period
TDG	Wells Forebay	1998-present[1]
	Wells Tailrace	1998-present[1]
Temperature	Columbia River (RM 544, 532, 530, 516)	2001-present
	Methow River (RM 1.5, 0.1)	2001-present[2]
	Okanogan River (RM 17, 0.5)	2001-present[2]
	Wells Tailrace	1998-present[3]
DO	Wells Forebay	2005-present[4]
pH	Wells Forebay	2005-present[4]
Limnology	Wells Reservoir (9 sites)	2005-2006[5]

[1] Seasonal monitoring from April 15-September 15 annually.
[2] Lower RM temperature monitoring sites for tributaries added in May 2005.
[3] Data collected via TDG monitoring stations.
[4] Seasonal monitoring.
[5] Data collected as part of the baseline studies (EES Consulting, 2006).

Table 5.2-7 Water quality monitoring programs conducted within or adjacent to the Wells Reservoir by resource agencies.

Agency	Monitoring Location	Monitoring Period	Parameters
Washington Dept. of Ecology	Okanogan River @ Malott (RM 17) Station 49A070	1967-Present[1]	Water Quality[2]
	Methow River near Pateros (RM 5) Station 48A070	1959-Present[3]	Water Quality
COE[4]	Chief Joseph Dam tailrace (Columbia River)	1997-Present	Temperature, TDG, pH, DO
	Wells Forebay[5] (Columbia River)	1984-Present	Temperature, TDG[6]
	Wells Tailrace[5] (Columbia River)	1998-Present	Temperature, TDG
US Geological Survey	Methow River near Pateros (RM 5) Station 12449950	1959-2003	Discharge Water Quality[7]
	Okanogan River near Malott (RM 15) Station 12447200	1963-2003	Discharge Water Quality[8]

[1] Periodic sampling between years up until 1984.
[2] Sampling consists of conventional parameters and metals.
[3] Periodic sampling between years up until 1978.
[4] Data hosted by the University of Washington's DART website.
[5] Data supplied by Douglas PUD.
[6] TDG monitored periodically from 1984-present. Temperature data monitored from 1995-present.
[7] Incomplete data set.
[8] Incomplete data set

5.2.7.1 Water Quality Monitoring by Douglas PUD

Total Dissolved Gas (TDG)

TDG supersaturation is a condition that occurs in water when atmospheric gasses are forced into solution at pressures that exceed the pressure of the overlying atmosphere. Water containing more than 100 percent TDG is in a supersaturated condition. Water may become supersaturated through natural or dam related processes that increase the amount of air dissolved in water. Supersaturated water in the Columbia River may result from the spilling of water at Columbia River dams. The occurrence of TDG supersaturation in the Columbia River system is well documented and has been linked to mortalities and migration delays of salmon and steelhead (Beiningen and Ebel, 1970; Ebel et al., 1975). At Wells Dam, TDG has been monitored by Douglas PUD for compliance with state and federal water quality regulations since 1998. Increases in TDG at Wells Dam are most likely to take place during April through September as a result of high flows caused by either rapid snow melt or flow augmentation for downstream juvenile salmonid passage. Consequently, monitoring for TDG at Wells Dam occurs between April 1 and September 15 annually to coincide with this observation. TDG monitoring at Wells Dam is facilitated through the deployment of Hydrolab Minisonde probes in the center of the Wells Forebay and approximately 3 miles downstream of Wells Dam. TDG data are logged every five minutes and transmitted on the hour. Probes are serviced and checked monthly for accuracy and calibrated if necessary. Average, minimum, and maximum TDG measurements at Wells Dam are provided in Table 5.2-8. Wells Forebay and Wells Tailrace TDG data collected since 1998 are provided in Figures 5.2-13 through 5.2-16.

Table 5.2-8 Average, minimum, and maximum TDG measurements at Wells Dam from Hydrolab MiniSonde stations placed in the Wells Forebay and Tailrace. Values are in percent dissolved gas and are 12 hour averages with measurements taken on the hour at both stations.

Station	TDG	1998	1999	2000	2001	2002	2003	2004	2005
Forebay	Avg	108.3	110.1	108.5	107.1	110.8	108.1	108.2	107.4
	Min	104.4	104.0	101.8	100.1	102.6	101.3	102.0	110.8
	Max	113.7	113.9	113.2	111.7	118.5	114.5	113.5	100.9
Tailrace	Avg	111.1	112.4	110.1	108.1	113.9	109.8	109.6	109.1
	Min	105.5	105.6	102.2	100.4	103.9	101.9	101.6	102.8
	Max	122.4	125.7	125.4	112.0	136.9	126.0	113.7	116.8

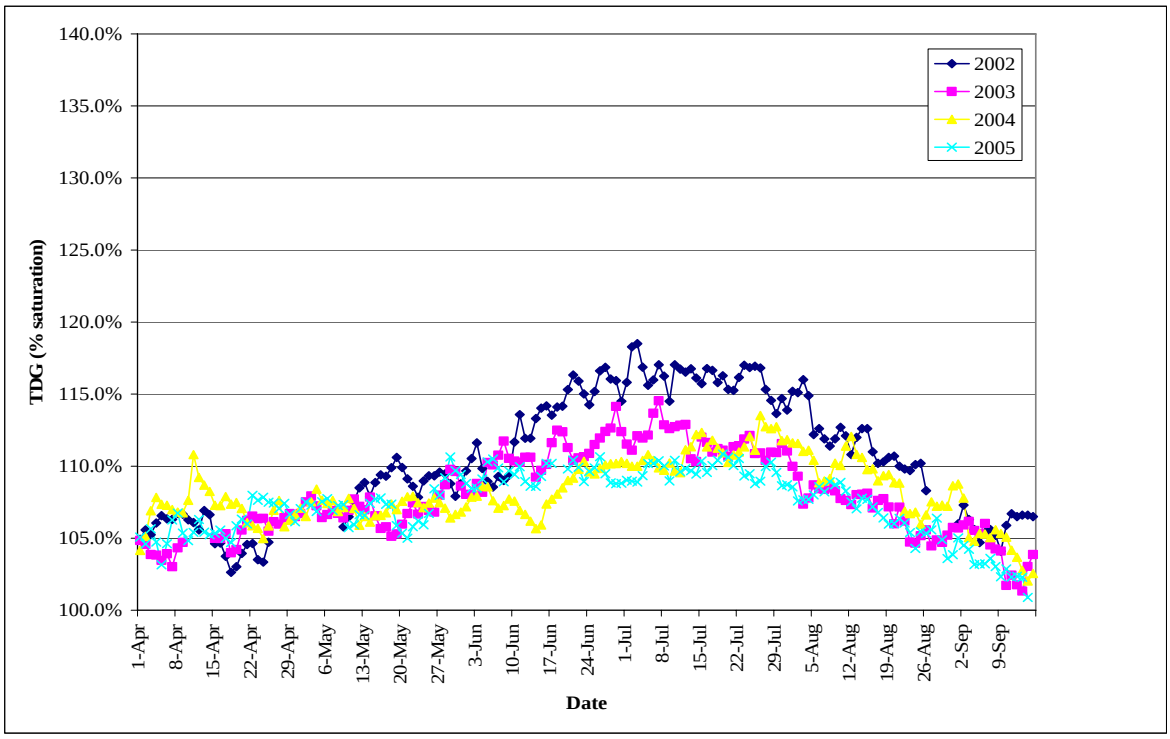

Figure 5.2-13 TDG measurements recorded in the Wells Forebay from April 1 to September 15 from 2002 to 2005 (12-hour average high).

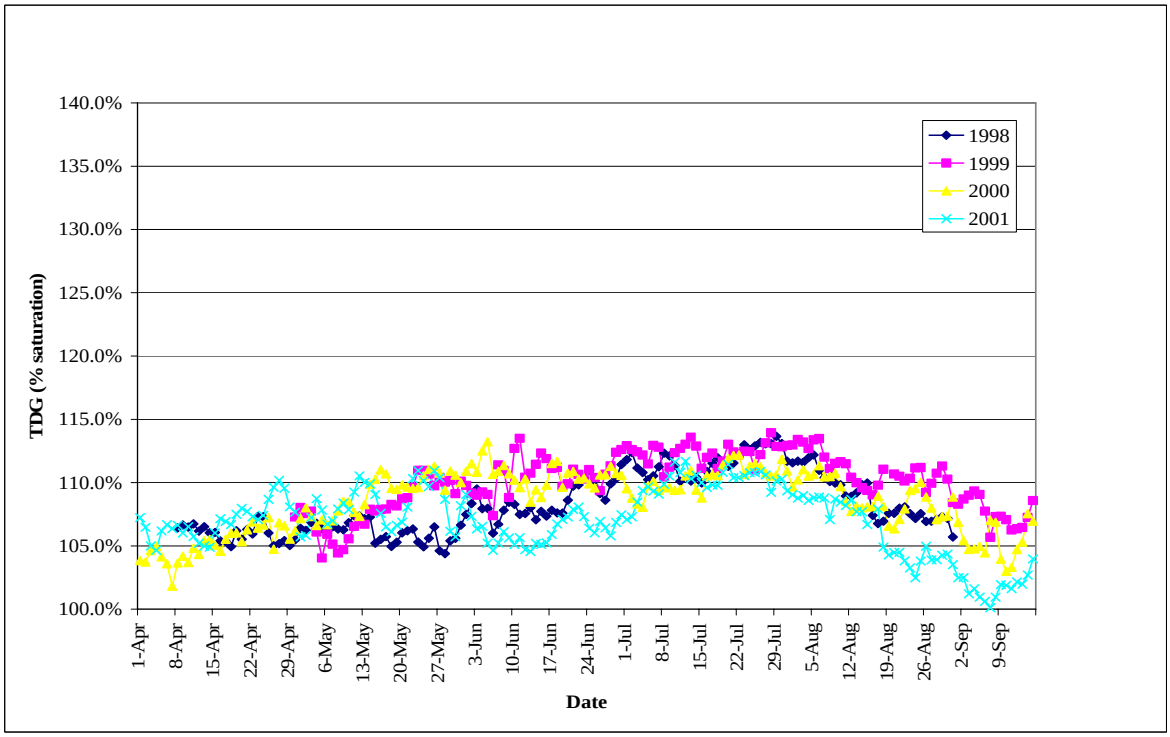

Figure 5.2-14 TDG measurements recorded in the Wells Forebay from April 1 to September 15 from 1998 to 2001(12-hour average high).

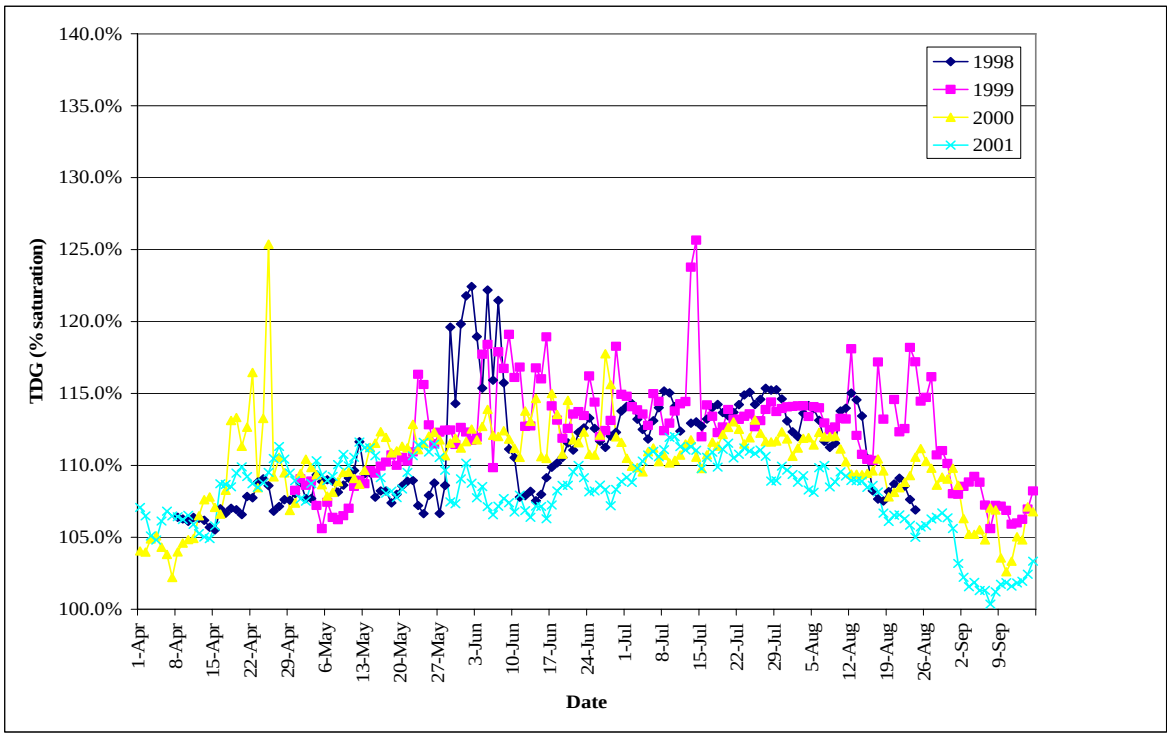

Figure 5.2-15 TDG measurements recorded in the Wells Tailrace from April 1 to September 15 from 1998 to 2001 (12-hour average high).

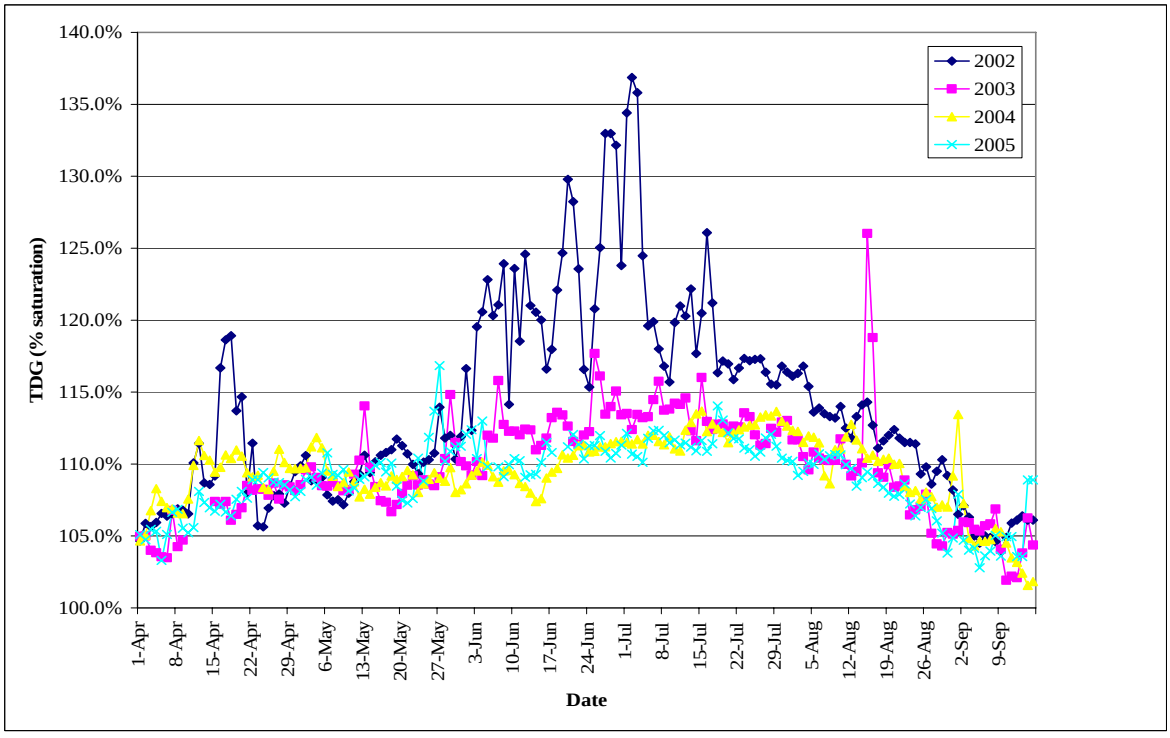

Figure 5.2-16 TDG measurements recorded in the Wells Tailrace from April 1 to September 15 from 2002 to 2005 (12-hour average high).

pH and DO

In August 2005, Douglas PUD added sensors to its existing forebay TDG monitoring equipment (Hydrolab Minisonde) in order to collect preliminary information on pH and DO in the Wells Reservoir. Figure 5.2-17 presents the pH and DO data collected in 2005. Douglas PUD plans to expand the monitoring period in 2006 to include the entire late summer period (August and September).

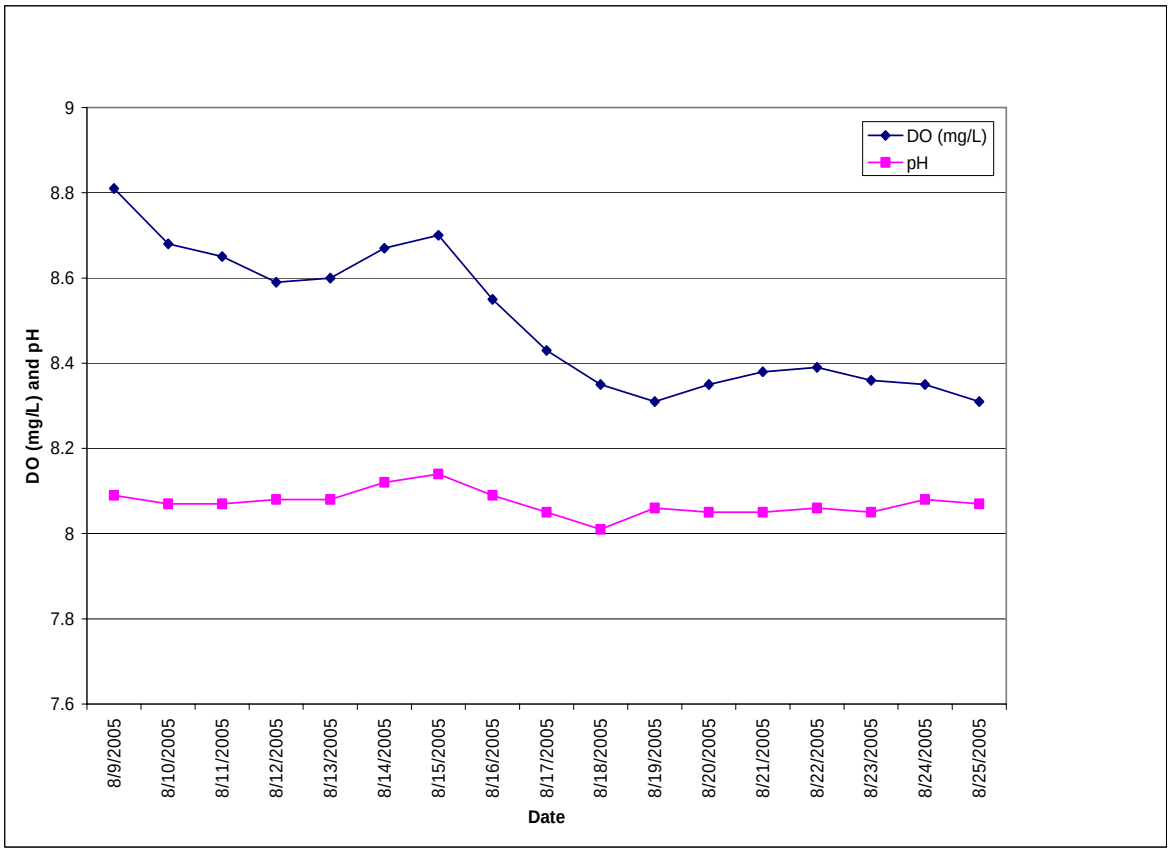

Figure 5.2-17 pH and DO measurements taken at the Wells Forebay TDG monitoring station (Hydrolab MiniSonde), August 9-25, 2005.

Temperature

Douglas PUD monitors water temperature in the Wells Reservoir from a variety of sources. The most reliable source of temperature information in the Wells Tailrace is from the Hydrolab MiniSonde fixed station used to measure tailrace TDG during the spill season. This fixed station collects temperature data in addition to TDG information and is monitored closely and calibrated monthly while in operation. Like TDG measured via the Hydrolab MiniSonde stations, temperature data from this source are only available between April 1 and September 15. The information is considered to be accurate and provide the most reliable time-series of information available. Figure 5.2-18 presents the data during this time period from 1998 to 2005 with the exception of 1999 when temperature data was not collected at this station.

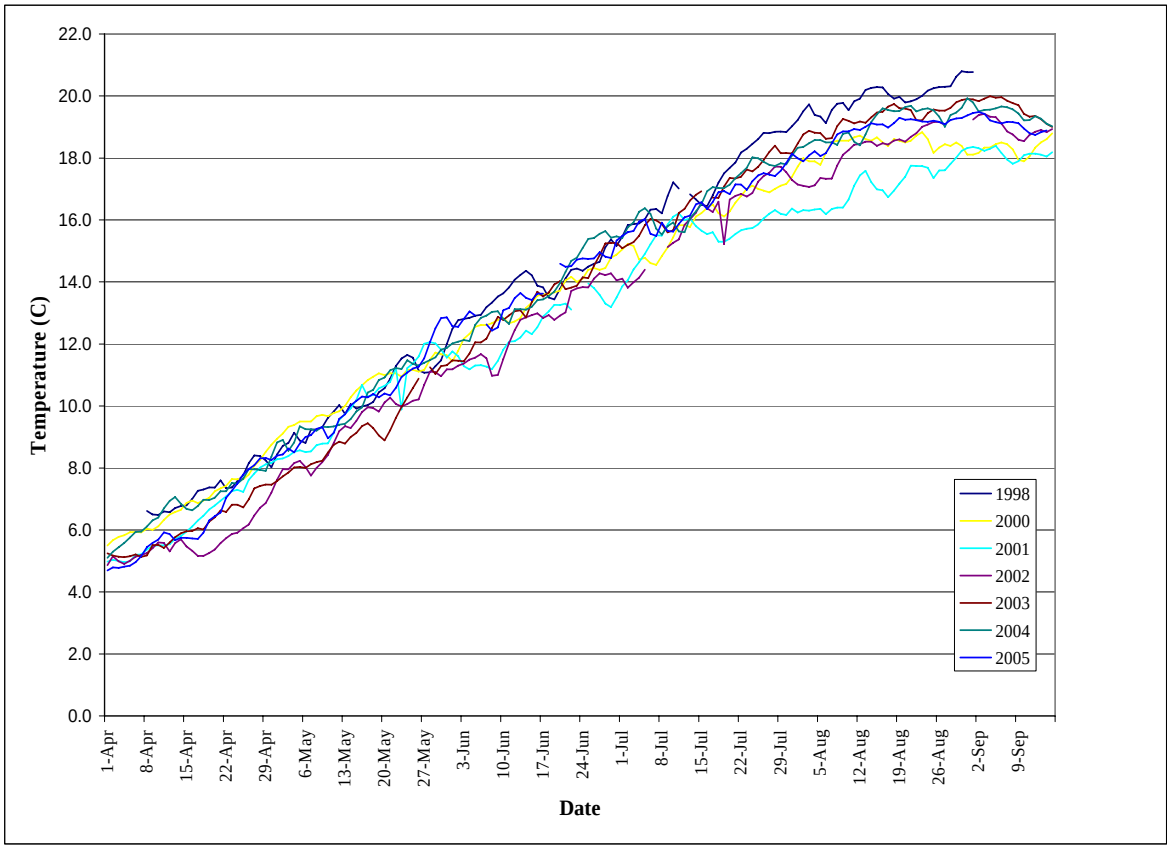

Figure 5.2-18 Wells Tailrace daily average temperatures recorded at the TDG monitoring station from April 1 to September 15 for years 1998-2005. Data were unavailable in 1999.

Beginning in 2001, an extensive water temperature monitoring effort was initiated by Douglas PUD in order to better understand the temperature dynamics throughout the Wells Reservoir. Temperature data have been collected at four locations in the Columbia River (RM 544, RM 532, RM 530, RM 516) and at one location in both the Okanogan (RM 17) and Methow (RM 1.5) rivers. Data were collected hourly using Onset tidbit temperature loggers. Monitoring start and end dates varied from year to year but generally began in the spring and ended in late fall. Quality assurance and control measures were implemented prior to deploying and upon retrieving temperature loggers to ensure that data collected was accurate (Douglas PUD 2005). Due to sensor loss or sensor malfunction in some years, the availability of data at some of these monitoring locations is sporadic. Figures 5.2-19 through 5.2-23 represent the available water temperature data as a result of this monitoring effort.

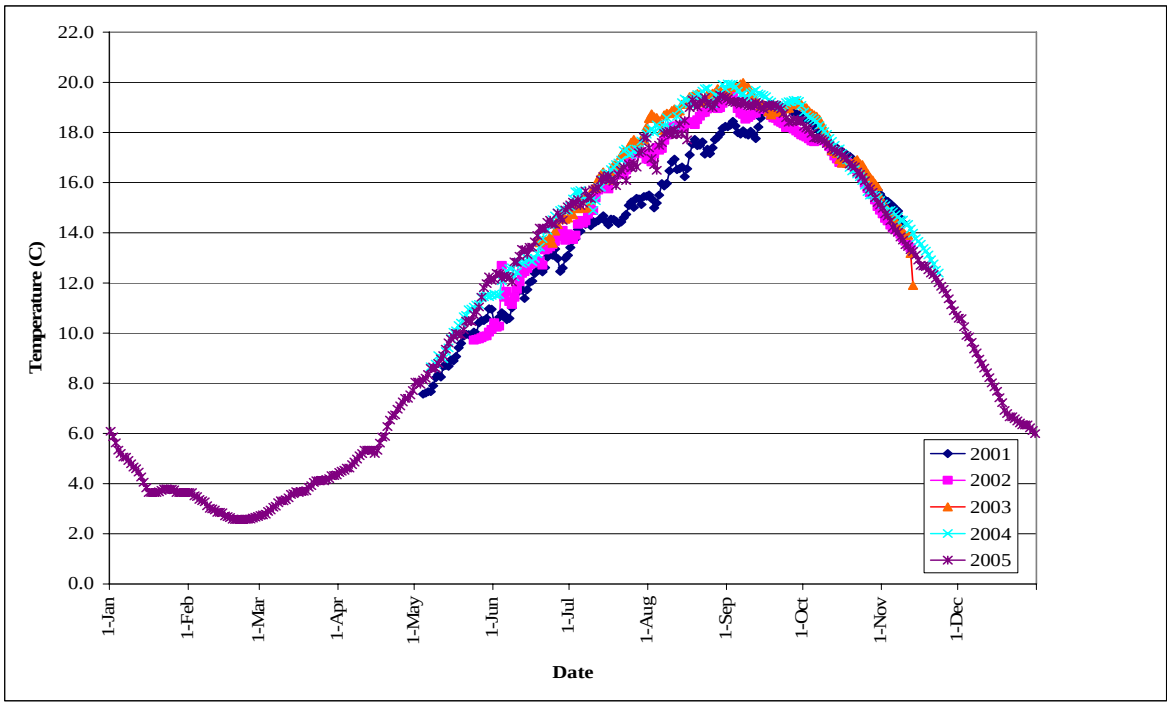

Figure 5.2-19 **Wells Project daily average temperature monitoring in the Wells Reservoir below Chief Joseph Dam tailrace (RM 544) using Onset temperature loggers for years 2001-2005.**

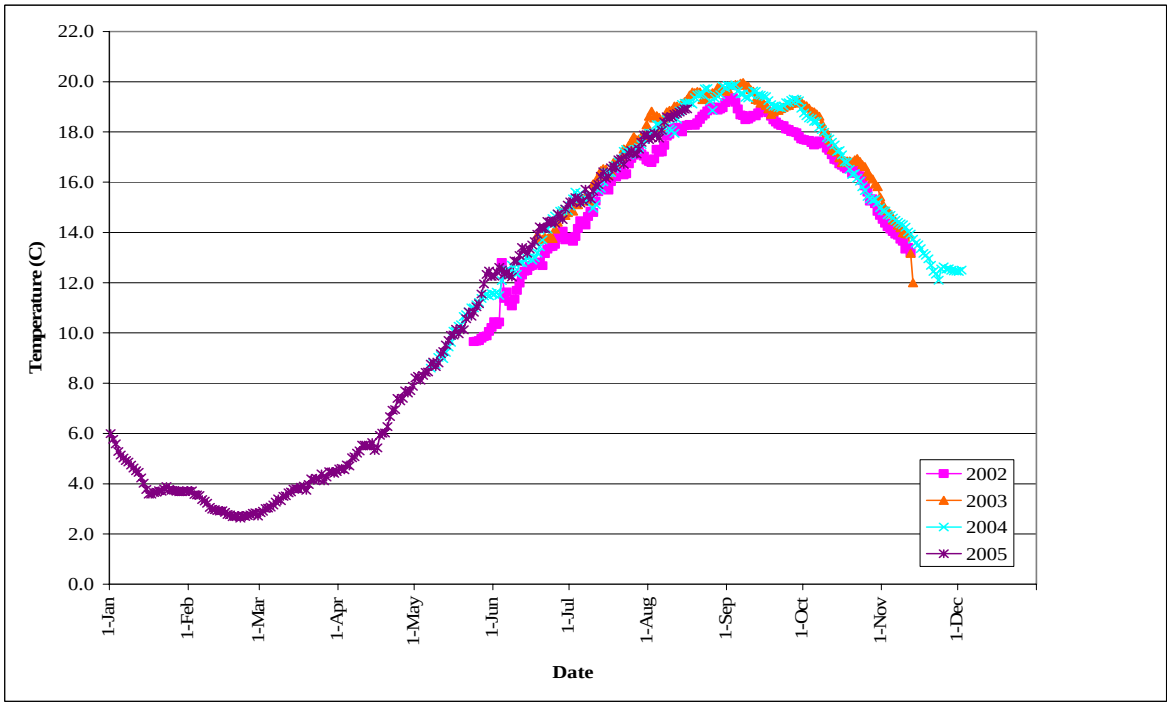

Figure 5.2-20 **Wells Project daily average temperature monitoring in the Wells Reservoir (RM 532) using Onset temperature loggers for years 2001-2005. Data were unavailable in 2001.**

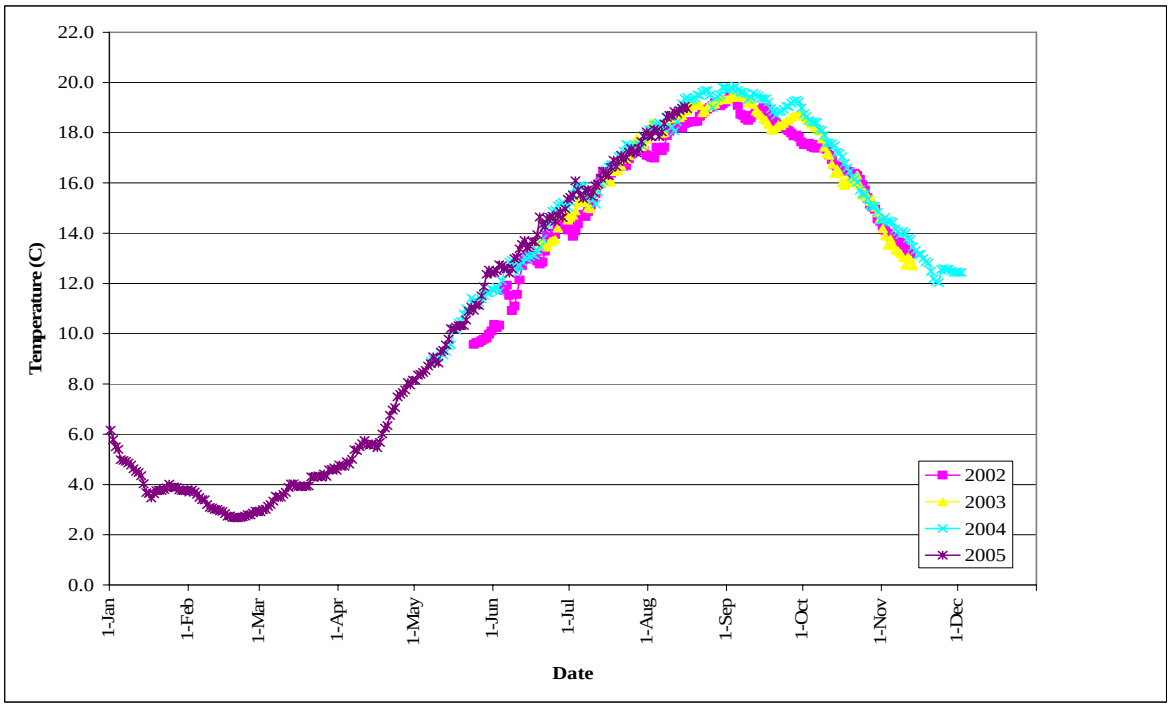

Figure 5.2-21 **Wells Project daily average temperature monitoring in the Wells Reservoir (RM 530) using Onset temperature loggers for years 2001-2005. Data were unavailable in 2001.**

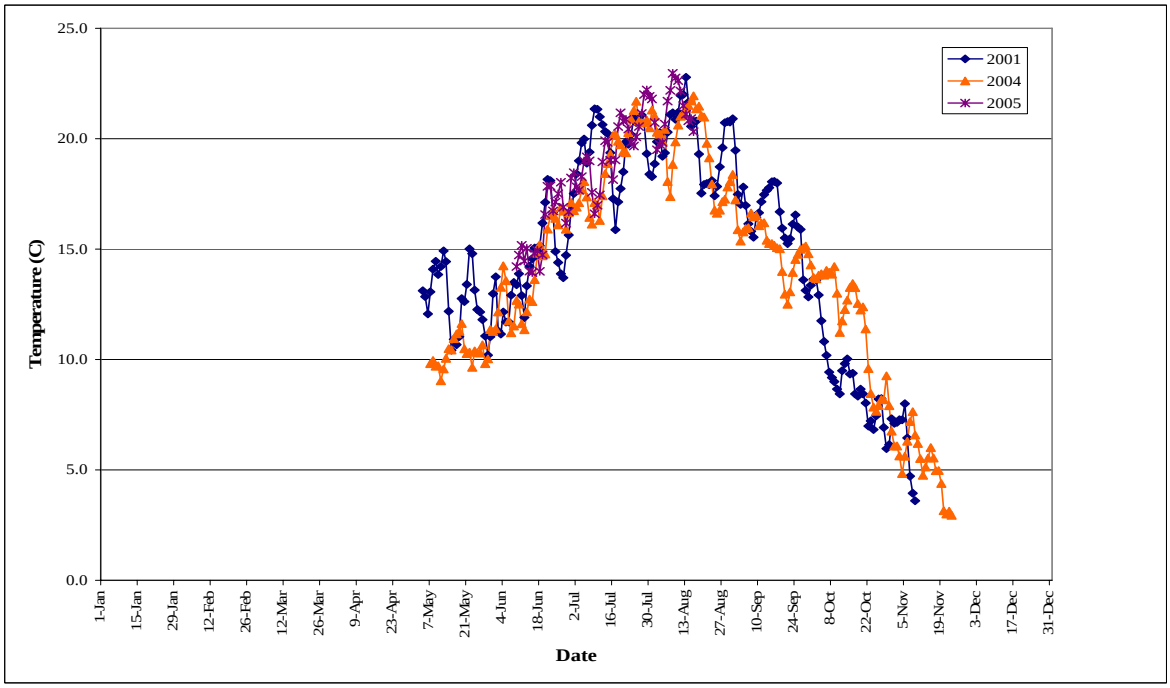

Figure 5.2-22 **Wells Project daily average temperature monitoring in the Methow River (RM 1.2) using Onset temperature loggers for years 2001-2005. Data were unavailable in 2002 and 2003.**

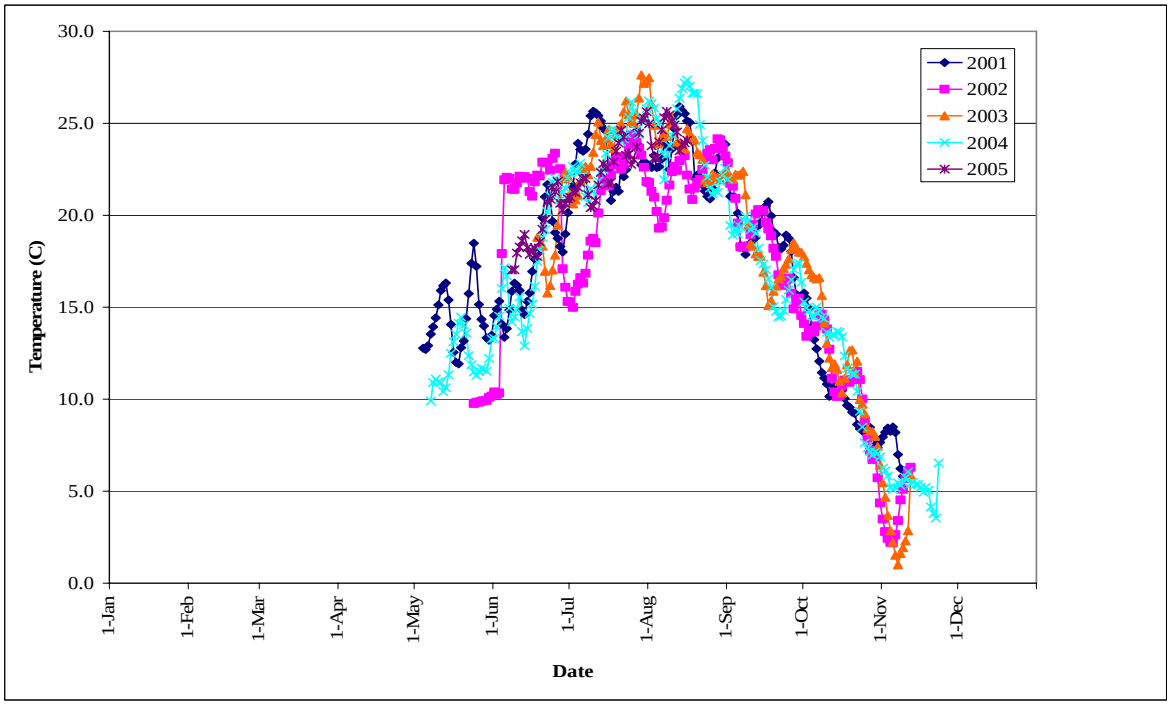

Figure 5.2-23 Wells Project daily average temperature monitoring in the Okanogan River (RM 15) using Onset temperature loggers for years 2001-2005.

An additional component of the water temperature monitoring effort launched in 2001 was to measure vertical temperature profiles at RM 516 in the Columbia River (Wells Forebay). The temperature station was located along the east portion of the forebay in what had been the original channel of the Columbia River prior to the construction of the Wells Project. During each year of the 2001-2005 period, temperature loggers were installed at 3 different depths between 5 and 90 feet and approximately 30 feet apart from one another (Figures 5.2-24 through 5.2-28). Results consistently showed no measurable thermal stratification in the Wells Forebay.

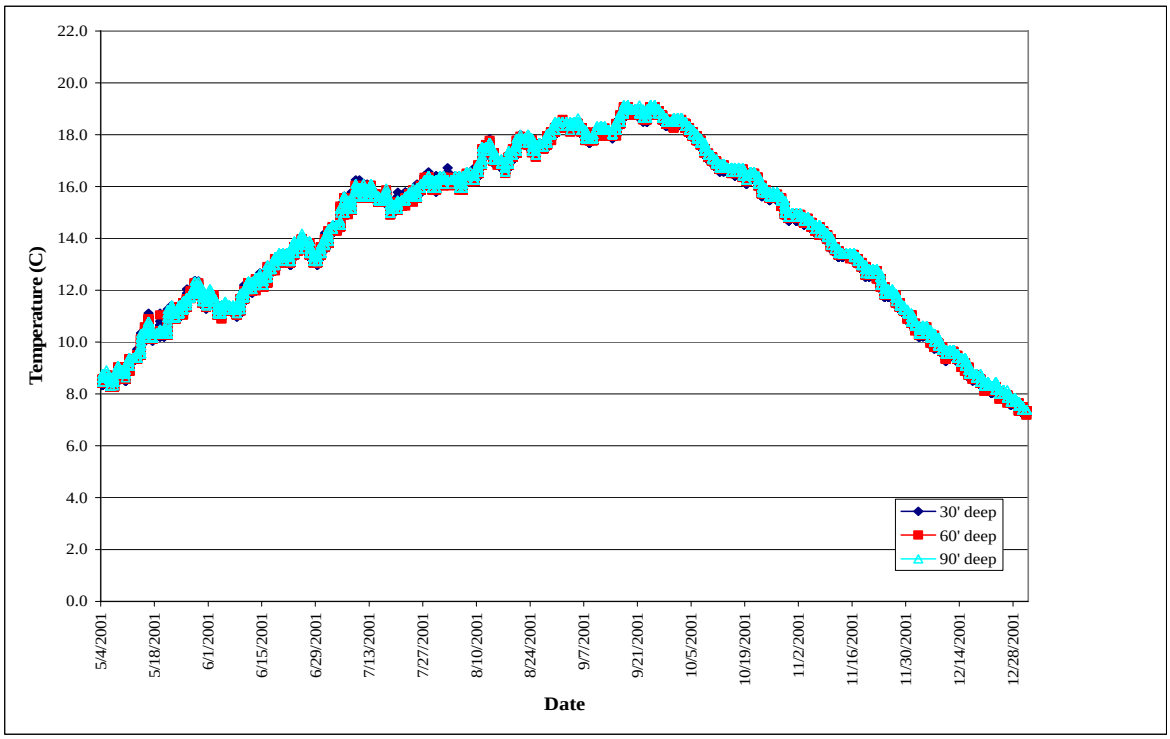

Figure 5.2-24 Vertical daily average temperature profile at Wells Forebay (RM 516) in 2001 (May-Dec.).

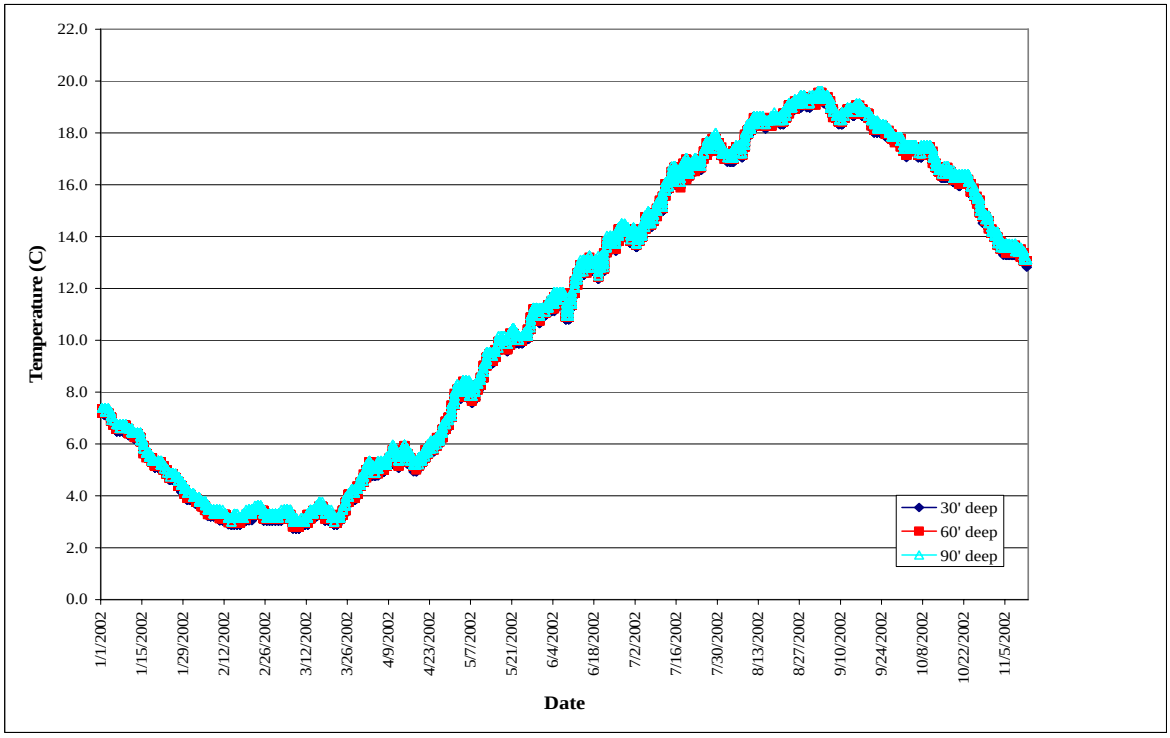

Figure 5.2-25 Vertical daily average temperature profile at Wells Forebay (RM 516) in 2002 (Jan.-Nov.).

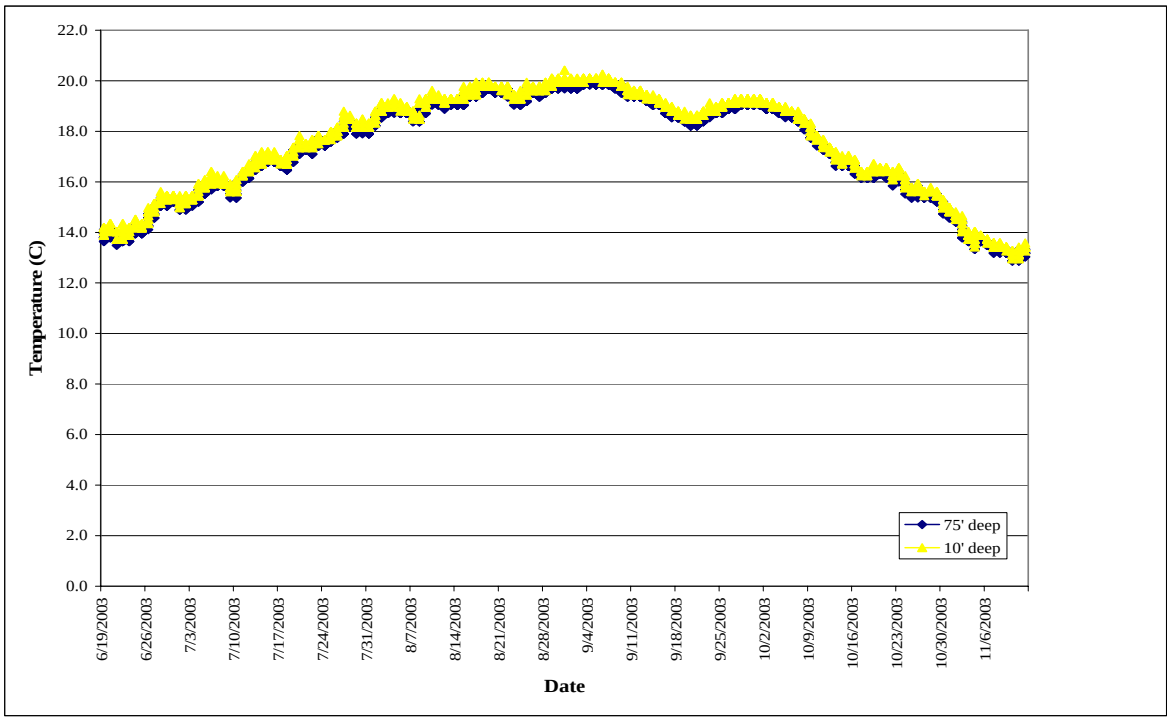

Figure 5.2-26 **Vertical daily average temperature profile at Wells Forebay (RM 516) in 2003 (June-Nov.). Temperatures were collected at only two depths in 2003.**

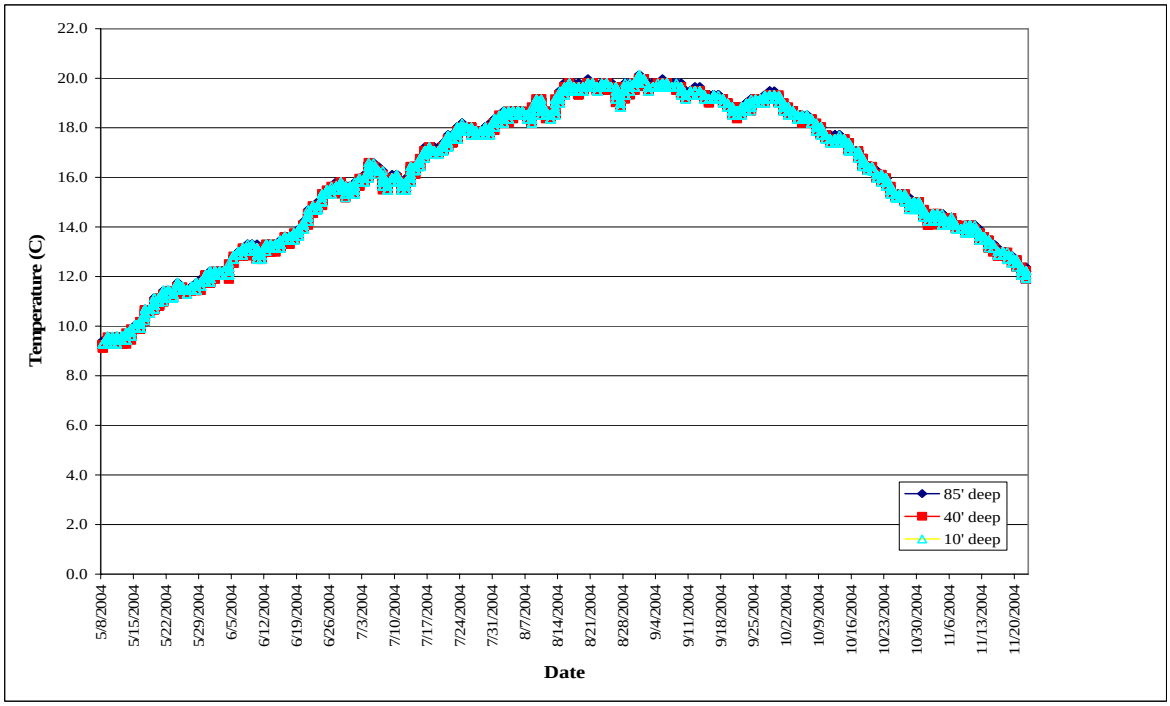

Figure 5.2-27 **Vertical daily average temperature profiles for Wells Forebay (RM 516) in 2004 (May-Nov.).**

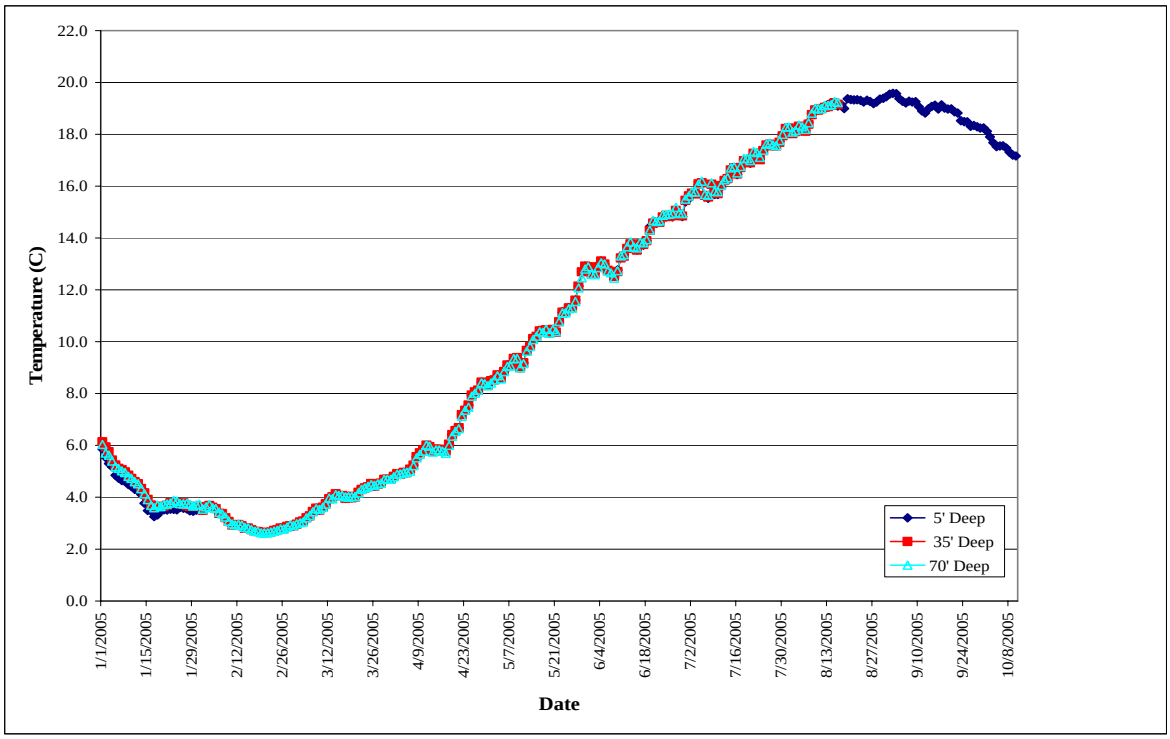

Figure 5.2-28 Vertical daily average temperature profiles for Wells Forebay (RM 516) in 2005 (Jan.-Oct.).

In 2006, Douglas PUD expanded the Wells Reservoir temperature monitoring season to cover the entire year and implemented a more frequent downloading schedule. Douglas PUD also added additional monitoring stations at the mouths of the Okanogan (RM 0.5) and Methow (RM 0.1) rivers. This data will be useful in the development of any future temperature models that may be necessary to support Section 401 Water Quality Certification.

Turbidity

At Wells Dam, secchi disk readings are taken daily during the adult fish passage assessment period of May 1 to November 15 to examine turbidity. A standard secchi disk is lowered into the forebay on the west side of Wells Dam near the exit to the west fishway. Measurements are recorded in feet of visibility and records have been made since the early 1970s, however, continuous, reliable information adhering to a standard protocol has been collected since 1998. Figures 5.2-29 and 5.2-30 provide secchi disk readings collected since 1998 at Wells Dam.

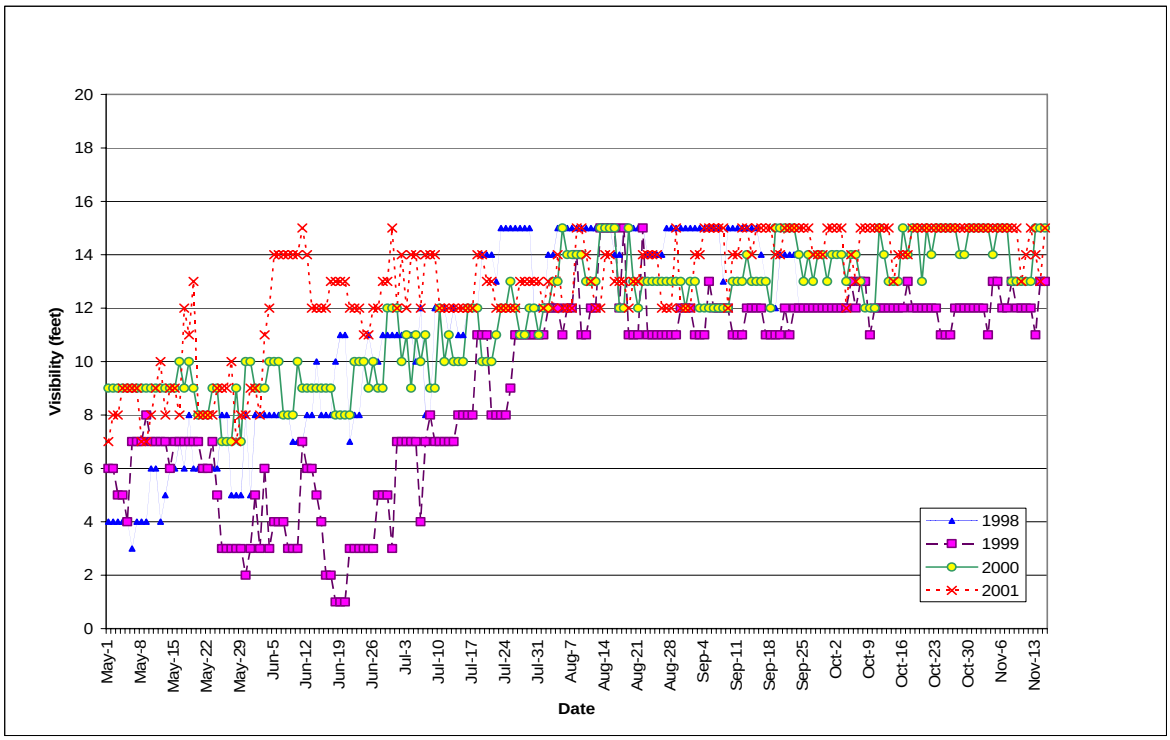

Figure 5.2-29 Secchi disk measurements taken in the Wells Forebay from May 1 to November 15 from 1998 to 2001.

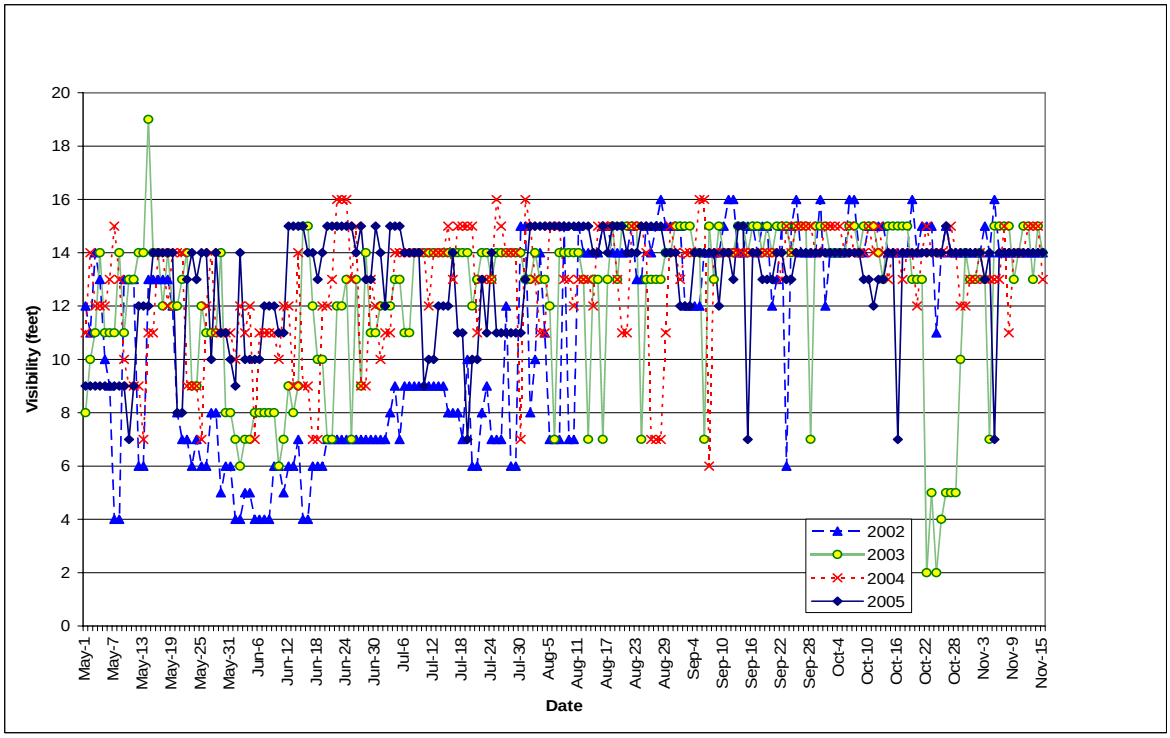

Figure 5.2-30 Secchi disk measurements taken in the Wells Forebay from May 1 to November 15 from 2002 to 2005.

5.2.7.2 Water Quality Monitoring: WA Department of Ecology (WDOE)

The WDOE has conducted monthly water quality monitoring at hundreds of stream stations throughout the state for nearly 50 years. The goal of WDOE's water quality monitoring program is to determine whether the water quality at a particular sampling site exceeds the water quality standard and to assess the status of water quality throughout the state. In the Wells Project area, WDOE maintains monitoring stations on both the Okanogan and Methow rivers outside the Wells Project Boundary.

Water quality monitoring station 49A070 is located on the Okanogan River near Malott upstream of the Wells Project. This station is located at approximately RM 17 and provides the most reliable information for the quality of water entering the Wells Reservoir from the Okanogan watershed upstream. Station 49A070 is classified by WDOE as a "long-term" station where monitoring has occurred monthly since 1984 and periodically as far back as 1967. Although in past years, portions of the Okanogan River have been put on the 303(d) list for various parameters, WDOE considers the overall water quality at this station to be of moderate concern based on the 2003 water-year assessment. Data can be accessed via the Internet at: http://www.ecy.wa.gov/apps/watersheds/riv/station.asp?sta=49A070

Water quality monitoring station 48A070 is located on the Methow River upstream of the Wells Project. This station is located at approximately RM 5 and provides the most reliable information for the quality of water entering the Wells Reservoir from the Methow watershed upstream. Station 48A070 is classified by WDOE as a "long-term" station where monitoring has occurred monthly since 1978 and periodically as far back as 1959 (Table 10). Overall water quality at this station met or exceeded expectations and is considered by WDOE to be of lowest concern based on the 2003 water-year assessment. Data can be accessed via the Internet at: http://www.ecy.wa.gov/apps/watersheds/riv/station.asp?sta=48A070

5.2.7.3 Water Quality Monitoring: United States Geological Survey (USGS)

The USGS studies surface-water quality in cooperation with local and state governments and with other federal agencies. Monitoring programs consist of collection, analysis, data archiving and dissemination of data and information describing the quality of surface water resources. Like WDOE, the USGS has monitoring stations on both the Okanogan and Methow rivers. However, with the exception of surface water flow data provided in Section 5.2.4, water quality data collected from both of these stations appear to be incomplete and less reliable in providing representative data for tributary water quality than data furnished by WDOE.

Water quality monitoring at station 12449950 is located near the City of Pateros. Data collection at this site has been inconsistent with monitoring occurring from 1959 to 1972 and then not again until 2001. Data can be accessed via the Internet at: http://nwis.waterdata.usgs.gov/wa/nwis/qwdata/?site_no=12449950

Water quality monitoring at station 12447200 is located near Malott. Data collection at this site is available from 1966 until 1994. Data can be accessed via the Internet at: http://nwis.waterdata.usgs.gov/wa/nwis/qwdata/?site_no=12447200&agency_cd=USGS

5.2.7.4 Water Quality Monitoring: COE

The COE owns and operates the Chief Joseph Project located at RM 545.3. Chief Joseph Dam is the next dam upstream from Wells Dam on the Columbia River. Similar to Douglas PUD, the COE monitors the water quality in the Chief Joseph Project, including the Chief Joseph tailrace at the upstream boundary of the Wells Project. The COE monitoring in the Chief Joseph tailrace provides Douglas PUD with important information regarding Columbia River water quality as it enters the upper extent of the Wells Reservoir. Parameters monitored by the COE in the Chief Joseph tailrace include temperature and TDG since 1997. Start and end dates for water quality monitoring varies each year but typically begin in the spring and end in the fall. Data is transmitted to the University of Washington's DART website which provides an interactive data retrieval resource for the Columbia River Basin. Data can be accessed via the Internet at: http://www.cqs.washington.edu/dart/dart.html

5.2.8 Water Quality Studies

Studies and monitoring activities recently implemented by Douglas PUD related to documenting overall water quality conditions within the Wells Project and understanding the Project's effects on these resources include:

- Wells Dam Spillway Total Dissolved Gas Evaluation (Columbia Basin Environmental 2006).
- Total Dissolved Gas Production Dynamics Study (EES Consulting, et. al., 2006),
- Macrophyte Identification and Distribution Study (Le and Kreiter, 2006),
- Limnological Investigation, Wells Hydroelectric Project (EES Consulting, 2006),
- Aquatic Macroinvertebrate Inventory and RTE Assessment, Wells Hydroelectric Project (BioAnalyst, 2006),
- Temperature Monitoring, Wells Hydroelectric Project (Douglas PUD, 2006).

Information from these studies indicates that the Wells Reservoir is a healthy, riverine water body with no thermal or chemical stratification. The reservoir ecosystem is dominated by native fish, macrophyte and benthic invertebrate communities. These studies have also demonstrated that the water found within the Wells Project is of high quality and is in compliance with the State standards for all of the parameters measured. Notable exceptions to meeting the State standards included seasonal exceedances in water temperature and TDG.

5.2.8.1 TDG Evaluation

Douglas PUD has recently initiated a series of assessments aimed at gaining a better understanding of TDG production dynamics resulting from spill operations at Wells Dam. Each year from 2003-2005 during spring runoff, Douglas PUD has undertaken spill tests to examine the relationship between water spilled over the dam and the production of TDG. In 2003 and

2004, Columbia Basin Environmental (CBE) deployed sensors along two transects. Study objectives were to determine the effectiveness of the tailwater sensor relative to the tailwater cross section profile for TDG and better define the relationship between spillway releases and TDG production (CBE 2003, 2004). In a two-week period, the studies showed that the tailwater station did provide an accurate record of daily average TDG values in the Wells Tailrace. The studies also showed that at times, gas levels from some turbine flows were being affected by spill.

In spring 2005, Douglas PUD contracted with CBE to implement a TDG study at Wells Dam. The study was designed to measure TDG pressures resulting from various spill patterns at the dam (CBE, 2006). An array of water quality data loggers was installed in the Wells Dam tailwater for a period of two weeks between May 23, 2005 and June 6, 2005. The Wells Dam powerhouse and spillway were operated through a predetermined range of operational scenarios that varied both total flow and shape of the spillway discharge. A total of eight configurations were tested including flat spill patterns (near equal distribution of spill across the entire spillway), crowned spill patterns (spill is concentrated towards the center of the spillway) and spill over loaded and unloaded units (Table 5.2-9).

Table 5.2-9 Test matrix for 2005 Wells Dam TDG Production Dynamics Study.

Test	Description
1A	Spill over load, east spill/east generation
1B	Spill over unloaded units, east spill/west generation
1C	Spill over unloaded units, west spill/east generation
1D	Spill over load, west spill/west generation
2A	Crowned spill, modest flow
2B	Flat spill, modest flow
2C	Crowned spill, high flow
2D	Flat spill, high flow

Results from the study indicated that spill from the west side of the spillway resulted in consistently higher TDG saturations than similar spill from the east side. Flat spill patterns consisting of near equal distribution of spill across the entire spillway yielded higher TDG saturations than crowned spill for similar total discharges. The results of this study indicated that TDG levels of powerhouse flows may have been influenced by spill. Additionally, background TDG levels, recorded by the Wells Forebay monitor, were affected both by thermal dynamics within the reservoir and upstream spill activity. Additional information related to the results of the 2005 TDG study can be found in Appendix F.

5.2.8.2 Wells Project Limnology

In 2005, Douglas PUD implemented a study to collect baseline limnological information for waters within the Wells Project (EES Consulting, 2006). The objectives of this study were to further document existing water quality conditions within the Wells Project and to collect information to fill water quality data gaps identified by Douglas PUD to support the water

quality certification process administered by WDOE. A total of nine sampling sites, which include mainstem sites, tributaries and littoral habitats were selected to represent the spatial variability within the Wells Project (Table 5.2-10). The year-long study began in May 2005 and investigated various water quality parameters at each of the nine sampling sites. Sampling included physical, chemical and biological water quality characteristics. A total of 22 water quality characteristics were sampled. All procedures used for the purpose of collecting, preserving and analyzing samples followed established EPA 40 CFR 136 protocol. Additional information regarding the methods used during this study can be found in Appendix F.

Table 5.2-10 Water quality sampling sites for the 2005-2006 Wells Project Limnological Investigation.

Site	Description
1	Downstream of Chief Joseph Dam
2	Columbia River just downstream of the Brewster Bridge
3	Bridgeport Bar littoral site
4	Columbia River downstream of Pateros where the thalweg approaches maximum depth in the lower Wells Reservoir
5	Okanogan River upstream of confluence with Columbia River
6	Methow River upstream of confluence with Columbia River
7	Lower Wells Reservoir/Starr Boat Launch littoral site
8	Wells Forebay
9	Wells Tailrace

Results from the limnological investigation showed that the Wells Reservoir is characterized by low to moderately low levels for nutrients, slightly basic pH (range 7.5–8.5), well-oxygenated water and low turbidity with moderately low algae growth. Average Secchi depth for the Wells Reservoir varied minimally during May through August with only a slight increase as the season progressed (study average per site range 4.1 meters to 4.5 meters). Secchi depth (transparency) increased to a seasonal peak in September of 6.25 meters before slightly decreasing in October to a mean depth of 5.3 m. Transparency increased downstream at the Brewster Bridge and Wells Forebay relative to the head of the reservoir at the Chief Joseph Dam tailrace for all months.

Turbidity in the Columbia River showed relatively little seasonal variation with an annual average of 0.98 NTU. Longitudinal variation in turbidity was also minimal; sampling did not occur within the mixing zone plume of the Okanogan River. Turbidity in the Okanogan River was consistently higher than the Columbia River. Turbidity in the Methow River was higher than in the Columbia River in May (due to sediment load) and in August due to phytoplankton growth. The only turbidity reading over 5 NTU was in the Methow River during May where turbidity was 5.6 NTU.

Water temperature in the Wells Reservoir is primarily governed by the temperature of inflowing water at Chief Joseph Dam with little warming occurring as water traverses the Wells Reservoir's length. Similar to the temperature monitoring data, results of the study indicate that

the Wells Reservoir remained unstratified throughout the entire study period and was vertically homogeneous for DO. Figure 5.2-31 shows a vertical water profile of the Wells Project. Low respiration rates at depth, a lack of vertical stratification and short water retention times resulted in homogeneous DO levels at all depths within the Wells Reservoir.

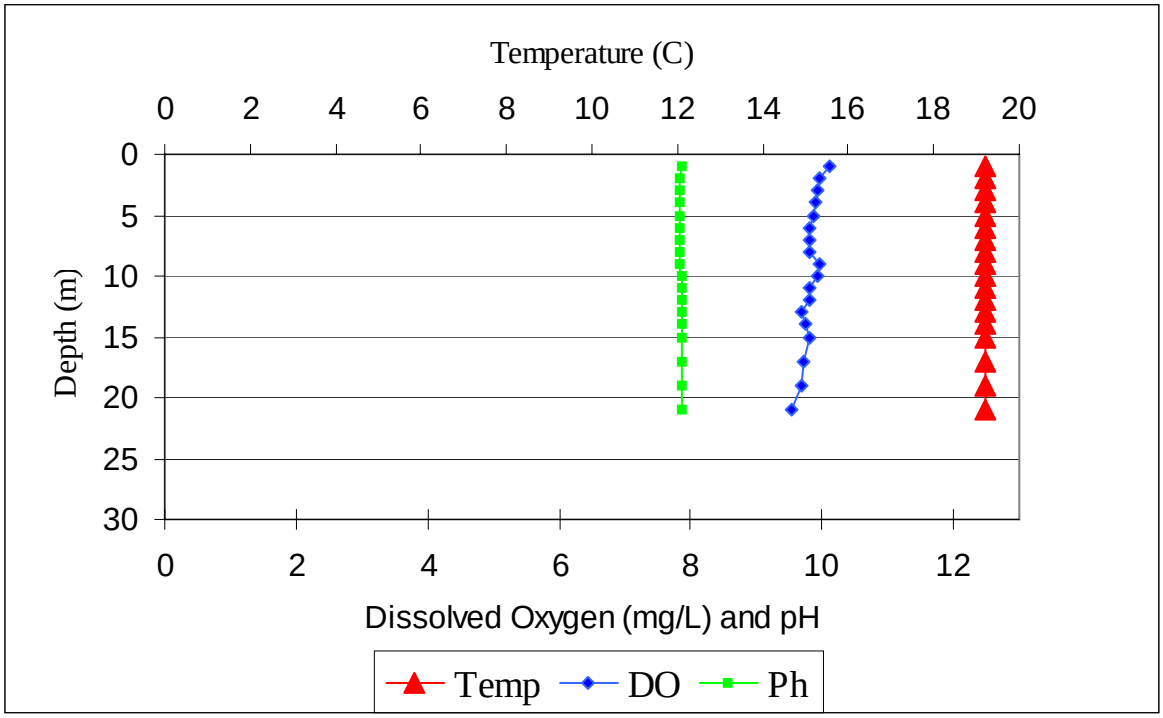

Figure 5.2-31 Vertical water quality profile of the Wells Project from sampling date August 17, 2005.

DO levels at one meter depth increased from upriver to downriver; the average difference (May through October) was 1.07 mg/L. The difference was more pronounced during May through August. The difference in September and October was 0.3 mg/L, which is at the limit of instrument reliability. Upstream to downstream differences in surface DO were negligible for the February 2006 sampling event. Littoral DO was similar or slightly higher than pelagic DO for surface waters. DO saturation levels were equal to or greater than 100 percent for all sites and all depths in all months except October when DO percent saturation for surface waters ranged from 110 percent to 91 percent saturation. The lower saturation levels in October may be due to reduced primary productivity while water temperatures were still relatively warm. All DO readings were above 8.0 mg/L and in compliance with the Washington State Water Quality Standard's numeric criteria.

Nitrogen and phosphorus are the two primary macronutrients needed for plant growth. Silica is important for diatomaceous phytoplankton. Ammonia levels were near or below detection levels for pelagic and littoral reservoir waters as well as the Okanogan River for May through August and in February. Ammonia levels were only slightly higher in September and October.

Ammonia peaked in the Methow River in August. Nitrates/Nitrites for reservoir waters were higher in May before leveling off during the summer and fall. Nitrates/Nitrites were significantly higher at all sites for the February sample than any other month. Nitrates within littoral waters were lower than pelagic waters except in February when levels were similar. Nitrates/Nitrites in both the Okanogan and Methow Rivers showed an increasing trend during the growing season. Total nitrogen levels for reservoir pelagic and littoral waters were similar and relatively constant with the exception of significantly higher levels at most sites during February.

Orthophosphorus peaked for all stations in July. Orthophosphorus levels for pelagic and littoral waters were similar in all months except July when littoral orthophosphorus concentrations were significantly higher than observed for pelagic areas. Orthophosphorus levels in the Methow and Okanogan rivers were higher than in the Columbia River. Orthophosphorus was partially depleted in the Okanogan River but not in the Methow River at the time of the August sampling. Total phosphorus was slightly higher in littoral waters than in pelagic areas. Wave disturbance to bottom sediments may be a factor for this difference. Total phosphorus levels in pelagic surface waters ranged from below detection limits to 30.8 ug/L. Total phosphorus was higher for the Okanogan River than elsewhere, which is likely due to the higher sediment load. Total phosphorus for all stations peaked in July before gradually declining throughout the rest of the growing season.

The range in N:P ratios for the Wells Reservoir was 2.5 to 30.8. The average TN:TP ratio in the Wells Reservoir was 13.7 for the photic zone and 14.8 averaged for samples from all depths. These values are within the suggested literature ranges for phosphorus limitation. The N:P ratios peaked in July with pelagic and littoral waters showing similar trends. A decreasing N:P ratio through the major part of the algae growing season is typical of moderate to low nutrient waters as algae assimilate available nutrients. The N:P ratios were higher in the tributary rivers relative to the Columbia River. The N:P ratios are an indicator but not an absolute confirmation of factors limiting productivity.

Moderate to low chlorophyll *a* concentrations (range 0.5 *u*g/L to 5.8 *u*g/L) occurred throughout the sample period with peaks in July and October for the Wells Reservoir. Concentrations were lowest in August and also had the least variability among sites for the August sampling event. Pelagic and littoral waters were similar for chlorophyll *a* concentrations in most months except October when littoral waters reported twice as high *c*hlorophyll *a* levels.

Phytoplankton were dominated by diatoms for all months at all sites sampled with Chryptophyta (small unicellular flagellates) being second dominant based on biovolume. Diatoms and Chryptophyta are both considered a good food source for the rest of the aquatic food web. Diatoms comprised 75 percent to 84 percent of the total phytoplankton biomass for the Wells Reservoir sites. Chlorophytes (green algae) were sub-dominant in the tailrace but only a minor component elsewhere. Total phytoplankton biomass was relatively low for all Wells Reservoir sample sites; total biomass was generally less than 200,000 um^3/ml. Biomass peaked in July and August for pelagic areas of the Wells Reservoir and minor peaks occurred in October for littoral sites. The timing of peaks varied among all stations. Cyanophyta (blue-green algae) were only recorded in the Wells Reservoir for the July sample at Brewster Bridge where they comprised 16

percent of the total biomass; however, the biomass of Cyanophytes were comprised of relatively few but very large multicellular units. Cyanophytes also were recorded in the Wells Tailrace (4.7 percent biomass) in July. Diatoms dominated phytoplankton in the Methow River where peak biomass occurred in August (1,455,158 um^3/ml). This peak is much higher than biomass observed anywhere else in the Wells Reservoir. Biomass levels in the Okanogan River were only slightly higher than in the Columbia River for most months with minor peaks occurring in May and October. Cyanophytes were a small proportion of the August biomass sample for the Okanogan River.

Diatoms also dominated periphyton. Seasonal lows occurred in July for all sites except Bridgeport shallows where the trend was decreasing periphyton biovolume as the season progressed.

Zooplankton density for pelagic waters was greatest in July (6,080/m^3) and lowest (1,289/m^3) in August. Copepods dominated the zooplankton population. Zooplankton densities in the river mouths peaked in May. Although rotifers were present in all months, their density dropped to very low levels after May. Cladocera were the third most prevalent group with a minor peak occurring in July for this group.

Trophic Status Index (TSI) developed by Carlson (1977, 1996) and modified for nitrogen by (Kratzer and Brezonik 1981) is an indication of the productivity of a lake based on Secchi depth, TP, TN and chlorophyll *a* concentrations for summer months (June through September). Wells Project waters are classified as oligo-mesotrophic based on a mean TSI score of 36.5 with 40 to 50 being the range for mesotrophic classification.

5.2.8.3 Meteorological Data Collection

Although meteorological data are not a direct water quality issue, site specific weather information is an integral component in the development of water temperature models. Weather information characteristic of the entire Wells Reservoir was unavailable until 2005 when Douglas PUD began collecting site specific meteorological data. Douglas PUD identified three sites that would most effectively characterize weather trends in the Wells Reservoir. These sites were Chief Joseph Dam (upper Wells Reservoir area), Bridgeport Bar (mid-Wells Reservoir area) and the Wells Forebay (lower Wells Reservoir area). Since reliable meteorological information was already available near Chief Joseph Dam, NRG Systems weather stations were erected at the other two identified sites in order to collect the suite of parameters that are required to fully support water temperature modeling. The parameters collected are air temperature, relative humidity, dew point temperature, solar incidence, cloud cover, wind speed and wind direction.

5.2.9 Management Plans Affecting Water Quality

5.2.9.1 Juvenile Fish Bypass

Douglas PUD operates a Juvenile Bypass System which utilizes five of eleven spillways equipped with constricting barriers to help guide juvenile migrating fish. The Wells bypass

system is an important feature of the Wells Project that contributes significantly to Douglas PUD's ability to achieve the No Net Impact (NNI) survival standards outlined in the Wells HCP. The bypass system serves as an effective method of bypassing fish away from turbines and safely over the dam. This configuration has demonstrated exceptionally high levels of protection while utilizing only 6-8 percent of the Columbia River flow. The efficiency and effectiveness of the bypass system are important factors in limiting the amount of spill, and therefore TDG, while maximizing fish passage and survival. Douglas PUD has conducted three years of juvenile survival studies at Wells Dam which have shown an average survival rate of 96.2 percent for yearling Chinook and steelhead (Bickford et al., 1999; Bickford et al., 2000; Bickford et al., 2001). This is the highest survival rate for any dam on the Columbia or Snake rivers and at the same time, the contribution to TDG levels downstream of Wells Dam is negligible (0-2 percent).

5.2.9.2 TDG Abatement Plan

In the past, Douglas PUD has submitted a TDG Abatement Plan every two years to the WDOE. The current Gas Abatement Plan was submitted to WDOE in 2004 and will be in effect for three years (2005-2007). In this plan, Douglas PUD outlines the past and future management activities that address both TDG and temperature. Information regarding data from previous years of monitoring programs (described in Section 5.2.7.1) and studies, dates and times of values in exceedance of the State standard, program operating conditions, and summary data of post season QC/QA are presented in the plan. Upon approval by WDOE, entities submitting such a plan may receive a waiver during the fish migration period that allows for a 12 hour high average of 115 percent and 120 percent TDG as measured in the forebay and tailrace of the dam, respectively. Douglas PUD received approval and an issuance of a TDG waiver for the 2005 TDG Abatement Plan and continues to address water quality concerns in the Wells Reservoir through the development of specialized studies and implementation of its existing monitoring programs.

5.3 Fish and Aquatic Resources

5.3.1 General Description of Fish Communities and Habitats

The aquatic ecosystem in the Wells Reservoir is an interconnected community that includes the Wells Tailrace, the upstream 29.5 miles of the Columbia River, the lower 1.5 miles of the Methow River, and the lower 15.5 miles of the Okanogan River. This interconnected waterway is made up of several different habitat types including deepwater, littoral, backwater and transitional habitats. These unique habitat types are defined by parameters such as velocity, depth, bathymetry, substrate, nutrient availability and overall complexity. These habitat types determine the degree to which periphyton/algae, aquatic plants and benthic macroinvertebrate communities can exist. Fish species distribution, abundance and composition in the Wells Reservoir are heavily influenced by the availability and quality of these various habitat types.

In the Wells Reservoir, fish resources consist of anadromous and resident, native and non-native, and warm and cold water species. These fish species depend upon a variety of habitat types for their various life history stages. Use of the Wells Project by fish varies considerably depending

on these habitat needs. Anadromous species utilize the Wells Reservoir primarily as a migratory corridor; this differs considerably from some resident species that may depend upon the habitats in the Project for all their life history needs. Further, and importantly, many of these species interact with, and depend upon, the other fish communities in the system.

Anadromous species using the Wells Reservoir include Chinook salmon (*Oncorhynchus tshawytscha*), sockeye salmon (*O. nerka*), steelhead (*O. mykiss*), coho salmon (*O. kisutch*), and Pacific lamprey (*Lampetra tridentata*). All of these species are native to the Columbia River basin and all but Pacific lamprey are considered game fish species although Pacific lamprey have utilitarian and cultural significance to some Columbia Basin tribes (Close et al., 2002). Upper Columbia River spring-run Chinook salmon and summer-run steelhead are federally listed as endangered under the ESA.

In the mid-Columbia River area, some 46 resident fish species have been documented (NMFS, 2002a). In the Wells Reservoir, through a combination of inventory-related resident fish sampling and anecdotal evidence, 27 resident fish species have been documented. Examples of resident game fish species include native cold water species such as rainbow trout (*O. mykiss*) and burbot (*Lota lota*) and non-natives such as walleye (*Stizostedion vitreum*). Non-native warm water species include smallmouth bass (*Micropterus dolomieu*) and bluegill (*Lepomis macrochirus)*. Bull trout (*Salvelinus confluentus*) are a resident game fish that is no longer harvested due to its status as an ESA listed threatened species. White sturgeon (*Acipenser transmontanus*) are classified as a game fish although retention is prohibited in the mid-Columbia River for conservation purposes.

Game fish species are supported by “forage” species. These “forage” species are composed of a wide range of species including cyprinids (minnows, dace *spp*.), catostomids (sucker *spp*.), ictalurids (bullhead *spp*.) and cottids (sculpin *spp*.). Table 5.3-1 provides a comprehensive list of the resident species documented in the Wells Reservoir.

Table 5.3-1 Native and non-native resident fish species that have been documented in the Wells Reservoir from past resident fish assessments, monitoring efforts, and miscellaneous studies (Dell et al., 1975; McGee, 1979; Burley and Poe, 1994; Beak, 1999; NMFS, 2002; BioAnalyst, Inc., 2004).

Common Name	Scientific Name
Native Species	
White sturgeon	*Acipenser transmontanus*
Chiselmouth	*Acrochelius alutaceus*
Longnose sucker	*Catostomus catostomus*
Bridgelip sucker	*Catostomus columbianus*
Largescale sucker	*Catostomus macrocheilus*
Lake whitefish	*Coregonus clupeaformis*
Prickly sculpin	*Cottus asper*
Threespine stickleback	*Gasterosteus aculeatus*
Burbot	*Lota lota*
Peamouth	*Mylocheilus caurinus*
Rainbow trout	*Oncorhynchus mykiss*
Mountain whitefish	*Prosopium williamsoni*
Northern pikeminnow	*Ptycholcheilus oregonensis*
Redsided shiner	*Richardsonius balteatus*
Dace	*Rhinichthys spp.*
Bull Trout	*Salvelinus confluentus*
Non-Native Species	
Carp	*Cyprinus carpio*
Black bullhead	*Ictalurus melas*
Brown bullhead	*Ictalurus nebulosus*
Pumpkinseed	*Lepomis gibbosus*
Bluegill	*Lepomis macrochirus*
Smallmouth bass	*Micropterus dolomieui*
Largemouth bass	*Micropterus salmoides*
Yellow Perch	*Perca flavescens*
Black crappie	*Pomoxis nigromaculatus*
Walleye	*Stizostedion vitreum*
Tench	*Tinca tinca*

5.3.2 Aquatic Habitat

A wide variety of aquatic habitats exist within the Wells Reservoir. This is due to the range of conditions that occur within the reservoir and a multitude of complex interacting factors such as water velocity, water quality, geomorphological characteristics and the presence of aquatic plant and invertebrate communities. These parameters vary at different locations within the Wells Reservoir and are key determinants to the types of available habitat.

5.3.2.1 Essential Fish Habitat

Congress added habitat conservation provisions to the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) in 1996. This federal law governs US marine fisheries management (NMFS, 2005).

The Magnuson-Stevens Act requires federal fishery management plans to describe the habitat essential to the fish being managed. In addition, in order to protect this Essential Fish Habitat (EFH), federal agencies are required to consult with the National Marine Fisheries Service (NMFS) on activities within their jurisdiction that may adversely affect EFH (PFMC, 2000).

The Pacific Fishery Management Council manages the fisheries for coho, Chinook, and Puget Sound pink salmon and has defined EFH for these three species. Salmon EFH includes all those streams, lakes, ponds, wetlands and other water bodies currently or historically accessible to salmon in Washington, Oregon, Idaho and California. Salmon EFH excludes areas upstream of longstanding naturally impassible barriers (i.e. natural waterfalls in existence for several hundred years) but includes aquatic areas above all artificial barriers except specifically named impassible dams (PFMC, 2000).

When the EFH needs of all these species at each life stage are considered as a whole, the EFH for the Pacific coast salmon fishery is broad, covering freshwater, estuarine, and marine environments. The geographic extent of freshwater EFH is specifically defined as all currently viable waters and most of the habitat historically accessible to salmon within the USGS hydrologic units (PFMC, 2000). For commercially-managed salmon species that are present in the Wells Reservoir (Chinook and coho), EFH consists of all of the water bodies in the Wells Reservoir. This includes the lower 15.5 mile section of the Okanogan River (HUC 17020006), the lower 1.5 mile section of the Methow River (HUC 17020008) and the section of the mainstem Columbia River encompassed within the Wells Project Boundary.

The Wells HCP contains NMFS conditions relative to the EFH provisions of the Magnuson-Stevens Act. The HCP was signed by the NMFS and also provides coverage relative to the ESA, the FPA, the Fish and Wildlife Coordination Act, and the Northwest Electric Power Planning and Conservation Act.

5.3.2.2 Wells Project Waters

Wells Project waters can be divided into six geographic sections based on general location and habitat conditions. These six geographic sections include the upper, middle, and lower portion of the inundated Columbia River, the Wells Tailrace and the Methow and Okanogan rivers within the Wells Project Boundary.

Wells Reservoir (Upper, Middle, Lower)

The uppermost five mile section of the Wells Reservoir immediately downstream from the Chief Joseph Dam tailrace (RM 540 to RM 545.1) is characteristic of a riverine environment. This section of the Wells Reservoir is relatively narrow and fast-flowing with a precipitous shoreline. Dominant substrate in this upper section is characterized by larger cobble-sized substrate.

The middle 10-mile section between the town of Brewster (RM 530) and just upstream of Chief Joseph State Park (RM 540) is more characteristic of a lacustrine environment. This section of the Wells Reservoir is a shallow, relatively broad area containing the confluence of the Okanogan River. Water velocities in this middle section are slower, more of the substrate is composed of fine sediment, and the bathymetry is more gradual than the Upper Wells Reservoir. This section has the highest density of aquatic plant communities and has the largest area of littoral fish habitat compared to the other two sections of the Wells Reservoir (Beak, 1999).

The lowermost 15-mile section is relatively narrow and fast flowing, compared to the middle section, but eventually slows and deepens as it nears the Wells Forebay. Shoreline slopes are steep with a relatively high frequency of rip-rap and substrates in this section tend to be coarse. The exception to these habitat characteristics in the lower section of the Wells Reservoir is the area near the confluence of the Methow River (Beak, 1999) which consists of higher levels of fine substrate that has been deposited within the Wells Reservoir by the Methow River.

Wells Tailrace

The section of the mainstem Columbia River downstream of Wells Dam and within the Wells Project Boundary is referred to as the Wells Tailrace. It is approximately one mile long. The habitat within this section of the river reflects its proximity to Wells Dam and its operations. Water velocities are high in this section of the river and shoreline slopes are steep and free of riparian vegetation. Benthic substrate is dominated by gravel and large cobble with low levels of fine sediment. Due to high flow, deep water, and larger substrate types, the Wells Tailrace area is not favorable to the establishment of aquatic vegetation. The Wells HCP defines the Wells Tailrace as the reach extending from the base of the dam to a point approximately 1,000 feet downstream.

Okanogan River

The Wells Project Boundary includes the lower 15.5 mile section of the Okanogan River to its confluence with the Columbia River. This lower section of river flows through a U-shaped, unconfined alluvial valley, has a gradient of 0.03 percent, and consists of mostly eroded banks and straight and impounded stream types (NMFS et al., 1998). Riparian vegetation is dense but is not of suitable height to provide adequate shading of the river. The entire Okanogan drainage is a broad valley composed of deep glacial deposits that are highly erodable. Bank stability is further degraded by land uses adjacent to the river. Benthic habitat in the Okanogan Basin, including the lower 15.5 miles of river, is primarily composed of fine sediment. Water temperatures often exceed the Washington State water quality standard in the lower Okanogan River during summer months. This exceedance is partly a result of natural phenomena (low gradient, low instream flow, arid conditions and solar radiation on the upstream lakes). Despite temperatures in exceedance of the state standard, the Okanogan watershed currently supports healthy runs of anadromous summer/fall Chinook and sockeye and smaller runs of steelhead (NMFS et al., 1998). The lower section of the Okanogan River within the Wells Project Boundary is utilized by anadromous salmonids primarily as a migratory corridor. Resident fish species utilize the aquatic habitat available in the lower Okanogan River as habitat for spawning, rearing and migration (NMFS et al., 1998).

Methow River

The Wells Project Boundary includes the lower 1.5 mile section of the Methow River to its confluence with the Columbia River. The lower Methow River drainage is a moderately confined alluvial valley with an average gradient of 0.37 percent (NMFS et al., 1998). Water quality in this lower section is considered excellent. Riparian and stream channel condition appear to have some damage from livestock grazing and agricultural development, however the quality of substrate in the mainstem Methow is in relatively good condition (NMFS et al., 1998). The Methow watershed currently supports healthy populations of anadromous summer/fall Chinook, ESA listed stocks of spring Chinook, steelhead and bull trout. Aquatic habitat in the lower section of the Methow is utilized by anadromous salmonids (Chinook, steelhead) primarily as an adult migratory corridor to access the upper mainstem reaches and by juveniles as a rearing and migration corridor. Resident fish species utilize the aquatic habitat available in the lower Methow River as habitat for spawning, rearing and migration (NMFS et al., 1998).

5.3.2.3 Aquatic Macrophytes

Aquatic plant communities in river and reservoir systems can be characterized as distinct zones of vegetation that are influenced by a complex of environmental variables such as water, depth, exposure, turbidity, salinity and soil characteristics (NMFS, 2002a). Aquatic bed habitats are those wetland and deepwater zones dominated by plants that grow principally on or below the surface of the water for most of the growing season in most years (NMFS, 2002a). Such habitat provides cover, food and rearing habitat for numerous aquatic species. The scope of the following discussion is limited to aquatic habitat associated with aquatic macrophyte beds.

Some information exists on aquatic macrophytes in the mid-Columbia River system. Vegetation mapping in and around the Rocky Reach Reservoir (RMs 473.6 to 515.5) identified 979 acres of aquatic macrophytes (Duke, 2001) out of a total surface area of 8,167 acres (Duke, 2001). Eurasian watermilfoil (*Myriophyllum spicatum*) represented 34 percent of the biomass samples collected from within the Rocky Reach Reservoir (Duke, 2001). In the Priest Rapids and Wanapum reservoirs, the composition of Eurasian watermilfoil in the aquatic macrophyte community was higher at 42 percent of littoral plant biomass (Normandeau et al., 2000).

In August and September 2005, Douglas PUD conducted an aquatic macrophyte study in the Wells Reservoir (Le and Kreiter, 2006). The study approach consisted of using high resolution orthophotography, detailed bathymetric data and extensive in water sampling to determine presence or absence of macrophyte beds. Species composition of existing macrophyte beds were verified during more intensive surveys. Species composition data were then categorized into several aquatic plant community types and then integrated into a final continuous macrophyte map layer in the GIS.

Sixty-one transects totaling 369 sample points were completed during the 2005 study (Lê and Kreiter, 2005). Depths of up to 30 feet were sampled and sampling points along transects were completed at intervals of 5 feet or less. A total of 9 aquatic plant species were documented (Table 5.3-2). Table 5.3-2 presents the percentage of samples in which each of the identified aquatic species was categorized as the dominant species (consisting of >60 percent of the sample composition). The two most dominant species in samples collected were common waterweed (*Elodea canadensis*) and leafy pondweed (*Potamogetion foliosus*) at 24.7 percent and 16.7 percent, respectively. Both of these species are native. Non-native Eurasian watermilfoil was dominant in only 6.3 percent of samples taken (Table 5.3-2) and all of these samples were taken at depths between 4 and 15 feet. Samples in which no plants were identified (absent) consisted of 41.7 percent of all samples taken and support the concept that macrophyte communities maintain a patchy distribution.

Results of the study found that in general, macrophyte communities in the Wells Reservoir were distributed by various depth ranges. Table 5.3-3 presents the aquatic plant community types observed in each zone and how these community types shifted with changes in depth. In general, macrophyte communities did not recruit to depths of less than 4 feet. Depths between 5 and 15 feet were characterized by a native dominant species composition. If Eurasian watermilfoil were present at these depths, they were often sub-dominant or at low densities (less than 10 percent milfoil). From depths of 15 to 24 feet, species composition consisted of exclusively native species. From 24 feet to 30 feet, macrophyte communities were absent most likely due to the limited light at these depths.

Table 5.3-2 Aquatic macrophyte species identified and the frequency at which each of the species was considered the dominant species (consisting of >60 percent of the total sample) in a given sample during the Macrophyte Identification and Distribution Study, 2005 (Lê and Kreiter, 2005).

Scientific Name	Common Name	Percentage of samples in which dominant
Chara spp.	Muskgrass	.003% (1/396)
Elodea canadensis	Common waterweed	24.7% (98/396)
Myriophyllum spicatum	Eurasian watermilfoil	6.3% (25/396)
Potamogeton crispus	Curly leaf pondweed	4.3% (17/396)
Potamogeton foliosus	Leafy pondweed	16.7% (66/396)
Potamogeton nodosus	American pondweed	1.3% (5/396)
Potamogeton pectinatus	Sago pondweed	0.8% (3/396)
Potamogeton zosteriformis	Flat-stemmed or eelgrass pondweed	2.3% (9/396)
Absent		41.7% (165/396)

Despite the general trend, there were some areas where macrophyte presence was expected but not observed. Macrophytes did not establish below 10 feet in areas downstream of Chief Joseph Dam as steep shoreline slopes promoted areas of high flow near shore. Between Park Island and Brewster Bridge, depths below 20 feet were located in the middle of the Columbia River where river velocity was not conducive to macrophyte colonization. In the inundated Okanogan River, limited light due to turbid conditions appeared to exclude macrophytes from depths greater than 8 feet (Table 5.3-3).

The results of this study indicate that the macrophyte community found within the Wells Project is healthy and dominated by native species. Project operations, including reservoir fluctuations, do not appear to be encouraging the growth of non-native macrophytes, including milfoil. Daily reservoir fluctuations do have an effect on the growth of macrophytes in the upper 2-4 feet of the reservoir but the overall community types and species composition are not affected by reservoir operations (DTA, 2006). Project operations are described in Section 3.5 and reservoir elevation in relation to time is shown in Figure 3.5-1.

Table 5.3-3 Aquatic plant community types by Wells Reservoir zone designation and water depth, Wells Macrophyte Identification and Distribution Study 2005.

Study Zones	Depth Range (ft)	Aquatic Plant Community Type	Density
Wells Dam to Pateros	0 - 4	Absent	N/A
(RM 515.8 – 524)	4 -10	Native Dominant	Dense
	10 - 16	Native	Dense
	16 - 20	Native	Medium
	20 - 30	Absent	N/A
Lower Methow River	0 - 2	Absent	N/A
(RM 0.0 – 1.5)	2 - 9	Native Dominant	Dense
	9 - 15[1]	Absent	N/A
Pateros to Brewster	0 - 4	Absent	N/A
(RM 524 – 530)	4 - 15	Native Dominant	Dense
	15 - 18	Native	Dense
	18 - 24	Native	Medium
	24 - 30	Absent	N/A
Brewster to Park Island	0 - 4	Absent	N/A
(RM 530 – 538.5)	4 - 10	Native Dominant	Dense
	10 - 15	Native Dominant	Medium
	15 - 20	Native	Sparse
	20 - 30	Absent	N/A
Park Island to Chief Joseph	0 - 5	Absent	N/A
(RM 538.5 – 545.1)	5 - 8	Native Dominant	Dense
	8 - 10	Native Dominant	Medium
	10 - 30	Absent	N/A
Lower Okanogan River	0 - 4	Absent	N/A
(RM 0.0 – 15.5)	4 - 6	Native Dominant	Dense
	6 - 8	Native	Sparse
	8 - 30	Absent	N/A

[1]Maximum depth along transect was 15 feet for all transects in Zone 2.

5.3.2.4 Spawning Habitat

The availability of spawning habitat in the Wells Reservoir varies with the myriad of fish species present in the area. Whether the fish species exhibits an anadromous, resident, or instream migratory life history strategy often determines the degree to which it may use habitat for spawning in the Wells Reservoir.

Anadromous Fish

Anadromous salmonids such as spring-run Chinook and sockeye salmon and summer steelhead generally utilize waters as a migratory corridor as they return to spawn in the middle and upper reaches of the Methow and Okanogan rivers and their respective tributaries (Table 5.3-4).

Table 5.3-4 Primary spawning distribution of anadromous fish species in the Wells Project (NMFS, 2002).

Species	Watershed	Tributaries
Spring-run Chinook Salmon	Methow River	Mainstem Methow River, lower mainstem Twisp River, and Lower Chewuch River
Summer and Fall-run Chinook Salmon	Methow River	Lower mainstem Methow River
	Columbia River	Tailrace of mainstem dams
	Okanogan River	Mainstem Similkameen and Okanogan rivers
Steelhead	Methow River	Methow mainstem; Gold, Libby, Wolf, and Early Winters Creeks; Twisp, Chewuch, and Lost rivers
	Okanogan River	Lower Similkameen River
Sockeye Salmon	Okanogan River	Mainstem Okanogan above Osoyoos Lake

At various times of the year, spring-run Chinook salmon, summer/fall-run Chinook salmon, summer steelhead and a small run of sockeye salmon return to the Methow River drainage to spawn. The primary spawning areas for spring Chinook salmon are the mainstem Methow River upstream of the Chewuch River confluence, the Twisp, Chewuch and the Lost rivers, as well as Thirtymile and Lake creeks. Spawning is observed occasionally in Foghorn Ditch as well, but it is likely that the fish spawning here are of hatchery origin. A very limited amount of spawning

has also been reported in Early Winters, Wolf and Gold creeks (NMFS, 2002a). In the Methow River, virtually all summer-run Chinook salmon spawn downstream of the Chewuch River confluence, a total of about 42 miles of spawning habitat (NMFS, 2002a). Summer steelhead use spawning habitat in the mainstem Methow River and eleven of its tributaries located in the mid and upper reaches of the drainage. Small numbers of sockeye salmon are observed nearly every year in the Methow River during spawning ground surveys for Chinook salmon. These fish are likely strays from either the Wenatchee or Okanogan river sockeye populations. Genetically and demographically, these salmon appear to be more similar to the Wenatchee River stock than the Okanogan River stock (Chapman et al., 1995). Documented spawning sites for anadromous salmonids in the Methow drainage are located outside of the Wells Project Boundary which extends up to RM 1.5 on the Methow River.

Sockeye salmon, summer/fall-run Chinook salmon, and a smaller run of steelhead return to spawn in the Okanogan River drainage primarily in the upper reaches of the river near the US-Canada border. The Okanogan Basin is one of only two remaining sockeye production areas still accessible in the Columbia River (Zook, 1983). Sockeye spawn in the Canadian portion of the Okanogan River between Vaseux Lake and Lake Osoyoos. These fish typically spawn from early October through early November. Adult summer/fall-run Chinook salmon spawn in limited areas between Zosel Dam and Malott. On the Similkameen River, a tributary near the US-Canada Border, summer Chinook salmon spawn in the 9-mile span from Enloe Dam to Driscoll Island (NMFS, 2002a). Documented spawning sites for anadromous salmonids in the Okanogan drainage are located outside of the Wells Project Boundary, which extends up to RM 15.5 on the Okanogan River just downstream of Malott.

In general, anadromous salmonids do not spawn within the Wells Project with the notable exception of summer/fall Chinook salmon that spawn in the Wells Tailrace and Wells Hatchery outfall. Prior to reservoir inundation, Meekin (1967) documented fall Chinook salmon spawning in the Columbia River in a 5-mile stretch of river immediately upstream from Brewster. Giorgi (1992) documented suitable spawning habitat for fall Chinook salmon and the existence of redds in the upper Rocky Reach Reservoir and lower Wells Tailrace in 1990 and 1991. In fall of 1999, Rensel Associates (2000) conducted surveys to delineate fall Chinook salmon spawning grounds throughout the entire Wells Reservoir. A majority of the spawning grounds and suitable habitats were located in a gravel bar area on the west riverbank one to one and a half miles downstream of Wells Dam. These results were consistent with the surveys conducted by Giorgi (1992). The 1999 survey also examined the areas documented by Meekin (1967) and found that suitable spawning gravel for summer/fall Chinook salmon no longer existed in the areas identified by Meekin (1967) (Rensel Associates, 2000).

Pacific lamprey is another anadromous fish species that is present in the Wells Reservoir. Given their documented habitat requirements in other areas (Beamish, 1980), it is likely that returning adult lamprey utilize Wells Reservoir primarily for overwintering and as a migratory corridor through which they travel destined for the middle and upper reaches of tributary streams outside of the Wells Project Boundary where habitat conditions are more suitable for spawning.

Resident Fish

Objectives of past resident fish studies (McGee, 1979; Zook, 1983; Beak, 1999) did not specifically address spawning habitat but rather focused on species diversity, relative abundance and spatial distribution. Therefore, little information exists about the location and availability of spawning habitat for resident fish species in Wells Project waters. It is likely that some resident fish species (cyprinids, catostomids, cottids) that spend their entire lives in Wells Project waters utilize areas of the Wells Reservoir, tailrace and lower tributaries (Methow and Okanogan rivers) to reproduce while other resident species although present in the Wells Reservoir, utilize areas outside of the Wells Project Boundary. Zook (1983) in his review of resident fish in the Wells Reservoir, hypothesized that some resident species such as mountain whitefish, rainbow trout and walleye, although present, may not be reproducing. Zook's review (1983) suggests that resident rainbow trout are primarily a product of residualism of hatchery-produced steelhead and that mountain whitefish appear to use the Wells Reservoir principally as a migration route between spawning areas in the Methow River and the Wells Tailrace. The report also suggests that walleye populations in the Wells Reservoir are recruited from the Lake Roosevelt population that was introduced in the late 1950s. The report also states that although spawning habitat appears to be available, evidence of successful reproduction has not been observed (Zook, 1983).

Northern pikeminnow control efforts have been implemented at the Wells Reservoir starting in 1995. Part of these efforts included the identification of known spawning locations through the use of radio-telemetry. Based upon results of this study, northern pikeminnow spawning habitat is located in the Wells Reservoir near Park Island, near RM 1.5 on the Methow River and in the Wells Tailrace immediately downstream of the east bank fish ladder (Bickford and Skillingstad, 2000).

White sturgeon spawn in swift currents over cobble, boulder and bedrock substrates similar to those occurring in the tailrace areas of dams throughout the mid-Columbia. The presence of juvenile White sturgeon suggests that successful spawning and rearing does take place within the Wells Reservoir. Spawning is expected to take place in the tailrace of Chief Joseph Dam; however, little information exists as to the exact location of spawning habitat for this species.

Resident fish species that exhibit instream migratory behavior include fluvial bull trout. Fluvial bull trout have been documented passing through Wells Dam and utilizing the Wells Reservoir. Fluvial bull trout are fish that mature in their natal streams but migrate to larger streams and rivers after maturation to forage prior to returning to natal streams to spawn. Fluvial bull trout have been observed passing upstream through Wells Dam in the spring and summer with peak counts in late May and early June. Recent radio-telemetry studies (BioAnalysts, Inc., 2004) have observed the majority of tagged fish moving back into the Methow River by the end of June. These movements coincide with migration timing related to fall spawning activity in the middle and upper reaches of the Methow River drainage. Current information indicates that bull trout do not spawn in the Wells Reservoir as warm water temperatures in late summer do not support suitable spawning conditions.

5.3.2.5 Rearing Habitat

Similar to spawning habitat, the importance of habitat for rearing varies depending upon the specific requirements of each fish species' life history strategy (anadromous, resident or instream migratory). Furthermore, with regard to anadromous salmonids, the specific race/demes also determine the degree to which Wells Project waters may be used for juvenile rearing.

Anadromous Fish

The Wells Project is operated as a run-of-the-river facility with a reservoir that has a relatively rapid flushing rate. Most of the shoreline in the Wells Reservoir and tailrace area are steep with relatively little littoral habitat. In general, these characteristics limit the rearing of stream-type juvenile anadromous salmonids. In the Methow and Okanogan rivers, habitat conditions may be more favorable for rearing of juvenile stream-type anadromous salmonids; however, warm water temperatures during late summer can be a limiting factor in tributary streams. Ocean-type Chinook salmon are known to extensively utilize the mainstem Wells Reservoir for rearing and migration (Chapman et al., 1994a).

Upon hatching, spring-run or stream-type Chinook salmon generally rear in their natal tributary streams for one-year prior to migrating to the ocean, typically during April, May and June. Spring-run Chinook salmon utilize the mainstem Columbia River primarily as a migration corridor and as a result, they spend little time rearing in the Wells Reservoir (NMFS, 2002a). In contrast, summer/fall-run Chinook salmon or ocean-type Chinook salmon tend to spawn in the mainstem Columbia River and in the lower reaches of tributary streams. Juvenile summer/fall Chinook salmon spend considerable time rearing in the Wells Reservoir (NMFS, 2002a; Chapman et al., 1994a). Recently emerged summer/fall-run Chinook salmon juveniles rear throughout the entire Wells Reservoir with many fish migrating out of the Wells Reservoir during June, July and August; other juvenile summer/fall Chinook salmon overwinter in the Wells Reservoir and migrate to the ocean the following spring (Chapman et al., 1994a).

The habitat features important to steelhead are similar to those discussed for spring-run Chinook salmon. However, juvenile steelhead can spend considerably longer periods of time in freshwater rearing as juveniles. As with spring Chinook salmon, the tributary habitat appears to be more important for juvenile rearing than the Wells Reservoir. The balance of the production occurs in the tributaries, although some minor amount of reservoir rearing may occur during overwintering periods. Steelhead rearing occurs mainly in the Methow River drainage with some rearing occurring in the Columbia and Okanogan rivers. Although steelhead typically feed during their seaward migration, mid-Columbia reservoirs, such as Wells, serve primarily as migration corridors rather than as rearing habitat (Chapman et al., 1994b).

Similar to spring-run Chinook salmon and steelhead, sockeye salmon spend a substantial amount of time rearing in freshwater areas. Although sockeye salmon could conceivably rear in the reservoirs, the rapid flushing rate, low primary productivity and lack of abundant zooplankton limit production potential (NMFS, 2002a). The Wells Reservoir may be a source of rearing habitat for the small run of Methow River sockeye (NMFS, 2002a); however, the larger run of

Okanogan River sockeye salmon rear in Lake Osoyoos near the US-Canada border prior to their outmigration through Wells Project waters.

Pacific lamprey exhibit a protracted freshwater juvenile residence in the stream benthos. Larvae, often referred to as ammocoetes, settle in depositional areas such as pools and eddies where they burrow into soft sediment for a period of 4-6 years (Close et al., 2002) before beginning their seaward migration. Within the Wells Project Boundary, no site-specific information is available that addresses Pacific lamprey rearing habitat; however, it is likely that ammocoetes utilize areas of the Wells Reservoir and lower tributaries that are consistent with these habitat criteria.

Resident Fish

Past resident fish surveys (McGee, 1979; Beak, 1999) observed significant spatial trends in species distribution within the Wells Reservoir. Both McGee (1979) and Beak (1999) noted that in general, spiny ray species (centrachids) were most abundant between RM 530 and RM 540 and in the lower Okanogan River. This unique area of the Wells Reservoir is shallow and broad with slower water velocities, finer substrate, warm temperatures, and higher turbidity (Beak 1999) and is conducive to rearing spiny ray fish species while excluding more streamlined fish that prefer fast flowing water. Both surveys also found that the more streamlined resident fish species, such as chiselmouth and redsided shiner (cyprinids), were most abundant downstream of RM 530 where water velocities increased, turbidity decreased, and the amount of shallow littoral habitat decreased. Other resident fish such as various sucker species and white sturgeon are most likely distributed throughout the Wells Reservoir but reside and feed at depths near the river bottom. Migratory, cold water species such as bull trout and whitefish spawn outside of the Wells Reservoir and it is likely that the majority of juvenile fish of these species rear in tributary habitats. Sub-adult bull trout, however, have been observed passing over other mid-Columbia River dams and recent studies suggest that bull trout forage for resident species present in the Wells Reservoir (BioAnalysts Inc., 2004).

5.3.2.6 Current Management Plans that Affect Aquatic Habitat

Shoreline Management Policy

Douglas PUD owns approximately 89 miles of shoreline in fee title and addresses shoreline management issues through the implementation of a strict Land Use Policy that requires formal approval of all land use activities that take place within the Wells Project Boundary. Applications to permit activities such as construction of boat docks, piers and landscaping are reviewed and considered for approval by Douglas PUD. When making land use or related permit decisions on Douglas PUD owned lands that affect habitat within the Wells Project Boundary, Douglas PUD is required by Section 5 of the Wells HCP to notify and consider comments from the HCP signatory parties (Douglas PUD, 2002). The intent of this part of the HCP agreement is to protect aquatic habitats from proposed land use activities within the Wells Project. Although shoreline enhancement activities are directly related to Wells Project land use, these management efforts may indirectly benefit resident fish, juvenile anadromous fish, and aquatic invertebrates and plants by minimizing impact in littoral areas within the Wells Project Boundary. For more information about Shoreline Management Policies, see Section 5.6.8.

Invasive Species Management Activities

In the late 1980's, Douglas PUD initiated aquatic habitat management activities to control exotic Eurasian watermilfoil at the boat launches in Pateros, Brewster and Bridgeport. This activity was conducted by a private contractor and consisted of herbicidal applications which resulted in little or no success. This activity has since been discontinued. With the availability of biological agents, Douglas PUD initiated off-project collection of insects. This collection and release is conducted annually for the control of terrestrial invasive weeds such as purple loosestrife (*Lythrum salicaria*), and Dalmatian toadflax (*Linaria dalmatica*); however, biological control efforts for invasive aquatic species such as Eurasian watermilfoil are still in the preliminary phases of implementation. In addition to the use of biological agents, Douglas PUD began working closely with the Okanogan County Weed Board in the early 1990s to control diffuse knapweed (*Centaurea diffusa),* Russian knapweed *(Acroptilon repens),* scotch thistle (*Onopordum acanthium*) and leafy spurge (*Euphorbia esula*) through use of herbicides.

5.3.3 Anadromous Fish Species

5.3.3.1 General Biology and Species Status

Six species of anadromous fish are found in the Wells Reservoir. Of the six species, five are anadromous salmonids which include the Upper Columbia River (UCR) spring-run Chinook salmon, UCR summer/fall-run Chinook salmon, sockeye salmon, UCR summer-run steelhead and hatchery origin coho salmon. The timing of adult migration, spawning, incubation, hatching emergence, juvenile rearing, smolt outmigration and ocean residence periods differs between salmonid species and some of these differences have been used to separate several species into different races/demes (NMFS, 2002a). Since 1967, counts of each of the five anadromous salmonids over Wells Dam have been monitored (Table 5.3-5). The sixth anadromous species present in the Wells Reservoir is the Pacific lamprey.

Table 5.3-5 Wells Dam annual ladder counts of salmon and steelhead. Counts for the period 1967-1997 are 16 hour counts. Counts for the period 1998-2005 are 24 hour counts.

Year	Chinook Spring	Chinook Summer	Chinook Fall	Chinook Trapped	Total Chinook	Coho	Sockeye	Steelhead	Steelhead Trapped	Total Steelhead	Total Salmonids	Period of Count Inclusive
1967	1,157	12,504	2,732	2,004	18,397	255	113,232	1,474	171	1,645	133,529	5/21-11/19
1968	4,931	8,922	2,623	2,277	18,753	221	81,530	2,112	413	2,525	103,029	5/01-11/15
1969	3,599	6,846	2,929	2,873	16,247	29	17,352	1,391	530	1,921	35,549	5/01-11/15
1970	2,670	8,003	4,388	1,745	16,806	62	50,667	1,597	399	1,996	69,531	5/01-11/15
1971	3,168	5,988	2,030	1,793	12,979	161	48,172	3,782	358	4,140	65,452	4/30-11/15
1972	3,616	4,141	2,419	1,694	11,870	665	33,398	1,894	354	2,248	48,181	4/30-11/15
1973	2,937	5,052	2,650	2,088	12,727	331	37,178	1,820	627	2,447	52,683	4/30-11/15
1974	3,420	4,567	1,114	2,893	11,994	112	16,716	580	260	840	29,662	5/01-10/31
1975	2,225	8,522	3,806	3,253	17,806	25	22,286	517	227	744	40,861	5/01-10/31
1976	2,759	7,901	3,843	2,518	17,021	99	27,619	4,664	337	5,001	49,740	5/01-11/15
1977	4,211	7,527	3,260	2,628	17,626	68	21,973	5,282	355	5,637	45,304	5/01-11/15
1978	3,615	6,419	1,336	2,259	13,629	77	7,458	1,621	356	1,977	23,141	5/01-10/31
1979	1,103	10,080	1,108	2,352	14,643	63	22,655	3,695	367	4,062	41,423	5/01-11/16
1980	1,182	4,892	709	1,827	8,610	82	26,573	3,443	372	3,815	39,080	5/01-11/22
1981	1,935	4,276	686	1,533	8,430	26	28,234	4,096	650	4,746	41,436	5/01-11/22
1982	2,401	3,349	2,064	700	8,514	357	19,005	7,984	590	8,574	36,450	5/01-11/22
1983	2,869	2,821	1,150	942	7,782	82	27,925	19,525	670	20,195	55,984	5/01-11/30
1984	3,280	5,941	1,812	1,094	12,127	104	81,054	16,632	690	17,322	110,607	5/01-11/25
1985	5,257	4,456	2,097	1,689	13,499	72	53,170	19,867	750	20,617	87,358	5/01-11/22
1986	3,150	4,178	1,143	1,118	9,589	87	34,876	13,303	650	13,953	58,505	5/01-11/14
1987	2,344	3,142	3,253	1,275	10,014	42	39,948	5,493	603	6,096	56,100	5/01-11/13
1988	3,036	2,775	1,935	1,364	9,110	75	33,980	4,401	651	5,052	48,217	5/01-10/31
1989	1,740	3,333	1,435	2,147	8,655	14	15,895	4,600	716	5,316	29,880	5/01-10/31
1990	981	3,354	749	1,109	6,193	32	7,597	3,815	735	4,550	18,372	5/01-11/07
1991	779	2,028	827	1,525	5,159	21	27,492	7,751	726	8,477	41,149	5/01-11/15
1992	1,623	1,967	1,503	895	7,980	28	41,844	7,027	658	7,685	57,537	5/01-11/15
1993	2,444	3,603	1,228	1,780	9,055	19	28,038	2,494	633	3,127	40,239	5/01-11/16

Table 5.3-5 (cont). Wells Dam annual ladder counts of salmon and steelhead. Counts for the period 1967-1997 are 16 hour counts. Counts for the period 1998-2005 are 24 hour counts.

Year	Chinook Spring	Chinook Summer	Chinook Fall	Chinook Trapped	Total Chinook	Coho	Sockeye	Steelhead	Steelhead Trapped	Total Steelhead	Total Salmonids	Period of Count Inclusive
1994	257	4,891	3,017	2,287	10,452	3	1,662	2,163	620	2,783	14,900	5/01-11/15
1995	103	3,076	1,229	2,164	6,572	6	4,801	942	619	1,561	12,940	5/01-11/15
1996	*387	2,389	917	1,665	4,971	4	17,703	4,128	509	4,637	27,315	5/01-11/15
1997	971	2,721	766	1,655	6,113	8	25,754	4,107	630	4,737	36,612	5/01-11/15
1998	*363	4,108	1,200	1,582	6,890	0	4,669	2,984	460	3,444	15,003	5/01-11/15
1999	345	7,787	2,548	938	11,618	224	12,388	3,504	416	3,920	28,150	5/01-11/15
2000	2,587	10,156	3,418	1,327	17,488	0	59,944	6,280	369	6,649	84,081	5/01-11/15
2001	10,871	38,126	9,591	556	59,144	612	74,490	18,528	392	18,920	153,166	5/01-11/15
2002	7,626	62,623	6,472	556	77,277	132	10,768	9,478	373	9,851	98,028	5/01-11/15
2003	4,702	46,391	8,253	556	59,902	168	28,977	9,963	374	10,337	99,384	5/01-11/15
2004	4,793	32,847	5,777	558	43,975	291	78,053	9,317	452	9,769	132,088	5/01-11/15
2005	4,996	31,763	3,461	563	40,783	348	55,559	7,203	417	7,620	104,310	5/01-11/15

* All of the spring Chinook passing over Wells Dam were trapped in 1996 and 1998 so that they could be used for spring Chinook supplementation activities at the Methow and Winthrop Fish Hatcheries.

Spring-Run Chinook Salmon

The Ecologically Significant Unit (ESU) for UCR spring-run Chinook salmon includes all naturally reproducing populations in all river reaches accessible to Chinook salmon in the mid-Columbia River tributaries between Rock Island Dam and Chief Joseph Dam, excluding the Okanogan River. NMFS has initially identified three important spawning populations within this ESU: the Methow, Wenatchee and Entiat river populations (NMFS, 2002a). These populations are genetically and ecologically separate from the summer/fall-run populations in the lower parts of many of the same river systems. Chinook salmon (and their progeny) from the following stocks that are raised in hatcheries, are considered part of the listed ESU: Chiwawa River, Methow River, Twisp River, Chewuch River, White River and Nason Creek.

The construction of Grand Coulee Dam (completed in 1942) blocked anadromous fish access to habitat upstream of RM 596.6 after 1938. The concurrent Grand Coulee Fish Management Plan (GCFMP) influenced the present distribution of the ESU. Production of non-listed Carson-origin spring-run Chinook salmon has also taken place within the UCR spring-run Chinook salmon ESU. Non-listed spring-run Chinook salmon hatchery populations contained within this ESU include fish from the Leavenworth, Entiat and Winthrop National Fish hatcheries.

Methow River spring-run Chinook salmon exhibit classic stream-type life-history strategies, including emigrating from freshwater as yearling smolts and undertaking extensive offshore ocean migrations. The majority of these fish mature at four years of age and return to the Columbia River from March through mid-May. In the mid-Columbia River Basin, Chinook salmon passing Wells Dam before June 28 are considered spring-run Chinook salmon (NMFS, 2002a). Between the years of 1996 and 2005 the number of spring-run Chinook salmon migrating over Wells Dam has averaged 3,689 adults a year and ranged from 363 adults in 1998 to 10,871 adults in 2001 (Table 5.3-6).

Table 5.3-6 Annual fish counts from 1996-2005 and ten year averages of anadromous salmonids (spring-run Chinook, summer-run Chinook, fall-run Chinook, summer steelhead, sockeye, coho) passing over Wells Dam.

Year	Spring Chinook	Summer Chinook	Fall Chinook	Summer Steelhead	Coho	Sockeye
1996	387*	2,389	917	4,128	4	17,703
1997	971	2,721	766	4,107	8	25,754
1998	363*	4,108	1,200	2,984	0	4,669
1999	345	7,787	2,548	3,504	224	12,388
2000	2,587	10,156	3,418	6,280	0	59,944
2001	10,871	38,126	9,591	18,528	612	74,490
2002	7,626	62,623	6,472	9,478	132	10,768
2003	4,702	46,391	8,253	9,963	168	28,977
2004	4,793	32,847	5,777	9,317	291	78,053
2005	4,996	31,763	3,461	7,173	339	55,559
Average	3,689	23,891	4,240	7,546	178	36,830

* All spring Chinook captured in these years were taken for broodstock.

After entering the Methow River and other mid-Columbia tributaries, adult spring Chinook salmon hold in the deeper pools and under cover until the onset of spawning. They may spawn near their holding areas or move upstream into smaller tributaries. Spawning generally occurs from late July through September and typically peaks in late August, although the peaks vary among tributaries (Chapman et al., 1995). Spring Chinook salmon eggs hatch in late winter and the fry emerge from gravel in April and May (Chapman et al., 1995). Most of these juveniles rear in freshwater for one year before migrating to the ocean.

NMFS determined that UCR spring-run Chinook salmon are at risk of becoming extinct in the foreseeable future, listing them as endangered under the ESA on March 24, 1999 (64 FR 14308). NMFS reaffirmed their listing determination on June 28, 2005 (70 FR 37160). On April 4, 2002, NMFS defined interim abundance recovery targets for each spawning aggregation in this ESU. These numbers are intended to represent the number and productivity of naturally produced spawners that may be needed for recovery, in the context of whatever take or mortality is occurring. They should not be considered in isolation, as they represent the numbers that, taken together, may be needed for the population to be self-sustaining in its natural ecosystem. For UCR spring-run Chinook salmon, the interim recovery levels are 2,000 spawners in the Methow River, 3,750 spawners in the Wenatchee River, 500 spawners in the Entiat River.

Summer/Fall-Run Chinook Salmon

This ESU includes all naturally spawned summer/fall Chinook salmon populations found in the Columbia River and its tributaries from the confluence of the Snake and Columbia rivers upstream to Chief Joseph Dam. Although these two groups of fish are considered part of the same ESU and are characterized as ocean-type fish, they spawn in different areas of the basin (Waknitz et al. 1995). UCR summer Chinook salmon spawn in the Okanogan River downstream of Lake Osoyoos and in the Similkameen, Methow, Wenatchee and Entiat rivers during late September through November with peak activity in October (NMFS 2002a). The spawning distribution of summer and fall Chinook salmon overlap in the lower reaches of mid-Columbia tributary streams (Okanogan, Methow and Wenatchee rivers) and in the tailraces of the mainstem mid-Columbia River dams. Fall-run Chinook are known to dominate spawning in the tailraces of Wanapum and Priest Rapids dams and in the free flowing Hanford Reach (Chapman et al., 1994a). Hatcheries that raise and release summer/fall Chinook include the Wells, Eastbank, Turtle Rock and Priest Rapids hatcheries. These programs release fish into the Okanogan, Similkameen, Methow, Wenatchee and mainstem Columbia rivers. A new summer/fall Chinook hatchery is also proposed for the tailrace of Chief Joseph Dam (Chief Joseph Hatchery). This program is intended to enhance populations of summer/fall Chinook in the Okanogan and Columbia rivers.

Most adult UCR summer/fall Chinook salmon enter the Columbia River from late May to early September and pass the mid-Columbia River dams from late June through October, after spending three or four years in the ocean (Chapman et al., 1994a). In the mid-Columbia Basin, summer Chinook salmon pass Wells Dam between June 29 and August 28 and fall Chinook salmon pass Wells Dam from August 29 through the end of the counting season in mid-

November (NMFS, 2002a). Between the years of 1996 and 2005 the number of summer-run and fall-run Chinook salmon migrating over Wells Dam annually has averaged 23,891 and 4,240 adults, respectively (Table 5.3-6). Summer-run Chinook salmon migrating over Wells Dam during this ten year period ranged from a low of 2,389 adults in 1996 to a high of 62,623 adults in 2002. During this same time period, fall-run Chinook counts have ranged from a low of 766 adults in 1997 to a high of 9,591 adults in 2001.

Naturally-produced juvenile summer/fall Chinook salmon emerge in April and May and move downstream within a few days to a few weeks (Chapman et al., 1994a). Ocean-type fish (summer and fall run Chinook salmon) generally migrate to the ocean as age-0 subyearlings in late summer and early fall months, passing mid-Columbia River dams between June and August (Chapman et al., 1994a). Based on limited observations, summer-run Chinook salmon leave the Wenatchee River in summer, as expected for ocean-type fish, but some may rear in the mainstem Columbia River for extended periods (Chapman Consultants, 1988). This phenomenon probably also occurs in other tributaries to the mid-Columbia River including the Okanogan, Similkameen, and Methow rivers, suggesting that mainstem reservoirs largely influence the success of ocean-type salmonids (NMFS, 2002a).

On March 9, 1998 NMFS determined that UCR summer/fall-run Chinook salmon were not at a level of extinction risk that warranted listing under the ESA (63 FR 11482).

Steelhead

NMFS considers all summer-run steelhead returning to tributary streams upstream of the confluence of the Yakima River and the Columbia River as belonging to the UCR ESU (61 Federal Register, 960730210-6210-01). The majority of naturally produced UCR steelhead that are present in the Wells Reservoir spawn in the Methow River watershed with a small population spawning in the Okanogan River watershed.

UCR steelhead hatchery programs that were included into the listing determination include the Wells and Eastbank Fish hatcheries. These programs release listed steelhead into the Okanogan, Similkameen, Methow and Wenatchee rivers.

Adult UCR steelhead enter the Columbia River during March through October, after spending one or two years in the ocean. Returning adults typically pass the mid-Columbia River dams from June through late September. Not only is the adult migration protracted over a long period, spawning does not occur until the following March through July (Peven 1992). Unlike other anadromous salmonids, steelhead adults (kelts) return to the ocean after spawning and may spawn more than once during their lifetime; however, repeat spawning in UCR steelhead is typically 2.1 percent or less (Brown 1995). Between the years of 1996 and 2005 the number of summer-run steelhead migrating over Wells Dam annually has averaged 7,546 adults and ranged from a low of 2,984 adults in 1998 to a high of 18,528 adults in 2001 (Table 5.3-6).

Steelhead eggs incubate from late March through June, and fry emerge in late spring to August. Fry and smolts disperse downstream in late summer and fall. Their use of tributaries for rearing

is variable, depending upon population size, and both weather and flow at any given time. Some steelhead residualize and live their entire lives in freshwater (Peven et al. 1994). As a result of their varied length of freshwater residence, their variable ocean residence, and their spatial and temporal spawning distribution within a watershed, steelhead exhibit an extremely complex mosaic of life-history types.

On March 24, 1999, the NMFS determined that UCR summer-run steelhead were at a high risk of becoming extinct in the foreseeable future and as such listed them as endangered under the ESA (64 FR 14517). This listing determination was reaffirmed by NMFS on June 14, 2004 (69 FR 33102) and again on December 23, 2005. Based on reports by the NMFS biological review team during the most recent determination, the status of UCR steelhead was downgraded from endangered to threatened as published in the Federal Register on January 6, 2006 (Volume 71, No. 3). This listing took effect on February 6, 2006. On April 4, 2002, NMFS defined interim abundance recovery targets for each spawning aggregation in this ESU. These numbers are intended to represent the number and productivity of naturally-produced spawners that may be needed for recovery, in the context of whatever take or mortality is occurring. They should not be considered in isolation, as they represent the numbers that, taken together, may be needed for the population to be self-sustaining in its natural ecosystem. For UCR summer-run steelhead salmon, the interim recovery levels are 2,500 spawners in the Methow River, 2,500 spawners in the Wenatchee River and 500 spawners in the Entiat River (NMFS, 2002b).

Sockeye Salmon

This ESU includes all naturally-reproducing sockeye salmon that spawn in areas upstream from Lake Osoyoos, in Lake Osoyoos or downstream of Lake Osoyoos in the Similkameen River (a tributary of the Okanogan River). The spawning habitat and primary rearing habitat of this ESU is located in British Columbia, while the migration corridor for both juveniles and adults include the Wells Reservoir. This population is genetically distinct from the Lake Wenatchee sockeye populations as determined by both spatial distribution and genetic differences (63 FR 16955).

An experimental hatchery program for this ESU is under development by Chelan and Grant PUDs. This program releases sockeye fry directly into Skaha Lake which is currently inaccessible to naturally returning adult sockeye.

Adult sockeye salmon begin entering the Columbia River in May and pass the mid-Columbia River dams between late May and mid-August (BPA et al., 1994) with the majority of the fish passing over Wells Dam during the month of July. Between the years of 1996 and 2005, the number of sockeye salmon migrating over Wells Dam annually has averaged 36,830 adults and ranged from a low of 4,669 adults in 1998 to a high of 78,053 adults in 2004.

The adult sockeye salmon migration back to Lake Osoyoos is frequently delayed at the mouth of the Okanogan River due to elevated water temperatures in that drainage. Once these fish reach Osoyoos Lake, the adults will hold in the north basin of the lake until spawning maturation is achieved. Spawning generally occurs in September and October.

Sockeye salmon fry emerge in March and April and move into Lake Osoyoos to rear for one to three years before migrating back through the Wells Reservoir in route to the ocean. Sockeye salmon smolts typically pass the mid-Columbia River dams between mid-April and late May during their outmigration (Chapman et al. 1995b).

On March 10, 1998 the NMFS determined that Okanogan River sockeye salmon were not at a level of extinction risk that warranted listing under the ESA (63 FR 11749).

Coho Salmon

Historically, coho salmon were distributed throughout the Columbia and Snake river basins. Within the Wells Project, the Methow River drainage once supported a population of coho salmon. In the early 1900s, mid-Columbia River coho salmon had been decimated by impassable tributary dams, unscreened irrigation diversions, and extensive harvest (BPA, 1999). Prior to 1910, irrigation, livestock grazing and mining were major contributors to the decline of coho salmon. Later, timber harvest, fire management and irrigation impacts were the major causes of coho stock decline. Indigenous coho salmon are extinct upstream from Rock Island Dam. Recent efforts to reintroduce coho salmon back to the mid-Columbia River Basin are currently underway. Between the years of 1996 and 2005 the number of recently reintroduced coho migrating over Wells Dam annually has averaged 178 adults and ranged from zero adults in 1998 and 2000 to 612 adults in 2001.

Due to the fact that coho salmon stocks were extirpated near the turn of the century, most life-history information is derived from affidavits from older residents (NMFS, 2002a). These accounts support the belief that coho salmon probably returned to mid-Columbia River tributaries in September, October and November. This has been consistent with the timing of coho salmon that have been reintroduced to the mid-Columbia Basin in recent years (NMFS, 2002a). In the Lower Columbia River tributaries, coho salmon spawn from October to mid-December. Juveniles typically spend one year in freshwater before outmigrating as yearling smolts in April and May. Coho salmon typically spend about 18 months at sea before returning to spawn (NMFS, 2002a).

Pacific Lamprey

Pacific lamprey are present in most tributaries of the Columbia River and in the mainstem Columbia River during their migration stages. They have cultural, utilitarian and ecological significance in the basin since Native Americans have historically harvested them for subsistence, ceremonial and medicinal purposes (Close et al. 2002). As an anadromous species, they also contribute marine-derived nutrients to the basin. Little specific information is available on the life history or status of lamprey in the mid-Columbia River watersheds. They are known to occur in the Methow, Wenatchee and Entiat rivers, although there are no indications that they currently use the Okanogan River system (NMFS, 2002a).

In general, adults are parasitic on fish in the Pacific Ocean while ammocoetes (larvae) are filter feeders that inhabit the fine silt deposits in backwaters and quiet eddies of streams (Wydoski and Whitney, 2003). Adults generally spawn in low-gradient stream reaches in the tail areas of pools

and in riffles, over gravel substrates (Jackson et al. 1996). Adults die after spawning. After hatching, the ammocoetes burrow into soft substrate for an extended larval period filtering particulate matter from the water column (Meeuwig et al. 2002). The ammocoetes undergo a metamorphosis, between 3 and 7 years after hatching, and migrate from their parent streams to the ocean from March to July, peaking in April (NMFS, 2002a). Until recently, relatively little information was available on Pacific lamprey in the mid-Columbia River Basin. However, with increased interest in the species coupled with a petition for listing under the ESA, the mid-Columbia PUDs have started to initiate studies to address Pacific lamprey passage and migratory behavior in their respective project areas.

In 2004, Douglas PUD conducted a radio-telemetry study to evaluate migratory behavior of Pacific lamprey at Wells Dam (Nass et al., 2005). Median time required to pass through the fishway was 0.3 days and accounted for 8 percent of total passage time (from detection in tailrace to fishway exit) (Nass et al., 2005). Although sample sizes for the 2004 study were relatively small (n=18), it provided useful baseline information on passage dynamics for lamprey at Wells Dam.

In 2006, Douglas PUD completed a comprehensive analysis of potential impacts resulting from reservoir fluctuations. This report included an analysis of lamprey stranding, spawning and habitat effects resulting from reservoir fluctuations. The results of this report did not identify impacts to lamprey resulting from daily operations (DTA, 2006).

Returning adult Pacific lamprey have been counted at Wells Dam since 1998. Between the years of 1998 and 2005, the numbers of lamprey passing Wells Dam annually has averaged 401 fish and ranged from 73 fish in 1999 to 1,417 fish in 2003 (Table 5.3-7). Lamprey pass Wells Dam from early July until late November with peak passage times between mid-August and late October (Figures 5.3-1 and 5.3-2). In all years since counting was initiated, Pacific lamprey counts at the east fish ladder are greater than at the west fish ladder. It is important to note that historically, counting protocols were designed to assess adult salmonids and did not necessarily conform to lamprey migration behavior (Moser and Close 2003). Traditional counting times for salmon did not coincide with lamprey passage activity which occurs primarily at night; the erratic swimming behavior of adult lamprey also makes them inherently difficult to count (Moser and Close, 2003). Furthermore, Beamish (1980) noted that lamprey overwinter in freshwater for one year prior to spawning. Consequently, lamprey counted in one year may actually have entered the system in the previous year (Moser and Close, 2003) which confounds annual returns back into the Columbia River Basin. It is unknown to what degree these concerns are reflected in Columbia River lamprey passage data. However, it is important to consider such caveats when examining historic lamprey count data at Columbia River dams including Wells Dam.

Table 5.3-7 Adult Pacific lamprey counts at Wells Dam for east and west fish ladders, 1998-2005.

	1998	1999	2000	2001	2002	2003	2004	2005
East Fish Ladder	173	47	96	153	226	723	263	148
West Fish Ladder	170	26	59	106	117	694	140	64
Total	343	73	155	259	343	1417	403	212

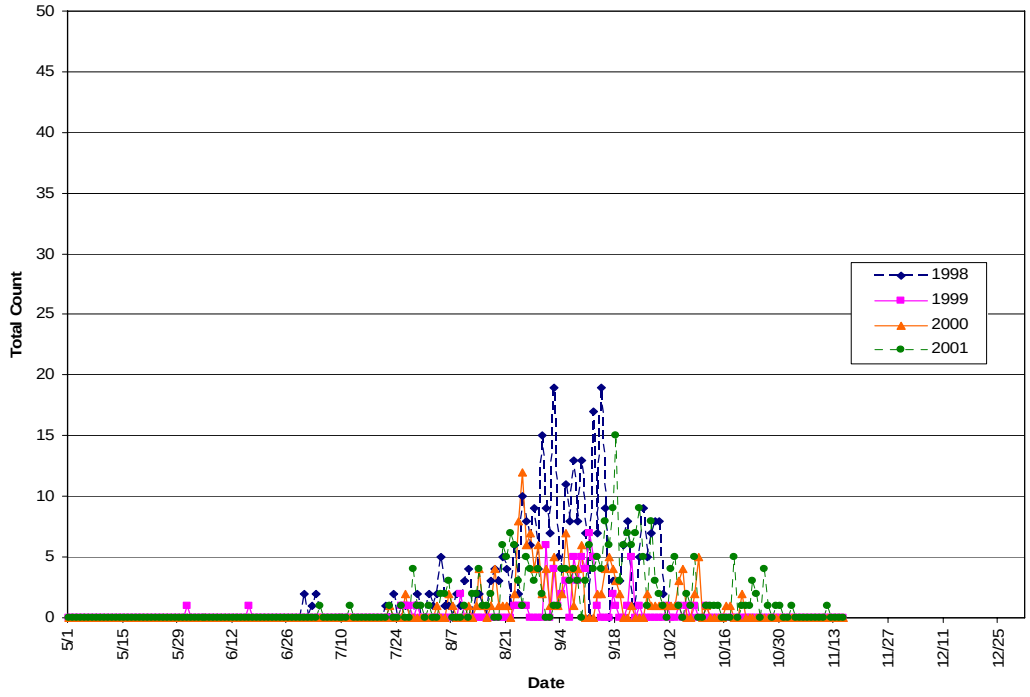

Figure 5.3-1 Daily counts of Pacific lamprey at Wells Dam during the fish counting season, 1998-2001.

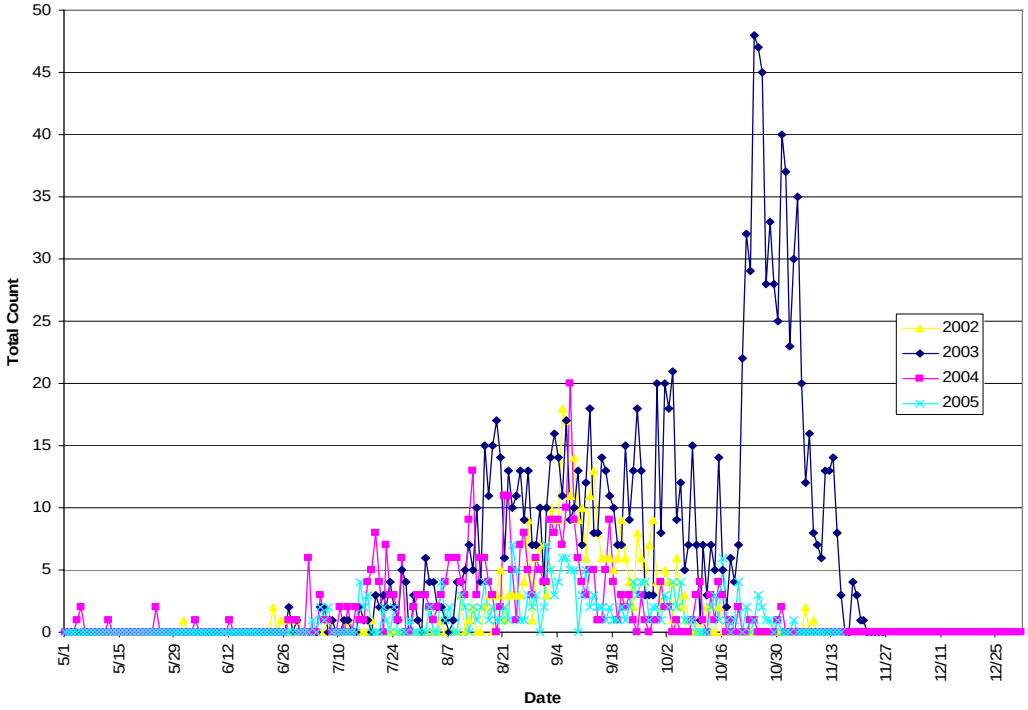

Figure 5.3-2 Daily counts of Pacific lamprey at Wells Dam during the fish counting season, 2002-2005.

5.3.3.2 Management Activities that Affect Anadromous Fish

Habitat Conservation Plan

The Wells HCP was approved by the NMFS, USFWS, WDFW and CCT in the spring of 2002. The Wells HCP was subsequently approved by the FERC and made part of the Wells Project license in the spring of 2004. The Yakama Nation (YN) signed the Wells HCP in the spring of 2005.

The objective of the Wells HCP is to achieve NNI for each Plan Species (UCR Spring-run Chinook Salmon, UCR Summer/Fall Chinook Salmon, Okanogan River Sockeye Salmon and UCR Steelhead and Coho Salmon). The Wells HCP outlines a schedule for meeting and maintaining NNI throughout the 50-year term of the agreement. NNI consists of two components including: 1) a 91 percent combined adult and juvenile Wells Project survival standard achieved by Wells Project improvement measures implemented within the geographic area of the Wells Project and 2) up to 9 percent compensation for unavoidable Wells Project related mortalities. Compensation to meet NNI is provided through a hatchery and a tributary program under which 7 percent compensation is provided through hatchery production and 2 percent compensation is provided through the funding of enhancements to tributary habitats that support plan species. The HCP also requires the formation of four committees that are used to implement, monitor and administer the agreement namely a policy, coordinating, hatchery and tributary committee.

The Wells HCP contains various plans for implementing the components of the agreement. These plans include the Passage Survival Plan (HCP Section 4), Wells Dam Juvenile Dam Passage Survival Plan (HCP Section 4.3), Tributary Conservation Plan (HCP Section 7), Hatchery Compensation Plan (HCP Section 8), Adult Passage Plan (HCP Section 4.4 and HCP Appendix A) and a Predator Control Program (HCP Section 4.3.3).

The Passage Survival Plan contained within Section 4 of the Wells HCP provides specific detail regarding the implementation and measurement of unavoidable juvenile and adult losses for each of the plan species passing through Wells Dam. This section of the plan also contains specific survival standards that must be achieved within defined time frames in order for the licensee to be considered in compliance with the terms of the Wells HCP (Douglas PUD, 2002).

In addition to the specific details regarding how survival studies will be implemented and evaluated relative to achievement of NNI, the Wells HCP also contains specific criteria directed at the operation of the Wells juvenile fish bypass system. This section of the Wells HCP outlines specific bypass operational criteria, operational timing and evaluation protocols to ensure that at least 95 percent of the juvenile plan species passing through Wells Dam are provided a safe, non-turbine passage route around the dam. The operational dates for the bypass are set annually by unanimous agreement of the parties to the Wells HCP. Over the past several years the HCP committee has agreed to initiate the operation of the bypass system on April 12 and to shut it down on August 26.

The Tributary Conservation Plan found in Section 7 of the Wells HCP guides the funding and allocation of dollars from the Plan Species Account. The intended goal of the dollars allocated to the Plan Species Account is to compensate for up to two percent unavoidable adult and/or juvenile mortality for plan species passing through Wells Dam. The intent of the Plan Species Accounts is to provide dollars to protect and restore tributary habitats for plan species within the Wells Project Boundary and within the portions of the Methow and Okanogan rivers that are accessible to plan species.

The Hatchery Compensation Plan, as described in Section 8 of the Wells HCP, was established to provide hatchery compensation for up to 7 percent unavoidable juvenile passage losses of plan species passing through Wells Dam. The goal of the program is to utilize hatchery produced fish to replace unavoidable losses in such a manner that the hatchery fish produced contribute to the rebuilding and recovery of naturally reproducing populations of plan species, in their native habitats, while maintaining the genetic and ecological integrity of each stock of plan species. Supporting harvest, where appropriate, was also identified as a goal of the Hatchery Compensation Plan.

The Adult Passage Plan, as contained within Section 4.4 and Appendix A of the Wells HCP is intended to ensure safe and rapid passage for adult plan species as they pass through the fish ladders at Wells Dam. The plan contains specific operating and maintenance criteria for the two adult fish ladders and the two adult fish ladder traps, and provides details regarding the implementation of passage studies on adult plan species including studies related to passage success, timing and rates of fallback.

For additional information on the Wells HCP please see Appendix G. Appendix G contains a copy of the Wells HCP and a copy of the most recent annual report (2005) detailing all of the HCP compliance activities completed during 2005.

Predator Control Program

Section 4.3.3 of the Wells HCP includes the requirement that Douglas PUD implement a northern pikeminnow, piscivorous bird and piscivorous mammal harassment and control program to reduce the level of predation upon anadromous salmonids in the mid-Columbia Basin. The northern pikeminnow removal program includes a northern pikeminnow bounty program, participation in fishing derbies and tournaments and the use of long-line fishing equipment. These efforts are designed to provide an immediate and substantial reduction in the predator populations present within the waters of the Wells Project.

Since efforts were first initiated in 1995 Douglas PUD's northern pikeminnow removal program has captured over 112,000 northern pikeminnow. The continual harvest of northern pikeminnow from these waters will provide additional decreases in predator abundance. Yearly removal efforts will also keep the northern pikeminnow population in a manageable state.
The other component of the predator control program is the implementation of control measures for piscivorous birds and mammals. The focus of these programs is not removal but hazing and access deterrents. Hazing includes propane cannons, pyrotechnics and the physical presence of

hazing staff. Access deterrents include steel wires across the hatchery ponds and tailrace, fencing and covers for hatchery ponds, and electric fencing. When hazing and access deterrents fail, options for removal are also implemented by the US Department of Agriculture (DOA) Animal Control staff hired to conduct the hazing programs.

Hanford Reach Fall Chinook Protection Program

The Hanford Reach Fall Chinook Protection Program is the successor agreement to the 1988 Vernita Bar Settlement Agreement. On February 16, 1988, Douglas PUD entered into the Vernita Bar Settlement Agreement between and among Grant PUD, Chelan PUD, the BPA, NMFS, WDFW, ODFW, the YN, the Confederated Tribes of the Umatilla Indian Reservation (CUR) and the CCT. The agreement resulted from extensive negotiations with the aforementioned fisheries agencies and tribes in an effort to protect fall Chinook salmon spawning on the Vernita Bar in the Columbia River downstream of the Priest Rapids Project. The agreement attempts to achieve an appropriate balance between power production and the protection of fall Chinook salmon by identifying certain minimum flows scheduled to be maintained below Priest Rapids Dam during adult spawning, incubation and emergence. The term of the Vernita Bar Settlement Agreement is for the remainder of the current license period for the Priest Rapids Project plus the term(s) of any annual license(s) issued thereafter.

The Hanford Reach Fall Chinook Protection Program Agreement was submitted to FERC by Grant PUD on April 19, 2004 and is awaiting approval. The parties to this agreement include Grant PUD, Chelan PUD, Douglas PUD, NMFS, WDFW, USFWS, the CCT and the BPA. The agreement is designed to replace the Vernita Bar Agreement and will extend until the end of the new license term for the Priest Rapids Project. It establishes obligations for the three PUDs and BPA to provide acceptable protection for fall Chinook salmon at Vernita Bar, similar to the previous agreement. Additions to the successor agreement address juvenile outmigration and juvenile stranding issues in the Hanford Reach Area.

5.3.4 Resident Fish

5.3.4.1 General Biology and Species Status

The resident fish assemblage present in the Wells Reservoir is composed of a diverse community of native and introduced, warm and coldwater, and recreational and non-recreational fish species. Since the construction of Wells Dam several studies have either directly (McGee, 1979; Beak, 1999) or indirectly (Dell et al., 1975; Burley and Poe, 1994) addressed the resident fish assemblage in the Wells Reservoir.

In assessing the occurrence of gas bubble disease on fish species in the mid-Columbia River reservoirs, Dell et al. (1975) observed that the most abundant resident fish species in the Wells Reservoir were northern pikeminnow, stickleback, and suckers (*Catostomus* spp.). They also determined that mountain whitefish and pumpkinseed were the most abundant resident game fish, although these two species accounted for less than two percent of the total 32,289 fish sampled. Overall, 27 species of resident and migratory fish were identified in the study area.

In 1994, a one-year study was conducted to determine the relative predation by northern pikeminnow on outmigrating juvenile salmonids and to develop relative predation indices for each of the five mid-Columbia River reservoirs. During the study, incidental catch (species captured other than northern pikeminnow) was high with over 25 fish species recorded and catch dominated by catostomid (suckers) species (Burley and Poe, 1994).

McGee (1979) noted that chiselmouth, redsided shiners, and largescale suckers (*Catasomus macrocheilus*) were the most abundant non-game fish captured during Wells Reservoir surveys while pumpkinseed were the most abundant game fish caught. Similar sampling design and methodology were employed in order to ensure that results of the study were comparable with past observations. In total, 2,480 fish were collected during the study using live traps, beach seines and angling. Twenty of the 27 known species previously trapped in other mid-Columbia reservoirs (Dell et al., 1974) were present in the Wells Reservoir.

In 1998, Douglas PUD conducted an updated Wells Reservoir resident fish assessment (Beak 1999). An effort was made to implement a sampling design similar to the two previous studies so as to be consistent and allow comparisons with past results. In total, 22 species of fish were identified with 5,657 fish captured using beach seines and 716 fish observed via diving transects. Beak (1999) reported suckers (*Catostomus* spp.) as the most abundant resident fish captured in beach seining sampling in the Wells study area. These species represented 41 percent of the beach seining catch and 46 percent of the underwater dive survey count. Other abundant species in the beach seine catch were bluegill (*L. microchirus*) (32 percent), northern pikeminnow (10 percent), peamouth (6 percent), and carp (5 percent). Fifteen other species represented the remaining 7 percent of the total catch of 3,783 fish. Table 5.3-8 ranks the relative abundance of dominant fish species captured in the 1974, 1979, and 1998 Wells Project studies and how species abundance has shifted over time.

Table 5.3-8 Ranking of relative abundance of dominant fish species in the 1974, 1979, and 1998 Wells Reservoir resident fish assessments (Beak, 1999).

Species	1974	1979	1998
Largescale sucker (*Catostomus macrocheilus)*	1	4	1
Redside Shiner (*Richardsonius balteatus)*	3	3	3
Northern Pikeminnow (*Ptycholcheilus oregonensis*)	2	5	4
Bluegill (*Lepomis macrochirus*)	16	0	2
Pumpkinseed (*Lepomis gibbosus*)	11	2	18
Chiselmouth (*Acrochelius alutaceus*)	4	1	10

5.3.4.2 Recreational Fish Species (Warm/Cold Water)

Largemouth Bass

Largemouth bass were widely introduced in Washington in the late 1800s (Wydoski and Whitney, 2003). They are listed as a priority species in Washington State because of their vulnerability to habitat loss or degradation and their recreational importance (WDFW, 2002a). They prefer clear water habitat with mud and sand substrates, which is best suited for aquatic vegetation production (Wydoski and Whitney, 2003). Little is known about the populations in the Wells Reservoir, although they are infrequently captured (Beak and Rensel, 1999; Duke, 2001; Burley and Poe, 1994).

Mountain Whitefish

Mountain whitefish are assumed to occur in all small-order tributaries to the Methow, Okanogan, Wenatchee and Entiat rivers, and in connecting larger lake systems. They are also believed to occur in the mainstem reservoirs, although their behavior patterns are not known. They mostly inhabit riffles in summer and large pools in winter (Wydoski and Whitney, 2003). Spawning typically occurs from October through December, generally in riffles, but also on gravel shoals of lake shores. Mountain whitefish feed primarily on instar forms of benthic aquatic insects, although they also occasionally eat crayfish, freshwater shrimp, leeches, fish eggs and small fish. In lakes, they feed extensively on zooplankton, particularly cladocerans. There is evidence that mountain whitefish still spawn in the lower reaches of some tributaries (NMFS, 2002a).

Northern Pikeminnow

Northern pikeminnow (formerly northern squawfish) are a slow-growing, long-lived predator native to the Columbia River basin. In summer, adult northern pikeminnow prefer shallow, low velocity areas in cool lakes or rivers. During the winter, they use deeper water and pools (Scott and Crossman, 1973). Spawning occurs during the summer, in shallow water areas with gravel substrate. They tend to concentrate in tailrace areas downstream of mainstem dams during the juvenile salmonid migration period, holding in relatively slow-moving water areas (less than about 3 feet per second) near passage routes (NMFS, 2002a). Due to their large numbers and distribution throughout the Columbia River basin, northern pikeminnow are considered to pose the greatest predation threat to migrating juvenile anadromous salmonids (NMFS, 2002a). From 1998 to 2005, the average counts of northern pikeminnow passing Wells Dam annually during the fish passage season (May 1 to November 15) was 482 fish. Section 5.3.4.2 and Figure 5.3-4 describes activities undertaken by Douglas PUD to manage northern pikeminnow in the Wells Reservoir.

Resident Rainbow Trout

Rainbow trout are an inland (remains in freshwater) form of steelhead. However, some rainbow trout remain in freshwater for most of their life but undergo a physiological change to a smolt and migrate to the ocean late in life. In addition to the potential for rainbow trout to become anadromous, the progeny of steelhead are believed to have the potential to become resident

rainbow (Peven, 1990). Inland rainbow and juvenile steelhead are not distinguishable from each other until the steelhead undergo smoltification. The mid-Columbia River tributaries contain a mixture of resident rainbow and ocean-migrating steelhead. Resident rainbow trout are likely present in low numbers in the Wells Reservoir. During the 1999 resident fish assessment, rainbow trout consisted of .05 percent of the relative catch (Beak, 1999).

Smallmouth Bass

Smallmouth bass (*M. dolomieui*) are a non-native game fish that have inhabited the mid-Columbia River reach since at least the 1940s. They are listed as a priority species in Washington State because of their vulnerability to habitat loss or degradation and their recreational importance (NMFS, 2002a). Preferred habitat for this species includes rocky shoals, banks, or gravel bars. Adult smallmouth bass in the mid-Columbia River are most abundant around the deltas of warmer tributary rivers. They are also abundant in areas upstream of the mid-Columbia River. The optimal temperature range for this species is from 70° to 81° F (21° to 27° C) (Wydoski and Whitney, 2003), which is higher than the temperatures typically observed in the mid-Columbia River reservoirs.

Ideal spawning temperatures for this species range from 60° to 65° F (15.5° to 18.5° C). Although such temperatures do not occur consistently in the mid-Columbia River reservoirs until late summer, these temperatures are present in the Okanogan River and Lake Osoyoos. Smallmouth bass build and defend nests in sloughs and littoral areas with sand and gravel substrates. Such areas are generally lacking in the mid-Columbia River System. It is believed that the majority of the natural reproduction of smallmouth bass in the mid-Columbia River takes place in the free-flowing Hanford Reach below Priest Rapids Dam and in the Okanogan River.

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

Walleye

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

Walleye occur throughout the mainstem reservoirs but are not typically found in the tributaries. Although suitable spawning habitat appears to be plentiful in the mid-Columbia River, peak

summer temperatures in this section of river are suboptimal and appear to restrict the recruitment of subyearling walleye to the yearling age class (Zook, 1983). Recruitment of walleye into the mid-Columbia River reservoirs is suspected to result from the entrainment of young fish through Grand Coulee Dam during spring run-off (Zook, 1983).

Westslope Cutthroat Trout

The Westslope cutthroat trout (*O. clarki lewisi*) are allopatric with rainbow trout and have similar life histories throughout their range (Wydoski and Whitney, 2003). They are chiefly distributed in upper reaches of east slope Cascade range tributaries (including the Methow, Wenatchee and Entiat rivers) and typically do not occur in the mainstem reservoirs. In the 1999 Wells Reservoir resident fish assessment, no westslope cutthroat trout were encountered during sampling in the Wells Reservoir (Beak, 1999).

On August 8, 2003 the USFWS determined that westslope cutthroat trout did not warrant listing as a threatened species under the ESA. Rationale for not listing the species included the determination by the USFWS that the species is abundant, stable and that reproducing populations remain well distributed through its historic range (68 FR 46991).

5.3.4.3 Non-Recreational Fish Species

Bull Trout

Bull trout are native to northwestern North America, historically occupying a large geographic range extending from California north into the Yukon and Northwest Territories of Canada, and east to western Montana and Alberta (Cavender, 1978). They are generally found in interior drainages, but also occur on the Pacific Coast in Puget Sound and in the large drainages of British Columbia.

Bull trout are members of the char group within the family Salmonidae. Bull trout closely resemble Dolly Varden (*Salvelinus malma*), a related species. Genetic analyses indicate, however, that bull trout are more closely related to an Asian char (*Salvelinus leucomaenis*) than to Dolly Varden (Pleyte et al., 1992).

Bull trout are believed to have more specific habitat requirements than other salmonids (Rieman and McIntyre, 1993). Growth, survival and long-term persistence are dependent upon habitat characteristics such as cold water, complex instream habitat, a stable substrate with a low percentage of fine sediments, high channel stability and stream/population connectivity. Stream temperature and substrate type, in particular, are critical factors for the sustained long-term persistence of bull trout. Spawning is often associated with the coldest, cleanest and most complex stream reaches within basins. However, bull trout may exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre, 1995), and should not be expected to occupy all available habitats at the same time (Rieman et al., 1997).

Bull trout exhibit four distinct life history types: resident, fluvial, adfluvial and anadromous. The fluvial, adfluvial and resident forms exist throughout the range of the bull trout (Rieman and

McIntyre, 1993). These forms spend their entire life in freshwater. The anadromous life history form is currently known only to occur in the Coastal-Puget Sound region within the coterminous US (Volk, 2000). Multiple life history types may be expressed in the same population, and this diversity of life history types is considered important to the stability and viability of bull trout populations (Rieman and McIntyre, 1993).

The majority of growth and maturation for anadromous bull trout occurs in estuarine and marine waters, adfluvial bull trout in lakes or reservoirs and fluvial bull trout in large river systems. Resident bull trout populations are generally found in small headwater streams where fish remain their entire lives.

For migratory life history types, juveniles tend to rear in tributary streams for 1 to 4 years before migrating downstream into a larger river, lake or estuary and/or nearshore marine area to mature (Rieman and McIntyre, 1993). Juvenile and adult bull trout in streams frequently inhabit side channels, stream margins and pools with suitable cover (Sexauer and James, 1993) and areas with cold hyporheic zones or groundwater upwellings (Baxter and Hauer, 2000).

The Columbia River bull trout populations were listed as threatened under the ESA in June 1998 (USFWS, 1998). The Wells Project is situated within the Upper Columbia River Recovery Unit and the USFWS has identified the Methow, Wenatchee and Entiat rivers as its core areas. A core area represents the closest approximation of a biologically functioning unit for bull trout. Within a core area, many local populations may exist. A local population is assumed to be the smallest group of fish that is known to represent an interacting reproductive unit. Sixteen local populations were identified in the Methow (8), Wenatchee (6), and Entiat (2) core areas (USFWS, 2002). On September 26, 2005, the USFWS designated critical habitat for bull trout populations within the Klamath River, Columbia River, Jarbidge River, Coastal-Puget Sound and Saint Mary-Belly River. In the Upper Columbia River Recovery Unit which encompasses the entire Wells Project area, no critical habitat was designated for bull trout (70 FR 56212).

Although bull trout are currently considered a non-recreational species due to federal protection under the ESA and general closure of the sport fishery, selective gear angling for bull trout is permitted in a portion of the Lost River, located in Okanogan County, from June 1 to October 31. Minimum size limit for bull trout is 14 inches and a maximum of 2 bull trout per day, meeting the size criteria, can be kept.

In the Wells Reservoir, bull trout originate from the Methow River while they are thought to be extirpated from the Okanogan River drainage. Currently, only adfluvial bull trout have been documented within the Wells Reservoir. The timing and extent of movements and spawning migrations varies substantially among populations of bull trout. Within the mid-Columbia Basin, telemetry studies have found that bull trout are utilizing the mainstem Columbia River and passing through the mid-Columbia projects (BioAnalysts, Inc., 2004). At Wells Dam, bull trout passage through the fish ladders was recorded primarily during spring Chinook salmon broodstock trapping operations in 1998 and 1999 (NMFS, 2002a). Douglas PUD began counting bull trout passage at Wells Dam in 2000 (May 1 through November 15). In recently years, Douglas PUD has initiated an experimental winter count for bull trout (November 16 through

April 30) (Table 5.3-9). Count data indicates that 90 percent of bull trout passing Wells Dam do so in May and June and to date no bull trout have been counted in the fish ladders during the experimental winter counting period.

Table 5.3-9 Wells Dam bull trout east and west-side ladder counts (24-hour counting period) from May 1st to November 15th from 2000-2005.

Site	2000	2001	2002	2003	2004	2005
East Ladder	52	48	31	25	29	23
West Ladder	37	59	45	28	18	26
Total	89	107	76	53	47	49

To gather additional information on bull trout migratory behavior in the mid-Columbia River, a 2-year radio-tagging study began in 2001 at Wells, Rocky Reach and Rock Island dams (BioAnalysts, Inc., 2004). In total, 79 bull trout were tagged during the study with 19 bull trout tagged at Wells Dam. Between 2001 and 2003, a total of 10 (2 tagged at Rock Island, 4 at Rocky Reach, 4 at Wells), 11(5 Rocky Reach, 4 Wells, 2 from 2001) and 1(1 Wells) tagged bull trout were detected moving upstream through the ladders of Wells Dam, respectively (Douglas PUD, 2004). Median travel times (tailrace detection to ladder exit detection) during the telemetry study at Wells Dam in 2001-2003 were 8.87, 7.60, and 1.16 days, respectively. Median ladder passage times (entrance detection to ladder exit detection) during the telemetry study at Wells in 2001-2003 were 5.70, 0.23, and 0.16 days, respectively (Douglas PUD, 2004). Adult bull trout migrating upstream of Wells Dam appear to be destined for the Methow River. During the 2001-2003 study, no bull trout selected the Okanogan River system. In the Wells Reservoir, migratory bull trout have entered the Methow River by the end of June and spawning is typically complete by late October with some fish returning to the Wells Reservoir by mid-December. It appears that no radio-tagged bull trout were injured at the dams or in the reservoirs due to project effects during telemetry monitoring in 2001, 2002 and 2003 (Douglas PUD, 2004).

Additional information on the behavior of bull trout in the waters surrounding Wells Dam was collected during the first year (2005) of the BTMMP. During the 2005 study season, six bull trout were trapped in the fishways at Wells Dam, radio-tagged and released upstream of the dam. Travel time from Wells Dam to the Methow River ranged from 7 hours to 12 days. Similar to past years of study, all of the tagged fish migrated into the Methow River (LGL Limited, 2006). Additional information collected during the 2005 BTMMP can be found in Appendix F including information regarding the collection of genetic samples from adult and sub-adult bull trout and the PIT-tagged of bull trout at Wells Dam and at smolt collection stations located in the Methow and Twisp rivers.

White Sturgeon

White sturgeon is a Washington State priority species with recreational, commercial, and/or Tribal importance (NMFS, 2002a). They are a long-lived, primitive fish species that forage primarily along the river bottom of large river systems in the Pacific Northwest. Prior to hydroelectric development in the Columbia River, the native anadromous white sturgeon could distribute downstream to feed in the rich estuary or marine areas before migrating back upstream

to spawn. This anadromous life history is currently restricted in the upper river because they do not readily pass through the Columbia River fish ladders. White sturgeon are currently found throughout the Columbia River Basin and are thought to be successfully reproducing in some of the impoundments (Setter and Brannon, 1992).

Commercial and sport harvest has depressed the population in the river, and their historic range has been fragmented by the construction of dams on the mainstem Columbia River. Male sturgeon may mature at 10 to 12 years of age, while females may not mature until 15 to 32 years of age. Spawning occurs between February and July, depending on water temperature; most spawning occurs when water temperatures are 50° to 63° F (10° to 17° C) (Pacific States Marine Fisheries Commission, 1992). Sturgeon spawn in swift currents (2 to 9 feet per second over cobble, boulder, and bedrock substrates) (Parsley and Beckman, 1994), similar to those occurring in the tailrace areas throughout the mid-Columbia River. Eggs and sperm are broadcast in fast-moving water, allowing the adhesive eggs to disperse before settling to the bottom. The eggs remain adhesive for less than 3 hours to allow additional time for fertilization.

Incubation occurs in 7 to 14 days, depending on water temperature. The hatched larvae are planktonic and drift downstream. Sturgeon are opportunistic feeders that prey on benthic organisms as juveniles, and a variety of benthic oriented prey as adults (including lamprey and fish).

DeVore et al. (1999) reported that white sturgeon are currently not abundant in the mid-Columbia River. They captured only four sturgeon in 95 overnight longline sets in the Rock Island Reservoir. Sampling in Rocky Reach Reservoir yielded an average of 4.3 fish per 1,000 longline fishing hours (NMFS, 2002a).

Douglas PUD completed a sturgeon population assessment and behavior study during 2001, 2002 and 2003 (Jerald, 2006 Draft). The study utilized setlines for the collection and tagging of sturgeon greater than 50 cm in total length. Fish captured on the setlines were measured, marked with PIT-tags and with scoot markings. Some of the fish were also radio-tagged and had pectoral fin rays removed for age analysis. Setline sampling took place over a two-year timeframe with a total of 129 setlines deployed and retrieved from throughout the reservoir.

During the study, 13 individual sturgeon were captured with the majority of the fish being captured in the Columbia River within 5 miles of the mouth of the Okanogan River. Results of the two-year mark-recapture portion of the study indicated that the sturgeon population in Wells Reservoir is small with a population estimate that ranged from 13 to 217 adult fish with a point estimate of 31 fish over 50 cm in length (Skalski and Townsend, 2005).

The length of the fish captured and tagged ranged from 60-202 cm. Eleven of the 13 fish were determined to be between six and 30 years of age demonstrating that all of these fish recruited to the Wells Reservoir after Wells Dam was completed in 1967 with strong year class recruitment between the years 1972 to 1978 and again between 1988 to 1996 (Figure 5.3-3).

Radio-tags were applied to six of the 13 sturgeon captured during 2001 and 2002. None of the six fish were detected downstream from Brewster or upstream of Park Island. One of the five mature fish radio-tagged made upstream migrations into the Okanogan River during the spring of 2002 and two different radio-tagged mature sized sturgeon made migrations into the Okanogan River during 2003 (Jerald, 2006 Draft).

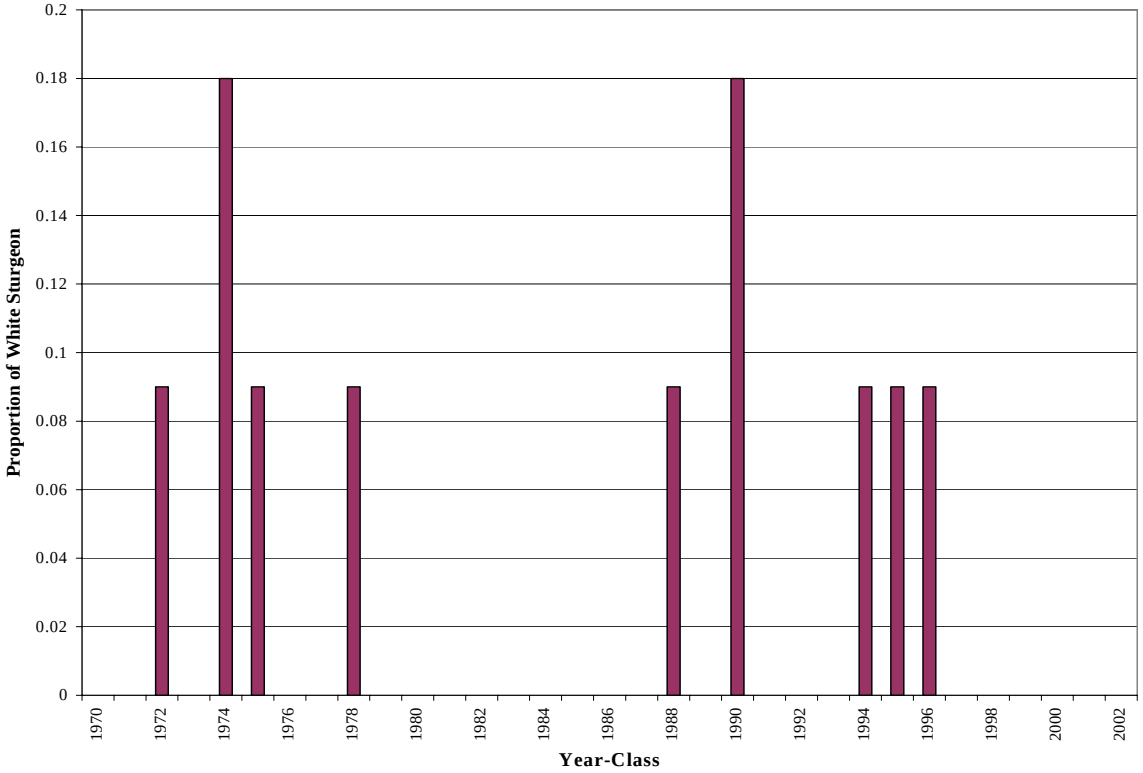

Figure 5.3-3 Year-class composition of white sturgeon sampled from the Wells Reservoir during 2001-2002.

Other Species Surveyed in 1999

In addition to the fish species discussed above, Table 5.3-1 lists the additional resident fish species that have been documented in the Wells Reservoir in past studies. These species are exclusively non-recreational species consisting of predominantly cyprinids (redside shiner, carp, chiselmouth, peamouth dace species) and catostomids (bridgelip, largescale and longnose suckers). Within the Wells Reservoir ecosystem, it is likely that these species, especially as juveniles, are an important prey base for other predatory, recreational fish species and wildlife species. Habitat preferences and life history information can be found in Wydoski and Whitney (2003). It is unlikely that there are significant levels of competition for food and habitat by these species with other recreational fish species due to their differing habitat requirements and life history strategy.

5.3.4.4 Management Plans that Affect Resident Fish

Bull Trout Monitoring and Management Plan

On July 30, 1998, Douglas PUD submitted an unexecuted form of an Application for Approval of the Wells HCP to FERC and to NMFS. Furthermore, to expedite the ability of FERC to complete formal consultation, biological evaluations of the effects of implementing the HCP on listed species under the jurisdiction of the USFWS were prepared by Douglas PUD.

In a letter to the FERC, the USFWS requested consultation under Section 7 of the ESA regarding the effects of hydroelectric project operations on bull trout in the Columbia River (letter from M. Miller, USFWS, to M. Robinson, FERC, dated January 10, 2000). The request for consultation was based on observations of bull trout in the study area. In its reply to the USFWS, FERC noted that there was virtually no information on bull trout in the mainstem Columbia River.

On November 24, 2003, Douglas PUD filed an application for approval of the executed Wells HCP. The 2004 application for approval replaced the 1998 application with the executed form of the Wells HCP.

On December 10, 2003, the USFWS received a request from FERC for formal consultation to determine whether the proposed incorporation of the Wells HCP into the FERC license for operation of the Wells Project was likely to jeopardize the continued existence of the Columbia River distinct population segment (DPS) of ESA-listed bull trout, or destroy or adversely modify proposed bull trout critical habitat. In response to the FERC request, the USFWS submitted a Biological Opinion (BO) and issued an Incidental Take Permit (ITP) to Douglas PUD. On June 21, 2004, FERC issued an order incorporating the Wells HCP and the bull trout BO into the FERC license. As required by the new license article, Douglas PUD, in concert with the USFWS, has developed and begun implementing the BTMMP for the Wells Project (Douglas PUD, 2004).

The BTMMP is intended to monitor and evaluate bull trout presence in the Wells Reservoir and quantify and address, to the extent feasible, potential project-related impacts on bull trout from Wells Project operations and facilities. Implementation of the BTMMP began in May 2005 and will continue until July 2008. The specific objectives of the BTMMP are:

1) Monitor adult upstream and downstream passage at Wells Dam and implement appropriate management plans to monitor any incidental take of bull trout through the use of telemetry studies, analysis of passage timing with operational data, and monitoring of off-season bull trout passage through the adult fishway.

2) Assess Wells Project-related impacts on upstream and downstream passage of sub-adult bull trout through PIT tagging and off-season passage monitoring.

3) Investigate the potential for sub-adult entrapment or stranding in off-channel or backwater areas of the Wells Reservoir through the evaluation of reservoir elevation and bathymetric data.

Predator Control Program

Since efforts were first initiated in 1995 Douglas PUD's northern pikeminnow removal program has captured over 112,000 northern pikeminnow (Figure 5.3-4). From 1995-1999, the Northern Pikeminnow Removal Program implemented by Douglas PUD consisted mainly of experienced anglers using hook and line techniques to remove northern pikeminnow from Wells Project waters. Traditionally, hook and line angling has lacked the ability to target species specifically. This has resulted in high rates of incidental catch for recreationally important fish species while angling for northern pikeminnow.

More recently (2000-present), the Northern Pikeminnow Removal Program has shifted to a long-line fishing system (Figure 5.3-4). This new system has proven be more cost efficient and effective at targeting northern pikeminnow. This has resulted in larger numbers of pikeminnow removed per year and a lower rate of incidental take for recreationally important species such as walleye and smallmouth bass. Long-line fishing gear has drastically decreased the rate of encounters with recreational species by fishing deeper in the water column and through the use of dead baits that are not selected by recreational species (Columbia Research, 2005). The long-line incidental catch has been limited almost exclusively to non-recreational species such as catostomid (suckers), cottids (sculpin) and peamouth. The shift in northern pikeminnow removal techniques from angling to long lining has resulted in a significant shift in incidental catch type from recreational to non-recreational species. Over the last 5 years, approximately 13,000 long lines have been set in the mid-Columbia River Basin. This translates into 910,000 hooks (on average, 70 hooks per line). During this period, no salmonids (except whitefish) have been encountered using the long line system (Columbia Research, 2005).

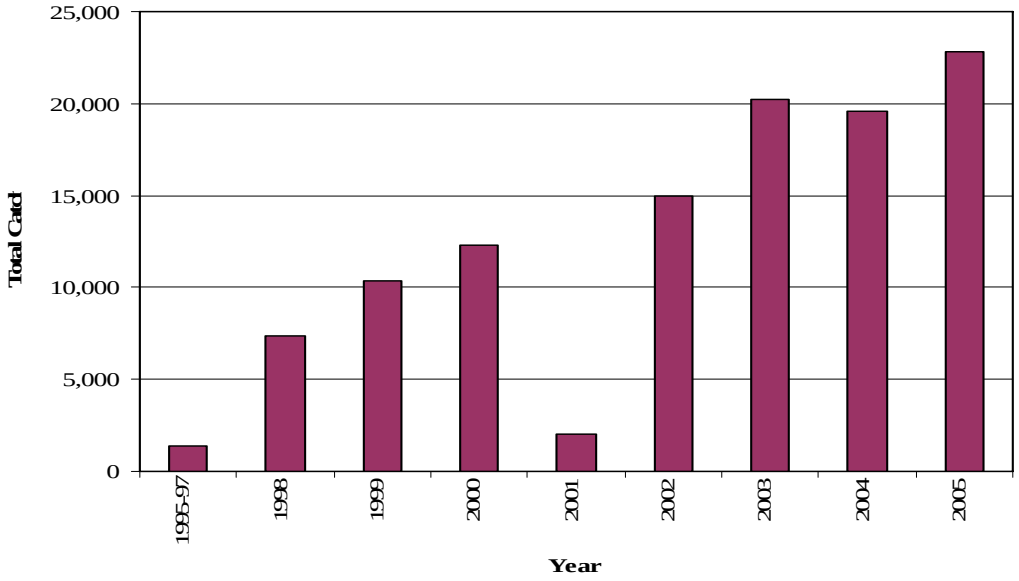

Figure 5.3-4 Total pikeminnow catch data as a result of the Douglas PUD Northern Pikeminnow Removal Program, 1995-2005.

Resident Fish Hatchery Program (Rainbow Trout)

In 1972, Douglas PUD entered into an agreement with WDFW to mitigate for the loss of game fish as part of the original license to operate the Wells Project. This agreement specified that the mitigation program would raise steelhead and that these fish would be reared at the Washburn Island ponds. In 1974, after it was concluded that the Washburn ponds were inadequate for rearing steelhead, the program was transferred to the Wells Hatchery and the mitigation plan was revised to rear 20,000 pounds of rainbow trout and 50,000 pounds of steelhead. The resident program initially relied upon steelhead residuals for the "put-and-take" program. These fish were held for one month in raceways until stream conditions were appropriate and then planted in mid-summer.

In 1994, concerns about the likelihood of a listing for steelhead in the mid-Columbia Basin, the reliance on steelhead residuals to operate the program, and the potential interactions of these stocked fish with wild steelhead in Methow drainage tributaries resulted in the discontinuation of using steelhead as a source for the resident rainbow trout program. To address these concerns, the current program utilizes rainbow trout stock from the Ford Hatchery near Spokane. Fish from the Ford Hatchery are transported to the Wells Hatchery as fry and reared on-site until reaching an appropriate stocking size. Furthermore, the stocking locations of these fish have been changed from the Methow drainage to lakes in Okanogan and Douglas counties where hatchery-wild interactions are of no concern.

5.3.5 Benthic Invertebrates

5.3.5.1 General Biology and Species Status

In September and October 2005, Douglas PUD conducted an aquatic invertebrate inventory and an assessment of the presence of RTE aquatic invertebrates within the Wells Reservoir. The overall objective of the study was to document the distribution, habitat associations and qualitative abundance of the current aquatic invertebrate (e.g., clams, snails and insects) assemblage in the Wells Reservoir. Additionally, an RTE assessment was conducted to document the possible presence of several species of mollusks that have been listed as species of concern in Washington State. These are the giant Columbia River limpet (*Fisherola nutalli*), the giant Columbia spire snail (*Fluminicola Columbiana*) and the California floater (*Anodonta californiensis*). The California floater and giant Columbia spire snail are also listed as candidate species for federal protection (BioAnalysts, Inc., 2005).

Samples were collected within the Wells Reservoir using an air lift suction device, Ponar grabs and colonization baskets. Approximately 20 species of freshwater mollusks were identified during the inventory from dredge samples (Table 5.3-10). Within the Methow, Okanogan and Columbia portions of the Wells Reservoir, 13, 11, and nine species of mollusks were present, respectively. Of the 20 species, 10 gastropods (snails) and 10 bivalves (clams, mussels) were identified. The gastropods included nine native species and one introduced species (Radix auricularia). Similarly, the bivalves also included nine native species and one introduced species (Corbicula fluminea) (BioAnalysts, Inc., 2005) (Appendix F). Douglas PUD also conducted a review of the effects of water level fluctuations in the Wells Reservoir on benthic

macroinvertebrates. This review indicated that aquatic invertebrates were scarcer within shallow water areas where daily fluctuations occur. Greater reductions in reservoir elevation may also modify the composition of benthic macroinvertebrate communities. However, because these events are uncommon and typically of short-duration, they are unlikely to permanently affect benthic macroinvertebrates because there would be no impediment to recolonization (DTA, 2006).

Table 5.3-10 Mollusks collected from sampling stations on the Methow, Okanogan, and Columbia rivers during the 2005 Wells Project Aquatic Macroinvertebrate Inventory.

Location	Common Name	Taxon
Methow River	Western pearlshell	*Margaritinopsis falcata*
	Striate fingernail clam	*Sphaerium striatinum*
	Ridgebeak peaclam	*Pisidium compressum*
	Western lake fingernail clam	*Musculium raymondi*
	Shortface lanx	*Fisherola nuttalli*
	Ashy pebblesnail**	*Fluminicola fuscus*
	Western floater	*Anodonta kennerlyi*
	Ubiquitous peaclam	*Pisidium casertanum*
	Big-ear radix*	*Radix auricularia*
	Golden fossaria	*Fossaria obrussa*
	Prairie fossaria	*Fossaria (Bakerilymnaea) bulimoides*
	Ash gyro	*Gyraulus parvus*
		Corbicula sp.
Okanogan River	Western ridgemussel	*Gonidea angulata*
	Striate fingernail clam	*Sphaerium striatinum*
	Ridgebeak peaclam	*Pisidium compressum*
	Ubiquitous peaclam	*Pisidium casertanum*
	Asian clam*	*Corbicula fluminea*
	Ashy pebblesnail**	*Fluminicola fuscus*
	Fragile ancylid	*Ferrissia californica*
	Ash gyro	*Gyraulus parvus*
	Western lake fingernail clam	*Musculium raymondi*
		Physella sp.
		Anodonta sp.
Columbia River	Western floater	*Anodonta kennnerlyi*
	Asian clam*	*Corbicula fluminea*
	Ridgebeak peaclam	*Pisidium compressum*
	Three ridge valvata	*Valvata tricarinata*
	Rocky Mountain physa	*Physella propinqua propinqua*
	Ash gyro	*Gyraulus parvus*
	Golden fossaria	*Fossaria (F.) obrussa*
	Prairie fossaria	*Fossaria (Bakerilymnaea) bulimoides*
	Big-ear radix*	*Radix auricularia*

*Introduced (non-native) taxon. **State species of concern.

Samples collected from colonization baskets and petite Ponar grabs are presented in Table 5.3-11 and Table 5.3-12, respectively. The colonization baskets were placed in shallow (1-5 meters) water habitat in the wider and generally lower velocity sections of the Wells Reservoir. In this habitat, chironomids, trichopterans, and gastropods made up the largest percentage of the invertebrates identified. However, tubellaria (flatworms) and crustacean were also a large percentage of the taxons identified in stations one and two, respectively. Chironomidae and Trichoptera were the dominant taxa in stations four and five that were in the narrower, swifter sections of Wells Reservoir. At these stations there was generally larger substrate (gravels and cobbles) mixed with sand and aquatic macrophyte beds were limited.

Table 5.3-11 Percent of macroinvertebrate groups found within colonization baskets deployed at five stations within the Columbia River. Stations one through three were deployed in the lower Wells Reservoir and four and five were deployed more upstream in the Wells Reservoir where there was more current velocity and large substrates.

Taxon	Columbia River Stations				
	1	2	3	4	5
Ephemeroptera (Mayflies)	0.0	0.0	0.9	0.0	0.0
Odonata (Damselflies and Dragonflies)	0.0	0.3	0.9	0.0	0.0
Coleoptera (Beetles)	0.0	0.0	0.0	0.0	0.0
Diptera-Chironomidae (Chironomid Flies)	29.5	2.9	32.9	88.2	85.2
Diptera (Flies)	0.0	0.0	0.0	0.0	0.0
Trichoptera (Caddisflies)	1.2	24.8	10.0	6.0	9.1
Lepidoptera (Butterflies and Moths)	0.0	0.0	0.0	0.0	0.0
Gastropoda (Snails and Limpets)	8.3	46.6	47.2	0.5	0.0
Bivalvia (Clams and Mussels)	0.5	0.0	0.0	0.0	0.0
Annelida (Segmented Worms)	4.8	1.2	0.4	2.1	1.9
Acari (Mites)	1.3	0.9	0.9	2.5	3.1
Crustacea (Crayfish, amphipods, isopods)	7.0	17.4	6.9	0.3	0.3
Nematoda (Roundworms)	0.0	0.0	0.0	0.5	0.3
Tubellaria (Flatworms)	47.2	0.0	0.0	0.0	0.0

Samples collected with the petite Ponar were made in deeper water habitats (> 5 meters) where silt and sand were the only substrates available. At these stations chironomids, bivalves, annelids, and Tricoptera were the dominant taxa identified (Table 5.3-12). In the Okanogan River, Coleoptera were dominant at one station and at one station in the Columbia River, nematodes were dominant (Table 5.3-12).

Table 5.3-12 Percent of macroinvertebrate groups found from petite Ponar grabs at six stations within the Wells Project. These stations represent the slow deeper habitat with fine substrates within the lower Methow and Okanogan rivers and in the Columbia River.

Taxon	Methow		Columbia		Okanogan	
	6	7	8	9	10	11
Ephemeroptera (Mayflies)	0.0	0.0	0.0	0.0	0.0	0.0
Odonata (Damselflies and Dragonflies)	0.0	0.0	0.0	0.0	0.0	0.0
Coleoptera (Beetles)	0.0	0.0	0.0	0.0	47.4	7.2
Diptera-Chironomidae (Chironomid Flies)	39.7	27.7	0.0	4.7	10.5	23.4
Diptera (Flies)	0.0	0.0	0.0	0.0	0.0	0.6
Trichoptera (Caddisflies)	0.2	0.0	20.0	5.1	23.0	3.6
Lepidoptera (Butterflies and Moths)	0.0	0.0	0.0	0.0	0.0	0.0
Gastropoda (Snails and Limpets)	0.0	0.2	0.0	0.0	0.7	0.3
Bivalvia (Clams and Mussels)	6.3	14.4	80.0	44.7	0.7	29.0
Annelida (Segmented Worms)	52.4	56.0	0.0	0.7	9.2	24.9
Acari (Mites)	0.4	1.5	0.0	1.0	4.6	7.2
Crustacea (Crayfish, amphipods, isopods)	0.8	0.2	0.0	0.3	2.0	2.4
Nematoda (Roundworms)	0.2	0.0	0.0	43.4	2.0	1.5

5.3.5.2 Rare, Threatened and Endangered Species

The ashy pebblesnail (*F. fuscus*) is a species of concern in Washington State and was a candidate species for federal listing under the name giant Columbia spire snail (*F. Columbiana*) in 1995. It is also commonly referred to as the Columbia pebblesnail (ICBEMP). Currently, the name is revised by Hershler and Frest (1996). It was determined that the ashy pebblesnail did not require federal protection and it is no longer considered a federal candidate. Specimens of this species were found during the survey in the Methow and Okanogan rivers. Only one specimen was found alive while all others were dead or identified from fragments.

5.3.5.3 Management Plans that Affect Benthic Invertebrates

Currently, there are no specific management plans related to benthic invertebrates in the Wells Reservoir.

5.4 Wildlife and Botanical Resources

5.4.1 General Description of Terrestrial Resources

The Wells Project is in the big sagebrush/bluebunch wheatgrass (*Artemisia tridentate/Pseudoroegneria [Agropyron] spicata*) or shrub steppe vegetation zone (Daubenmire R., 1970 and EDAW, INC. 2006a). This ecological zone is the most widespread steppe zone in Washington State and occurs in southern Idaho, central Oregon, the northern Great Basin in Utah, and parts of Montana (Cassidy, K. M. 1997). The Wells Project is located near the northern limit of the central arid steppe zone of Washington State (Cassidy, K. M. 1997). The region is classified as semi-arid. Annual precipitation ranges from 8 to 12 inches (20 to 30 cm),

falling as snow during the winter and rain in the early spring. The growth characteristics of the upland plant species found within the Wells Project take advantage of the sparse moisture that is available during the winter and early spring.

Shrub steppe is the most common upland vegetation type found within and adjacent to the Wells Project. Grass cover types are also present in upland areas where ground disturbing activities have removed the sagebrush or where higher amounts of available soil moisture favor grasses. Conifer cover types dominated by ponderosa pine (*Pinus ponderosa*) are present in a few locations with favorable aspect, soil and moisture conditions**.** Stands of ponderosa pine, mixed with Douglas fir (*Pseudotsuga menziesii*), are found on upland slopes in the Wells Project area. Riparian and wetland plant communities have developed along the shoreline since the Wells Reservoir was filled in 1967. Shoreline vegetation on the Okanogan River from RM 8 to RM 15.5 was not cleared before the Wells Reservoir was filled and represents the only example of original riparian plant communities on the Wells Reservoir. These riparian and wetland plant communities provide important habitat for a variety of native aquatic and wildlife species in the Wells Project. Mature riparian habitats within the Project boundary have become well established over time due to the relatively stable elevation of the Wells Reservoir (DTA, 2006).

5.4.2 Botanical Resource

A botanical survey of the Wells Project was conducted in 2005 (EDAW 2006a) to determine the presence of RTE plants and to identify invasive plant species. The study also included a cover type mapping component, in which approximately 2,539 acres were mapped using heads up digitizing of aerial orthophotos in Arcview GIS. Ground truthing of the cover type maps were completed during field surveys (EDAW, 2006a).

The 12,217-acre study area for the Wells Project included approximately 9,678 acres of Wells Reservoir and about 2,539 acres of land within the Wells Project Boundary. The study included all of the land and waters found within the Wells Project with the exception of the Wells Project transmission line corridor, which extends 41 miles from Wells Dam to Douglas Switchyard near Rocky Reach Dam. In total, 44 cover types were identified on the lands within study area (EDAW, 2006a). The mapped cover types were grouped into seven different categories:

- Upland Vegetation
- Upland Rock Habitats
- Wetland/Riparian Vegetation
- Littoral Zone – Wash,
- Bare – Disturbed – Eroded,
- Agricultural, and
- Developed.

Upland Vegetation, Wetland/Riparian Vegetation, and Agriculture are the most abundant cover type categories. These three categories of cover types comprise 32, 31, and 26 percent of the terrestrial habitats within the Wells Project, respectively. The most abundant Upland Vegetation

type is Shrub Steppe at 502 acres, followed by the Grass (136 acres) and Grass/Weed (157 acres) cover types. The Wetland/Riparian Vegetation cover types combined to occupy a total of 789 acres of the Wells Project. The Wetland/Riparian Vegetation category includes the Riparian Deciduous Tree, Riparian Shrub, Emergent Wetland and Pond cover types. A full description of all the various categories and cover types as well as their abundance and distribution within the Wells Project can be found below.

5.4.2.1 Upland Vegetation

Conifer Types

Conifer vegetation occurs on five acres or 0.2 percent of lands within the Wells Project Boundary lands (EDAW, 2006a). The conifer cover type is often dominated by ponderosa pine and occurs in open stands scattered along the Wells Reservoir. The understory consists of shrub steppe species, or a mix of introduced honeysuckle (*Lonicera spp.*) and native riparian shrubs including common snowberry (*Symphoricarpos albus*), wax current (*Ribes cereum*) and Saskatoon serviceberry (*Amelanchier ailnifolia*) in locations near the Wells Reservoir. Arrowleaf balsamroot (*Balsamorhiza sagittata*), purple sage (*Salvia dorrii*), Idaho fescue (*Festuca idahoensis*), Sandberg bluegrass (*Poa secunda*) and California brome (*Bromus carinatus*) are among the common herb and grass species in the understory. One bitterbrush/ponderosa pine cover-type along the Okanogan River is unique in the Wells Project area. Long stabilized sand dunes support an open stand of ponderosa pine with bitterbrush (*Purshia tridentate*) in the shrub layer. Brittle prickly-pear (*Opuntia fragilis*), veiny dock (*Rumex venosus*), pale evening primrose (*Oenothera pallida*), needle-and-thread grass (*Heterostipa [Stipa] comata*), Indian ricegrass (*Oryzopsis hymenoides*) and sand dropseed (*Sporobolis cryptandra*) are typical herbaceous layer species. Ponderosa pine is one of the few commercially valuable native species in the Wells Project; however, very little commercial harvest of this species occurs.

Shrub Steppe Types

Shrub steppe occurs on 502 acres or 19.8 of the total lands within the Wells Project Boundary (EDAW, 2006a). Big sagebrush, bitterbrush, and grey rabbitbrush (*Chrysothamnus nauseosus*) are the most dominant shrub layer species. Snow buckwheat (*Eriogonum niveum*), Gray's biscuitroot (*Lomatium grayi*), bluebunch wheatgrass (*Pseudoroegneria spicata*), cheatgrass (*Bromus tectorum*), Sandberg bluegrass, threadleaf fleabane (*Erigeron filifolius*) and fernleaf biscuitroot (*Lomatium dissectum*) are among the more common herb layer species. Shrub steppe vegetation with sandier substrates also may support field sagewort (*Artemisia campestris*), needle and thread, bastard toadflax (*Comandra umbellate*), wingnut cryptantha (*Cryptantha pterocarya*) and pale evening primrose in the herb layer. Sites that have not been disturbed also support a thin cryptogamic crust, which is composed of mosses, lichens, algae and bacteria. Cryptogamic crust function as soil builders, replenishes soil nutrients and prevents soil erosion.

Grass Types

Open areas of grass were mapped on 136 acres or 5.4 percent of the total lands within the Wells Project Boundary (EDAW, 2006a). Open grass areas are transitional vegetation and are typically associated with historical ground disturbance (e.g. land clearing and fire). Disturbed areas, that once supported shrub steppe vegetation are often dominated by annual grass species such as cheat grass, hairy brome (*Bromus japonicus*) and annual fescue (*Vulpia spp*.). There are a few locations in the study area that are dominated by perennial grasses, including sites that support little bluestem (*Schizachyrium scoparium*).

In some areas with more moist growing conditions, the composition of grass species may also include reed canarygrass (*Phalaris arundinacea*), tall fescue, smooth brome (*Bromus inermis*), tall wheatgrass (*Elytrigia pontica*), streambank wheatgrass (*Agropyron dasystachyum*), and quackgrass (*Elymus repens*). While some grass cover types may contain reed canarygrass, streambank wheatgrass or quackgrass, these species are more typically found in emergent wetlands (EDAW, 2006a).

"Weedy" Disturbed Types

Weedy areas were mapped on 163 acres or 6.4 percent of lands within the Wells Project Boundary (EDAW, 2006a). This cover type was mapped, almost exclusively, in the fields adjacent to the Okanogan River and in degraded, shrub steppe communities on Cassimer Bar. The weedy cover types are similar to the upland shrub steppe and grassland communities except that they typically occur on sites with more recent disturbance. These more recently disturbed cover types are characterized by a high proportion of non-native invasive and noxious weed species, which distinguish them from the less disturbed upland vegetation.

Species commonly observed in the weedy cover types include diffuse knapweed (*Centaurea diffusa*), mullein (*Verbascum thapsus*), perennial pepperweed (*Lepidium latifolium*), yellow salsify (*Tragopogon dubius*), St. John's wort (*Hypericum perforatum*), smooth brome (*Bromus inermis var. inermis*), cheatgrass, Mexican fireweed (*Kochia scoparia*), orchard grass (*Dactylis glomerata*), tall fescue (*Festuca arundinacea*), morning glory (*Convolvulus arvense*), prickly lettuce (*Lactuca serriola*) and hairy whitetop (*Cardaria pubescens*) (EDAW, 2006a).

5.4.2.2 Upland Rocky Types

Upland rocky habitats are found primarily along the Douglas County shoreline downstream of Pateros and also occur in several locations between Bridgeport and the Bridgeport Bar Unit of the WWA in Douglas County (EDAW, 2006a). A total of 12 acres or 0.5 percent of the land within the Wells Project Boundary is classified as upland rocky habitats. The vegetation observed in upland rocky habitats has many species in common with shrub steppe but also includes many plants typical of moist rock crevices and aspects. Douglas maple (*Acer glabrum*), smooth sumac (*Rhus glabra*), mock orange (*Philadelphus lewisii*), poison ivy (*Rhus radicans*), serviceberry, chokecherry (*Prunus virginiana*) and western white clematis (*Clematis ligusticifolia*) are common rock outcrop shrub species.

5.4.2.3 Wetland/Riparian Vegetation

Riparian vegetation is sustained by the existence of wet soils along the river bank above the ordinary high water mark and extends upland until the soil moisture is no longer sufficient to support mesic species. Depending on the depth of moisture, riparian vegetation may be considered a wetland or upland habitat, but this cannot be determined on aerial photographs.

Riparian vegetation found on the shoreline of the Wells Reservoir can be divided into two categories: 1) stands of riparian vegetation with large deciduous trees as the overstory and; 2) stand with riparian shrubs as the main component. There are 142 acres of the riparian vegetation with deciduous tree overstory on lands within the Wells Project Boundary. Forty-two acres of this vegetation type are found in small stands along the Columbia River, while 105 acres of riparian deciduous tree stands are found below the Wells Project Boundary on Cassimer Bar and along the Okanogan River (EDAW, 2006a).

Riparian Deciduous Tree Type

Native tree species in the riparian areas include black cottonwood (*Populus balsamifera ssp. Trichocarpa*), a few nearly tree-sized Rocky Mountain juniper (Juniperus scopulorum), Bebb's willow (*Salix bebbiana*) and Sitka alder (*Alnus viridis ssp. sinuata*). However, most stands of riparian trees are dominated by non-native species including white cottonwood (*Populus alba*), Russian olive (*Eleaegnus angustifolia*), silver maple (*Acer saccharinum*), eastern cottonwood (*Populus deltoidea*), Siberian elm (*Ulmus pumila*) and white mulberry (*Morus alba*). Riparian tree stands typically occur in proximity to Wells Reservoir and pond margins and usually have at least some common riparian shrub and emergent wetland species. The understory species in some riparian tree stands are not distinctly hydrophytic (water loving) in character and often include species characteristic of the weed cover types, primarily due to past ground disturbance (EDAW, 2006a). None of the riparian tree species found in the Wells Project area have commercial value.

Riparian Shrub Type

Riparian shrub stands without a tree overstory are found on 314 acres or 12.4 percent of lands within the Wells Project Boundary. Riparian shrub stands contains a high proportion of both native and non-native species, except along the Okanogan River were only native riparian habitat exists. Coyote willow (*Salix exigua*), Bebb's willow, Sitka alder and water birch (*Betula occidentalis*) are widespread native species, but only coyote willow forms dense, and sometimes large, thickets. Saplings of black cottonwood, Oregon ash (*Fraxinus latifolia*), shining willow (*Salix lucida ssp. lasiandra*), Siberian elm and white mulberry are common within at least some riparian shrub stands. Wood rose (*Rosa woodsii*) is ubiquitous and is the co-dominant shrub in many stands. Multiflora rose (*Rosa multiflora*) and an unidentified species of shrubby honeysuckle are particularly common upstream of Brewster. Russian olive shrubs are abundant at Cassimer Bar (EDAW, 2006a).

With FERC's permission, Douglas PUD did not clear the riparian vegetation on the Okanogan River between RM 8 and RM 15.5 before the Wells Reservoir was filled in 1967 and this

riparian vegetation is the only example of intact riparian vegetation on the Wells Reservoir. The Okanogan River has a diverse blend of riparian shrub species with a generally dense structure. The most common riparian shrubs include wood rose, Douglas hawthorn (*Crataegus douglasii*), Columbia hawthorn (*C. columbiana*), red osier dogwood (*Cornus sericea*), snowberry (*Symphoricarpos alba*), Bebb's willow, Sitka alder, coyote willow and shining willow (EDAW, 2006a).

Emergent Wetland Types

Wetlands are transitional habitat between terrestrial and aquatic systems where the water table is near the surface or covered with shallow water. Emergent wetlands are found on 200 acres or 7.9 percent of the land below the Wells Project Boundary. The largest emergent wetlands are found on Cassimer Bar and in the Washburn Island Slough. Emergent wetlands include Wells Reservoir shorelines where wetland plants typically occur at or above the littoral (area of light penetration in the water column) zone along the Wells Reservoir. Emergent wetlands are usually comprised of tall, herbaceous vegetation and may have a few riparian shrubs and/or deciduous trees.

One type of emergent wetland in the Wells Project area includes a diverse mixture of native and non-native species and is referred to as "mixed wetland." Many of the dominant species are tall, non-native invasive species, including yellow flag (*Iris pseudacorus*), purple loosestrife, reed canarygrass, tansy ragwort (*Tanacetum vulgare*), St. John's wort, sweet white clover (*Melilotus alba*) and Canada thistle (*Cirsium arvense*). Common and abundant, tall, native wetland species include bulrush (*Scirpus validus*), narrowleaf cattail (*Typha latifolia*), Canada goldenrod (*Solidago canadensis*), milkweed (*Asclepias speciosa*) and western goldenrod (*Euthamnia occidentialis*). Predominant lower-growing herbaceous species include bugle weed (*Lycopus americana, L. asper*), rush (*Juncus balticus, J. effusus, J. longistylis*), western panicgrass (*Panicum acuminatum*), woolly sedge (*Carex lanuginosa*), fox sedge (*Carex vulpinoidea*), spurless forget-me-not (Impatiens ecalcarata), loosestrife (*Lysimachia thrysiflorus, L. ciliata*), (*Galium spp.*), horsetail (*Equisetum hyemale, E. arvense*), marsh spikerush (*Eleocharis palustris*) and Kentucky bluegrass (*Poa pratensis*). Common sedges observed in emergent wetlands include porcupine sedge (*Carex hystericina*), short beaked sedge (*Carex brevior*), Bebb's sedge (*Carex bebbii*), knotsheath sedge (*Carex retrorsa*), lakeshore sedge (*Carex lenticularis*) and smallwing sedge (*Carex microptera*). Jointleaf rush (*Juncus articulatus*) and poverty rush (*Junus tenuis*) are ubiquitous species in emergent wetlands (EDAW, 2006a).

The species composition of emergent wetlands changes with the shoreline elevation, width, and slope. The low elevation shoreline is frequently inundated and composed of mud and gravel substrates (EDAW, 2006a). Wide, low gradient shorelines are often dominated by cattail, yellow flag and bulrush, particularly in backwater areas along the Okanogan River. Some of the wider, low-gradient shorelines support a relatively uncommon "mudflat" habitat with little competing vegetation. Chaffweed, a wetland plant under review by Washington Department of Natural Resources (WDNR) to determine its range and abundance, was found in these mudflat wetlands. In contrast to the cattail-bulrush-yellow flag vegetation, these mudflat habitats have very low vegetation cover.

The higher elevation shoreline positions are moist rather than wet. These areas are generally grass-dominated and support fewer hydrophytic species compared to lower elevations. Higher positions along steep, narrow shorelines are dominated by reed canarygrass in many sites and red fescue (*Festuca rubra*) in a few sites (EDAW, 2006a).

Cassimer Bar has emergent wetland meadows that are located on low-lying, swale-like areas adjacent to the wetter cattail-bulrush wetlands (EDAW, 2006a). These areas are more moist than wet, yet still have a high proportion of hydrophytic species. The emergent wetland meadows occupy 87 acres on Cassimer Bar, approximately 3.4 percent of the total land below the Wells Project Boundary. Species found in the emergent wet meadows include foxtail barley (*Hordeum jubatum*), red top (*Agrostis alba*), curly dock (*Rumex crispus*), common rush (*Juncus effusus*), chairmakers bulrush (*Scirpus americanus*), bay forget-me-not (*Myosotis laxa*), Baltic rush (*Juncus balticus*) and Canada thistle (*Cirsium arvense*).

The emergent wetlands on the Methow River islands are similar to wetlands elsewhere in the Wells Project area. However, some species and species assemblages are unique to these islands. One wetland had an extensive stand of little green sedge (*Carex oederi*) and the only observations of inland sedge (*Carex interior*) and golden sedge (*Carex aurea*). Blister sedge (*Carex vesicaria*) is also more abundant on these islands compared to the rest of the Wells Reservoir (EDAW, 2006a).

Pond Types

The pond cover type was mapped on 46 acres or just 1.8 percent of lands within the Wells Project Boundary. The vegetation associated with ponds was similar to species found in the emergent wetland, riparian shrub, and riparian deciduous tree cover types. Aquatic species in ponds were usually not particularly abundant, but did include common water weed, leafy pondweed, curly leaf pondweed and Eurasian watermilfoil (Le and Kreiter, 2006)

5.4.2.4 Littoral Zone – Wash Type

There were 61 acres mapped as the sand, silt and gravel cover type. These areas are most often represented by alluvial deposits in dry washes. Subsurface moisture in many of the washes supports emergent wetland vegetation either within the banks of the active channel or near the Wells Reservoir margin. These wetlands often alternate or intermix with the dry, coarse alluvial substrates. The silt, sand and gravel areas tend to support sparse vegetation cover of species such as Dalmatian toadflax, Russian thistle (*Acroptilon repens*), tall whitetop and Canada thistle but also some native shrub steppe species.

5.4.2.5 Bare – Disturbed – Eroded Type

Bare ground/disturbed areas, where the majority of vegetation has been removed, occupies only 29 acres or 1.1 percent of lands within the Wells Project Boundary (EDAW, 2006a). A total of 19 acres or 0.8 percent of lands within the Wells Project Boundary along shorelines and slopes are eroding. Erosion is found on some slopes and banks along the Wells Reservoir. Most of the

eroding slopes are comprised of sandy substrates and likely will continue to erode until a stable angle (angle of repose) is achieved or vegetation can become established to effectively stabilize the slope.

5.4.2.6 Agriculture Types

Agricultural uses are permitted on 648 acres or 25.5 percent of lands within the Wells Project Boundary. Orchards (105 acres) are most abundant between Pateros and Bridgeport, but also occur along the Okanogan River (EDAW, 2006a). Orchards represent the most commercially valuable botanical resources in the Wells Project area. There were 281 acres or 11.1 percent of lands within the Wells Project Boundary used to grow alfalfa. Pastures (72 acres) occur primarily along the Okanogan River. Farming activities also include: fallow (53 acres), unidentified crops (56 acres) and idle fields (81 acres).

5.4.2.7 Developed Types

There are 175 acres of developed land within the Wells Project Boundary. Wells Dam, associated warehouses and boneyard occupy 37 acres of land. Wells Hatchery occupies 33 acres of land within the Wells Project Boundary. The remaining development permitted on Wells Project land includes: rip-rap (38 acres), landscaped areas (15 acres), recreation sites (21 acres), highways, roads and railroads (26 acres), structures (1 acres), and industrial uses (4 acres) (EDAW, Inc. 2006a).

5.4.2.8 Wells Project Transmission Corridor

The Wells Project includes two 230 kV single-circuit transmission lines. The transmission corridor runs 41 miles from Wells Dam to the Douglas Switchyard (Appendix E). The lines run parallel to each other on 45-85 foot steel towers along a common 235-foot wide right-of-way. The vegetation along the transmission corridor has not been mapped or searched for RTE species. The transmission lines climb from the Columbia River, approximately 3 miles turning southeast to the Waterville Plateau crossing shrub steppe vegetation and small stands of conifer trees. On the plateau the transmission lines continue 3 miles southeast crossing a mix of shrub steppe vegetation and wheat fields. Turing southwest, for 25 miles, the transmission lines primarily cross wheat fields and Conservation Reserve Program (CRP) fields but also cross small isolated tracts of shrub steppe vegetation. Near Waterville the lines turn south southwest and climb over Badger Mountain. On Badger Mountain the lines cross over a mix of shrub steppe vegetation, conifer tree stands and wheat fields. The transmission lines then descend approximately 3 miles from Badger Mountain to the Columbia River Valley until reaching Douglas Switchyard. The last three miles of the lines cross a mix of shrub steppe vegetation and orchard lands.

5.4.2.9 Plants of Traditional Cultural Significance

Douglas PUD is working with the CCT on cultural resource issues in the Wells Project area. A list of plant species of traditional-cultural significance will be developed with the Cultural Resource Work Group.

5.4.3 Wildlife Resources

5.4.3.1 General Description of the Wildlife Resource

The Wells Reservoir and wetlands provide habitat for a variety of waterfowl, shorebirds and aquatic furbearers. Riparian plant communities within the Wells Project support more wildlife species than any other vegetation type and include important habitat for migratory and nesting birds, mammals, reptiles and amphibians. Shrub steppe plant communities provide habitat for birds, reptiles and mammals adapted to thrive in this dry open habitat. Wildlife surveys were conducted during the breeding season and fall migration season in 2006 and detected 120 avian, 3 amphibian, 6 reptile, and 12 small mammal species within the Wells Project (Table 5.4-1). The results of the wildlife surveys indicate that the Wells Project supports an abundance of healthy, native wildlife species (EDAW 2006b). DTA (2006) conducted an assessment of the impacts of water level fluctuations on waterfowl and amphibians in the Wells Reservoir. This study concluded that impacts to waterfowl were limited and offset by plantings at the WWA. Impacts to amphibian resources from current Project operations are minimal (DTA, 2006).

Aquatic Wildlife

The WDFW considers the Wells Reservoir as one of the most important waterfowl wintering areas in eastern Washington (Patterson B, WDFW, pers. comm.). Aerial survey data from fall 2001 to spring 2005 shows a maximum of 33,912 ducks and geese during the fall migration, and a maximum of 38,909 ducks and geese wintering on the Wells Reservoir (Table 5.4-2). In addition to the ducks and geese, a maximum of 23,150 American coots were seen during the fall migration, and a maximum of 25,700 coots wintered on the Wells Reservoir between 2001 and 2005. The native pond weeds found growing in the Wells Reservoir provide food for waterfowl during the spring and fall migration and sustains them through the winter. Corn, wheat and other grains grown on the WWA provide food for dabbling ducks, like mallards (*Anas platyrhynchos*) and for Canada geese (*Branta canadensis*).

Common winter residents on the Wells Reservoir include American coot, greater and lesser scaup, American widgeon (*Anus platyrhynchos*), ring-necked duck and mallard. Other wintering water fowl include gadwall (*Anus strepera*), northern shoveler (*Anus clypeata*), bufflehead, Barrows goldeneye (*Bucephala islandica*), ruddy duck, common merganser and hooded merganser. Common loons (*Gavia immer*), pied-billed grebes (*Podilymbus podiceps*), eared grebes (*Podiceps nigricollis*), and western/Clark's grebe (*Aechmophorus occidentalis*) are all present on the Wells Reservoir during winter. Wintering coots and ducks provide an important food supply for bald eagles wintering within and adjacent to the Wells Reservoir.

Table 5.4-1 Wells Project wildlife detected by 2005 survey (2006b).

Common Name	Scientific Name
Pelagic Birds and Herons	
Common Loon	*Gavia immer*
Eared Grebe	*Podiceps nigricollis*
Horned Grebe	*Podiceps auritus*
Red-necked Grebe	*Podiceps grisegena*
Western Grebe	*Aechmophorus occidentalis*
American White Pelican	*Pelecanus erythrorhynchos*
Double-crested Cormorant	*Phalacrocorax auritus*
Great Egret	*Casmerodius albus*
Waterfowl	
Canada Goose	*Canadensis taverneri*
Mallard	*Anas platyrhynchos*
Gadwall	*Anas strepera*
American Wigeon	*Anas americana*
Northern Pintail	*Anas acuta*
Blue-winged Teal	*Anas dicors*
Cinnamon Teal	*Anas cyanoptera*
Ruddy Duck	*Oxyura jamaicensis*
Wood Duck	*Aix sponsa*
Redhead	*Aythya americana*
Ring-necked Duck	*Aytha collaris*
Scaup spp.	*Aytha spp.*
Barrow's Goldeneye	*Bucephala islandica*
Bufflehead	*Bucephala albeola*
Common Merganser	*Mergus merganser*
Hooded Merganser	*Lophodytes cucullatus*
Raptors	
Turkeys Vulture	*Cathartes aura*
Osprey	*Pandion haliaetus*
Northern Harrier	*Circus cyaneus*
Sharp-shinned Hawk	*Accipiter striatus*
Cooper's Hawk	*Accipiter cooperii*
Golden Eagle	*Aquila chrysaetos*
Bald Eagle	*Haliaeetus leucocephalus*
Red-tailed Hawk	*Buteo jamaicensis*
American Kestrel	*Falco sparverius*
Peregrine Falcon	*Falco peregrinus*
Prairie Falcon	*Falco mexicanus*

Table 5.4-1 (cont.) Wells Project wildlife detected by 2005 survey (2006b).

Common Name	Scientific Name
Gamebirds	
Chuckar	*Alectoris chuka*
Ring-necked Pheasant	*Phasianus colchicus*
California Quail	*Callipepla californica*
Rails, Cranes, & Shorebirds	
Virginia Rail	*Rallus limicola*
American Coot	*Fulica americana*
American Golden Plover	*Pluvialis dominica*
Killdeer	*Charadrius vociferous*
Greater Yellowlegs	*Tringa melanoleuca*
Spotted Sandpiper	*Actitis macularia*
Dowitcher spp.	*Limnodromus spp*.
Common Snipe	*Gallinago gallinago*
Wilson's Phalarope	*Phalaropus tricolor*
Gulls & Terns	
Bonaparte's Gull	*Larus philadelphia*
Ring-billed Gull	*Larus delawarensis*
California Gull	*Larus californicus*
Caspian Tern	*Sterna caspia*
Black Tern	*Chlidonias niger*
Common Tern	*Sterna hirundo*
Doves	
Rock Dove	*Columba livia*
Mourning Dove	*Zenaida macroura*
Owls & Goatsuckers	
Great Horned Owl	*Bubo virginianus*
Common Nighthawk	*Chordeiles minor*
Hummingbirds & Kingfishers	
Rufous Hummingbird	*Selasphorus rufus*
Black-chinned Hummingbird	*Archilochus alexandri*
Belted Kingfisher	*Ceryl alcyon*

Table 5.4-1 (cont.) Wells Project wildlife detected by 2005 survey (2006b).

Common Name	Scientific Name
Woodpeckers & Flycatchers	
Northern Flicker	*Colaptes auratus*
Downy Woodpecker	*Picoides pubescens*
Western Wood Pee-wee	*Contopus sordidulus*
Willow Flycatcher	*Empidonax trailli*
Say's Phoebe	*Sayornis saya*
Eastern Kingbird	*Tyrannus tyrannus*
Western Kingbird	*Tyrannus verticalis*
Corvids & Swallows	
Steller's Jay	*Cyanocitta stelleri*
Black-billed Magpie	*Pica hudsonia*
American Crow	*Corvus brachyrhynchos*
Common Raven	*Corvus corax*
Tree Swallow	*Tachycineta bicolor*
Violet-green Swallow	*Tachycineta thalassina*
Cliff Swallow	*Petrochelidon pyrrhonota*
Bank Swallow	*Riparia riparia*
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*
Barn Swallow	*Hirundo rustica*
Chickadees, Wrens & Kinglets	
Black-capped Chickadee	*Poecile atricapillus*
House Wren	*Troglodytes aedon*
Canyon Wren	*Catherpes mexicanus*
Marsh Wren	*Cistothorus palustris*
Ruby-crowned Kinglet	*Regulus calendula*
Golden-crowned Kinglet	*Regulus satrapa*
Thrushes & Starlings	
Gray Catbird	*Dumetella carolinensis*
European Starling	*Sturnus vulgaris*
American Robin	*Turdus migratorius*
American Pipit	*Anthus rubescens*
Waxwings	
Cedar Waxwings	*Bombycilla cedrorum*

Table 5.4-1 (cont.) Wells Project wildlife detected by 2005 survey (2006b).

Common Name	Scientific Name
Warblers & Tanagers	
Orange-crowned Warbler	*Vermivora celata*
Nashville Warbler	*Vermivora ruficapilla*
Yellow-rumped Warbler	*Dendroica coronata*
Yellow Warbler	*Dendroica petechia*
MacGillivray's Warbler	*Oporornis tolmiei*
Wilson's Warbler	*Wilsonia pusilla*
Common Yellowthroat	*Geothlypis trichas*
Yellow-breasted Chat	*Icteria virens*
Western Tanager	*Piranga ludoviciana*
Sparrows & Icterids	
Spotted Towhee	*Pipilo maculatus*
Chipping Sparrow	*Spizella passerina*
Lark Sparrow	*Chondestes grammacus*
Grasshopper Sparrow	*Ammodramus savannarum*
Savannah Sparrow	*Passerculus sandwichensis*
Lincoln's Sparrow	*Melospiza lincolnii*
Song Sparrow	*Melospiza melodia*
White-crowned Sparrow	*Zonotrichia leucophrys*
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*
Red-winged Blackbird	*Agelaius phoeniceus*
Brewer's Blackbird	*Euphagus cyanocephalus*
Brown-headed Cowbird	*Molothrus ater*
Bullock's Oriole	*Icterus bullockii*
Finches & Allies	
Dark-eyed Junco	*Junco hyemalis*
Black-headed Grosbeak	*Pheucticus melanocephalus*
Lazuli Bunting	*Passerina amoena*
House Finch	*Carpodacus mexicanus*
American Goldfinch	*Carduelis tristis*
Evening Grosbeak	*Coccothraustes vespertinus*
House Sparrow	*Passer domesticus*
Amphibians	
Pacific Treefrog	*Pseudacris [Hyla] regilla*
Great Basin Spadefoot Toad	*Spea intermontana*
Long-toed Salamander	*Ambystoma macrodactylum*
Bullfrog	*Rana catesbeiana*

Table 5.4-1 (cont.) Wells Project wildlife detected by 2005 survey (2006b).

Common Name	Scientific Name
Reptiles	
Painted Turtle	*Chrysemys picta*
Gopher Snake	*Pituophis melanoleucus*
Yellow-bellied Racer	*Coluber constrictor mormon*
Sagebrush Lizard	*Sceloporus garaciosus*
Western Terrestrial Garter Snake	*Thamnophis elegans*
Common Garter Snake	*Thamnophis sirtalis*
Western Rattlesnake	*Crotalus viridis*
Small Mammals	
Deer Mouse	*Peromyscus maniculatus*
Great Basin Pocket Mouse	*Parognathus parvus*
Western Harvest Mouse	*Reithrodontomys megalotis*
Sagebrush Vole	*Lemmiscus curtatus*
Montane Vole	*Microtus montanus*
Meadow Vole	*Microtus pennsylvanicus*
Vagrant/Masked Shrew	*Sorex spp.*
Bushy-tailed Woodrat	*Neotoma cinerea*
House Mouse	*Mus musculus*
Cottontail Rabbit	*Sylvilagus spp.*
Long-tailed Weasel	*Mustela frenata*

Table 5.4-2 Wells Reservoir winter aerial waterfowl survey.

Species	10/26/01	11/15/01	12/18/01	10/23/03	11/14/02	01/13/03	10/23/03	11/13/03	10/20/04	11/18/04	12/14/04	01/11/05
Trumpeter Swan	0	0	2	0	0	0	0	0	0	0	0	0
Western Canada Goose	150	369	410	450	10	450	80	465	340	666	510	1095
Lesser Canada Goose	0	0	0	0	0	0	0		50	80	0	40
Unid. Canada Goose	0	0	0	0	44	130	0	0	50	27	0	100
Total Geese	150	369	410	450	54	580	80	465	440	773	510	1235
Mallard	150	885	1810	845	6830	170	290	40	355	840	4410	1235
Gadwall	150	275	120	25	460	50	100	0	1120	920	590	980
American Wigeon	14370	7460	8400	12900	16080	1740	10800	4000	13980	10150	6330	1810
Green-winged Teal	0	0	0	30	0	0	1	0	0	0	0	0
Blue-winged Teal	0	0	0	0	0	0	0	0	0	0	0	0
Cinnamon Teal	0	0	0	0	0	0	0	0	0	0	0	0
Northern Shoveler	2	0	0	0	0	0	0	0	0	0	0	0
Northern Pintail	0	15	0	0	0	0	0	0	0	0	0	0
Wood Duck	0	0	0	0	0	0	2	0	0	0	0	0
Total Puddle Ducks	14672	8635	10330	13800	23370	1960	11193	4040	15455	11910	11330	4025

Table 5.4-2 (cont.) Wells Reservoir winter aerial waterfowl survey.

Species	10/26/01	11/15/01	12/18/01	10/23/03	11/14/02	01/13/03	10/23/03	11/13/03	10/20/04	11/18/04	12/14/04	01/11/05
Redhead	7600	6400	1500	3000	3530	1750	1570	0	1440	1350	850	2020
Canvasback	2200	2750	1200	1470	4000	130	0	0	50	1550	640	1100
Scaup	7000	5450	9650	5900	3520	1630	1600	1200	3870	5500	6110	980
Ringneck	2090	700	3380	2910	3340	90	450	520	4150	5500	6110	980
Goldeneye	0	40	440	50	620	210	0	50	0	1080	920	90
Bufflehead	60	130	100	50	400	110	0	60	100	150	320	90
Ruddy	140	700	0	0	50	300	0	0	400	150	0	60
Total Diving Ducks	19090	16170	16270	13380	15460	4220	3620	1830	10010	15280	14950	5320
Common Merganser	0	1	20	0	0	0	0	0	4	30	34	70
Hooded Merganser	0	3	0	10	25	0	0	0	5	30	3	10
Total Merganser	0	4	20	10	25	0	0	0	9	60	37	80
Total Ducks	33762	24809	26620	27190	38855	6180	14813	5870	25474	27250	26317	9425
Total Waterfowl[1]	33912	25178	27032	27640	38909	6760	14893	6335	25914	28023	26827	10660
Coots	22300	17700	15000	23150	19300	17530	14000	2970	21700	19450	25700	24200
Total Survey	56212	42878	42032	50790	58209	24290	28893	9305	47614	47473	52527	34860

[1] Waterfowl surveys compiled from FWS/WDFW data.

Canada geese are the only waterfowl that nest on the Wells Reservoir in large numbers. The ten year average number of Canada goose nests (1995–2004) found during annual surveys on the Wells Reservoir is 128 (Table 5.4-3) (Hallet, 1981–2005; Washington Department of Game, 1978, 1979). Gosling production for the same time period averaged 659. Nests are found on island and washtub nesting platforms. Mallards nest in low numbers on the islands, near ponds and on the shoreline. A few broods are seen in late spring. Common mergansers may also nest in low number on the Wells Reservoir. Shorebirds use the habitat found at the waters edge to feed on small aquatic invertebrates. These species are benefited by stable beaches that provide a gentle slope to the water edge. They also use wetland and riparian habitats. Shorebirds that migrate through the Wells Project include: American golden-plover, greater yellowlegs, and dowitcher. Killdeer and spotted sandpiper are known to nest in the Wells Project.

Table 5.4-3 Annual number of Canada Goose nests and estimated gosling production on Wells Reservoir.

	Canada Goose Nest			Goslings
Year	Island Nests	Tub Nests	Total Nests	
1977	21	0	21	n/a
1978	38	0	38	n/a
1979	36	0	36	n/a
1980	55	0	55	n/a
1981	52	3	55	245
1982	43	0	43	160
1983	0	0	0	208
1984	33	22	55	260
1985	0	0	0	251
1986	43	28	71	342
1987	0	0	0	414
1988	67	29	96	408
1989	51	34	85	472
1990	63	31	94	492
1991	0	0	0	504
1992	77	44	121	646
1993	74	35	109	627
1994	87	34	121	508
1995	80	36	116	607
1996	72	35	107	596
1997	86	43	129	721
1998	55	26	81	594
1999	86	34	120	561
2000	105	25	130	680
2001	123	36	159	877
2002	87	22	109	656
2003	132	36	168	777
2004	117	40	157	524

Aquatic furbearers present on the Wells Reservoir include beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), mink (*Mustela vision*) and river otter (*Lutra canadensis*). Mink and otter are much less common on the Wells Reservoir than beaver or muskrats. Riparian trees and shrubs, especially cottonwood and willow species, provide food and lodge materials for beaver and emergent wetland plants provide food and den material for muskrat. River otter feed primarily on fish, amphibians, insects, crayfish and small mammals captured from the Wells Reservoir. Mink feed on fish, amphibians, clams, crayfish, small mammals, birds and bird eggs. The otter and mink also occasionally raid fish hatchery ponds.

Amphibians and reptile surveys in the Wells Project area documented four amphibian species: long-toed salamander, Great Basin spadefoot (*Spea intermontana*), bullfrog and Pacific treefrog (EDAW, 2006b). The Wells Reservoir is in the geographic range of tiger salamander (*Ambystoma tigrnum*), Columbia spotted frog (*Rana luteiventris*) and western toad (*Bufo boreas*) but none were found during the survey. Painted turtle are also found in the ponds along the Wells Reservoir.

Evidence of amphibian breeding was only found in the ponds isolated from the Wells Reservoir but not in wetlands connected to the Wells Reservoir (EDAW, 2006b). Breeding may only occur in ponds isolated from the Wells Reservoir because of the abundance of fish that prey on amphibians (Duke, 2000). The lack of amphibian breeding in ponds connected to the Wells Reservoir may also be attributive to colder water temperatures in the Wells Reservoir during the spring and fluctuating water levels (EDAW 2006b). The bullfrog, a non-native species, occurs in a number of ponds in the Wells Project. This species feeds on native amphibians, as well as insects, small mammals and small birds. As in other areas of the Pacific Northwest (McAllister et. al. 1999), it is possible that bullfrogs may be reducing native amphibian populations within Wells Project wetlands.

Shoreline Wildlife

Distance from the shoreline to the Wells Project Boundary varies with topography and ranges from a few feet to over 3,000 feet on Cassimer Bar. Riparian and wetland vegetation make up 18 percent and 11 percent, respectively, of the total vegetation below the Wells Project Boundary (EDAW, 2006a). Riparian vegetation is confined mostly to thin strips along the shoreline, except on Cassimer Bar and the riparian vegetation developed by WDFW on and the Washburn Island and the Bridgeport Bar Unit of the WWA. Wetlands are also confined to a narrow band along the Wells Reservoir except for Cassimer Bar and Washburn Island and two locations on the Okanogan River.

Birds detected in wetland habitats represented 20 percent and 10 percent of all avian detections during the breeding season and fall migration, respectively (EDAW, 2006b). A total of 38 and 43 species of birds were detected in Wells Project wetlands during both breeding season and fall surveys, respectively.

Many of the wetland associated birds typically nest either semi-colonially or in large compact aggregations. Red-winged blackbird and yellow-headed blackbird are semi-colonial nesting birds. Red-winged blackbirds were the most abundant wetland bird, accounting for 30 percent of all detections in this habitat type (EDAW, 2006b). Brewer's blackbird and brown-headed cowbird, which breed in upland shrub steppe, riparian shrub and grassland habitats, forage in wetland during the breeding season.

Nesting habitat for coots and pie-billed grebes is found in the wetlands surrounding ponds and along the shoreline. These wetlands also provide habitat for breeding marsh wrens. Wood ducks and hooded mergansers nest in artificial nest boxes maintained by WDFW in wetlands and riparian areas, and may nest in natural cavities in large riparian trees on the Wells Reservoir. Though seldom found nesting in wetlands along the Wells Reservoir, Canada geese are often seen with young goslings near wetlands where the young birds can feed on aquatic invertebrates.

Overall, 27 percent of all birds detected during the breeding season in the Wells Project area were in riparian habitats, more than any other habitat type. Absolute abundance during the fall was about half that of the breeding season (EDAW, 2006b). During the breeding season, 43 avian species were detected in riparian habitat, while 47 species were detected in the fall.

Riparian habitat found on the Wells Project supports a diverse collection of neotropical migrant species including Bullock's oriole, western wood pee-wee (*Contopus sordidulus*), violet-green swallow, willow flycatcher, western kingbird (*Tyrannus verticalis*), eastern kingbird (*Tyrannus tyrannus*), yellow warbler (*Dendroica petechia*), gray catbird, rufous hummingbird, black-chinned hummingbird, and Wilson's warbler (EDAW, 2006b). These species nest solitarily or in loose aggregations within the riparian areas.

Other bird species that utilize the riparian habitat for nesting include: mourning dove, American robin, northern flicker, Steller's jay, downy woodpecker (*Picoides pubescens*) and House finch. The non-native European starling was the most abundant bird found in riparian habitat.

Raptors known to nest in the riparian habitat include red-tailed hawk, great-horned owl (*Bubo virginianus*) and osprey (EDAW, 2006b). Sharp-shinned hawk (*A. striatus*), Cooper's hawk and American kestrel are also known to use riparian habitat on the Wells Reservoir. The turkey vulture (*Cathartes aura*) is known to nest in the cottonwood trees on Cassimer Bar. California quail and ring-necked pheasant (*Phasianus colchicus*), an introduced game species, are also known to nest in the riparian vegetation.

During the fall, the number of neotropical species observed typically decreases substantially as species migrate out of the Wells Project area (EDAW, 2006b). Neotropical migrants found in the riparian habitat during the fall migration, include yellow-rumped warbler (*Dendroica coronata*) and Lincoln's sparrow (*Melospiza lincolnii*). Short distance migrants found in the riparian habitat, during the fall, include Black-billed magpie and cedar waxwing (*Bombycilla cedrorum*). Wintering bald eagles begin to arrive in the Wells Project area in the fall with numbers continuing to build through winter until a maximum is reached in late February. Bald eagles use the larger riparian trees as hunting and resting perches during the day.

The common garter snake and western terrestrial garter snake, are commonly observed in wetland and riparian habitats on the Wells Reservoir. These two garter snakes feed on earthworms, slugs, frogs, fish and small mammals. Western terrestrial garter snakes may also feed on small birds and eggs. Surveys of the Wells Project found a single gopher snake or "bull snake" in a wetland (EDAW 2006b). Gopher snakes feed on small mammals and birds.

Mammals using the riparian and wetland habitats on Wells Project include raccoon (*Procyon lotor*), long-tailed weasel, striped skunk (*Mephitis mephitis*), coyote (*Canis latrans*), mink, muskrat, beaver and mule deer (*Odocoileus hemionus*) and whitetail deer (*Odocoileus virginianus*). Small mammals documented in Wells Project area wetland and riparian habitat (EDAW 2006b) include: deer mouse, western harvest mouse, meadow vole, vagrant/masked shrew and house mouse.

The riparian and wetland habitats along the Wells Reservoir provide food and thermal cover for wildlife species during the winter. Mule deer can be found using the riparian habitat during harsh winter conditions, particularly when heavy snow accumulates in the higher elevations. During mild winters, mule deer are rarely found within the riparian Wells Reservoir community. Instead they typically use shrub steppe winter range at higher elevations away from the Wells Reservoir and outside the Wells Project Boundary. Wetland and riparian habitats also provide very important cover for ring-necked pheasants and California quail during hard winters. A number of raptor species use riparian habitat for hunting, roosting and perching. Cooper's hawks and sharp-shinned hawks hunt small birds that shelter in riparian habitat during winters.

Upland Wildlife

Fifteen percent of the birds detected during breeding season surveys were found in shrub steppe habitat. The detection rate dropped to 10 percent of the birds observed during the fall migration surveys. The total number of avian species detected during the spring and fall surveys was 27 and 30 species, respectively (EDAW, 2006b).

The most abundant birds in the shrub steppe are species that require open shrub habitat for nesting, including the western meadowlark (*Sturnella neglecta*), Brewer's blackbird, Brewer's sparrow and sage sparrow (*Amphispiza belli*). Shrub steppe is also used by species that breed in other habitats but feed part of the time on the seeds or insects produced by the plant in this habitat. Northern rough-winged swallow, bank swallow and cliff swallow all nest in different habitats but feed in nearby shrub steppe. California quail had the highest number of detections of all birds found in shrub steppe (EDAW, 2006b). Other species found feeding in shrub steppe include: common raven, European starling, American goldfinch, American robin, black-billed magpie, western kingbird, western wood Pee-wee, purple finch (*Carpodacus purpureus*), song sparrow and American crow. Raptors that hunt in the shrub steppe habitat include: red-tailed hawk, great horned owl, American kestrel and northern harrier. The prairie falcon and peregrine falcon both use the upland habitats adjacent to the Wells Reservoir but are not known to nest within the Wells Project area.

The fall migration brings a number of bird species to the Wells Project area, and for a short time the migrants are found in shrub steppe habitat both adjacent to and within the Wells Project area. Large mixed species flocks of sparrows move through the area and include: the Savannah sparrow, dark-eyed junco, lazuli bunting and white-crowned sparrow. White-crowned sparrows and dark-eyed juncos are fall migrants but at least some of these birds remain for the winter. All of the neotropical bird species leave the Wells Project in fall. American kestrels also leave the Wells Project; rough-legged hawks (*Buteo lagopus*) move into the area during the fall and winter.

Reptile surveys in the Wells Project area documented the western yellow-bellied racer, north pacific rattlesnake (*Cortalus viridis oreganus*) and northern sagebrush lizard in the shrub steppe habitat (EDAW 2006b). Gopher snakes also are known to use the shrub steppe within the Wells Project area. Western yellow-bellied racers feed on small mammals, lizards, frogs and insects and can also be found in wetlands and riparian habitats adjacent to the Wells Reservoir. Northern Pacific rattlesnakes feed mainly on small mammals, but have been found during the heat of the summer in emergent wetlands where they may be feeding on young blackbirds. Northern sagebrush lizards feed on insects and small invertebrates. Rattlesnake habitat can be found throughout the Wells Project. Areas where Rattlesnakes were found during the 2005 survey included Wells Dam and near Rattlesnake Point on the Okanogan River.

The shrub steppe habitat in the Wells Project area supports mule deer, coyote, cottontail rabbits and yellow-bellied marmots (*Marmota flaviventris*). Black bear (*Ursus americanus*) and moose (*Alces alces*) are uncommon but have been observed in the shrub steppe habitat adjacent to the Wells Project. Small mammals documented in shrub steppe habitat in the Wells Project area include the deer mouse and Great Basin pocket mouse. The bushy-tailed woodrat, least chipmunk (*Eutamias minimus*) and northern pocket gopher (*Thomomys talpoides*) are also known to inhabit shrub steppe within and adjacent to the Wells Project.

Agricultural

Avian abundance and species richness in the agricultural lands associated with the Wells Project area is low compared to other habitat types (EDAW 2006b). Thirty species of birds were found to use agricultural lands during the spring breeding and fall migration periods. The European starling was the most abundant bird sighted in the agricultural area in the breeding season, and the second most abundant during fall migration. Birds using the agricultural areas tend to be the most common avian species observed in the Wells Project and include the California quail, ring-necked pheasant, American robin, swallow species, blackbird species, mourning dove, western meadowlark, killdeer, Bullock's oriole, eastern kingbird, American crow and northern flicker.

Idle agricultural fields provide poor habitat because they consist of mostly non-native grass species. Twenty-one avian species were seen in the idle agriculture fields during the breeding season and 15 species during the fall. Birds found in the idle agricultural fields are species typical of the other agricultural areas, but occur in lower numbers (EDAW 2006b). Agriculture has a negative impact on the abundance and species diversity of small mammals. Rodenticides are frequently used in fruit orchards to control small mammals that can damage the

bark and roots of young fruit trees. Relatively few species and low number of small mammals were documented during surveys in Wells Project area agricultural lands. Species recorded included the deer mouse, vagrant/masked shrew, house mouse and meadow vole (EDAW (2006b).

Yellow bellied marmots can be found in the vicinity of agricultural orchards throughout the Wells Project area and cottontail rabbits also occur in the vicinity of active agricultural sites. Idle agricultural fields in the Wells Project area appear to support a greater number of small mammal species; the western harvest mouse, deer mouse, bushy-tailed woodrat, mountane vole (*Microtus montanus*), sagebrush vole, vagrant shrew (*Sorex vagrans*) and cottontail rabbit were all documented during surveys in this habitat (EDAW 2006b). Mule deer and beaver damage orchard trees, and orchard owners can obtain permits from WDFW to shoot mule deer and can hire professional trappers, licensed by the state, to control beaver populations.

5.4.3.2 Wells Transmission Line Corridor

The habitat in the vicinity of the corridor includes shrub steppe, small stands of conifer tree dryland wheat fields and fields planted to grass and shrubs under the Conservation Reserve Program. The area supports huntable populations of mule deer and upland game birds including California quail, grey partridge and chukar. Raptors are found hunting the fields in the vicinity of the corridor and nest in the conifer tree stands. Songbirds, owls, ravens and crows are all present in the area.

5.4.3.3 Wildlife of Traditional Cultural Significance

Douglas PUD is working with the CCT on cultural resource issues in the Wells Project area. A list of wildlife of traditional-cultural significance will be developed with the Cultural Resource Work Group.

5.4.3.4 Management Plans

Douglas PUD has entered into a number of mitigation and management agreements with several entities since obtaining the Wells Project license. The first set of agreements addressed mitigation for habitats lost by construction of the Wells Project. The second set of agreements mitigated the effects of the two-foot raise in Wells Forebay elevation in 1982. This section summarizes these mitigation agreements and the associated management activities that have resulted from the agreements.

Wildlife Mitigation – WDFW

Douglas PUD and WDFW, then Washington Department of Game, signed an agreement on July 15, 1974 to mitigate for Wells Project construction and the ongoing effects of Wells Project operations. Douglas PUD provided WDFW with 5,715.8 acres of land, in fee title, and provided WDFW with management rights to 566.2 acres of land within the Wells Project Boundary (Table 5.4-4). Management rights were also secured on 1,884.0 acres of BLM and WDNR land adjacent to fee land provided by Douglas PUD. WDFW also received $1,250,000 for the capital

equipment and operation of the mitigation lands. WDFW has named the mitigation lands the WWA. Active management of the WWA began during the summer of 1975. Douglas PUD provided funding for a baseline vegetation and wildlife survey of the WWA in 1976, which was conducted by WDFW biologists and intended to guide mitigation activities (Nelson, 1977).

Table 5.4-4 Lands managed by WDFW for Wells Project mitigation (acres).

Management Unit	Fee Title Land[1]	Leased Land[2]	Within Project Boundary[2]	Total Acres
Bridgeport Bar	205.8		296.2	502.0
Central Ferry Canyon	1,569.0	33.0		1,602.0
West Foster Creek	1,025.0			1,025.0
Indian Dan Canyon	2,865.0	1,851.0		4,716.0
Okanogan	91.0		9.0	100.0
Washburn Island			261.0	261.0
Total Acres	5,715.8	1,884.0	566.2	8,206.0

[1]Land given to WDG in fee title cost $930,376 in 1975 dollars.
[2]Land management agreements between WDFW and BLM and WDNR.
[3]Land within the Wells Project Boundary managed as part of WWA cost $202,647 in 1975 dollars.

WDFW's original management goal for the WWA was solely to develop habitat for game species and to release upland game birds, primarily ring-necked pheasants, for hunting recreation lost when the Wells Reservoir was filled. Over the years, WDFW's wildlife management goals, at a state-wide level, have changed from solely managing game species (upland birds, waterfowl and big game). The agency is now responsible for protecting game and non-game species and their habitats, managing for species diversity and providing consumptive (hunting) and non-consumptive (bird watching) wildlife related recreation. Changes in state-wide wildlife management goals have impacted the management of the WWA.

The WWA is divided into three shoreline management units and three upland units (Figure 5.4-1); each is described below.

- The Bridgeport Bar Unit is located on the shoreline of the Wells Reservoir in Douglas County between the cities of Bridgeport and Brewster and is the largest shoreline unit. A total of 502 acres of land are managed on this unit, with 296 acres within the Wells Project Boundary. The Bridgeport Bar Unit is intensely managed for upland game and waterfowl. With the help of irrigation, WDFW has developed large stands of native and non-native riparian shrubs and trees that border small fields where cereal grains, corn, wheat and millet are grown to feed upland birds and wintering waterfowl and passerines. The unit also includes fields used as goose pasture, areas of shrub steppe habitat for upland game cover and plots of annual vegetation that provide food and cover for upland and passerine birds. In addition, WDFW has developed ponds fed by groundwater that are intended to provide waterfowl nesting habitat as well as rearing habitat for amphibians. Consequently, the Bridgeport Bar Unit provides habitat for a diverse assortment of wildlife.

- The 261-acre Washburn Island Unit is entirely within the Wells Project Boundary and is located upstream of the Cassimer Bar. The island is accessed by crossing one of two dikes. The Washburn Island Unit was originally managed by WDFW for migrant and resident waterfowl and upland birds. A tenant farmer raised circle-irrigated alfalfa which provided goose pasture and planted a small grain strip for upland birds and waterfowl. The tenant farmer agreement was eventually abandoned and WDFW began farming the island by planting more grains and developing a few ponds to increase the diversity of habitats and animals using the unit. WDFW has recently been planting riparian shrubs on this unit.

- The Okanogan Unit (approximately 100 acres) is located on the right bank of the Okanogan River below Monse. Nine acres of the Okanogan Unit are within the Wells Project Boundary. The unit consists of native shrub steppe vegetation and a large emergent wetland. The unit is not actively managed, except for weed control.

- Indian Dan Canyon Unit (4,716 acres) is the largest of the three upland units, all of which are outside of the Wells Project Boundary. Indian Dan Canyon is located several miles from the Wells Project Boundary and is located between the cities of Pateros and Brewster in Okanogan County. The unit was originally a dryland farm. Management activities involved developing shrub steppe habitat, excavating two large ponds, creating wetland and riparian habitat and controlling weeds. The unit supports diverse wildlife species dependent on shrub steppe, wetland and riparian habitats. The wildlife unit also provides range for mule deer that migrate from the Methow River drainage during hard winters.

- Central Ferry Canyon Unit (1,602 acres) is an upland unit located downstream of Brewster in Douglas County. The unit was originally a dryland farm. WDFW has replanted the fields in shrub steppe vegetation and grass, planted riparian vegetation and controlled weeds. The unit supports a diverse group of wildlife dependent on shrub steppe, riparian and conifer habitats. The unit provides winter habitat for sharp-tailed grouse and was the historical site of a sharp-tailed grouse lek. Central Ferry Canyon Unit is located next to property purchased by WDFW that has an active sharp-tailed grouse lek.

- West Foster Creek Unit (1,025 acres) is the smallest upland unit, located south of Bridgeport in Douglas County. This unit was originally a dryland farm. Management activities have involved replanting fields to shrub steppe vegetation, developing riparian vegetation, developing a seasonal pond and building check dams in the down cut creek bed. West Foster Creek forms a large emergent wetland and wet meadow on one part of the unit. Habitats in the unit support a diverse variety of wildlife dependent on shrub steppe, riparian and wetland vegetation. Management activities in recent years have emphasized the development and maintenance of sharp-tailed grouse habitat.

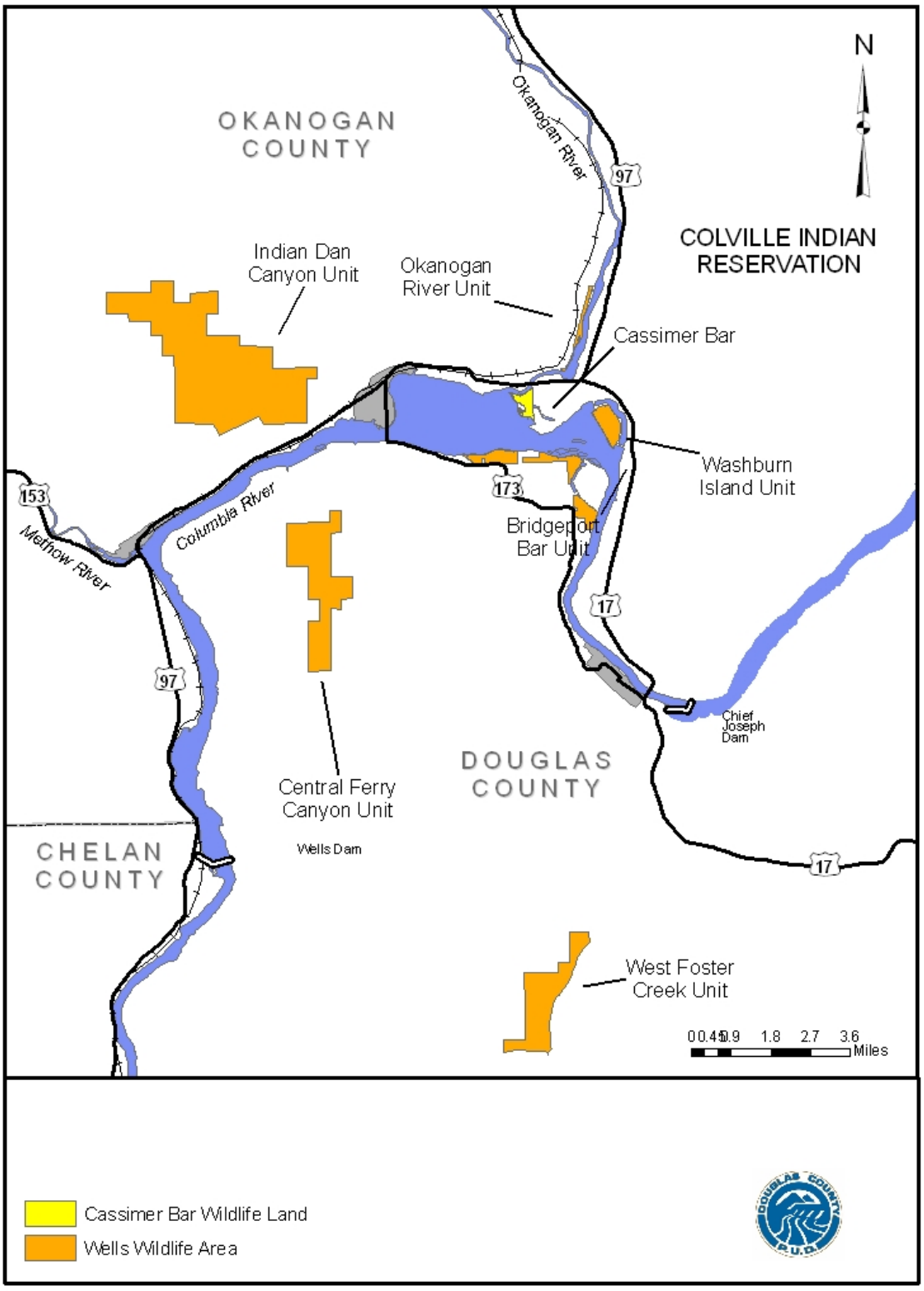

Figure 5.4-1 Wells Wildlife Area and Cassimer Bar Wildlife Management Area.

Hunting activity on the WWA has been consistently tracked since 1976. Over this period, the number of upland game bird hunters has ranged from 384 to over 2,800 annually, with pheasant harvests ranging between 397 and 2,468 per year (Table 5.4-5). Starting in 1976 and ending in 1982, WDFW released ring-necked pheasants on some units of the WWA, releasing a total of 10,768 rooster pheasants, averaging 1,538 per year. Table 5.4-6 provides annual harvest data for waterfowl, mourning dove and mule deer harvest and the number of hunters, from 1978 to 2004, on all units of the WWA combined.

Table 5.4-5 Combined upland game bird harvest WWA 1978 – 2004.

Year	Hunters[1]	Ring-necked Pheasant[2]	California Quail	Gray Partridge	Chukar Partridge	Total
1978	814	618	204	15	50	887
1979	1910	1173	618	70	147	2008
1980	926	1271	589	32	109	2001
1981	2666	1501	731	109	127	2468
1982	2850	1195	538	93	93	1919
1983	907	72	532	75	25	704
1984	384	74	511	55	19	659
1985	569	53	320	16	8	397
1986	885	86	571	17	0	674
1987	932	93	545	60	31	729
1988	989	64	958	67	2	1091
1989	1108	96	1177	66	8	1347
1990	1004	61	790	36	14	901
1991	1124	99	615	68	19	801
1992	1080	88	826	35	4	953
1993	912	87	394	16	2	499
1994	829	85	559	16	0	660
1995	764	65	366	20	0	451
1996	542	49	446	61	0	556
1997	670	46	501	4	0	551
1998	663	102	637	15	0	754
1999	949	72	816	52	2	942
2000	958	57	994	77	11	1139
2001	986	72	1136	37	6	1251
2002	1284	54	1614	26	27	1721
2003	1006	21	1659	34	7	1721
2004	1153	20	1504	27	4	1555

[1]WDFW installed hunter registration booths on the WWA starting in 1979. Hunters are required to register before hunting and must record their harvest on the registration card and leave the card at the booth.
[2]WDG operated a pheasant release program on the WWA between 1976 and 1982. 10,768 pheasants were released during the seven years of the program averaging 1,538 pheasant released each hunting season. The reduction in numbers of hunters and pheasant harvested reflects the change to natural production.

Table 5.4-6 Waterfowl, dove and deer harvest on the WWA.

	Waterfowl Harvest				Dove Harvest		Deer Harvest	
Year	Hunters	Ducks	Geese	Total	Hunters	Dove	Hunters	Deer
1978	88	194	37	231	58	29	n/a	n/a
1979	904	852	78	930	60	143	n/a	n/a
1980	40	342	16	358	89	125	35	3
1981	771	1128	107	1235	196	502	20	5
1982	548	347	110	457	134	27	100	14
1983	602	85	28	113	186	354	76	18
1984	747	401	127	528	186	354	76	18
1985	590	771	136	907	139	138	194	15
1986	453	366	41	407	159	448	70	15
1987	356	353	90	443	71	129	55	13
1988	360	256	100	356	73	182	48	9
1989	371	219	53	272	98	193	65	10
1990	404	332	104	436	189	635	21	2
1991	490	337	142	479	238	500	114	7
1992	499	595	205	800	194	506	83	13
1993	484	377	132	509	244	506	127	12
1994	486	555	130	685	163	443	97	8
1995	662	849	159	1008	231	392	72	6
1996	542	773	196	969	212	773	78	4
1997	716	915	63	978	176	524	88	4
1998	528	677	79	756	132	284	88	4
1999	618	1059	74	1133	135	490	26	3
2000	459	855	57	912	157	469	60	9
2001	592	1296	71	1367	203	643	123	15
2002	640	1546	42	1588	182	448	129	14
2003	538	1108	91	1199	95	264	111	16
2004	434	1021	34	1055	127	375	147	15

In 1993, WDFW informed Douglas PUD that the funds ($1.25 million) provided in 1974 to operate the WWA, were being depleted by the present rate of expenditure. Operation of the WWA could only continue if manpower was reduced and habitat development was terminated. WDFW asked if Douglas PUD would provide additional money to continue operation of the WWA. A Memorandum of Agreement between Douglas PUD and WDFW was signed on June 19, 1995 to provide supplemental funding for the continued operation of the WWA.

WDFW expended $5,409,027 for the operation of the WWA from 1975 to 2004, and received $4,658,690 in interest income from the funds provided by Douglas PUD in 1974 and small grants received from other sources for various special projects. Douglas PUD provided $750,337 in supplemental funding for the WWA from 1994 through 2004.

WDFW and Douglas PUD signed a mitigation agreement on July 19, 1982 related to raising the maximum elevation of the Wells Reservoir from 779 feet to 781 feet. To fulfill the mitigation agreement, Douglas PUD rebuilt the islands used for Canada goose nesting in the Wells Reservoir. As part of the agreement, Douglas PUD created four islands (Kirk Islands) between Brewster and Pateros and 11 islands (Bridgeport Bar Islands) near the WWA. The new islands replaced the former islands that were impacted by the two-foot pool raise and ongoing erosion related to Wells Project operations. Shoreline areas were raised using fill material and pit-run cobble was used to armor the shorelines of the islands. Interior areas below the Wells Reservoir elevation were not filled, creating ponds and wetlands in the interior of some of the islands. Protection of the emergent wetlands on Washburn Island involved pumping water to the Washburn Island pond to slowly raise the pond elevation over 4 years. Douglas PUD also planted 14 acres of riparian vegetation and erected 25 raptor perch poles as part of the mitigation agreement.

Wildlife Mitigation – Colville Confederated Tribes

Douglas PUD and the CCT signed a wildlife mitigation agreement on January 26, 1970. The agreement mitigated for the construction of the Wells Project and the project related impacts to wildlife found on reservation lands. The terms of the mitigation agreement required Douglas PUD to pay CCT $16,800 annually for ten years. The funds were to be used to develop wildlife habitat and hunting improvement projects within the boundaries of the CCT Reservation. An agreement between Douglas PUD, CCT, and Ervin and Loretta Wolley set aside 137 acres of land on Cassimer Bar within the CCT Reservation as the Cassimer Bar Wildlife Management Area. The Cassimer Bar Wildlife Management Area is jointly managed by CCT and Douglas PUD.

Douglas PUD and CCT signed a wildlife mitigation agreement on May 2, 1984 related to raising the maximum elevation of the Wells Reservoir from 779 feet to 781 feet. The agreement conditions included building dikes along the shoreline of Cassimer Bar to stabilize the water levels of three sloughs that support aquatic plants and are important to waterfowl and other animals. The sloughs were also fenced to protect the wetland from livestock grazing. The agreement also required completion of the conditions of the wildlife mitigation agreement between WDFW and Douglas PUD.

Wells Reservoir Level Fluctuations and Wildlife

Changes in water surface levels of 1 foot or less are typical of many large lakes and rivers and would not be expected to impact associated wildlife or the vegetation on the Wells Reservoir. Impacts from large reservoir fluctuations for extended periods can have noticeable effects on plants and wildlife, including decreased amounts of macrophytes available for wintering waterfowl and lower nesting success for Canada geese at the Bridgeport Bar islands.

The impacts of project operations on wildlife, including Wells Reservoir fluctuations, are limited and to the extent practicable have been mitigated by the funding of the WWA. Specifically, effects on macrophytes and overwintering waterfowl have been addressed by the annual

cultivation of waterfowl food plots on the Bridgeport Bar and Washburn Island Wildlife units (Appendix B). Impacts to Canada goose nesting have been similarly mitigated through annual funding of the three wildlife areas adjacent to the Wells Reservoir (Bridgeport Bar, Washburn and Okanogan), the cultivation of food plots for geese on two of these wildlife areas and the construction of the goose nesting islands and tubs following the completion of the two foot pool raise in 1982. Potential effects to riparian and wetland communities have been mitigated through the construction of ponds and the planting of riparian trees and shrubs in the WWA and on Wells Project lands.

Invasive Species

An invasive weed survey was conducted in the Wells Project during the summer of 2005 (EDAW 2006a). The survey focused on inventorying Class A and B weeds, as defined by the Washington State Weed Control Board. No Class A weeds were found during the surveys. Six Class B weeds were identified in the Wells Project area. Two of these Class B species (Russian knapweed (*Acroptilon repens*) and diffuse knapweed) are widespread in the Wells Project area. The four other Class B weeds found in the Wells Project occur in relatively distinct infestation and include purple loosestrife, Dalmatian toadflax (*Linaria dalmatica*), perennial pepperweed and leafy spurge (*Euphorbia esula*). Okanogan County Weed Control Board requires landowners to control infestations of these four species.

In 1989, Douglas PUD discovered and began controlling purple loosestrife by digging out the plants in wetlands along the Columbia River. Rodeo™ Herbicide was used between 1990 and 1999 to control purple loosestrife. Biological control agents (beetles) have been released annually beginning in 2000 to control purple loosestrife rather than using herbicide in the wetlands along the Wells Reservoir. Douglas PUD has worked closely with the Okanogan County Weed Board to control noxious weeds in the Wells Project. Herbicide spray records have been kept on file since 1990 when Washington State law was changed to require the retention of records. These records show that Douglas PUD has controlled Scotch thistle (*Onopordum acanthium*) since 1990, Dalmatian toadflax (1995), leafy spurge (1990) and perennial pepperweed (2004). Biological agents are also collected and dispersed annually by Douglas PUD to control leafy spurge and Dalmatian toadflax in the Wells Project. WDFW also controls noxious weeds in the Wells Project when managing the WWA.

Predator Control Program

Section 4.3.3 of the Wells HCP includes the requirement that Douglas PUD implement a control program to reduce the level of predation at Douglas PUD's two salmon hatcheries and in the Wells Tailrace. Douglas PUD annually hires the USDA to employ various techniques to harass fish-eating (picivorous) birds at hatcheries and in the tailrace of Wells Dam. Avian harassment techniques include aerial pyrotechnics, propane cannons and the physical presence of humans in the area. The USDA has also installed wires over the hatchery ponds and over the Wells Tailrace to deter picivorous birds from feeding and has installed fencing around the hatchery ponds to reduce the level of mammalian predation on hatchery fish. When hazing and access deterrents fail, options for lethal removal of a few birds, may be implemented by USFWS.

Bird species affected by the picivorous avian control program include: mallard, common merganser and hooded merganser, ring-billed gull, California gulls, Bonaparte's gull, Caspian tern, common tern, black tern, great blue heron (*Ardea herodias*) and belted kingfisher (*Ceryle alcyon*). A great blue heron rookery is present on Cassimer Bar and belted kingfishers are known to nest along the Wells Reservoir. Neither the terns nor gulls that feed at the Wells Hatchery are known to nest on the Wells Reservoir. Double-crested cormorants (*Phalacrocorax auritus*) are recent arrivals to the Wells Reservoir and nest at the great blue heron rookery on Cassimer Bar. As the double-crested cormorant nesting population grows, they may exclude the herons nesting at this location. Cormorants may also be affected by the avian control program. Hazing of picivorous bird species will not affect the overall diversity of bird species in the Wells Project area, but will help to protect ESA-listed steelhead and spring Chinook reared at the Wells and Methow River hatcheries. Control of avian predators at the hatcheries and in the tailrace may have a localized impact but is not expected to affect regional bird populations.

Picivorous mammals are also controlled at the two hatcheries. Mink, river otter, and raccoon can have a large impact on hatchery production if not controlled. In the past, WDFW provided the control work at the hatcheries. They have recently developed a program where a trained licensed trapper, Nuisance Wildlife Control Operator (NWCO), can be hired to control furbearing mammals, such as mink, otter and raccoon. Douglas PUD has hired a NWCO to remove mink, raccoon and otter that habitually feed on fish at the hatcheries. Control of these furbearers may have a localized impact but not a regional effect on wildlife populations.

A large beaver population can quickly damage riparian vegetation in a localized area. In the past, WDFW removed beaver that were damaging trees in orchards along the Wells Reservoir when requested by the orchard owner and when beavers clog the water conveyance systems at the hatcheries. Douglas PUD has hired an NWCO to control beavers at the hatcheries and to prevent damage to large trees and other riparian tree and shrub species along Wells Reservoir. In particular, the beaver control program protects large riparian trees that are used by bald eagles and other raptors for perching and that provide habitat for the many neotropical birds that nest along the Wells Reservoir. The beaver control program does have a localized impact on the beaver population, but is not expected to affect regional beaver populations.

Land Use Permits

Land use permits are one of the tools Douglas PUD uses to balance private uses of lands within the Wells Project Boundary and the protection of native vegetation and wildlife habitat. Douglas PUD has issued 276 land use permits for the use of lands within the Wells Project Boundary by adjacent landowners for boat docks, landscaping (15.0 acres) and for agricultural uses (647.7 acres). Large irrigation pumping facilities that meet fish screen and water right requirements are permitted by Douglas PUD as required by Article 48(c) of the Project License. New land uses and renewal of existing land use permits on Wells Project land are reviewed by Douglas PUD for compliance with Douglas PUD's Land Use Policy and FERC License. WDFW is provided with the opportunity to comment on land use permits issued, according to the 1974 Agreement for Wildlife Mitigation between WDFW and Douglas PUD. WDFW, USFWS, NOAA, CCT and YN are all provided an opportunity to comment on land use permits since the June 2004 Order

by FERC approving the Wells HCP. Douglas PUD issues water related permits for boat docks only when all county, state and federal permits have been issued by the responsible agencies. All of the water related land use permits are first reviewed and approved by the COE and WDFW.

The unauthorized removal of native vegetation on lands within the Wells Project Boundary by adjoining property owners is prohibited. Loss of established habitat may impact wildlife dependent on that habitat. Douglas PUD inspects all lands within the Wells Project Boundary biweekly by boat to look for damage and encroachments on Wells Reservoir habitat and to look for unauthorized uses of lands within the Wells Project Boundary. When encroachments are observed, the adjacent land owner is contacted and the encroachments are repaired by replanting native vegetation following the removal of the structure or activity that caused the habitat to be destroyed. Riparian vegetation has been planted by Douglas PUD on shoreline areas as required by various permits for recreation development and shoreline protection.

Wildlife Habitat Enhancement

Douglas PUD has planted native riparian shrubs and trees on the shoreline of the Wells Reservoir in areas were erosion or bank cutting was occurring to help stabilize the shoreline. Native riparian shrubs and trees have been replanted where livestock disturbance has damaged the shoreline. Fencing has been installed to exclude livestock from shoreline riparian areas.

Wildlife Surveys

FERC required that annual wildlife surveys be conducted on the WWA and that an annual report on the mitigation program be sent to FERC. Douglas PUD assists with the annual pre-hunting season wildlife surveys on the WWA. WDFW writes the annual report describing the wildlife mitigation program, goals and progress toward meeting various management objectives. Douglas PUD reviews the report and submits the final document to FERC. Douglas PUD also assists WDFW with annual goose nest surveys and independently conducts bi-monthly winter bald eagle surveys on the Wells Reservoir and project shorelines.

5.5 Rare, Threatened and Endangered Species (RTE)

Endangered, threatened and candidate species as defined by the federal ESA; and endangered and threatened species as defined by the Washington State Endangered Species Act (state ESA) are included in this section. Plant species listed by the Washington State Natural Heritage Program (WNHP) as Review List 1 are also included since their present statewide abundance is unknown and the species may be listed in the future.

For this section, RTE species are defined to include the following:

- Species listed as threatened or endangered under the federal ESA;
- Species proposed for listing as threatened or endangered under the federal ESA;
- Species candidates for listing as threatened or endangered under federal ESA;
- Species listed as threatened or endangered under the state ESA;

- Species listed as sensitive under the state ESA; or
- Species listed as Review List 1 (plants only) under the state ESA.

The WDFW maintains a list of state endangered, threatened and sensitive fish and wildlife species (Washington Administrative Codes 232-12-014 and 232-12-011). Listing procedures were developed by a group of citizens, interest groups, and state and federal agencies and adopted by the Washington Fish and Wildlife Commission in 1990 (WAC 232-12-297). The Washington Natural Heritage Program (WNHP), which is administered under the WDNR, has developed a list of plant species considered endangered, threatened, sensitive, possibly extirpated and under review (lists 1 and 2) for conservation purposes.

Starting in August 2005, Douglas PUD initiated stakeholder outreach meetings followed by a series of Resource Work Groups with interested stakeholders. The primary goal of the Resource Work Groups was to identify resource issues and discuss whether studies were needed to address these issues during relicensing. A large component of this process included the identification of RTE species and whether existing information was sufficient to determine whether the Wells Project has an effect upon RTE species. A record of these pre-filing interactions with stakeholders is included in Appendix B – Summary of Consultation and Contacts.

To assist Douglas PUD in these discussions, on December 7, 2005, the FERC formally designated Douglas PUD as the non-federal representative for ESA consultation related to RTE species found within the Wells Project. This designation allowed Douglas PUD to consult with the USFWS and NMFS regarding relicensing issues and studies needed for RTE species found within the Wells Project.

Based upon the results of the 2005 baseline studies, four federally listed species, three threatened and one endangered, were found in the Wells Project area. In addition to the federal species, two state threatened and one state endangered species were also present. Three state Review List 1 plant species were also found within the Wells Project (Table 5.5-1). Based upon these studies, project operations, including reservoir elevation changes, do not appear to have impacts on RTEs. Information on RTE species documented in the Wells Project area is provided below and is followed by a section that summarizes the management activities undertaken by Douglas PUD to protect and conserve these species.

Table 5.5-1 Federal and state RTE species found within the Wells Project.

Common Name	Species Name	Federal List	State List
Botanical Resources			
Little Bluestem	*Schizachyrium scoparium*		State Threatened
Snails			
None			
Mollusks			
None			
Insects			
None			
Fishes			
Spring Chinook	*Oncorhynchus tshawytscha*	Federal Endangered	State Candidate
Steelhead	*Oncorhynchus mykiss*	Federal Threatened	State Candidate
Bull Trout	*Salvelinus confluentus*	Federal Threatened	State Candidate
Amphibians			
None			
Reptiles			
None			
Mammals			
None			
Birds			
Bald Eagle	*Haliaeetus leucocephalus*	Federal Threatened	State Threatened
American White Pelican	*Pelecanus erythrorhynchos*		State Endangered
Sharp-tailed Grouse	*Tympanuchus phasianellus*		State Threatened

5.5.1 Botanical

An RTE plant survey of the Wells Project area was conducted in spring-summer 2005 (EDAW, 2006a). Based on information from the WNHP, FWS and Rocky Reach Project relicensing studies (Calypso Consulting 2000), 46 RTE plant species potentially occur in the Wells Project area (EDAW, 2006a). Thirteen occurrences of four rare plants were observed and documented during the surveys, including little bluestem, chaffweed (*Centunculus minimus*), northern sweetgrass (*Hierochloe odorata*) and brittle prickly-pear (EDAW, 2006a). Ute ladies'-tresses (*Spiranthes diluvialis*) an orchid species federally listed as threatened known to occur in the Rocky Reach Project area, was not observed in the Wells Project area during rare plant surveys conducted in 2005 despite the presence of suitable wetland habitat.

5.5.1.1 Little Bluestem

Little bluestem was the only state listed threatened plant species observed in the Wells Project area. It was found just downstream of Chief Joseph Dam. Typically more common in Idaho and farther east, the population observed along Wells Reservoir was only the fourth documented record of this species in the State of Washington. Little bluestem is also known to occur at the upstream ends of Rocky Reach and Rock Island reservoirs. The habitat for populations of this species along Rocky Reach, Rock Island and Wells Reservoir shorelines is more riverine in character than the lacustrine habitat typically associated with reservoirs (EDAW, 2006a). These reaches were characterized by flowing water that is apparent during all but the lowest flows. The little bluestem site at Wells Reservoir, was further characterized by alluvial deposition (beaches and bars) along some portions of the shoreline and polished bedrock banks indicating long-term exposure to flowing water.

Five subpopulations comprising one population of little bluestem were mapped along 1,500 feet of shoreline (EDAW 2006a). The granitic, coarse sandy substrate supports transitional riparian vegetation between wet shoreline emergent wetland and shrub steppe dominated uplands. The topographic position of most occurrences averaged approximately 10 to 15 feet horizontally from the shoreline, and 2 to 5 feet elevation above the mean water surface at the time of the surveys.

5.5.1.2 Chaffweed

Chaffweed is listed by the WNHP as a Review List 1 species. Chaffweed is found in seven Washington counties including Pend Oreille, Spokane, Klickitat, Whitman, Wahkiakum, Chelan and Benton counties. Its observation along Wells Reservoir is the first record for Douglas County (EDAW, 2006a).

Four occurrences of chaffweed were observed on frequently inundated, low-gradient mud-gravel banks with little competing vegetation (EDAW, 2006a). At least some of the plants observed in August had dehisced capsules that presumably produced mature seed. The cover and density of chaffweed in all four sites was low, consisting of only a few scattered plants. One chaffweed site included shining flatsedge (*Cyperus bipartitus*), a WNHP watch list species. This particular site is somewhat unique among the four chaffweed sites because a portion of the low gradient mudflat was both above the most frequently inundated shoreline zone and not dominated by taller, dense emergent wetland vegetation that is so common along Wells Reservoir.

5.5.1.3 Northern Sweet Grass

Northern sweet grass is a Review List 1 species found in 16 Washington counties, primarily in the central and eastern parts of the state. Its occurrence along Wells Reservoir during this study is the first record for Douglas County (EDAW, 2006a).

Sand-silt-gravel banks that are frequently inundated and also support emergent wetland vegetation are common and abundant along Wells Reservoir. Northern sweet grass was

observed at two sites, growing at the upper elevation end of low-gradient banks (EDAW, 2006a). These sites were inundated by approximately 6 inches of water during high reservoir elevation. At the Washburn Island site, the associated species provided approximately 80 percent cover and included Baltic rush (*Juncus balticus*), coyote willow (*Salix exigua*), yellow flag (*Iris pseudacorus*), woolly sedge (*Carex lanuginosa*) and fowl mannagrass (*Glyceria striata*). The other site is located near the little bluestem population and supports primarily Baltic rush and woolly sedge with scattered northern sweet grass.

5.5.1.4 Brittle Prickly-Pear

Brittle prickly-pear is a Review List 1 species known from 16 Washington counties, both east and west of the Cascade Range and including Douglas County. The WNHP has plans to remove this species from the review list in the near future because it readily hybridizes with the more widespread plains prickly-pear cactus (*Opuntia polyacantha*), which is also found in the Wells Project area (F. Caplow, WDNR, personal communication).

Brittle prickly-pear was predominantly found in sandy soils supporting shrub steppe vegetation in all parts of Wells Reservoir including the Okanogan River reach (EDAW, 2006a). Common associated species include antelope bitterbrush (*Purshia tridentata*), big sagebrush (*Artemisia tridentata*), grey rabbitbrush needle-and-thread, snow buckwheat (*Eriogonum niveum*), pale evening primrose and bastard toadflax.

Brittle prickly-pear was observed at six sites during searches for the five federal or state listed threatened or endangered species potentially occurring in upland habitats associated with the Wells Project area. The upland habitat within the Wells Project Boundary is very narrow and unlikely to be affected by Wells Project operations. Searches in upland habitats were focused on areas most likely to be affected by bank erosion and access associated with Project maintenance and operation. It is likely that brittle prickly-pear is more widespread and abundant than documented by the surveys (EDAW, 2006a).

5.5.2 Wildlife

RTE wildlife surveys were conducted in the Wells Project area during the spring and summer 2005 (EDAW, 2006b). State or federal listed wildlife species known to use the Wells Project area include the bald eagle, American white pelican (Elecanus erythrorhynchos) and sharp-tailed grouse. Sharp-tailed grouse were not observed during the survey.

5.5.2.1 Bald Eagle

The bald eagle was listed as threatened in Washington State under the federal ESA in March 11, 1967. The USFWS began efforts to delist bald eagles from the federal ESA in the lower 48 states in July 6, 1999 but concern about the future protection of this species and its habitat has delayed delisting. The USFWS, on February 13, 2006, proposed voluntary guidelines for landowners with bald eagle habitat and reopened the comment period for delisting the species under the federal ESA. The Wells Project is in Recovery Zone 8 (Palouse Prairie) for the bald eagle, and the Wells Project area currently meets the target of one territory, as defined by the

recovery plan for this species (USFWS, 1986). There is no designated critical habitat for the bald eagle in the Wells Project area.

Bald eagles winter in the Wells Project area in relatively large numbers; the maximum number observed over 9 years (1997/98-2005/06) of winter boat surveys on the Wells Reservoir was 68 in January 1998 (Table 5.5-2). Bald eagles wintering in the Wells Project area feed on the abundant waterfowl that also winter on the Wells Reservoir (Table 5.5-3). American coots are important prey for bald eagles wintering in the mid-Columbia, representing over 64 percent of their diet in a study conducted in the early 1980s (Fielder 1982). Wintering eagles also feed on lesser amounts of big game carrion, waterfowl, resident fish, game birds, owls and medium sized birds.

Three bald eagle communal roosts are found adjacent to the Wells Reservoir. The Azwell Roost is located approximately 1 mile upstream of Wells Dam in a conifer stand in small east facing canyon above the Wells Reservoir in Okanogan County. The Brewster Roost is located east of the Brewster Bridge in Douglas County on a north facing hillside covered with conifer. A third communal roost is the Pearl Roost, located one mile southeast of the Brewster Roost. Bald eagle use of the communal roosts in the Wells Project area is shown in Table 5.5-3 (Hallet 2003, 2004, 2005).

There are three active bald eagle nests in the Wells Project area. One nest is at the Azwell Roost in a large ponderosa pine tree. The eagles nesting at this site have produced young in the past but nesting success has not been monitored recently. The second nest is located above Bridgeport Bar, in a ponderosa pine tree just below the crest of the rim rock. Production in this nest is unknown. A third nest located within the Wells Project Boundary was discovered in 2004 in a small ponderosa pine tree across the Columbia River from Bridgeport. Two young fledged from this nest in 2004; the site was reused in 2005 but nesting success is unknown. Bald eagles raising young in the vicinity of the Wells Reservoir have an abundant supply of fish to feed themselves and their young. Eagles have access to sunfish, resident trout, jack salmon, suckers, large minnows and bullheads.

Table 5.5-2 Wells Reservoir Bald Eagle winter surveys.

	November			December			January			February		
	Adult	**Immature**	**Total**	**Adult**	**Immature**	**Total**	**Adult**	**Immature**	**Total**	**Adult**	**Immature**	**Total**
1997/98	7	2	9	9	26	35	29	39	68	16	21	37
1998/99	5	4	9	5	10	15	11	11	22			
1999/00	6	1	7	15	19	34	23	25	48	19	28	47
2000/01	9	4	13	12	29	41	18	22	40	16	24	40
2001/02	6	8	14									
2002/03	6	8	14	8	16	24	18	42	60	13	24	37
2003/04												
2004/05	7	2	9	8	17	25	38	27	65	27	38	65
2005/06	5	11	16	17	24	41						

Table 5.5-3 Bald Eagle roost monitoring winter 2001-2004 collected by BLM (Hallet, 2003, 2004, 2005).

	Brewster Roost				Pearl-Upper Wells Roost				Azwell Roost				Total			
Date	**A**	**I**	**U**	**Total**	**A**	**I**	**U**	**Total**	**A**	**I**	**U**	**Total**	**A**	**I**	**U**	**Total**
12/3/01	1	2	0	3	1	1	0	2	0	0	0	0	2	3	0	5
12/17/01	0	0	0	0	2	0	0	2	1	1	0	2	3	1	0	4
1/2/02	0	0	0	0	2	3	0	5	3	0	0	5	5	5	0	10
1/14/02	3	3	0	6	5	1	0	6	3	4	2	9	11	8	2	21
1/28/02					1	2	0	3	2	4	0	6	3	6	0	9
12/16/12	1	0	0	1	0	0	0	0	6	3	0	9	7	3	0	10
12/30/02	1	4	0	5	3	1	0	4	11	6	0	17	15	11	0	26
1/13/03	0	0	0	1	15	0	16	21	9	0	30	22	22	24	0	46
1/27/03					4	13	0	17	26	42	0	68	30	55	0	85
2/10/03					4	4	0	8	23	12	0	35	27	16	0	43
2/24/03					0	9	0	9	17	10	0	27	17	19	0	36
12/15/03	0	4	0	4	1	7	0	8	2	7	0	9	3	18	0	21
12/29/03					4	18	0	22	5	8	0	13	9	26	0	35
1/12/04					2	20	0	22	3	8	0	11	5	28	0	33
1/26/04						19	0	22	2	7	0	9	5	26	0	31
2/9/03					10	39	0	49				10	10	39	0	49
2/23/04					6	23	0	29	4	16	0	20	10	39	0	49
3/8/04					2	3	0	5	2	5	0	7	4	8	0	12

A = Adult
I = Immature
U = Unknown

5.5.2.2 American White Pelican

American white pelicans are listed as endangered by Washington State. Seventy-three white pelicans arrived on the Wells Reservoir for the first time in 1989 (Hallet 1990). White pelican numbers have fluctuated over the years with a high count of 204 in 1990 and a low count of 41 in 1992; 155 pelicans were counted on the Wells Reservoir in 2004 (Hallet 1990–2005).

White pelicans usually arrive on the Wells Reservoir in June and remain until October, but have been seen as late as mid-November. One pelican with an injured wing survived living on the Wells Reservoir year round for three years. The pelicans using the Wells Reservoir during the summer appear to be bachelor birds. No evidence of secondary sexual characteristics, indicating breeding age birds, has been observed on the Wells Reservoir. No useable nesting habitat is available on the Wells Reservoir for these birds. The white pelicans are feeding on the abundant fish found in the Wells Reservoir. White pelicans have access to sunfish, resident trout, suckers, minnows and bullheads during the summer.

5.5.2.3 Sharp-tailed Grouse

Columbia sharp-tailed grouse are a threatened species in Washington State. Sharp-tailed grouse were found throughout the shrub steppe, steppe and meadow steppe habitat before settlement of eastern Washington State. Sharp-tailed grouse are now confined to small isolated remnant populations in Douglas, Okanogan and Lincoln counties. The sharp-tailed grouse status report indicates that the closest population to the Wells Reservoir resides on the Waterville Platte in northern Douglas County (Schroeder, M. and M. Tirhi. 2003).

The conversion of native shrub steppe habitat to cropland and the fragmentation of the remaining habitat are the primary causes of the long-term decline of sharp-tailed grouse in Washington State (Schroeder, M. and M. Tirhi. 2003). Early pioneers to the area cut down most of the trees found in the ephemeral creek drainages and hillsides above the Columbia River to provide building materials. This action eliminated much of the winter habitat for this species (Schroeder, M., WDFW, pers. comm.). WDFW has been actively purchasing property in northern Douglas County to provide habitat necessary for the survival of this small isolated population of sharp-tailed grouse. Two units of the WWA (West Foster Creek and Central Ferry Canyon) are also managed to provide nesting, summer, and wintering habitat for sharp-tailed grouse. Breeding habitat (leks) for this species exist near both of these units.

Sharp-tailed grouse are reported to take shelter in the shoreline riparian habitat on the Wells Project during hard winters (Marc Hallet, WDFW, pers. comm.). Sharp-tailed grouse feed on fruits, seeds and buds of deciduous tree and shrubs (e.g., chokecherry, serviceberry, snowberry, wild rose, hawthorn, aspen and water birch) along with wheat and corn, if available, throughout the winter (Schroeder, M. and M. Tirhi, 2003). Most of these food items are available on the Bridgeport Bar Unit of the WWA and other locations in the Wells Project area. The riparian vegetation developed by WDFW on Bridgeport Bar and stands of riparian vegetation in other locations on the Wells Reservoir may also provide thermal cover for sharp-tailed grouse during the hard winters.

5.5.3 Fish

5.5.3.1 Upper Columbia River Spring-run Chinook

UCR spring-run Chinook were listed as endangered under the federal ESA in August 1997 (NMFS, 1997). The mainstem Columbia River from the Wells Tailrace to the confluence of the Columbia and Methow rivers, along with the accessible portions of the Methow River Basin, are included in the critical habitat listed for spring Chinook in the Wells Project area (NMFS, 2005).

See Section 5.3.3.1 for a broader description of the life-history of spring Chinook found in the waters within and adjacent to the Wells Project.

5.5.3.2 Upper Columbia River Summer-run Steelhead

UCR summer-run steelhead was listed under the federal ESA as endangered in August 18, 1997 (NOAA, 1997). The status of UCR summer steelhead listed under the ESA was changed to threatened on January 5, 2006 (NMFS, 2006). Critical habitat for summer steelhead in the Wells Project area includes; (1) the mainstem Columbia River from the Wells Tailrace to the confluence of the Columbia and Okanogan rivers, (2) the accessible portions of the Methow River Basin, (3) the accessible portions of the Okanogan River Basins, excluding the Colville Reservation and Salmon Creek (NOAA, 2006).

See Section 5.3.3.1 for a broader description of the life-history of UCR steelhead found within and adjacent to the Wells Project.

5.5.3.3 Bull Trout

The Columbia River bull trout populations were listed as threatened under the federal ESA in June 1998 (USFWS, 1998). On September 26, 2005, the USFWS designated critical habitat for bull trout populations within the Columbia River and other locations. Critical habitat for the bull trout in the Wells Project area includes only the upper reaches of the Methow River drainage outside of the Wells Project Boundary (FWS, 2004).

See Section 5.3.4.1 for a broader description of the life-history of Columbia River bull trout found within and adjacent to the Wells Project.

5.5.4 Management Activities

Douglas PUD owns the majority of the shoreline of Wells Reservoir in fee title. This is unique among Columbia River hydroelectric projects, as most hydro development has taken place through the acquisition of flowage easements. Ownership of lands within the Wells Project Boundary has produced significant benefits for wildlife, cultural and recreation resources and habitat protection for RTE species found in the Wells Project.

5.5.4.1 Land Use Policy

Because of its unique ownership and stewardship role, Douglas PUD developed a detailed Land Use Policy to guide land management activities associated with the Wells Project. The Land Use Policy is intended to provide guidance for management decisions and actions taking place within the Wells Project Boundary and limits the use of activities that are consistent with the Policy and that have received all of the applicable local, state, federal and tribal permits. Specifically, certain types of private or commercial uses of lands and waters within the Wells Project Boundary are restricted, including development, construction, clearing, grading, soil disturbance, and the installation of boat docks, water systems, fences, landscaping and agriculture plantings.

The main goal of the Land Use Policy is to ensure compliance with the many aspects of Wells Project operations, including compliance with the FERC license, protection of wildlife and/or riparian habitat, protection of significant historical, cultural and natural features and compliance with settlement agreements. The Land Use Policy is also used to ensure that public access and recreation within the Wells Project area takes place in a safe and environmentally consistent manner. In addition, the Policy provides guidance for resolving conflicts with adjacent land owners and provides guidance to be taken when adjacent land owners violate the policy and encroach upon lands or waters within the Wells Project Boundary.

Each permit application goes through a formal review and approval process before a permit is issued for private or commercial uses of land within the Wells Project Boundary. First, an environmental checklist must be properly filled out and all applicable permits from county, state and federal agencies obtained by the Permittee. Douglas PUD also reviews the proposed permit to determine if there are any fish or wildlife issues not addressed in the county, state and federal permit processes. After internal review the proposed permit is sent for regulatory review and comment by state, federal and tribal fish and wildlife agencies including the WDFW, USFWS, NMFS, CCT and YN, according to the "Reservoir as Habitat" provision of the Wells HCP and the 1974 Wildlife Mitigation Agreement.

5.5.4.2 Noxious Weed Control

Invasive non-native plants under Washington State law (RCW 17.10) are considered noxious weeds and the State Department of Agriculture (WDA) and Okanogan Noxious Weed Control Board maintain lists of weed species that must be controlled by landowners. Control of noxious weeds protects native plant species and wildlife habitat and protects farmland.

Herbicide applications on lands within the Wells Project Boundary are applied by Douglas PUD personnel licensed by the State of Washington, according to label requirements. Douglas PUD also contracts with a licensed herbicide applicator for the control of some noxious weeds. All necessary permits for the application of herbicides near wetland shoreline areas are obtained before any herbicide is applied to those locations. Douglas PUD has provided its personnel and contractors with maps showing the locations of RTE plants within the Wells Project area to avoid damage to these species from any herbicide applications.

Noxious weeds controlled by Douglas PUD include: defuse, spotted and Russian knapweed (*Centaurea spp.*), Canada thistle (*Cirsium arvense*), scotch thistle (*Onopordum acanthium*), leafy spurge (*Euphorbia esula*), Dalmation toadflax (*Linaria genistifolia ssp. dalmatica*), perrenial pepperweed (*Lepidium latifolium*), puncture vine (*Tribulus terrestris*), water hemlock (*Cicuta douglasii*) and kochia (*Kochia scoparia*). DOA approved biological control agents (beetles) have been released by Douglas PUD to control purple loosestrife and Dalmation toadflax.

5.5.4.3 Bald Eagle Habitat Improvements/Protection

Under the requirements of the 1982 Wildlife Mitigation Agreement, Douglas PUD constructed 25 perch poles in areas used by bald eagles. The perch poles have been maintained and replaced when needed. Douglas PUD also actively protects the large riparian trees along the Wells Reservoir from beavers and damage caused by adjoining property owners. Cottonwood saplings and cuttings have been planted on the Wells Reservoir to provide future perches for bald eagles. In addition, Douglas PUD owns 33 acres of mixed conifer habitat at the Brewster Roost that is adjacent to BLM land. This land was set aside to protect the Brewster Roost from future development.

5.5.4.4 Wells Wildlife Area

WDFW's original management goal for the WWA was to release and develop habitat for upland game birds, primarily ring-necked pheasants, to mitigate for the hunting recreation lost when the Wells Reservoir was filled. Over the last 32 years, WDFW's mandate for managing wildlife under state law has changed. The original mandate was to manage fish and game populations and set fishing and hunting seasons. WDFW later became responsible for managing game and non-game species and their habitats, protecting species diversity, and providing consumptive (hunting) and non-consumptive (bird watching) wildlife related recreation. Changes in statewide wildlife management mandates have affected the management goals of the WWA. WDFW is actively managing the West Foster Creek and Central Ferry Canyon Units of the WWA for sharp-tailed grouse habitat using funds provided by Douglas PUD. Riparian vegetation developed on the Bridgeport Bar Unit also provides winter habitat for wildlife.

5.5.4.5 Wells Habitat Conservation Plan

The Wells HCP was developed to protect five Columbia River anadromous salmonids species that migrate past the Wells Project, including two ESA listed species. The Wells HCP was approved by FERC and made a part of the Wells License on June 21, 2004. The HCP commits Douglas PUD to a 50-year program to ensure the Wells Project NNI survival conditions for anadromous salmonids, including the ESA listed summer steelhead and spring Chinook. The NNI goal means the Wells Project will be virtually invisible to salmon and steelhead migrating past the dam. This is accomplished through a combination of project survival enhancements, off-site hatchery programs, and habitat enhancement activities in waters accessible to anadromous salmonids upstream of the Wells Project.

5.5.4.6 Bull Trout Monitoring and Management Plan

The Wells BTMMP was developed after USFWS expressed concern that the Wells HCP could jeopardize the continued existence of the Columbia River DPS of ESA listed bull trout, or destroy or adversely modify proposed bull trout critical habitat. The Wells BTMMP was approved by FERC on April 19, 2005. The goal of the plan is to identify, develop and implement management plans to monitor and address potential project-related impacts to bull trout from the operation of the Wells Project. The plan is based on a collaborative effort by Douglas PUD and USFWS in consultation with NMFS, WDFW, and interested Tribes. The plan has four goals: (1) identify potential project-related impacts to upstream and downstream passage of adult bull trout at Wells Dam; (2) assess the impacts on upstream and downstream passage of sub-adult bull trout; (3) investigate the potential of sub-adult entrainment or stranding in off-channel or backwater areas of the Wells Reservoir; and (4) identify the core areas and local populations of bull trout utilizing the Wells Project area.

5.6 Recreation and Land Use

The Wells Reservoir is a recreation resource for local residents and visitors. Local residents have easy access to the Wells Reservoir. Access to the Wells Reservoir from the greater Seattle area is most common via Interstate 90 over Snoqualmie Pass to US Highway 97. Highway 97 borders the Wells Reservoir on the west and extends to British Columbia. Other routes from western Washington include US Highway 2 over Stevens Pass and summer access via State Route 20 (also known as the North Cascades Highway). Visitors from eastern Washington typically visit the area via Highway 2 from Spokane. Canadian visitors access the area by heading south on Highway 97, which meets the Wells Reservoir near Malott.

Many people visit the Wells Project area during the summer to participate in recreation opportunities at the Wells Project, including boating, fishing, hiking and RV camping. Additionally, sportsmen visit the area during the fall season to fish for steelhead and to hunt for waterfowl, upland birds and deer.

Douglas PUD's commitment to developing and enhancing recreational access to lands and waters within the Wells Project Boundary has been documented in its Wells Recreation Plan (1967), Wells Recreation Plan Supplement (1974), Public Use Plan (1982) and Recreation Action Plans (1987, 1992, 1997, and 2002). Douglas PUD's commitment to recreation and Wells Reservoir access has resulted in the development of over 30 access sites and use areas along both sides of the Wells Reservoir and up the Methow and Okanogan rivers. In addition, Douglas PUD has funded and developed major parks and recreation facilities along the Wells Reservoir in Pateros, Brewster and Bridgeport.

Figure 4.1-1, from Section 4, shows the Wells Project and recreation sites. Descriptions of existing recreational sites and facilities within the Wells Project area follow.

5.6.1 Major Recreational Sites and Facilities

5.6.1.1 Wells Dam

Wells Dam Overlook

A viewing area overlooking Wells Dam from the west is located off of Highway 97. A turn lane for accessing the Wells Project Overlook off of Highway 97 was funded by Douglas PUD and completed in 2006. The Wells Dam Overlook includes vehicle and day-use RV parking, restrooms and a picnic shelter. Exhibits at the Overlook include Native American pictographs, a project information kiosk and an original Wells Project turbine runner. The Wells Dam Overlook is accessible 24 hours-a-day (Figures 5.6-1 and 5.6-2).

Figure 5.6-1 Wells Dam Overlook and Wells Project information signs.

Figure 5.6-2 Wells Dam Overlook and original turbine runner.

Wells Dam Visitor Center

The Wells Dam Visitor Center is located inside Wells Dam and includes exhibits on the life-cycle of salmon and the Wells Project power generation facilities. It also includes a variety of exhibits depicting historical, geographic and scientific facts of the area. A window in the Visitor Center provides for close viewing of migrating salmon through the fish ladders. The Visitor Center is open to the public through prearranged tours (Figures 5.6-3).

Figure 5.6-3 View from inside the Wells Dam Visitor Center.

5.6.1.2 Pateros, Washington

Douglas PUD has helped develop and fund the existing parks and recreation facilities on lands and waters within the Wells Project Boundary in Pateros. These facilities include Peninsula Park, Memorial Park, tennis courts, two concrete boat launches, parking, a fish cleaning station and restrooms. A privately-owned 8-site RV park is located adjacent to Memorial Park.

Peninsula Park

Peninsula Park is located near the confluence of the Methow and Columbia rivers. It includes two gazebos, paved walking path, covered picnic shelter, swimming beach, restroom facilities, playground equipment, lagoon and lawn area (Figures 5.6-4). The City of Pateros is responsible for maintaining Peninsula Park, and Douglas PUD voluntarily assists with major repairs and improvements.

Figure 5.6-4 View of Peninsula Park.

Memorial Park

Memorial Park is located in Pateros along the Columbia River. It includes three covered picnic shelters, fishing and ski docks, vehicle parking, interpretive displays, restroom facilities, a fish cleaning station and a developed waterfront trail (Figure 5.6-5). The waterfront trail begins at the east end of Memorial Park near City Hall and meanders through the park, under the Highway 97 bridge and terminates at the Methow Boat Launch. A second boat launch is located just upstream of Memorial Park. The City of Pateros is responsible for maintaining Memorial Park, and Douglas PUD voluntarily assists with major repairs and improvements.

Figure 5.6-5 View of Memorial Park and waterfront trail.

Methow Boat Launch

The Methow Boat Launch is located in Pateros between Peninsula Park and Memorial Park at the confluence of the Columbia and Methow rivers. The site includes a concrete boat launch and dock, parking, fish cleaning station, basketball hoops and restrooms. The boat launch area is connected to Memorial Park via an accessible walkway underneath Highway 97 and the railroad bridge. The City of Pateros is responsible for maintaining the Methow Boat Launch, and Douglas PUD voluntarily assists with major repairs and improvements.

Tennis Courts

Three paved tennis courts are located in Pateros along the left bank of the Methow River approximately ¼ mile upstream from Peninsula Park. The tennis courts were funded through a

community effort on property provided by Douglas PUD. The City of Pateros is responsible for maintaining the tennis courts, and Douglas PUD voluntarily assists with major repairs and improvements.

5.6.1.3 Brewster, Washington

Douglas PUD has helped develop and fund the existing parks and recreation facilities on lands and waters within the Wells Project Boundary in the City of Brewster. These facilities primarily include Columbia Cove Park and a developed waterfront trail.

Columbia Cove Park

Columbia Cove Park includes a boat launch, boat docks, three covered picnic shelters, swimming beach, restroom facilities, playground equipment, lawn area, vehicle parking and a basketball court (Figures 5.6-6 and 5.6-7). The park is located adjacent to a city pool and RV campground. The city's RV campground includes approximately 23 full hookups. The City of Brewster is responsible for maintaining Columbia Cove Park and Douglas PUD voluntarily assists with major repairs and improvements. The City of Brewster maintains and manages its pool and RV campground.

Figure 5.6-6 Columbia Cove Park picnic shelter and play equipment.

Figure 5.6-7 Columbia Cove Park swimming area.

Brewster Waterfront Trail

The waterfront trail in Brewster is located north of the park and extends approximately ½ mile along the Brewster City waterfront and consists of compacted stone surface. The City of Brewster developed the trail with the assistance of Douglas PUD and WDNR. The trail is generally 6 to 8 feet above the water level and 20 feet or more below adjacent streets and residential areas. It is connected to city streets at either end by ramps and at three intermediate locations by stairs. The City of Brewster is responsible for maintaining the waterfront trail, and Douglas PUD voluntarily assists with major repairs and improvements.

5.6.1.4 Park Island

Park Island, formerly proposed to be Chief Joseph State Park, consists of approximately 300 acres of land on the Bridgeport Bar in Douglas County. This area was identified in the 1967 Wells Recreation Plan for future development and transferred in fee title to Washington State Parks by Douglas PUD in 1967. An interlocal agreement between Douglas PUD and State Parks pertaining to Chief Joseph State Park was signed in 1983 as mitigation for the Wells Reservoir elevation increase. Under the terms of the agreement, Douglas PUD agreed to pay State Parks a lump sum of $125,000 and $25,000 annually through 2012 to assist in the future development of the park. The site, however, was later determined to be unsuitable as a high-density recreation facility. This determination was made in conjunction with State Parks based on an analysis funded by the 1997 Recreation Action Plan Update. An MOU with State Parks regarding the proposed Chief Joseph State Park was later adopted in 2003. This MOU acknowledged Douglas

PUD's 1997 Recreation Action Plan Update that identified the need for protection of natural areas and wildlife habitat and also raised concerns regarding the incompatibility of intense recreation development of the proposed Chief Joseph State Park adjacent to highly valued wildlife habitat on the Bridgeport Bar. The MOU provided for the sale of the Chief Joseph State Park land back to Douglas PUD, identified unspent funds from the 1983 agreement, required payment of the future obligation of Douglas PUD under the 1983 Interlocal Agreement and allowed that these monies be used to secure a substitute property. The proceeds from the property sale would be used to acquire other property to substitute for Chief Joseph State Park, and the proceeds from the lump sum payment would be used for the development of an existing park within the Wells market area or used to purchase substitute property. State Parks used the proceeds to further develop Pearrygin Lake State Park in the Methow Valley. Douglas PUD no longer holds title to Park Island.

5.6.1.5 Bridgeport, Washington

Douglas PUD has helped develop and fund Marina Park, which is located on lands and waters within the Wells Project Boundary in the City of Bridgeport.

Marina Park

Marina Park includes a fish cleaning station, covered picnic shelters, gazebo, playground equipment, swimming beach, lawn area, restrooms, vehicle parking, asphalt pathway, two boat launches (one boat launch was funded by the COE), two boat docks and an RV campground (Figures 5.6-8 and 5.6-9). The RV campground includes approximately 18 full hookups and 4 tent sites. The City of Bridgeport is responsible for maintaining Marina Park and Douglas PUD voluntarily assists with major repairs and improvements.

Figure 5.6-8 Marina Park swimming area and boat docks.

Figure 5.6-9 Marina Park play equipment.

5.6.2 Additional Opportunities and Sites

5.6.2.1 Carpenter Island Boat Launch

The Carpenter Island Boat Launch is a concrete plank boat launch located on the right bank of the Wells Tailrace immediately downstream of the Wells Project near RM 515.5. This boat launch is located within the Wells Project Boundary on land owned by Douglas PUD and is used primarily for fishing access. It includes a single launch lane and portable toilets. Access to this launch is provided via Azwell Road. Douglas PUD is responsible for the maintenance of the Carpenter Island Boat Launch.

5.6.2.2 Starr Boat Launch

The Starr Boat Launch is located on 2.1 acres of land on the right bank of the Wells Reservoir near RM 518. It is accessible via Highway 97. This site includes a gravel parking area, concrete boat launch and vault toilet. Recreation users access the Wells Reservoir via the Starr Boat Launch for boating, skiing and waterfowl hunting. A turn lane for accessing the Starr Boat Launch off Highway 97 was funded by Douglas PUD and completed in 2006. Douglas PUD is responsible for the maintenance of the Starr Boat Launch.

5.6.2.3 Methow Fishing Access – Site 1

The first Methow River fishing access site is owned by Douglas PUD and is located along the right bank of the river. This fishing access is 2.4 acres located off of State Highway 153 approximately ½ mile from Highway 97 at the confluence of the Columbia and Methow rivers. This site includes a gravel car-top boat launch, gravel parking and 2 vault toilets. Douglas PUD is responsible for the maintenance of this site.

5.6.2.4 Methow Fishing Access Sites – Sites 2-6

Additional fishing and boating access sites are located along the Methow River shoreline between Pateros and Carlton. The WDFW holds fee title and easements for 20,000 feet of shoreline along the Methow River which includes these access and boat launch sites. Douglas PUD purchased and deeded these lands and easements to WDFW as part of the mitigation for the impacts of the Wells Project. WDFW maintains these sites; however, Douglas PUD has voluntarily provided major repairs and improvements.

5.6.2.5 Informal Boat Launch 1

An informal, undeveloped boat launch is located on Douglas PUD land on the left bank of the Wells Reservoir across from Pateros at RM 524.3. Boats are launched over the bank to access the Wells Reservoir for fishing, boating and waterfowl hunting. Douglas PUD does not maintain this site.

5.6.2.6 Informal Boat Launch 2

An informal, paved boat launch is located on the left bank of the Wells Reservoir at RM 533. Boats are launched from this area (formerly a paved street) to access the Wells Reservoir for fishing, boating and waterfowl hunting. Douglas PUD does not maintain this site.

5.6.2.7 Chicken Creek Boat Launch

The Chicken Creek Boat Launch is located near RM 537 at Washburn Island where Chicken Creek flows into the Washburn Island Slough. The facilities at the site are owned by Douglas PUD and include a concrete plank boat launch, gravel parking lot and vault toilet. The boat launch provides access to the Washburn Island Slough but not the Wells Reservoir. Douglas PUD is responsible for the maintenance of this site.

5.6.2.8 Monse Bridge Boat Launch

The Monse Bridge Boat Launch was developed by Douglas PUD and is located on the right bank of the Okanogan River at RM 4.7. Facilities at the boat launch include a concrete plank launching ramp, gravel parking and a vault toilet. Douglas PUD is responsible for the maintenance of this site.

5.6.2.9 Cassimer Bar Fishing Access

The Cassimer Bar Fishing Access was developed by Douglas PUD and is located on the left bank of the Okanogan River near RM 1. The site is in close proximity to the Highway 97 bridge near the mouth of the Okanogan and Columbia rivers. This site includes shoreline access, gravel parking and a vault toilet. Douglas PUD maintains this site.

5.6.2.10 Okanogan River Informal Boat Launch and Fishing Site 1

The Okanogan River Informal Boat Launch is located on the right bank of the Okanogan River at RM 2.5. Public access to the site is available via Monse River Road off of Highway 97. This undeveloped area serves as boat launch for waterfowl hunters and as a shoreline fishing location. Douglas PUD does not maintain this site.

5.6.2.11 Okanogan River Informal Boat Launch and Fishing Site 2

The Okanogan River Informal Boat Launch is located on the right bank of the Okanogan River at RM 6.7. Public access to the site is available via Monse River Road. This undeveloped area serves as boat launch for waterfowl hunters and as a shoreline fishing location. Douglas PUD does not maintain this site.

5.6.2.12 Okanogan River Fishing Access

The Okanogan River Fishing Access is located on the right bank of the Okanogan River at RM 15.5. Public access to this site is via the former Highway 97 which runs along the west side of the Okanogan River. This area serves as a location for shoreline fishing and waterfowl hunting. Douglas PUD does not maintain this site.

5.6.2.13 Wildlife Areas

A variety of wildlife areas are located along the Wells Reservoir and in upland areas in the vicinity of the project. These wildlife areas provide habitat for and offer wildlife related recreation opportunities, such as hunting and bird watching. Douglas PUD has consistently provided significant annual funding for the operation and maintenance of the WWA.

The WWA consists of over 8,200 acres of land within six different units throughout Douglas and Okanogan counties. This land was funded by Douglas PUD and developed by the WDFW for wildlife mitigation purposes. Additional wildlife sites exist within the Wells Project area. A detailed description of all sites is included in Section 5.4.

5.6.3 Other Recreation Areas in the Project Vicinity

There are no specially designated recreation areas in the Wells Project area. Lands and waters within the Wells Project Boundary are not located within or adjacent to any of the following: 1) a National Wild and Scenic River System or a state-protected river segment, 2) lands under study for inclusion in the National Trails System or Wilderness Area or 3) in the vicinity of any regionally or nationally important recreation areas.

Other recreation areas in the project vicinity up to about 20 miles outside the Wells Project Boundary include:

- Alta Lake State Park – A 181-acre camping park located four miles southwest of Pateros on Highway 153;
- Bridgeport State Park – A 748-acre camping park located three miles northeast of Bridgeport on the Columbia River (Rufus Woods Lake) directly upstream of Chief Joseph Dam; and
- Fort Okanogan State Park – A 45-acre day-use park and interpretive center located near the mouth of the Okanogan River on a high plateau overlooking the Wells Reservoir.

5.6.4 Current Recreational Use and Resource Capacity

Douglas PUD completed a Recreation Visitor Use Assessment during May to December of 2005 in an effort to collect information related to visitor use at Wells Project recreation sites (DTA, 2006). The primary goals of this study were to assist in the preparation of the PAD and to describe use levels, preferences, attitudes and characteristics of the Wells Project area's primary recreation user groups. Specific objectives included:

- Describing recreation respondents' characteristics;
- Describing user preferences for recreation settings and facilities;
- Identifying possible recreation conflicts, crowding, or personal safety issues;
- Describing users' attitudes toward management actions;
- Describing recreation respondents' activities; and
- Identifying the amount, activity type and spatial and temporal distribution of existing recreation use.

A stratified systematic sampling strategy was chosen for the Recreation Visitor Use Assessment. To ensure that diversity in types of recreation users and variation in type of days visited, sampling was conducted at designated recreation sites and on the Wells Reservoir from May 24, 2005 through December 13, 2005, months that together account for the majority of use.

Respondents completing the mail-back survey were primarily male, Caucasian, with some college courses or a college degree, employed full-time, with total household incomes of greater than $30,000 per year. Respondents generally visit the Wells Project area with their family. Just over 25 percent of respondents were from surrounding communities, with just under 75 percent from outside the area (Figure 5.6-10).

Respondents to the mail-back survey were split as to whether they stayed overnight or were on a day trip visiting the area. The overall group size for overnight respondents was slightly higher than that of day trippers, and the majority of those staying overnight stayed at an RV park or Campground. The majority of respondents captured in this survey identified the Wells Project area as their primary destination (79 percent).

Recreation use levels were estimated for peak and non-peak weekday, weekend, and holiday days, with substantially increased use identified during peak seasons at the Pateros, Brewster, and Bridgeport resource areas. The greatest estimated use occurred in the Bridgeport, Brewster, and Pateros resource areas during peak season.

The most frequently mentioned activities included relaxing/camping, fishing from a boat, speed/sport boating, fishing from shore, and swimming. The majority of respondents surveyed at the six resource areas encompassing the Wells Project area were predominantly indifferent to the number of people encountered as approximately 70 percent reported there was *neither too many* nor *too few people* at their primary destination.

Generally, respondents were satisfied with facilities, with the only rating below a '7' identified for the Okanogan boat ramp. The highest levels of crowding were reporting at the RV Campgrounds and Wildlife areas, with an overall mean of 4.8 and 5.4 respectively. The majority of respondents did not feel more controls were needed to prevent user conflicts or environmental damage. Most indicated that educational/interpretive opportunities exist. Overall, respondents rated their overall experience as 7.7 on a 10 point scale.

In summary, the Recreation Visitor Use Assessment indicates that existing recreation facilities are commensurate to the current level of visitor use. Included below are a series of tables related to the Recreation Visitor Use Assessment (Tables 5.6-1 through 5.6-6). Additional information related to the Recreation Visitor Use Assessment can be found in Appendix F.

Table 5.6-1 Survey dates by type of day.

Date	Day Type
5/21/2005	Weekend
5/24/2005	Weekday
5/26/2005	Weekday
5/29/2005	Holiday
6/04/2005	Weekend
6/09/2005	Weekday
6/15/2005	Weekday
6/24/2005	Weekday
6/26/2005	Weekend
7/02/2005	Holiday
7/09/2005	Weekend
7/12/2005	Weekday
7/16/2005	Holiday
7/28/2005	Weekday
8/01/2005	Weekday
8/07/2005	Weekend
8/20/2005	Weekend
8/24/2005	Weekday
8/30/2005	Weekday
9/09/2005	Weekday
9/18/2005	Weekend
9/24/2005	Weekend
9/28/2005	Weekday
10/02/2005	Weekend
10/10/2005	Weekend
10/16/2005	Weekend
10/28/2005	Weekday
11/05/2005	Weekend
11/26/2005	Weekend
12/13/2005	Weekday

Table 5.6-2 Facility satisfaction of respondents to Wells Project recreation area (10 = highest level of satisfaction).

Facility Visited (Avg. Rating)	Mean Satisfaction	n
RV Campground	7.6	46
Boat ramp	7.2	74
Playground	8.6	12
Trail	8.0	7
Wells Dam Overlook	9.4	21
Fishing Dock	7.6	15
Wildlife Areas	9.1	11

Table 5.6-3 Recreation behavior of respondents to Wells Project recreation area by resource area and type of day.

	Pateros/ Wells			Brewster			Okanogan/ Bridgeport		
Activity (mean #)	Weekday (n=15)	Weekend (n=11)	Holiday (n=3)	Weekday (n=15)	Weekend (n=11)	Holiday (n=3)	Weekday (n=15)	Weekend (n=11)	Holiday (n=3)
Wells Reservoir Surface Recreation Use Data									
Fishing/ski boats	1.1	4.5	8.7	2.5	7.7	4.7	3.5	30.6	7.7
Fishing boat									
Boat	0.3	1.8	1.7	2.2	6.7	2.3	3.0	29.6	4.0
People	0.4	3.6	3.0	4.2	18.2	3.0	5.4	89.6	6.7
Skiing									
Boat	0.9	2.6	7.0	0.3	1.0	2.3	0.5	1.0	3.7
People	1.3	8.6	3.7	0.3	3.4	4.3	0.5	2.2	6.0
Jet Skiing									
Jet skis	0.2	1.0	5.7	0.9	1.5	1.7	0	0.1	0
Skiers	0.1	1.5	2.0	0.5	1.2	0.7	0	0.2	0
Non-motorized watercraft	0.1	0	0	0.6	0.5	0.3	0	0.4	1.3
Sea kayaks	0	0	0	0	0.1	0	0	0.2	1.3
Sailboats	0	0	0	0.6	0.4	0.3	0	0	0
River kayaks	0.1	0	0	0	0	0	0	0.2	0
Canoes	0	0	0	0	0	0	0	0	0
Shoreline Recreation Use Data									
Anglers	0.3	2.2	1.7	0.1	0	0	1.6	3.5	0.3
Picnickers	0.1	1.6	2.3	0.7	1.1	0.5	0	1.4	5.3
Campers	0	0.1	0.3	0.6	1.2	1.5	0.5	0	0.3

Table 5.6-4 Recreation behavior of respondents to Wells Project recreation area by resource area and season.

Activity (mean #)	Pateros/ Wells		Brewster		Okanogan/ Bridgeport	
	Peak Season (n=22)	Non-peak Season (n=7)	Peak Season (n=22)	Non-peak Season (n=7)	Peak Season (n=22)	Non-peak Season (n=7)
Fishing/ski boats	3.5	2.3	6.0	0.7	18.2	1.9
Fishing boat						
Boat	0.6	2.3	5.0	0.7	16.8	1.9
People	1.0	4.7	12.1	1.1	43.7	17.7
Skiing						
Boat	2.9	0	1.0	0	1.3	0
People	5.7	0	2.5	0	2.2	0
Jet Skiing						
Jet skis	1.4	0	1.6	0	0.1	0
Skiers	1.1	0	1.0	0	0.1	0
Motorless watercraft	0.1	0	0.7	0	0.4	0
Sea kayaks	0	0	0.1	0	0.3	0
Sailboats	0	0	0.6	0	0	0
River kayaks	0.1	0	0	0	0.1	0
Canoes	0	0	0	0	0	0
Anglers	0.2	4.1	0.1	0	2.3	1.7
Picnickers	1.2	0	1.0	0	1.4	0
Campers	0.1	0	0.6	0	0.4	0

Table 5.6-5 Annual watercraft use estimate summary by resource area.

Resource Area	Annual Est.	Peak Season Estimate	Shoulder Seasons Estimate
Pateros/Wells Overlook	929.0	557.9	371.1
Brewster	1129.3	1051.3	78.0
Okanogan/Bridgeport	2307.1	2010.1	297.0
Total (6 location cluster)	4365.4	3619.3	746.1

Table 5.6-6 Watercraft peak season (May - September) use estimate by resource area.

	Peak Season (May through September)						
Resource Area	Use Estimate	Weekday Average	No. of Weekdays	Weekday Estimate	Weekend Average	No. of Weekend Days	Weekend Estimate
Pateros/Wells Overlook	557.9	1.5	105	157.5	9.1	44	400.4
Brewster	1051.3	4.9	105	514.5	12.2	44	536.8
Okanogan/Bridgeport	2010.1	4.1	105	430.5	35.9	44	1579.6
Total (3 location cluster)	3619.3						

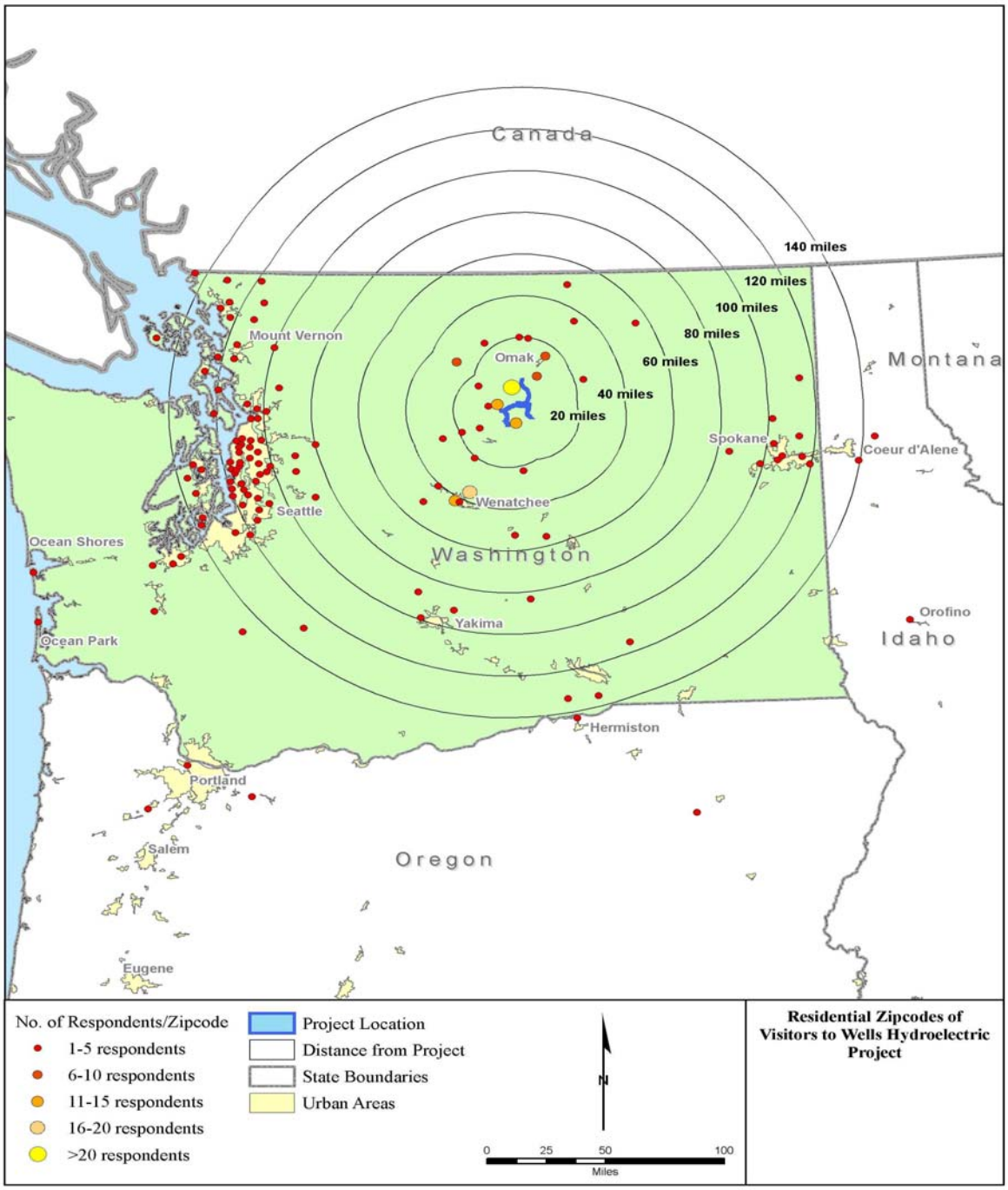

Figure 5.6-10 Distribution of residents visiting the Wells Project.

5.6.5 Recreation Needs Identified in Management Plans

Douglas PUD has reviewed the current state comprehensive outdoor recreation plan as well as comprehensive plans for the cities and counties associated with the Wells Project area. These plans have been reviewed for any listings of current or future recreational needs within the Wells Project area. Applicable information from each plan is summarized as follows:

5.6.5.1 SCORP Document (2002–2007)

The 2002–2007 State Comprehensive Outdoor Recreation Planning (SCORP) Document is produced by the Interagency Committee for Outdoor Recreation (IAC). The SCORP "is intended to inform decision-makers about issues and opportunities associated with outdoor recreation" (p. 1). The SCORP recommends the following regarding FERC-licensed hydropower projects:

> IAC recommends that non-federal hydropower project operators enhance inventory with trails and paths for walking and bicycling, manage dispersed shoreline camping, improve access for on-water recreation, and improve opportunities for nonconsumptive interaction with nature including fish and wildlife. In instances where the license holder has provided recreation land or facilities to other agencies, IAC recommends that the license holder also provide maintenance and operation assistance (p. 62).

5.6.5.2 Douglas County Countywide Comprehensive Plan

The Countywide Comprehensive Plan for Douglas County was amended on January 24, 2005 and focuses on the rural areas of Douglas County, which is representative of the lands in Douglas County within the Wells Project Boundary. The plan includes the following recreation goals:

- Promote public access to lakes, rivers, creeks and other water bodies through signage, maps, public information programs, trails, scenic overlooks, picnic areas and other mechanisms;
- Encourage efforts to maintain scenic open space, cultural, historic and heritage resources;
- Encourage the operation of rural commercial businesses, natural resource related industries, recreation and tourism activities, cottage industries, small scale business, and home occupations that are consistent with existing and planned land use patterns and are of an appropriate size and scale to maintain rural character; and
- Encourage the promotion of tourism and implement measures to maximize visitor spending during peak seasons.

5.6.5.3 Okanogan County Comprehensive Plan

The Comprehensive Plan for Okanogan County was established in 1964 and is in the process of being updated. This plan is being revised by Okanogan County to include the current goals, needs and policies. When completed, the plan is expected to more accurately reflect the current and future needs of recreation in Okanogan County. Douglas PUD will review the updated Comprehensive Plan once it is completed.

5.6.5.4 City of Pateros Comprehensive Plan

The 2005 Draft Comprehensive Plan for the City of Pateros includes a "Parks Element." This section of the plan includes a description of the parks and recreation facilities in the City of Pateros. The plan also includes a summary of the results of a recreation facility needs assessment which was completed in 1999. The results indicate that "Pateros residents appreciate the parks and recreation opportunities available in the City…and there is no compelling need for additional parks and recreation facilities" (p. 7). The plan then concludes that the City of Pateros should emphasize maintenance and improvement of existing facilities through the following goals:

- Provide adequate, well-planned, and well-maintained parks, greenbelt, playgrounds, trails, recreation opportunities and open spaces within the City;
- Provide facilities for the visitors to come into the area, thereby enhancing the City's economy;
- Support cooperation and coordination of public and private efforts to provide recreational opportunities; and
- Coordinate Parks planning efforts with Economic Development and Transportation planning and development efforts in the Comprehensive Plan and elsewhere.

5.6.5.5 City of Brewster Park and Recreation Plan and Comprehensive Plan

The City of Brewster Park and Recreation Plan (1987) established a program for identifying recreational needs as well as methods for potential funding sources for improvements to existing facilities. The following recommendations were identified in the plan:

- Submit the Plan to the IAC for review and approval;
- Develop a cooperative agreement with Douglas PUD for the development and operation of water related recreational opportunities;
- Establish an annual park use calendar and begin efforts to promote maximum use of park facilities during all seasons of the year;
- Prepare applications to appropriate agencies for funding improvements identified in the Action Plan;
- Coordinate recreational planning goals and actions with other agencies;
- Establish a permanent ad hoc citizens advisory committee to oversee plan implementation and updating; and
- Begin negotiations to acquire additional property north of the lagoon as identified in the Plan.

The Parks and Recreation Element of the Brewster Comprehensive Plan (1995 Draft) defined the following goals:

- Efforts should be made to enhance recreational opportunities for all users. This includes facility development for all age groups, development of water-related recreation and accommodations for both residents and visitors;
- Joint public/private partnerships are encouraged to create a sense of pride in community owned and operated facilities; and
- Upgrade the Columbia Cove Recreation Center to provide for the rapidly expanding indoor recreational needs of the general public.

5.6.5.6 City of Bridgeport Urban Area Comprehensive Plan

The Draft Bridgeport Urban Area Comprehensive Plan was adopted in 2001 with amendments added in 2004. The plan includes a variety of goals and policies for the City of Bridgeport. Recreation goals and policies are summarized as follows:

- Focus should be concentrated on developing and enhancing natural, outdoor, informal types of recreation facilities to accommodate continuous year-round use;
- Establish criteria for developing, siting and locating recreational vehicle parks and hook-ups;
- Provide a wide range of passive and active park facilities and recreational programs responsive to the needs, interests and abilities of all users;
- Maintain the parks and recreation facilities to a high standard while encouraging low maintenance designs;
- Enhance recreational site access by linking parking areas, adjoining developments, transit systems and other recreation facilities with walkways and/or bikeways; and
- Encourage recreation planning that involves participation by all interested individuals, agencies, clubs, and groups involved in providing, utilizing and benefiting from recreational activities.

5.6.6 Non-Recreational Land Use Within the Wells Project Boundary

Portions of land within the Wells Project Boundary are used for either wildlife or agricultural purposes. In addition to the designated wildlife areas within the Wells Project Boundary described in Section 5.4, there are many areas managed for wildlife. The three agricultural uses of project land include pasture, hay and orchard. Douglas PUD's Land Use Policy allows for permitted use of certain lands within Wells Project Boundary for agricultural purposes. These lands are owned by Douglas PUD and are managed through the land use permitting process.

Douglas PUD owns approximately 2,140 acres of land within the Wells Project Boundary. These lands are open and available to the public for "full public utilization of such lands" as required by Article 7 of the Wells Project license. Adjacent land owners may receive approval for the non-exclusive use of lands within the Wells Project Boundary.

5.6.7 Land Use Adjacent to the Wells Project Boundary

There are recreational and non-recreational uses adjacent to the Wells Project Boundary. All of the lands owned by Douglas PUD are managed under Douglas PUD's Land Use Policy. Some lands adjacent to the Wells Project Boundary, including portions of the Bridgeport Bar Wildlife Unit and Okanogan River Wildlife Unit, are owned by the WDFW. Both of these areas are units of the WWA. Douglas PUD participates in the funding of these areas. However, WDFW is responsible for managing these areas in accordance with its management procedures and policies. Additionally, the Fort Okanogan Interpretive Center is adjacent to the Wells Project Boundary. The site is owned by the State Parks and is operated by the CCT.

5.6.8 Shoreline Management Policies

The shoreline of the Wells Reservoir is approximately 93 miles in total length. Douglas PUD owns approximately 89 miles of shoreline in fee title and approximately 5 miles of shoreline is owned by federal and local agencies. Douglas PUD's Land Use Policy addresses shoreline management issues and identifies a process for the placement of any structures within the Wells Project Boundary, such as boat docks and piers. The process also includes obtaining Douglas PUD approval for land uses within the Wells Project Boundary, such as agricultural, commercial and recreation uses.

If a person or entity expresses interest in the use of lands within the Wells Project Boundary, Douglas PUD can grant people the authority to seek permits through the appropriate local, state and federal agencies with regulatory authority. Once all of the permits and documentation are acquired, Douglas PUD reviews the information and can either grant approval, deny approval or request additional information. This process ensures that the applicant has satisfied the standards of the appropriate local, state and federal agencies prior to final consideration by Douglas PUD and before any shoreline enhancements are made.

Douglas PUD has placed 500-foot buffer zones for dock and pier installations around the islands that are a part of the WWA, such as the Pateros Island, Kirk Islands and Bridgeport Bar Wildlife Islands. Similar buffer zones are established around wildlife mitigation areas associated with the Wells Project license amendment in 1982. Any regulatory shoreline buffers are mandated and enforced by agencies with the appropriate regulatory jurisdiction.

Douglas PUD monitors its shoreline through periodic Wells Reservoir inspections and through the use of aerial photography. The Wells Reservoir inspections by boat are conducted every two weeks during the spring, summer and fall and every six weeks during the winter. Douglas PUD staff also frequently travel by car and off-road vehicles throughout lands within the Wells Project Boundary and have the opportunity to monitor the shoreline and lands on an informal basis. Staff members also utilize a GIS for land management activities, compliance monitoring and for permit review.

5.6.9 Management Activities

5.6.9.1 Recreation Action Plan

Douglas PUD's commitment to providing access to lands and waters within the Wells Project Boundary is documented in the Wells Recreation Plan (1967), Wells Recreation Plan Supplement (1974), Public Use Plan (1982) and Recreation Action Plans (1987, 1992, 1997 and 2002). This long-term and ongoing planning and implementation process has helped in the development and maintenance of the sites previously described. The planning process has complied with Articles 7, 44 and 51 of the Wells Project license, which are included in Appendix D: Current License Articles.

On September 23, 1982, FERC amended the License to add Article 51 in response to Douglas PUD's request to raise the maximum elevation of the Wells Reservoir from 779 feet to 781 feet. In accordance with this article and the aforementioned articles, Douglas PUD published a Public Use Plan for the Wells Project in 1982. The plan analyzed the types of public recreation facilities that the Wells Reservoir can reasonably accommodate and discussed how those facilities can be developed and maintained. The plan also utilized data from the IAC, which produced the 1979 SCORP. The information presented in the 1982 Public Use Plan included an analysis of recreation facilities within a 100-mile radius of the Wells Project.

In response to the 1982 Public Use Plan, The National Park Service (NPS) and State Parks recommended periodic updates (every five years) to the 1982 Public Use Plan. By FERC Order dated August 12, 1987, 40 FERC ¶ 62,157, this recommendation was made part of the Wells Project license resulting in updates to the 1982 Public Use Plan every five years. Douglas PUD's 1987 Recreation Action Plan, which is a supplement to the 1982 Public Use Plan, was supported by the NPS, Washington State Parks and Recreation Commission and the cities of Pateros, Brewster and Bridgeport. Douglas PUD has published subsequent updates to the 1982 Public Use Plan in 1992, 1997 and 2002. The next update is scheduled to be completed in 2007.

5.6.9.2 Land Use Policy

Douglas PUD established a Land Use Policy in 1993 to provide guidance for land use management decisions pertaining to lands and waters within the Wells Project Boundary. Douglas PUD's Land Use Policy has subsequently been amended to include rules governing docks, piers and fences. Prior to 1993, Douglas PUD did not have a formalized policy but managed lands through the guidance of Article 48, which was added to the Wells Project license in 1981.

The Land Use Policy applies to all Douglas PUD lands and land rights. The policy provides guidance for land use management decisions and:

- Maintains compliance with FERC License obligations for the Wells Project;
- Meets applicable federal and state requirements for non-project lands;
- Provides for good stewardship of both project and non-project lands;
- Provides for consideration of wildlife and/or riparian habitat;

- Provides for the continued operation of the transmission and distribution system;
- Provides for consideration of significant historical, cultural and natural features;
- Evaluates all existing uses of project and non-project land and land rights;
- Complies with existing agreements; and
- Develops a process by which a policy violation can be resolved.

The goals of the Land Use Policy are to:

- Govern the use of lands within the Wells Project Boundary pursuant to the FERC License and comply with all applicable state and federal laws and regulations;
- Address historic, cultural and archaeologically significant sites located on the Project lands in coordination with appropriate agencies;
- Develop only those recreational facilities that will not interfere with the preservation of natural ecosystems associated with the Wells Project;
- Sustain the existing natural systems associated with the Wells Project lands; and
- Allow access, where practicable, to the waters of the Wells Reservoir and adjacent lands within the Wells Project Boundary.

5.6.9.3 Reservoir as Habitat

The Wells HCP directs Douglas PUD to notify all permit applicants that their proposed activities may result in an incidental take of ESA listed species. The notification is also intended to direct permit applicants to the fact that should an incidental take be anticipated that advanced authorization for incidental take should be coordinated with the NMFS or the USFWS. The Wells HCP also requires Douglas PUD to consider the cumulative impacts of issued and pending land use permits prior to issuing new permits that may have an impact on Wells Reservoir habitat. During the evaluation of cumulative impacts to Wells Reservoir habitat, Douglas PUD has agreed to notify and consider comments from all of the signatory parties to the Wells HCP.

5.7 Aesthetic/Visual Resources

5.7.1 Existing Aesthetic/Visual Resource Conditions

The Wells Project is one of seven large mid-Columbia River hydroelectric projects and is situated between the Rocky Reach Reservoir and the Chief Joseph Reservoir. The Columbia River along this river reach forms the visual boundary between Douglas, Chelan and Okanogan counties and is a southern boundary of the Colville Indian Reservation. This wide river corridor is considered a regional aesthetic/visual resource for a number of people including residents of these counties, residents of the cities of Pateros, Brewster, and Bridgeport located along the shoreline of Wells Reservoir, members of the CCT, and visitors to the region.

Visual elements of the Wells Project include the 30-mile-long Wells Reservoir, 4,460-foot-long Wells Dam and surrounding complex, 41 miles of transmission lines, several shoreline recreation sites and seven Wildlife Management Areas covering over 8,300 acres. The Wells Project area is located along a rural, scenic reach of the Columbia River and Project waters back up into the lower reach of the Okanogan River. The Wells Reservoir is approximately one-third to one-half

mile in width in most places. The Wells Reservoir is at its widest point between the city of Brewster and the mouth of the Okanogan River (1.7 miles wide). The Wells Reservoir is a naturally dominant visual element that contrasts with surrounding hills and mountains, semi-arid shrub steppe land, and fruit orchards along the Wells Reservoir but outside of the Wells Project Boundary (Figure 5.7-1).

Figure 5.7-1 Wells Reservoir and view of various land uses.

Visitors to the Wells Project area can view Wells Reservoir and the Wells Dam complex from several vantage points. Elements of the Project can be viewed while traveling along three highways: US Highway 97 that parallels the Columbia River between Wells Dam and the cities of Pateros and Brewster and along the lower reach of the Okanogan River, and along SR 17 and SR 173 that parallel either side of the river between the cities of Bridgeport and Brewster.

Existing shoreline recreation sites and boat launches provide visitors with direct views of Wells Reservoir and its shoreline. The Wells Dam Overlook is a visitor interpretive facility, viewpoint and day use area that is accessed from US Highway 97 and is managed by Douglas PUD. This site provides the best view of Wells Dam and its surrounding facilities. Shoreline recreation sites are located at the cities of Pateros (Memorial Park and Peninsula Park), Brewster (Columbia Cove Park and Waterfront Trail) and Bridgeport (Marina Park). In addition, state recreation areas along Wells Reservoir include Fort Okanogan State Park and the Bridgeport, Washburn and Okanogan units of the WWA.

5.7.1.1 Topography

Wells Reservoir is located in the Columbia River valley with the foothills of the Cascade Mountains to the west, the Okanogan Highlands to the northeast, and the Columbia Plateau to the southeast (Figure 5.7-2). Most of the shoreline has relatively steep topography with slopes rising at a steep incline to an elevation of 20 to 40 feet above the Wells Reservoir (Figure 5.7-3). Exceptions to this include the shorelines at Pateros, Brewster, Cassimer Bar, Washburn Island, and Bridgeport Bar, among others.

Figure 5.7-2 Wells Reservoir view looking upstream from Wells Dam.

Figure 5.7-3 Wells Reservoir with view of shoreline and shrub steppe.

5.7.1.2 Vegetation

Generally views of the Wells Project area are scenic with the natural beauty of the water of the Columbia River in the foreground and fruit orchards and/or shrub steppe vegetated hills and mountains in the background. Outside of the winter months, the intermingling of green, irrigated areas of vegetation with brown, non-irrigated areas provides a visual impression of a desert and oasis condition (Figure 5.7-4). During the winter months, much of the Wells Project area's vegetation is infrequently covered by snow.

Figure 5.7-4 Wells Reservoir with view of shrub steppe and fruit orchards.

Because residential and commercial development is not allowed within the Wells Project Boundary, the riparian zone along the Wells Reservoir is generally well established with areas of mature riparian and wetland habitats, sandy beaches, cobble stone shoreline and undisturbed shrub steppe vegetation (Figure 5.7-5). For the most part, lands within the Wells Project Boundary naturally blend into the surrounding landscape. Further information on Wells Project area vegetation is provided in Section 5.4.

Figure 5.7-5 View of Cassimer Bar shoreline from Fort Okanogan Overlook.

5.7.1.3 Land Use, Management and Ownership

The Wells Reservoir shoreline is primarily owned and managed by Douglas PUD and is in a natural condition. Land use surrounding the Wells Project Boundary is predominately rural farmland with fruit orchards and areas of shrub steppe dominated undeveloped open space. Non-agricultural development in the Wells Project area includes the Wells Dam complex and limited residential landscaping and municipal infrastructure around the cities of Pateros, Brewster, and Bridgeport. Shoreline residential and/or non-agricultural commercial uses are allowed only by special permit within the Wells Project Boundary.

The land adjacent to the Wells Project shoreline is primarily privately owned with land uses including fruit orchard production, cattle rangeland, scattered single family residences and natural shrub steppe open space. Parcel size varies greatly along the Wells Reservoir shoreline outside of the Wells Project Boundary.

There are some federally managed lands located within the Wells Project Boundary. About 3 miles of shoreline are owned by the BLM and less than one-half mile is owned by the COE. Lands located along the Wells Project's 230 kV transmission line ROW are primarily private, with some small segments crossing BLM-managed land and Washington State DNR-managed land. There are no USFS-managed lands within the Wells Project Boundary; the closest USFS-managed land is located on the Okanogan-Wenatchee National Forest approximately five miles northwest of the Wells Project Boundary.

Land use along the Okanogan River, where Wells Project waters back up into the lower reach of the river, has a predominantly rural land use in the lowland areas and a forested open space land use in the higher elevation areas. Lower portions of the Okanogan Valley are relatively flat and wide and are comprised primarily of land uses such as fruit orchards, pasture land, hay fields, and natural open space (Figure 5.7-6). Land use on the eastern side of the Okanogan River is generally open space and is undeveloped. This area becomes more forested as you move upstream closer to the Wakefield Bridge (Figure 5.7-7). The shoreline is undeveloped with riparian and wetland vegetation along much of the lower reach of the Okanogan River.

Figure 5.7-6 Shoreline along the lower reach of the Okanogan River.

Figure 5.7-7 View of Okanogan River and Okanogan Highlands.

5.7.1.4 Wells Dam

Wells Dam is an industrial element in the landscape and visually contrasts with the surrounding rural or natural landscape. The Wells Dam hydrocombine consists of a west embankment (2,300 feet long), a central concrete structure (1,130 feet long), and an east embankment (1,030 feet long). The central concrete structure, referred to as the hydrocombine, includes the generating units, spillways, switchyard, and fish passage facilities (Figure 5.7-8). The facilities are predominately grey in color, with some yellow-painted structures such as the gantry cranes atop the hydrocombine.

Figure 5.7-8 View of Wells Dam looking west.

5.8 Cultural Resources

In preparation for the Wells ILP, Douglas PUD initiated the consultation process required under Section 106 of the National Historic Preservation Act (NHPA). In November, 2005, Douglas PUD convened a Cultural Resource Work Group (CRWG), comprised of agencies, tribes, and Douglas PUD. The goals of the CRWG were to develop mutually agreed upon steps for Section 106 and to identify potential resource issues and study plans to be included in the Wells Pre-Application Document (PAD). FERC formally initiated the consultation process by letter dated December 7, 2005 authorizing Douglas PUD to carry out day-to-day consultation on FERC's behalf.

Another step in the process was to establish the Area of Potential Effect (APE). The CRWG defined the APE for the Wells Project as follows:

The Wells Project APE includes all lands within the FERC Project boundary. The APE also includes any lands outside of the Project boundary where cultural resources may be affected by Project-related activities that are conducted in compliance with the FERC license (e.g. the Wells HCP Tributary Conservation Program).

In general, the Project Boundary encompasses all lands that are necessary for Project purposes. The Project Boundary and Project APE are depicted in Appendix E.

In preparation for developing study requirements for relicensing, the CRWG identified a need to compile and summarize the numerous past archaeological investigations that have been conducted for the Wells Project. Consequently, Douglas PUD contracted with Western Shores Heritage Services (WSHS) to conduct a cultural resources data review for the Wells Project (Hartman and Berger, 2006). The results of this data review are summarized below.

5.8.1 History of archaeological investigations in the Wells Project area

The Wells Project APE and adjacent areas have been the setting of numerous cultural resource management related investigations. Early investigations consisted of large-scale surveys and the excavation of Fort Okanogan. Since the early 1960s, investigations have been linked directly to the construction and operation of the Wells Project and can be characterized as survey, salvage excavation, and monitoring efforts throughout Wells Reservoir. With the exception of Fort Okanogan, archaeological research in the project area has focused on pre-contact sites.

- Louis Caywood conducted the first archaeological investigations in the APE in 1952, testing at 45OK64 (Fort Okanogan) (Caywood and Butler, 1954). The Fort was further investigated by Earl Swanson, Jr. in 1957 and Robert Greengo in 1958. Swanson's investigations focused on finding artifacts and structural remains to be displayed and used for interpretation at the Fort Okanogan Museum (Chatters, 1992; Cook, 1992; Swanson, 1962). Greengo excavated most of the interior of Fort Okanogan to learn more about Fort structures, trade goods, evidence and dates of rebuilding, and date of abandonment. Investigations did not address archaeological deposits outside the Fort's walls or underlying the Fort (Grabert, 1968b). Grabert (1965b) analyzed artifacts excavated from the Fort.
- Stallard (1957) surveyed portions of the APE for archaeological sites, identified 24 sites, and made recommendations for future research in the first cultural resources investigations linked to the proposed construction of Wells Dam. Based upon review of site forms on file at DAHP, 12 sites were recorded by Stallard in the APE.
- Swanson (1958) conducted an extensive survey and some testing in the Methow Valley in 1957, recording and testing one site (45OK30) in the APE.
- Salvage identification, evaluation, and data recovery efforts were carried out between 1963 and 1966 leading up to dam impoundment, mostly under the supervision of Robert Greengo (Browman, 1966; Grabert, 1964, 1965a, 1965b, 1966, 1968a, 1970, 1973).
- Grabert (1965a) excavated a house pit and other features, uncovering pre contact, protohistoric, and historic deposits at 45OK52.

- Browman (1966) excavated 45OK58 in a salvage project prior to commencement of dam operation in 1967, described archaeological materials and stratigraphy, and presented a chronology of occupation.
- Grabert (1968a) conducted extensive salvage work in the project area prior to construction of the Wells Hydroelectric Project. Under his direction, field crews recorded 107 sites and tested 17 sites. Using data from these sites, Grabert (1968a) proposed a cultural sequence for the Lower Okanogan Valley. He later drew on additional data from northern portions of the Okanogan Valley and the Thompson Valley (Grabert, 1970) to revise his cultural sequence to encompass the entire Okanogan region.
- In 1977, the United States Army Corps of Engineers inventoried archaeological sites in the project area. Lawr Salo and David Munsell performed the survey to determine the effects of flow from the Chief Joseph Dam and visited 22 sites that had been exposed by increased flow and erosion from the Dam (45OK51, 45DO66, 45DO291H, 45OK372H, 45OK374H, 45OK382, 45OK49, 45OK53, 45OK383, 45DO292, 45DO293, 45OK371, 45OK375, 45OK376, 45OK377, 45OK378, 45OK379, 45OK380, 45OK381, 45OK75, 45OK50, 45OK373) (Grabert and Griffin 1980). Most sites below the waterline had lost integrity and were visible as lag deposits of cultural materials.
- Grabert and Griffin's (1980) reevaluation of Wells Reservoir cultural resources included the evaluation of 72 sites, 42 of which had not been recorded before. The survey was designed to examine cultural resources within the limits of the reservoir and pool margins. They ranked sites in terms of mitigation priority and tested six of them (DO372, DO387, OK419, OK49, OK53, and OK69). At the time, 107 archaeological sites had already been recorded in the project area, and Grabert and Griffin relocated only 30 of them. The other 77 sites were either determined to be outside the area to be affected by the proposed pool raise or had "been totally inundated or obscured by revetting" (Grabert and Griffin, 1980).
- Carlevato et al. (1982) conducted test excavations at 17 sites (45OK69, 45OK92, 45OK55, 45DO292, 45OK382, 45OK383, 45OK422, 45DO372, 45DO386, 45OK419, 45OK424, 45OK425, 45OK426, 45OK439, 45OK77, 45OK78, and 45OK49) and visited another (45OK53) to evaluate the sites for National Register of Historic Places (NRHP) eligibility and develop a mitigation plan (Grabert, 1965, Grabert, 1968; Grabert and Griffin, 1980). Thirteen of these sites (45OK69, 45OK92, 45OK382, 45OK53, 45OK383, 45OK422, 45DO372, 45OK419, 45OK424, 45OK426, 45OK77, 45OK78, and 45OK49) were determined eligible and nominated for the NRHP as the Lake Pateros Archaeological District; the other five sites were determined ineligible (Carlevato et al., 1982).
- Welch et al. (1982) visited and assessed the condition of nine sites in the project area in order to identify effects of the anticipated two-foot pool raise. They found that only 45OK74 would be affected.
- Western Heritage, Inc. (1983) conducted further testing and evaluation at five sites (45OK69, 45OK74, 45OK92, 45OK382, and 45OK383). All but 45OK74 had been tested before but high pool elevation had prevented excavations from reaching the bottom of cultural deposits in the previous field season.
- Mierendorf (1983) conducted a study to predict the potential effects of the pool raise on the 13 sites in Lake Pateros Archaeological District and evaluate ongoing impacts prior to increasing the pool elevation. He recorded geomorphic, sedimentary, and soil characteristics at each of the 13 sites, all of which are in the Wells APE. Bank protection was proposed at sites 45OK49 and 45OK77 due to their elevation above the Reservoir and

the water table and their gravelly matrix; protection-in-place was considered unfeasible for the other sites.

- In 1983 Douglas PUD entered into a memorandum of agreement (MOA) with Washington State Historic Preservation Officer (SHPO) to undertake a cultural resources management program to mitigate the potential adverse effects of the Wells Hydroelectric Project on historic properties. The MOA laid out the elements of a cultural resources plan (identification, evaluation, determination of effect, and mitigation) and provided protocols for monitoring archaeological sites and the treatment of human remains. The MOA specified that certain archaeological sites were to be regularly monitored and appropriate site stabilization measures were to be implemented, as needed. In the most recent monitoring cycle, the number of sites to be monitored had grown to 29 due to newly identified sites and/or Wells Project impacts (Hartmann and Gill, 2004).
- Chatters (1986a) summarized testing at 13 sites, 12 of which had previously been tested, and data recovery at nine sites for the Wells Reservoir Archaeology Project (WRAP) in 1983 and 1984. Reports of investigations at each site are presented in Volumes 2 and 3 (Benson et al., 1987; Chatters, 1986b) of the WRAP report.
- Monitoring programs stipulated in the MOA began in 1984. Grabert and Griffin (1984) "examined all shorelines within the Lake Pateros area," including 10.5 miles of the Okanogan River and 1.5 miles of the Methow River. They recorded seven sites and relocated one site (45OK50) that had not been visible during the 1980 resurvey. Griffin and Griffin (1985) conducted test excavations at these sites and evaluated them for NRHP eligibility. Grabert requested DOEs for the seven sites identified in 1984; three (45DO467, 45DO469, 45OK520) were found to be ineligible and four were determined eligible (45DO468, 45DO470, 45OK519, and 45OK521). A DOE was not requested for 45OK50 because it had already lost integrity due to erosion and was thought to no longer have the potential to provide significant information about the past (Griffin and Griffin, 1985). In 1985, shoreline monitoring included reconnaissance of the entire reservoir (Grabert et al., 1985), and identified two new sites (45DO472 and 45OK527). Under the direction of James Chatters, two new sites (45DO485 and 45DO486) were recorded in 1986. Monitoring consisted of the visual inspection of all shorelines affected by the Wells Reservoir (Reid and Zweifel, 1986).

Between 1986 and 2001, Chatters investigated two Okanogan Phase sites, 45DO373 and 45OK420. Following testing at 45DO373 in 1994, Chatters, SHPO, and tribal officials determined the site to be ineligible for the NRHP by consensus (Chatters, 2003). Chatters (2003) conducted surface collection of eroding cultural deposits at 45OK420 on eight occasions between 1986 and 1994. In 1994, the site was protected by geotextile and gravel armoring.

As of 1986, 183 sites spanning 8,000 years of human occupation had been identified around the Wells Reservoir. Only three more sites have been recorded since: one identified by Welch (1990) and two identified by Chatters (1995a, 1995b) in shoreline monitoring. Monitoring has been conducted triennially since 1989. Monitoring efforts in 1992, 1998, 2001, and 2004 did not identify any new archaeological or historic sites within the APE (Hartmann and Gill, 2004; Hartmann and Noll, 2001). Surveys conducted prior to dam impoundment were not strictly confined to the Project Boundary, which had not yet been formally established. As a result,

some sites recorded in the area are located outside the Wells APE. Of the 186 sites recorded in the Wells Reservoir area, 171 appear to be in the APE.

5.8.2 Archaeological and historic site data

As part of the data review (Hartmann and Berger, 2006), site types were assigned to all recorded sites using Washington State DAHP site type tables (DAHP no date) (Table 5.8-1).

- Of the 171 archaeological sites in the APE, 160 are pre contact, nine are historic, and two have historic and pre contact components.
- Investigations at 65 sites (38 percent of sites in the APE) are documented in cultural resources reports summarized in this data review.
- The Wells Project area is classified on the NRHP as the Lake Pateros Archaeological District. The Archaeological District is comprised of 24 contributing features which are located throughout the Wells Project.
- The NRHP eligibility is unknown at this time for most sites in the APE. There are DOEs on file at DAHP for 24 of these sites (Table 5.8-2); 13 of these are members of the Lake Pateros Archaeological District.
- Fifteen other sites in the APE have received consensus determinations (Table 5.8-3).
- As early as 1957, when originally recorded, erosion effects were observed at 30 of the sites and 12 more had already been damaged by construction, looting, and agricultural activities. These numbers are based on information from the original site forms. Of these, at least six sites have been revisited and were found to have lost all integrity. Although salvage efforts leading up to construction, impoundment, and operation of Wells Dam were extensive, many sites were inundated and otherwise impacted.
- Since 1980, steps have been taken to protect fifteen sites in the APE from further damage due to erosional effects of Project operations (Table 5.8-4). Methods have included the installation of various combinations of vegetation, geotextile or filter cloth coverings, gravel, sand, and cobble armoring, and earthen berms as appropriate to site-specific conditions. Triennial shoreline monitoring has found these methods to be effective against erosion.

Table 5.8-1 Numbers of recorded archaeological and historic sites and sites where investigations have occurred in Wells APE listed by DAHP site type.

Number of Sites	Number of Sites Investigated	DAHP Site Type	DAHP Description
2	1	historic and pre contact components	refuse scatter, debris pit, landfill (if > 50 years old)
2		historic debris scatter/concentration	
2		historic debris scatter/concentration and historic structure unknown	
3		historic homestead	
1		historic mining properties	mine portals, shafts, tailings, campsites
1		historic structure unknown	foundation, etc., function unknown
4	3	pre contact sensitive site	buried/eroding materials
2	2	pre contact sensitive site and pre contact camp	
1	1	pre contact sensitive site and pre contact house pit/depression	
3	1	pre contact cairn	rock pile, cache, or suspected sensitive site
77	26	pre contact camp	short term occupation site
2	2	pre contact camp and pre contact house pit/depression	
2		pre contact feature	post molds, heart, oven, or FCR concentration
6	1	pre contact house pit/depression	
1	1	pre contact isolate	single artifact (flake, knife, pestle, net sinker, etc.)
13	7	pre contact lithic material	lithic scatter, quarry, tools, or debitage
3		pre contact lithic material and pre contact cairn	
1	1	pre contact lithic material and pre contact rock alignment	
1		pre contact petroglyph	pre contact or historic native carvings
2	1	pre contact pictograph	pre contact or historic native paintings
1		pre contact pictograph and pre contact camp	
1		pre contact rock shelter	shallow overhang, greater width than depth
26	11	pre contact shell midden	matrix of shell, bone, fire-cracked rock (FCR), lithics
1		pre contact shell midden and pre contact feature	
1	1	pre contact shell midden and pre contact house pit/depression	
2		pre contact talus pit	hunting blind, storage pit, cache, or depression
3	3	pre contact village	larger site or cluster of dwellings/house pits
7	4	submerged other	pre contact or historic feature in flucutation zone

Table 5.8-2 Sites in Wells APE with DOE request forms on file at DAHP.

Site No.	DAHP Site Type	NRHP Status	DOE Year
45OK65	historic and pre contact components	eligible	1973
45DO372*	pre contact camp	listed	1982
45OK382*	submerged other	listed	1982
45OK383*	pre contact shell midden and pre contact house pit/depression	listed	1982
45OK419*	pre contact lithic material	listed	1982
45OK422*	pre contact shell midden	listed	1982
45OK424*	pre contact camp	listed	1982
45OK426*	pre contact camp	listed	1982
45OK49*	pre contact camp and pre contact house pit/depression	listed	1982
45OK53*	pre contact sensitive site and pre contact camp	listed	1982
45OK69*	pre contact sensitive site and pre contact camp	listed	1982
45OK77*	pre contact camp	listed	1982
45OK78*	pre contact camp	listed	1982
45OK92*	pre contact camp	listed	1982
45DO387	pre contact camp	eligible	1983
45DO468	pre contact lithic material	eligible	1984
45DO470	pre contact lithic material	eligible	1984
45OK519	pre contact camp and pre contact house pit/depression	eligible	1984
45OK521	pre contact shell midden	eligible	1984
45OK520	pre contact camp	ineligible	1984
45DO467	pre contact lithic material	ineligible	1985
45DO469	pre contact shell midden	ineligible	1985
45OK74	pre contact shell midden	eligible	1983
45OK131	pre contact camp	ineligible	2004

* Member of Lake Pateros Archaeological District (Carlevato et al. 1982: Table 13; Chatters 1986a:35).

Table 5.8-3 Sites with records of consensus DOEs (Chatters 2003; J. Welch to J. Gregg, letter, 20 February 1982, Douglas PUD, East Wenatchee, Washington) but no DOE request form on file at DAHP.

Site No.	DAHP Site Type	NRHP Status	DOE Year
45CH276H	historic debris scatter/concentration and historic structure unknown	ineligible	1981
45DO291H	historic debris scatter/concentration	ineligible	1981
45DO380H	historic homestead	ineligible	1981
45DO381H	historic homestead	ineligible	1981
45OK372H	historic mining properties	ineligible	1981
45OK374H	historic homestead	ineligible	1981
45OK427H	historic structure unknown	ineligible	1981
45OK434H	historic debris scatter/concentration and historic structure unknown	ineligible	1981
45OK438H	historic debris scatter/concentration	ineligible	1981
45DO292	pre contact camp	ineligible	1982
45DO386	pre contact camp	ineligible	1982
45OK425	pre contact camp	ineligible	1982
45OK439	pre contact camp	ineligible	1982
45OK55	pre contact camp	ineligible	1982
45DO373	pre contact lithic material	ineligible	1994

Table 5.8-4 Sites in APE that have been stabilized by Douglas PUD (Chatters 1986a, 2003; Hartmann and Gill 2004).

45DO372	45OK420	45OK50	45OK53	45OK74
45OK382	45OK422	45OK519	45OK58	45OK78
45OK383	45OK49	45OK521	45OK69	45OK92

5.8.3 Traditional Cultural Properties

Douglas PUD is not aware of any Traditional Cultural Properties (TCPs) in the APE. Through early discussions with the CRWG, the need to conduct a TCP study was identified. As a result, Douglas PUD is initiating a TCP study. The Confederated Tribes of the Colville Reservation have been selected as the lead contractor to complete the TCP study for the Wells APE.

Ethnographic sources mention a number of named places and describe land use practices in the project area. Recorded place names in the project area refer to village sites, and fishing, hunting, and plant-collecting grounds, and may have associated archaeological materials in the APE. While location descriptions for some of these places are vague, some correspond with archaeological sites recorded in the APE. A more detailed description of the Wells ethnography is available in Hartmann and Berger (2006).

5.8.4 Existing Discovery Activities

The Douglas PUD cultural resource management program is guided by a Memorandum of Agreement (MOA) with the DAHP to address the potential adverse effects of the Wells Project on historic and archaeological sites. Under the MOA, Douglas PUD identifies, evaluates and applies treatments to historic and archaeological sites within the Lake Pateros Archaeological District. The MOA also established protocols for triennial monitoring and treatment of human remains.

Additionally, Douglas PUD voluntarily accepted FERC's standard land use article in 1981 at which time it was added to the FERC License as Article 48. This article delegates authority to Douglas PUD to manage routine conveyances, leases and easements for non-project use of lands within the Wells APE. Section (e) of this article mandates consultation with the Washington State Historic Preservation Officer (SHPO) for certain activities permitted by Douglas PUD within the Wells APE.

In 2004, Article 60 was added to the License to ensure that potential impacts to cultural resources would be considered for ground disturbing activities related to the Wells HCP. The article states that prior to the commencement of any ground disturbing activities at the Project or on non-federal lands pursuant to provisions in the HCP Tributary Conservation Plan, Douglas PUD shall consult with the SHPO and potentially affected Indian tribes about the need for a cultural resources survey.

Under the MOA, archaeologists contracted by Douglas PUD conduct a cultural resource monitoring program within the APE every three years. Areas of erosion are also inspected for newly exposed sites. The results are summarized in written and photographic reports. The reports are sent to the SHPO and to the CCT for review and comment. The most recent monitoring survey was completed in 2004.

5.8.5 Identification and Consultation with Tribes

5.8.5.1 Background

Prior to European settlement, three aboriginal groups occupied the Wells Project area, the Methow, the Lower Okanogan and the Moses-Columbia bands (Grabert, 1968). The Methow occupied the Methow River basin and the Columbia River from the modern town of Brewster downstream nearly to the Chelan County boundary. They also used a reach of the Okanogan River, where they maintained winter villages. The Lower Okanogan occupied the rest of the Okanogan River and its tributaries north to Tonasket, and both sides of the Columbia River upriver from Brewster. (Chatters et. al., 1986). The Moses-Columbia occupied the north side of the Wells Reservoir downriver from Brewster (Grabert, 1968). All three bands spoke Interior Salish, and peaceful interaction between the tribes was frequent.

The Colville Indian Reservation was created by Executive Order of President Grant in 1872. The CCT represents twelve bands of Indians that were settled on the Colville Reservation, including the Methow, Lower Okanogan and Moses-Columbia bands. The Colville Reservation is 1,397,500-acres located in North Central Washington.

5.8.5.2 Consultation with Colville Confederated Tribes Tribal Historic Preservation Officer (THPO)

As part of compliance with Section 106 of the National Historic Preservation Act (NHPA), Douglas PUD consults with the THPO and SHPO for license compliance activities that may impact cultural resources. Prior to issuance of the PAD and NOI, Douglas PUD formed a Cultural Resources Work Group and initiated informal consultation meetings with the CCT, THPO, SHPO and BLM. The purpose of the informal consultation was to agree to a process for complying with Section 106 and to identify issues and potential studies. This process will take into account issues related to Project operations, including any adverse impacts of project operations on eligible cultural resource sites.

On December 7, 2005, FERC issued a letter granting Douglas PUD authorization to conduct day-to-day consultation regarding the Wells ILP. Following receipt of FERC's letter, the Cultural Resources Work Group mapped out the steps and a schedule for the Section 106 process, defined the APE, and identified potential study needs.

As part of this process, Douglas PUD reviewed and summarized all of the available archaeological information for the Wells APE (Hartmann 2006). The report included three components: 1) a compilation and review of all archival site information; 2) an analysis and summary of past archaeological studies for the APE; and 3) an information database for each site. The cultural resources data review summary was used by the Cultural Resources Work Group to identify future study needs for the Wells ILP.

5.9 Socioeconomic Resources

Wells Dam is located within Douglas and Chelan counties in north central Washington State. The state population has increased 21.1 percent between 1990 and 2000, ranking tenth overall for population growth (CensusScope, 2006). The Wells Reservoir is located in Douglas, Chelan, and Okanogan counties. Approximately two miles of the Wells Reservoir reside within the Chelan County boundary; there are no Chelan County communities affected by the Wells Project.

The socioeconomic resources in the Wells Project area primarily involve the communities and commercial interests along the Wells Reservoir in Douglas and Okanogan counties. The area surrounding the Wells Project is sparsely populated and generally undeveloped. The cities of Pateros (population: 643), Brewster (population: 2,189) and Bridgeport (population: 2,059) are the principal municipalities located in the vicinity of the Wells Reservoir (US Census 2000). Unlike other reservoirs nearby, the land within the Wells Project Boundary is generally owned in fee title by Douglas PUD. Most of the lands outside of the Wells Project Boundary are privately owned with some tracts of state and federally owned land interspersed.

Douglas County is located near the geographical center of the state. The population of Douglas County was estimated to be 34,200 in 2004 (Washington State Office of Financial Management). The incorporated areas of Douglas County include the cities East Wenatchee (2004 population: 8,255), Waterville (2004 population: 1,170), Bridgeport (2004 population: 2,075), Rock Island (2004 population: 870), Mansfield (2004 population: 325) and a portion of Coulee Dam (2004 population: 1,025). East Wenatchee is located 140 miles east of Seattle and 163 miles west of Spokane. Douglas PUD headquarters is located in East Wenatchee approximately 50 miles south of Wells Dam. The City of Bridgeport is the only community in Douglas County located along the Wells Reservoir. Bridgeport is located approximately 28 miles upstream of Wells Dam and approximately one mile downstream of Chief Joseph Dam.

Okanogan County borders Douglas County to the north and extends to the border of Washington State and Canada. The Colville Indian Reservation occupies a large portion of the eastern part of Okanogan County. The population of Okanogan County was estimated to be 39,600 in 2004. The incorporated areas of Okanogan County, with estimated 2004 populations, include the cities of Omak (2004 population: 4,700), Okanogan (2004 population: 2,435), Brewster (2004 population: 2,195), Conconully (2004 population: 190), Coulee Dam (2004 population: 1,025), Elmer City (2004 population: 265), Nespelem (2004 population: 210), Oroville (2004 population: 1,670), Pateros (2004 population: 610), Riverside (2004 population: 320), Tonasket (2004 population: 1,005), Twisp (2004 population: 960) and Winthrop (2004 population: 360). The cities of Pateros and Brewster are the only communities in Okanogan County located along the Wells Reservoir. Pateros is located approximately 8 miles upstream of Wells Dam and Brewster is located approximately 15 miles upstream of Wells Dam.

Agriculture is the primary industry in Douglas and Okanogan counties. The three predominant agricultural uses of lands near the Wells Project are for pasture, hay and orchard. The orchard areas produce substantial crops of apples, pears and cherries due to the favorable soil, climate

conditions and irrigation water supply. Douglas County also produces a significant amount of wheat. Okanogan County also produces a significant number of livestock.

Although the economies of Douglas and Okanogan counties are based primarily on agriculture, they are also supported by government, retail, trade, manufacturing and service industries. Tourism also is an important component of the area's economy. Douglas and Okanogan counties are popular vacation destinations for visitors from the greater Seattle area and British Columbia, Canada. These visitors are primarily interested in outdoor recreation, such as hiking, fishing, hunting, boating, camping, snowmobiling and snow skiing.

Tables 5.9-1 through 5.9-10 describe the general socioeconomic conditions in Douglas County, Okanogan County and communities in the Wells Project area.

Table 5.9-1 Population growth in Washington State and by county.

Year	Washington State	Douglas County	Chelan County	Okanogan County
2000	5,894,121	32,603	66,616	39,564
1990	4,866,692	26,205	52,250	33,350
1980	4,132,156	22,144	45,061	30,639
1970	3,413,244	16,787	41,103	25,867
1960	2,853,214	14,890	40,744	25,520

Source: CensusScope, 2006.

Table 5.9-2 Population trends for cities in the Wells Project area.

Year	Douglas County	Okanogan County	
	Bridgeport	Brewster	Pateros
2004	2,075	2,195	610
2003	2,070	2,200	615
2002	2,065	2,200	640
2001	2,080	2,205	640
2000	2,059	2,189	643

Source: Washington State Office of Financial Management, 2000 Census, 2001-2004 estimates.

Table 5.9-3 Median household income estimates for Douglas and Okanogan counties.

Year	Douglas County	Okanogan County
2004	$41,705	$32,873
2003	$40,961	$31,944
2002	$41,367	$32,482
2001	$41,092	$31,906
2000	$40,830	$31,077

Source: Washington State Office of Financial Management.

Table 5.9-4 Douglas County civilian labor force (annual average).

	2000	2001	2002	2003	2004
Civilian Labor Force	17,640	17,090	17,470	17,790	23,360
Total Employment	16,210	15,650	16,140	16,330	22,100
Total Unemployment	1,430	1,440	1,330	1,460	1,260
Unemployment as Percent of Labor Force	8.1%	8.4%	7.6%	8.2%	5.4%

Source: State of Washington Employment Security Department.

Table 5.9-5 Okanogan County civilian labor force (annual average).

	2000	2001	2002	2003	2004
Civilian Labor Force	20,570	19,020	18,770	19,290	21,270
Total Employment	18,300	16,820	16,900	17,380	19,590
Total Unemployment	2,270	2,200	1,870	1,910	1,680
Unemployment as Percent of Labor Force	11.1%	11.6%	10.0%	9.9%	7.9%

Source: State of Washington Employment Security Department.

Table 5.9-6 Non-agricultural wage and salary workers in Chelan and Douglas counties (annual average).

	2000	2001	2002	2003	2004
Natural Res., Mining & Construction	2,300	2,200	2,600	2,600	2,600
Manufacturing	2,700	2,400	2,100	2,100	2,200
Trade, Trans., Warehousing & Utilities	8,800	8,500	8,400	7,900	8,300
Retail Trade	5,900	5,700	5,700	5,300	5,500
Government	8,300	8,300	8,300	8,400	8,500

Source: State of Washington Employment Security Department.
*Chelan County and Douglas County data exist together as a Metropolitan Statistical Area.

Table 5.9-7 Non-agricultural wage and salary workers in Okanogan County (annual average).

	2000	2001	2002	2003	2004
Natural Res., Mining & Construction	710	500	540	610	590
Manufacturing	350	170	180	170	170
Trade, Trans., Warehousing & Utilities	2,610	1,990	1,960	1,870	2,040
Retail Trade	1,640	1,530	1,490	1,470	1,610
Government	4,310	5,280	5,260	5,240	5,350

Source: State of Washington Employment Security Department.

Table 5.9-8 Taxable retail sales for Douglas and Okanogan counties.

Year	Douglas County	Okanogan County
2004	$350,764,614	$343,582,246
2003	$322,207,611	$325,355,759
2002	$307,630,083	$315,369,577
2001	$267,627,029	$313,370,225
2000	$252,384,632	$310,758,191

Source: Washington State Department of Revenue.

Table 5.9-9 Taxable retail sales for cities in the Wells Project area.

Year	Douglas County	Okanogan County	
	Bridgeport	Brewster	Pateros
2004	$3,915,602	$21,798,016	$4,033,891
2003	$3,448,364	$22,556,112	$3,571,688
2002	$3,434,298	$19,261,996	$3,647,442
2001	$3,788,295	$20,731,216	$3,995,958
2000	$3,698,367	$24,510,458	$4,705,215

Source: Washington State Department of Revenue.

Table 5.9-10 Estimated land use (acres).

	Douglas County	Okanogan County
Cropland	446,100	78,600
Conservation Reserve Program	150,800	0
Pastureland	15,500	67,800
Rangeland	443,500	731,000
Forested	0	734,700
Minor Land Uses	55,500	162,200
Urban	15,000	30,100
Water and Streams	20,700	33,900

Source: Natural Resources Conservation Service, 1997 Natural Resources Inventory (NRI).

5.10 Tribal Resources

Both the CCT and the YN have expressed interest in Wells Project relicensing. Contacts for the tribes have been identified as follows:

Confederated Tribes of the Colville Reservation
Mr. Michael Marchand
Business Council Chairman
P.O. Box 150
Nespelem, WA 99155

Confederated Tribes and Bands of the Yakama Nation
Mr. Jerry Meninick
P.O. Box 151
Toppenish, WA 98948-0151

The 1.4 million-acre Colville Reservation was created by Executive Order of President Ulysses S. Grant in 1872. The CCT represent twelve bands of Indians that were settled on the Colville Reservation, including the Wenatchee, Colville, Entiat, Nespelem, Okanogan, Chelan, Moses-Columbia, Palus, Nez Perce, Methow, San Poil and Lake. Of those bands, the Methow, the Lower Okanogan, and the Moses-Columbia occupied the Wells Project area prior to European settlement (Grabert 1968). Consequently, the CCT have an interest in natural resource, cultural resource, and socioeconomics issues. Douglas PUD is not aware of any other Indian tribes with current or past ties to lands within the Wells Project Boundary.

Both the CCT and YN have an interest in potential effects of ongoing Project operations on Columbia River aquatic resources, such as fish and water quality. Both the YN and CCT are signatories to the Wells HCP.

On August 8, 2005, Douglas PUD sent letters to the CCT and YN requesting information from the tribes related to the natural and social resources found within the Wells Project. Douglas PUD also sent a letter, dated August 31, 2005, inviting both the CCT and YN to participate in relicensing discussions prior to the filing of the NOI and PAD. On October 4, 2005, Douglas PUD held a relicensing outreach meeting with the CCT and on October 5, 2005, held a relicensing outreach meeting with the YN. During each of the outreach meetings, representatives from both tribes expressed interest in participating in relicensing discussions prior to the formal Wells Project relicensing. Starting in October 2005, Douglas PUD facilitated meetings to identify issues associated with the Wells Project to be studied during the formal FERC relicensing of the Wells Project. Representatives from the CCT and YN participated in many of these meetings.

5.10.1 Tribal Interests Affected by the Project

Douglas PUD invited the CCT and YN to participate in initial issue identification meetings held between December of 2005 and April of 2006. The following describes past activities related to issues of interest to the CCT and YN.

5.10.1.1 Cultural Resources

Douglas PUD currently manages historic properties at the Wells Project under a Memorandum of Agreement with the DAHP and consults with the CCT on cultural resource issues related to Wells Project operations. Douglas PUD's cultural resource management program is described in Section 3.8.1.11 and Section 5.8.

5.10.1.2 Aquatic Resources

Both the CCT and YN are signatories to the Wells HCP (2004). The HCP is a 50-year agreement that was approved and made a part of the FERC License on June 21, 2004. The HCP addresses project-related impacts to spring Chinook, summer/fall Chinook, steelhead, sockeye and coho (collectively referred to as Plan Species). With respect to Plan Species, the HCP parties have agreed to be supportive of Douglas PUD's long-term relicensing efforts. The HCP also provides ESA coverage for all of the permit species (spring Chinook, summer/fall Chinook, sockeye and steelhead). The agreement is described in more detail in Section 3.8.1.25.

5.10.1.3 Land Use

On February 11, 2005, FERC approved a settlement agreement between Douglas PUD and the CCT pertaining to claims for annual charges for the alleged use of tribal lands and the bed of the Okanogan and Columbia rivers. This settlement included a Settlement Agreement, Power Sales Contract Agreement and Power Sales Service Agreement. The Settlement Agreement is described in more detail in Section 3.8.1.27.

5.10.1.4 Fish and Wildlife

On January 26, 1970, Douglas PUD entered into an agreement for fish and wildlife mitigation with the CCT. Douglas PUD provided payments for fishery and wildlife mitigation which constituted full compensation for all damage to the Colville Indian Reservation fish and wildlife as a result of the development of the Wells Project. The agreement is described in more detail in Section 3.8.1.6.

On April 2, 1984, Douglas PUD entered into an Offer of Partial Settlement regarding Wildlife Habitat Mitigation with the CCT. The settlement included habitat protection efforts at Cassimer Bar related to raising the maximum elevation of the Wells Reservoir. This agreement is described in more detail in Section 3.8.1.14.

6.0 PRELIMINARY ISSUES AND STUDY PLAN SUMMARIES

6.1 Introduction to Resource Work Group Issues

In August 2005, Douglas PUD initiated a series of Resource Work Group (RWG) meetings with a group of stakeholders regarding the upcoming relicensing of the Wells Project. This voluntary effort was initiated to provide stakeholders with information about the Wells Project, to identify resource issues and to develop preliminary study plans prior to filing the NOI and PAD. The RWGs were formed to discuss issues related to the Wells Project and its operations.

Douglas PUD initiated this RWG process by hosting an introductory workshop regarding the ILP on October 18, 2005. The intent of the workshop was to introduce stakeholders to FERC's new relicensing process, to provide stakeholders with information about the Wells Project and to introduce stakeholders to the relicensing schedule. At the conclusion of the workshop, stakeholders were encouraged to participate in the following four RWGs: Aquatic, Terrestrial, Cultural, and Recreation and Land Use. A series of RWG meetings and site tours were held beginning in November 2005 and continued to the filing of the NOI and PAD in December 2006. A record of these interactions is included in Appendix B – Summary of Consultation and Contacts.

The primary goals of the RWGs were to identify resource issues and develop study plans. This process provided stakeholders and Douglas PUD an opportunity to have open dialog about issues in advance of the rigorous timeline that begins once the NOI and PAD are filed. Over 150 issues or concerns were originally identified and discussed. Through six rounds of meetings, each RWG cooperatively developed a list of Issue Statements, Issue Determination Statements and Agreed Upon Study Plans. An Issue Statement is an agreed upon definition of a resource issue raised by a stakeholder. An Issue Determination Statement reflects the RWGs' efforts to apply FERC's seven criteria to each individual Issue Statement. Agreed Upon Study Plans are the finished products of the informal RWG process.

6.2 Issues for Study

The informal RWG process included the identification of issues, the application of FERC's seven criteria and development of study plans. Each issue and issue determination statement was discussed collaboratively during RWG meetings to determine if the issue warranted a study. The Issue Statements and Issue Determination Statements were mutually agreed upon and reflect the discussions. Listed below are the issues for study that Douglas PUD is proposing for the two-year ILP study period.

6.2.1 Aquatic RWG

6.2.1.1 Operations of the Project may affect juvenile Pacific lamprey dam passage and reservoir survival (survival, route of passage and timing) during their downstream migration.

Issue Determination Statement

It is unknown as to whether there is a Project effect on juvenile lamprey. At this time, there are no studies documenting Project effects on juvenile lamprey. However, dam passage survival can be broken down into 4 specific areas of concern; survival, route of passage, timing and predation. Currently, there are two limitations to the implementation of a field study for dam passage survival; 1) Tag technology for juvenile macropthalmia is currently being developed; and 2) obtaining macropthalmia in sufficient numbers within the Project to meet sample size requirements for a statistically rigorous study is not practicable. Reservoir predation on juvenile lamprey is unknown. A review of existing data and literature on predation, including bird predation in the tailrace, would be beneficial.

The resource work group agrees that a study is needed during the two-year ILP study period. This study will include an updated literature review on juvenile lamprey survival and predation on juvenile lamprey and will examine the stomach contents of fish. If permits can be obtained, the study will also examine the stomach contents of birds.

6.2.1.2 The Wells Project may affect adult Pacific lamprey habitat use.

Issue Determination Statement

There were two types of habitat identified by the group (spawning and overwintering habitat). It is unlikely that there is a Project effect on adult lamprey overwintering habitat. Literature suggests that overwintering habitat for adult Pacific lamprey consists of deep pools. In the Wells Reservoir, deepwater habitat is plentiful and undisturbed by Project operations.

There is no information currently available related to adult lamprey spawning habitat within the Wells Project. Existing literature (Beamish, 1980) suggests that adult lamprey prefer smaller tributaries that are characterized by suitable spawning substrate and velocities (pool-tailouts, large gravel to small cobble substrate, depth of 1 meter). This type of habitat is generally not available within the Wells Project.

Adult Pacific lamprey spawning has not been documented within the Wells Project; however, there may be areas within the Wells Project that may have marginal spawning habitat for adult Pacific lamprey.

The resource work group agrees that a study is needed to determine whether adult lamprey are spawning within the Wells Project and if so, whether the operation of Wells Dam is affecting this habitat. This study should be conducted during the two-year ILP study period.

6.2.1.3 The Wells Project may affect adult Pacific lamprey behavior related to ladder passage, timing, drop back and upstream migration.

Issue Determination Statement

Work group members have determined that this issue has a tie to the Project as it relates to lamprey migration through Wells Dam. Preliminary passage information has been collected at

Wells Dam; however, the sample size of the study was limited and additional information is needed. A radio-telemetry study would be feasible to address passage, timing, drop back and upstream migration. The results of an adult lamprey passage study would be useful during the development of PME measures.

The resource work group agrees that a radio-telemetry study to assess lamprey behavior as it relates to passage, timing, drop back and upstream migration should be conducted at Wells Dam during the two-year ILP study period.

6.2.1.4 Project operations may affect the input, movement, accumulation and retention of toxins (sediment dynamics and water column) originating from the Okanogan River subbasin and their potential effects on aquatic organisms and humans.

Issue Determination Statement

The Okanogan River likely contains toxins within the sediment and in the water column. These pollutants are discharged into the river from mining, industrial and agricultural activities upstream of the Project boundary. There are numerous reports by the Washington State Department of Ecology and the Colville Tribe documenting the presence and levels of toxins within the Okanogan Basin. Of the five assessments conducted on toxins in the Okanogan River most have focused on the presence of toxins within the water column, sediment and within the fish found in the Okanogan River.

The lower Okanogan DDT PCB Detailed Implementation Plan (WDOE, 2006) submitted to and approved by the Environmental Protection Agency for the purpose of providing direction to assure that DDT and PCB concentrations are reduced to a level that meet regulatory standards recommends continued monitoring of fish tissues from the lower Okanogan River.

The resource work group agrees that a study is needed during the two-year ILP study period. The study would assess the concentration of DDT and PCBs found within fish tissues collected from the lower Okanogan River. This study would also collect sediment samples from specific recreation areas located between the mouth of the Okanogan River upstream to RM 15.5.

6.2.1.5 Wells Dam may affect compliance with Total Dissolved Gas (TDG) standards in the Wells Tailrace and Rocky Reach Forebay.

Issue Determination Statement

Wells Dam can have an effect on compliance with the TDG standard. The resource work group believes that additional information is necessary in the form of continued monitoring and that these data will be meaningful with respect to 401 Water Quality Certification. Douglas PUD has been implementing studies at Wells Dam to address TDG production dynamics. The need for future studies during the two-year ILP study period (2008-2009) is dependent upon TDG studies scheduled for 2006 and 2007.

6.2.1.6 Project operations may affect compliance with temperature standards in the Wells Project.

Issue Determination Statement

The Wells Project can have an effect on compliance with the water temperature standard. The Aquatic Resource Work Group members agree that studies to address this issue are feasible and the results will be meaningful for the 401 Water Quality Certification Process. Douglas PUD is currently collecting temperature data throughout the Wells Project. Furthermore, Douglas PUD has established weather stations to collect meteorological data in key locations of the Wells Reservoir. These data sets will be utilized to develop a temperature model (i.e., CE-QUAL-W2) to assess the Wells Project's effect on water temperatures.

The Resource Work Group believes that a study to develop a temperature model is necessary to determine compliance with the state's water quality standards. The resource work group agrees that this study (development of specific water temperature models) should be implemented during the two-year ILP study period.

Toward this goal, Douglas PUD will continue to collect water temperature and meteorological data during 2006 and 2007 for use in the development of a temperature model to be used in 2008 and/or 2009. Data may continue to be collected in 2008 and 2009, if necessary.

6.2.1.7 Project operations may affect compliance with DO, pH and turbidity in the Wells Project.

Issue Determination Statement

The Wells Project may have an effect on compliance with the standards for DO, pH and turbidity. Currently, Douglas PUD has collected water quality data toward the evaluation of meeting the numeric criteria for these parameters. Initial data collected during the 2005 baseline limnological assessment indicates that Douglas PUD is in compliance with the Washington State Standard for these parameters. However, additional monitoring is required to make a final determination.

The resource work group agrees that a study during the two-year ILP study period is necessary. The study will focus on the collection of DO, pH and turbidity in the Wells Project especially focusing on data collection from the Okanogan River and at Wells Dam.

6.2.2 Recreation and Land Use RWG

6.2.2.1 Reservoir fluctuations during high recreation use days may limit access and use of the reservoir and recreation facilities.

Issue Determination Statement

There may be some scenarios where Project operations, notably reservoir fluctuations, affect access to and use of public boat launches and docks. The work group recommends that a site

evaluation study be completed to determine which recreation facilities are rendered inaccessible at various reservoir elevations. The study should provide options for improving access to public boat launches and docks. The study should also evaluate how reservoir elevations affect on-water boating experiences (e.g. motorboats vs. man-powered boats).

The resource work group agrees that a site evaluation study will be completed during the two-year ILP study period. This study will help to determine whether new measures are needed to address this issue for the term of the next license.

6.2.2.2 The reservoir may have resulted in the growth of aquatic vegetation at recreation sites, which may restrict access and use of the reservoir.

Issue Determination Statement

The Wells Project may have enhanced the growth of aquatic vegetation in the Wells Reservoir. Douglas PUD has completed baseline assessments of macrophyte distribution in the reservoir. Results of the baseline assessments indicated that most of the aquatic vegetation in the reservoir is native vegetation which may provide important fish habitat and waterfowl forage.

The resource work group agrees that a site evaluation study should be completed during the two-year ILP study period to determine where and to what degree public access to and use of the reservoir is restricted by aquatic vegetation. The proposed site evaluation study should include a map showing where macrophytes occur and focus on identifying where macrophytes restrict or discourage access to public recreation facilities. The study should also include options to address the issue should it be determined that aquatic vegetation is impacting access to and use of the reservoir. The study will help identify measures to address this issue for the term of the next license.

6.2.2.3 The reservoir and Project operations may affect sediment transport and deposition, which may restrict access to and use of the reservoir.

Issue Determination Statement

The resource work group agrees that a study is needed during the ILP two-year study period. Sediment conditions at public recreation sites will be considered during the site evaluation study discussed in issues above. The resource work group agrees that it is important to continue monitoring the sediment conditions at Wells Project access sites along the Methow and Okanogan rivers.

6.2.2.4 Recreation proposals under the license need to consider Endangered Species Act (ESA), Americans with Disabilities Act (ADA), Electric Consumers' Protection Act (ECPA), State Comprehensive Outdoor Recreation Plan (SCORP), County Shoreline Master Programs as well as local ordinances, laws, regulations and comprehensive plans.

Issue Determination Statement

Douglas PUD agrees that proposals under the new license need to consider all of the above-mentioned laws, plans and regulations. These should be applied at existing and future recreation sites. The resource work group agrees that additional information is needed and a study is recommended during the two-year ILP study period. An evaluation of ADA compliance and other regulations will be considered in the Recreation Needs Assessment.

6.2.2.5 Existing recreation facilities may not meet future recreation needs through the duration of the next license term. Recreation plans under the new license should consider recreation trends and an analysis of the condition and capacity at recreation facilities.

Issue Determination Statement

Douglas PUD completed a Recreation Visitor Use Assessment for the Wells Project conducted in 2005. This assessment will be useful in answering questions related to the current use of existing recreation facilities.

The existing Wells Project recreation sites were developed under the original license to provide safe and efficient access to Project lands and waters. Safe and efficient access to Project land and waters is a requirement of the original FERC license and is expected to be a requirement under the new long-term FERC license. Enhancements to existing facilities or the installation of new sites/facilities will be considered based upon projected use and capacity ratings, consistent with FERC recreation policies.

The current condition of existing recreation facilities and their ability to meet future needs is unknown. The resource work group agrees that additional information is needed and that a Recreational Needs Assessment should be conducted during the two-year ILP study period. This study should assess the condition of existing facilities and evaluate the ability of existing facilities to meet future recreation demands within the Wells Project. The Recreation Needs Assessment should also consider results from the Interagency Committee for Outdoor Recreation's (IAC) statewide outdoor recreation participation survey and the WDFW fishermen survey and additional recreation information from the Project area.

6.2.2.6 The new license should consider new facilities or enhancements to existing facilities (eg. Chief Joe Hatchery, Fort Okanogan State Park and Interpretive Center, Fort Okanogan Overlook Site, Wells Visitor Center, Pateros Visitor Center, Alta Lake State Park and Wells Tracts off Pit Road) and should consider trails and trail linkages between communities.

Issue Determination Statement

The resource work group agrees that a Recreational Needs Assessment is considered necessary during the two-year ILP study period. The results of this study will help identify potential enhancements to meet current, future and potential recreation needs within the Project, including the possibility of trails and trail linkages between communities. The study will help to determine

whether adequate demand exists to justify the construction of new recreation facilities and will consider existing and future plans for recreation sites in the Project vicinity. Enhancements to existing facilities outside the Project will be considered if recreation needs cannot be met within the Project boundary.

6.2.2.7 Wells Dam may be a hindrance to river travel.

Issue Determination Statement

Douglas PUD is not aware of an ongoing need for human river travel past Wells Dam. Wells Dam operators have identified only three instances where the public has requested portage either upstream or downstream of the dam in the past five years. In each instance, Douglas PUD has been able to adequately accommodate these individuals and transport their equipment. This issue may have a tie to the Project if a significant need is identified in the future.

The resource work group agrees that a study is needed during the two-year ILP study period. An evaluation of portage options to address this issue should be considered in the Recreation Needs Assessment.

6.2.3 Terrestrial RWG

6.2.3.1 Ongoing control of nuisance wildlife may influence wildlife species abundance and diversity.

Issue Determination Statement

Douglas PUD conducts a nuisance wildlife control program to reduce predation on fish. The effect of this program on wildlife populations found within the Wells Project is unknown.

Removal of bird and mammal predators is an important part of reducing predation on ESA listed steelhead and spring Chinook at the Wells Project and associated hatchery facilities. In 2005, WDFW estimated loss due to predation at the Wells Hatchery at 7-14 percent. Douglas PUD, through the U.S. Department of Agriculture and WDFW's nuisance species trapping program, has developed and continues to employ many alternatives to lethal removal and only uses removal actions when non-lethal measures have failed. Hazing consists of noise makers, propane cannons, decoy predators, electric fence, tailrace and hatchery wires, fencing, hatchery covers and the hiring of hazing personnel. As a last resort, removal techniques, including the use of traps and shot guns, would be utilized.

Project operations related to wildlife control may have an effect on terrestrial resources and additional information is needed to determine which species may be significantly affected under this program and if there is a significant impact on sensitive or recreationally important species.

The resource work group agrees that a study is needed during the two-year ILP study period to evaluate existing practices, evaluate alternatives and inform future management decisions.

6.2.3.2 Presence of the transmission lines could kill or injure birds and the presence of the transmission towers could affect wildlife behavior and use of adjacent habitat.

Issue Determination Statement

The Wells Project license includes two 230 kV single-circuit transmission lines. The lines run 41 miles in length from the switchyard at Wells Dam to the Douglas Switchyard operated by Douglas PUD. The lines run parallel to each other on 45-85 foot steel towers along a common 235-foot wide corridor.

The transmission lines and towers could have impacts on wildlife, including bird collisions and raptor nesting. Baseline studies have not been completed to assess these potential impacts. Wildlife and botanical species inventories have not been completed along the transmission corridor.

The RWG agrees that a study is needed during the two-year ILP study period and is proposing to complete baseline wildlife and RTE inventories along the transmission corridor. In addition to documenting baseline conditions, this study would be used to document presence (whether raptors, corvids and prairie grouse are found within or adjacent to the transmission corridor). A literature review will also be completed to specifically identify potential effects on raptors and prairie grouse.

6.2.3.3 Maintenance of the transmission corridor could affect wildlife and/or botanical species (e.g. weed control and road maintenance).

Issue Determination Statement

The Wells Project license includes two 230 kV single-circuit transmission lines. The lines run 41 miles in length from the switchyard at Wells Dam to the Douglas Switchyard operated by Douglas PUD. The lines run parallel to each other on 45-85 foot steel towers along a common 235-foot wide corridor.

Maintenance activities along the transmission corridor could have an impact on wildlife and botanical resources. Wildlife and botanical species inventories have not been completed along the transmission corridor.

The resource work group agrees that a study is needed during the two-year ILP study period and is proposing to complete baseline wildlife, botanical and RTE inventories along the transmission corridor.

6.2.4 Cultural RWG

6.2.4.1 Continued operation of the Wells Project could affect cultural resources that are listed or considered eligible for inclusion in the National Register of Historic Places.

Issue Determination Statement

Section 106 of the National Historic Preservation Act requires federal agencies having the authority to license any undertaking to take into account the effect of the undertaking on historic properties. Because the Wells Project is licensed by FERC, the relicensing process is considered a federal undertaking and the National Historic Preservation Act (NHPA) and its implementing regulations are applicable.

There are a number of Project effects that might harm cultural resources. Erosion of the shoreline caused by Project operation could expose buried cultural resources or damage traditional cultural properties (TCPs). Other ground disturbing activities related to ongoing Project license compliance activities could also impact cultural resources.

Starting in early 2006, a cultural resource data review was implemented in an effort to understand what archeological and historical property information is currently available for the Wells Project. This effort is being conducted jointly by Douglas PUD, the Colville Tribe and Western Shore Heritage Services. Douglas PUD has also agreed to fund the Colville Tribe to conduct a TCP study starting in 2006.

6.3 Study Plan Summaries

The agreed upon study plans are the culmination of the informal RWG process. Each study plan addresses FERC's seven criteria and includes developed nexus statements and background information. A total of 12 studies have been identified for the two-year ILP study period. These study plans were developed collaboratively by each RWG, and the study plan titles and their summaries are included below. The entire collection of study plans is included in Appendix H.

6.3.1 Aquatic RWG

6.3.1.1 Survival and Rates of Predation for Juvenile Pacific Lamprey Migrating through Columbia River Hydroelectric Projects (6.2.1.1)

The Aquatic RWG is proposing a study is intended to fill gaps in the local knowledge of juvenile Pacific lamprey (*Lampetra tridentata*) survival migrating through the Wells Project. Although there is a growing body of information on adult Pacific lamprey and their interactions at hydroelectric projects, relatively little information exists related to the survival of outmigrating juvenile lamprey (macrophthalmia) at hydroelectric projects. A review of the recent body of literature related to juvenile lamprey survival passing through hydroelectric projects concludes that there is currently a lack of methodologies and technologies to effectively quantify the level of survival of juvenile lamprey migrating through a hydroelectric facility. In other words, no studies currently exist that document the level of survival attributed to a project's operations, nor does an accepted technology currently exist that would achieve this level of assessment for juvenile lamprey.

In lieu of being able to directly measure survival for juvenile lamprey passing through the Wells Project, the Aquatic RWG proposes to conduct an updated literature review which will compile all of the available information regarding juvenile lamprey survival at hydroelectric projects in

the Columbia River Basin. Additionally, a field study will be implemented during the 2-year ILP study period to assess the significance of juvenile lamprey in the diets of predatory fishes and birds present in the Wells Dam forebay and tailrace. Stomach samples of both predatory fishes and birds will need to be obtained and an effort will be made to coordinate with pre-existing activities that may already be collecting such specimens (An evaluation of the effects and alternatives to the existing piscivorous bird and mammal control program (Terrestrial Issue 6.2.3.1)).

A technical report summarizing the results of this study will be produced to provide a current state-of-the-science assessment of juvenile lamprey survival to address the issues raised by the Aquatic RWG. Furthermore, the results of the study will inform future Wells Project relicensing decisions by assessing the effectiveness of existing predator control programs (which have traditionally targeted salmonid predators) for juvenile lamprey.

6.3.1.2 An Assessment of Adult Pacific Lamprey Spawning within the Wells Project (6.2.1.2)

The Aquatic RWG is proposing a study intended to examine the effects of Wells Project operations on adult Pacific lamprey (*Lampetra tridentata*) habitat, specifically spawning habitat. Currently, the information available in the mid-Columbia River on adult Pacific lamprey addresses only their migration through hydroelectric projects. No studies have been conducted to examine the presence of spawning within a Project area and further whether Project operations impact lamprey spawning.

The study proposes to identify sites within the Wells Project where suitable spawning habitat may be available through an analysis using Geographic Information Systems (GIS). These sites will be field verified for suitability prior to the implementation of a field study. The field study will consist of spawning surveys throughout the lamprey spawning period (typically May to July) in 2008. If spawning activity is observed, an analysis will be conducted to examine whether Wells Dam operations have an effect on lamprey spawning habitat.

A technical report summarizing the results of this study will be produced to help fill the information gap identified by the Aquatic RWG. The results of the study will assist the Aquatic RWG in future Wells Project relicensing decisions.

6.3.1.3 Adult Pacific Lamprey Passage and Behavior Study (6.2.1.3)

The Aquatic RWG is proposing a study to examine the effects of the Wells Project and its operations on the migration of adult Pacific lamprey (*Lampetra tridentata*). To perform this study, Douglas PUD will undertake a radio-telemetry study to assess migration and passage characteristics of adult lamprey migrating through Wells Dam. Adult lamprey will be captured in the fishways at Wells Dam during August and September 2008. All captured lamprey meeting specific size criteria will be tagged, and released at or below Wells Dam. A combination of fixed-station monitoring at Wells Dam will be used to determine migration and passage characteristics of these tagged fish.

A technical report summarizing the results of this study will provide the resource information needed to inform relicensing decisions related to adult lamprey passage through Wells Dam.

6.3.1.4 Assessment of DDT and PCB in Fish Tissue and Sediment in the Lower Okanogan River (6.2.1.4)

The Aquatic RWG is proposing a study to determine collect more information with regards to DDT and PCB in the lower Okanogan River within the Wells Project Boundary and its potential human health effects related to recreational activities (fishing, swimming and boating). The study will collect and analyze for the presence of toxins in fish tissue and at specific recreation sites located on the lower Okanogan River. These samples will be collected in an effort to address the human health concerns brought forth by the Aquatic RWG.

In 2001-2002, WDOE conducted a technical assessment in support of the development of a Total Maximum Daily Load (TMDL) for 1,1,1-trichloro-2,2-*bis*[*p*-chlorophenyl]ethane (DDT) and polychlorinated biphenyls (PCBs) in the Lower Okanogan River. For the purposes of the 2001-2002 assessment, the Lower Okanogan River was defined as the portion of the river from the U.S./Canadian border at Lake Osooyos (RM 80.2) downstream to the town of Monse (RM 5.0). During this assessment, various mediums (water, sediment, and fish tissue) at various locations in the Okanogan River were assessed for concentrations of DDT and PCB. This study will augment the previous information collected during the development of the TMDL and will be consistent with the recommendations of the Water Quality Implementation Plan (WDOE, 2006) submitted by WDOE which provides recommendations to assure that DDT and PCB concentrations in the waters and fish tissues from the Okanogan River and its tributaries continue to improve with the goal of meeting the regulatory standards for these persistent bioaccumulative toxins.

Sampling locations for fish during the study will include all accessible reaches of the lower Okanogan River within Project boundary (RM 15.5 to RM 0.0). Sampling sites for sediment will include recreational sites of concern (e.g. swimming areas and boat launches) from the Okanogan River mouth up to RM 15.5. Study implementation is planned for the 2-year ILP study period (2008-2009) with sampling occurring in May 2008. Sampling frequency, timing, and methodology as well as sample analysis will be consistent with the 2001-2002 WDOE TMDL Technical Assessment as outlined in Serdar (2003) and WDOE's "Water Quality Certification for Existing Hydropower Dams: Preliminary Guidance Manual (September 2004)."

A technical report of the study will be produced to assist the Aquatic RWG in determining the concentration of DDT and PCBs in recreational fish species and in swimming areas of the lower Okanogan River within Project boundary. The information may inform the development of an appropriate information and education program to address the human health risks towards recreational use by the public in the lower Okanogan River.

The Washington State Department of Ecology (WDOE) will use this information during their development of a 401 water quality certificate for the Wells Project.

6.3.1.5 An Investigation into the Total Dissolved Gas Dynamics of the Wells Project (6.2.1.5)

The Aquatic RWG is proposing a study to further examine the TDG production dynamics at the Wells Project. The specific objectives of this study are contingent upon the results from TDG studies scheduled for 2006 and 2007. TDG may become a water quality concern when gases supersaturate a river, lake or stream. The plunging water caused by spill at hydroelectric facilities may elevate TDG to levels that result in impaired health or even death for aquatic life residing or migrating within the affected area. Since 2003, Douglas PUD has been engaged in the assessment of TDG production dynamics at Wells Dam.

In spring of 2006, Douglas PUD examined whether or not operational scenarios (i.e. spill shaping) were able to minimize TDG production to a level that is capable of meeting the Washington State water quality standard for TDG production at Wells Dam during high flows up to 7Q10 flows (246 kcfs at Wells Dam). The 7Q10 flow is defined as the highest average flow which occurs for seven consecutive days in a once-in-ten-year period. At 7Q10 flows and above, water quality standards for TDG do not apply. Preliminary results of the study (EES et al., 2006) suggest that at 7Q10 flows specific operating scenarios that concentrate spill flows (crowned spill and full gate shapes) produce significantly lower levels of TDG in the Wells Dam tailrace. Further analysis of the data will provide a logical framework in which to base decisions focusing on the scope of continued TDG activities (i.e., more spill studies, modeling,) at Wells Dam during the 2-year ILP study period. Contingent upon the results of the 2006 and 2007 TDG studies, additional research into TDG at Wells Dam may or may not be needed. The Washington State Department of Ecology (WDOE) will use this information during their development of a 401 water quality certificate for the Wells Project.

6.3.1.6 Development of a Water Temperature Model Relating Project Operations to Compliance with the Washington State and EPA Water Quality Standards (6.2.1.6)

The Aquatic RWG is proposing a study to develop a water temperature model for assessing project effects on water quality. In 2005, Douglas PUD began the initial steps for the development of a water quality model through the collection of detailed bathymetric, meteorological and water temperature data. With guidance from consultants with expertise in water quality modeling, Douglas PUD identified the CE-QUAL-W2 (W2 model) model as being appropriate for assessing temperature effects of the operation of the Wells Project. The W2 model is widely used to support the establishment of TMDLs for Washington waters and is the generally accepted model for evaluating the effects of hydroelectric projects on state waters. Therefore, the W2 model was considered the basis for making decisions regarding data needs and data archiving.

Starting in 2005, Douglas PUD conducted a data review and data gap analysis which resulted in the implementation of a data collection program to ensure that the appropriate model-specific parameters were being collected from within and adjacent to the Wells Project. Data collected during the new monitoring program are being archived in a format that is complementary to future water quality modeling efforts. This data collection program was initiated in 2006 and will continue through 2007 for use in model development during the ILP study period.

Methodologies for W2 model development consist of a data collection component and a model development/implementation component. The data collection component in W2 model development consists of activities such as site review and field reconnaissance, data gap analyses, preliminary data collection design and implementation of data collection programs. The model development/implementation component consists of model input data preparation, model development, hydrodynamic and temperature calibration, sensitivity analyses and hypothesis testing. Douglas PUD is currently (2005-2007) implementing the data collection component.

W2 model development and implementation will proceed in consultation with the Aquatic RWG. Model results will clarify the effects of Project operations as they relate to the state's narrative and/or numeric standards for temperature and will produce model output that will be used during the 401 water quality certification process for the Wells Project.

6.3.1.7 Continued Monitoring of DO, pH and Turbidity in the Wells Forebay and Lower Okanogan River (6.2.1.7)

The Aquatic RWG is proposing a study aimed at collecting additional DO, pH, and turbidity data from within the Wells Project. Douglas PUD and other state and federal agencies have monitoring programs in place that collect water quality information related to these parameters at various scopes and frequencies. This study will augment the established sampling regimes and will provide additional information related to DO, pH and turbidity from within the Wells Project.

Sampling locations for the study are the Lower Okanogan River within Project boundary and the Wells Dam forebay. Study implementation is planned for 2008 with sampling occurring during periods where the probability of exceedance with the water quality standard is highest (between mid-July and mid-September).

A technical summary of the monitoring study will be produced to assist the Aquatic RWG in determining whether the Wells Project is in compliance with the state's water quality standards for these parameters which are a necessary component of the 401 water quality certification process.

6.3.2 Recreation and Land Use RWG

6.3.2.1 Evaluation of Public Access to and Use of Wells Reservoir as it Relates to Reservoir Fluctuations, Aquatic Plants and Substrate Buildup (6.2.2.1, 6.2.2.2 and 6.2.2.3)

The Recreation and Land Use RWG is proposing a study to evaluate whether the Wells Project recreation facilities, such as docks, boat launches and swimming areas, can be reasonably accessed under various reservoir operating scenarios. The study will analyze accessibility to boat docks and launches during low reservoir elevations, evaluate how reservoir elevations affect on-water boating experiences and will evaluate whether aquatic plant growth and substrate buildup at public access sites is restricting public use of Project waters.

The results of this study will be used to help Douglas PUD and recreation management entities to identify existing access issues that should be addressed during the development of protection, mitigation and enhancement measures.

6.3.2.2 An Evaluation of Recreational Needs within the Wells Project (6.2.2.4, 6.2.2.5, 6.2.2.6 and 6.2.2.7)

The Recreation and Land Use RWG is proposing a study to evaluate future recreation needs associated with the operation of the Wells Project. The purpose of the Recreation Needs Analysis is to evaluate recreational use information and identify current and future recreation needs within the Wells Project boundary. The needs analysis will identify recreation needs within the Project that recreation resource managers should strive to address during the term of the new license.

The needs analysis will evaluate existing recreation use data, assess the current condition of existing facilities, and identify potential enhancements to meet current and future recreation needs. The results of this study will be used to help Douglas PUD identify existing and future recreation needs so that protection, mitigation, and enhancement measures can be developed for the new license term.

6.3.3 Terrestrial RWG

6.3.3.1 An Evaluation of the Effects and Alternatives to the Existing Bird and Mammal Control Programs (6.2.3.1)

The Terrestrial RWG is proposing a study to evaluate the effects and to develop alternatives to the existing bird and mammal control programs. Douglas PUD currently implements several bird and mammal control programs that are primarily related to fish survival goals within the Wells Habitat Conservation Plan (HCP).

The Wells HCP requires Douglas PUD to implement a predator control program. The goal of the predator control program is to reduce the number of juvenile salmon and steelhead that are consumed by predators. Both the hatchery and predator control programs are important in meeting the No Net Impact (NNI) survival goals in the Wells HCP.

The primary objectives of the study are: (1) Identify and count the current and historic number and species of birds and mammals feeding on fish at the Project hatcheries and in the Wells Tailrace; (2) Assess the potential impacts of mortality caused by piscivorous birds and mammals to ESA listed, sensitive and recreationally important species; (3) Describe each of the existing nuisance wildlife control measures, including species targeted, reason for control, frequency of control and effectiveness of the control method; and (4) Evaluate alternatives, including the costs and benefit of each measure recommended**.** The study will provide alternative methods of preventing predation of fish at the Wells Project and in hatchery rearing ponds.

6.3.3.2 Plant and Wildlife Surveys and Cover Type Mapping for the Wells Hydroelectric Project 230 kV Transmission Corridor (6.2.3.2 and 6.2.3.3)

The Terrestrial RWG is proposing a study to assess the effects of the Project's 230kV transmission line and associated corridor on wildlife. This proposed study is intended to fill the gaps in local knowledge of botanical resources, including rare, threatened and endangered (RTE) plants, invasive plant species, and vegetation communities within the 230-foot Wells Project 230 kV transmission line corridor. The study will also provide bird species presence, identify if bird collision, with the line and structures, is a problem and provide information on the extent of use and dependency on the transmission corridor by sage grouse (*Centrocercus urophasianus)* and sharp-tailed grouse (*Tympanuchus phasianellus*), both RTE species. Surveys will also be conducted for RTE mammals and reptiles. The study plan outlines methods that will be used to collect information on these plants and animals.

6.3.4 Cultural RWG

6.3.4.1 Cultural Resources Investigation (6.2.4.1)

The Cultural RWG is proposing a Cultural Resources Investigation to resolve existing gaps in knowledge of cultural resources in the Area of Potential Effect (APE). The Cultural Resource Investigation will identify and revisit all previously recorded historic properties within the APE, update the current location and condition of each site, update the site forms for each site, develop a prioritized list of sites and evaluate whether they are eligible for the National Register of Historic Places (NRHP), and evaluate the Project's effects on historic properties identified within the FERC Project Boundary.

The results of this study will be used to develop protection, mitigation, and enhancement (PME) measures for historic properties in the Wells Project APE. The PME measures will be incorporated into the Historic Properties Management Plan which will be filed with FERC along with the final license application in May, 2010.

6.4 Issues Identified as Not Appropriate for Study

RWG members raised a variety of issues throughout the course of RWG meetings. All issues and issue determination statements were fully discussed over the course of the meetings with efforts made to apply FERC's seven criteria to each issue. The RWG members mutually determined that these issues were not for study for various reasons, such as no nexus to project operations; a study is not feasible; lacks statistical precision or rigor; existing information is adequate to address the issue; and study information would not inform future license articles. Douglas PUD believes that it is important to document these issues, although it is not proposing to study these issues.

6.4.1 Aquatic RWG

6.4.1.1 Operations of the Project may affect juvenile Pacific lamprey habitat including availability of habitat at various juvenile life stages.

Issue Determination Statement

The work group agrees that juvenile lamprey are likely mobile and robust organisms capable of avoiding the fluctuation zone. An evaluation of actual juvenile lamprey use of identified habitats is problematic due to an inability to accurately capture, mark and recapture juvenile ammocoetes within the deep water habitats of the Wells Project. In addition, there are no statistically rigorous methodologies to accurately assess juvenile lamprey abundance and distribution. Lastly, the preferred collection mechanism, electro-shocking, is not advisable within the Wells Project due to the presence of ESA-listed fish, including steelhead, spring Chinook and bull trout.

Accurate population assessment methodologies have not been developed for juvenile lamprey and studies would be limited by available sampling technology. Therefore, a juvenile lamprey habitat assessment would not be sufficiently reliable to identify project effects during the two-year ILP study period. Therefore, a two-year ILP study would not contribute to the development of future license requirements.

The resource work group agrees that a study on the effects of the Project on juvenile lamprey rearing habitat cannot be completed during the two-year ILP study period.

6.4.1.2 The Wells Project may be affecting white sturgeon habitat and carrying capacity.

Issue Determination Statement

The current estimate of the white sturgeon population in the Wells Project ranges from 20-50 adult fish based on a 2001-2002 assessment. The effect of the Project on these fish and their habitat is unknown. The white sturgeon population in the Wells Reservoir is so small that establishing a habitat suitability curve for white sturgeon is not feasible. Given their low numbers, it is likely that white sturgeon are utilizing only high quality habitat within the Wells Project. Furthermore, little is known about white sturgeon habitat and preference other than their preference for deep water habitats which is not lacking in the Wells Project. Project operations are not thought to affect deepwater habitats and there is little evidence to suggest that white sturgeon habitat is adversely affected.

A carrying capacity estimate could be developed; however, the accuracy of such an estimate is in question given the dynamic nature of a lotic system. Additionally, there are a multitude of factors which may affect the carrying capacity of a population making it difficult to assess effects directly attributed to Wells Project operations versus other cumulative effects.

The development of carrying capacity estimates would not be reliable because of low abundance of the subject species, the inability to conduct a statistically meaningful study, and the inability to accurately assess the effects of Wells Project operations on white sturgeon carrying capacity. Additionally, a study on potential habitat alterations is not needed because no alterations are proposed.

The resource work group does not believe that a carrying capacity and habitat assessment can be completed during the two-year ILP study period. However, other relicensing processes in the mid-Columbia River basin are currently finalizing white sturgeon management plans. These

plans propose upfront implementation of augmentation programs. The RWG agrees that the most appropriate time to implement a carrying capacity and habitat assessment would be several years after an augmentation program has boosted sturgeon numbers to a population level that can be effectively captured, tagged and evaluated. The RWG agrees that a proposed white sturgeon augmentation strategy in the Wells Reservoir should be implemented prior to the initiation of studies to determine the carrying capacity of the Wells Reservoir for juvenile and adult white sturgeon.

6.4.1.3 The Wells Project may affect white sturgeon genetics and productivity related to spawning, rearing, recruitment and upstream and downstream passage (entrainment/recruitment).

Issue Determination Statement

The Wells Project currently restricts upstream passage of adult sturgeon. Additional passage information is not needed because 8 projects downstream of Wells Dam also block adult sturgeon from migrating from the lower Columbia River to areas upstream of Wells Dam. Further, the population of sturgeon in the Rocky Reach Reservoir is small (less than 50 adults) and not likely limited by habitat within that reservoir.

Sturgeon typically spawn in the tailraces of Columbia River dams. This is also expected to be the case in the Wells tailrace. Because Wells Dam is a run-of-river project, flow and temperature manipulations to assist in sturgeon spawning are not feasible.

The sturgeon population found within the Wells Reservoir is small (20-50 adults fish) and juvenile fish are present within the population. This population is expected to spawn in the Chief Joseph tailrace, which is outside of the Wells Project boundary. Early rearing is expected to take place within the Wells Project; however, because the adult population is relatively small and because spawning is infrequent and sporadic, the ability to study spawning effectiveness and recruitment during the two-year ILP study period is not feasible or meaningful.

Augmentation has been suggested as a means to increase the population size to a level that could provide meaningful study results. The resource work group has discussed the potential to enhance the sturgeon population via the implementation of an augmentation program (during the term of the new license) similar to the other mid-Columbia PUDs (Grant and Chelan County). Longer-term monitoring of recruitment would be conducted after an augmentation program has been initiated and additional adult fish are present within the Project.

The resource work group agrees that a study is not needed during the two-year ILP study period. The group recommends that additional sturgeon information be collected during the new license term.

6.4.1.4 There may be an opportunity to shift a portion of the existing off-site resident fish program to enhance recreational fishing opportunities within the Wells Reservoir without conflicting with the current fish assemblage, ESA-listed species and recovery goals.

Issue Determination Statement

Existing information on the resident fish assemblage from studies published in 1974, 1979, 1983, 1994 and 1999 provides helpful baseline information. The resource work group agrees that a study is not needed during the two-year ILP study period because current off-site mitigation is appropriate considering the potential negative interaction within the Wells Project with ESA-listed species (steelhead, spring Chinook and bull trout). In addition to these conflicts, planting trout within the Wells Reservoir would also conflict with ESA recovery goals.

6.4.1.5 Fluctuations in the Wells Reservoir, including those caused by system-wide energy requirements, may affect the ecosystem (i.e., allochthonous inputs into the system). This may include impacts on aquatic and wetland plant communities, fish use and macroinvertebrates.

Issue Determination Statement

The existing aquatic and wetlands plant communities have evolved over the past forty years of Wells Project operations. Douglas PUD is not proposing to change Project operations during the next license term. Aquatic and wetland plant distribution studies conducted in 2005 document the presence of robust communities which are indicative of the long-term effects of reservoir fluctuation on these plant communities. Mobility of fish and macroinvertebrates has allowed these species to adapt to the areas affected by reservoir fluctuations.

Existing information is adequate to assess impacts on aquatic and wetland plant communities to address this issue. The resource work group agrees that a study is not needed during the two-year ILP study period.

6.4.1.6 The Wells Project may affect Bull Trout survival and habitat.

Issue Determination Statement

There is consensus by the group that the Bull Trout Monitoring and Management Plan (Plan), which has been approved by FERC and the U.S. Fish and Wildlife Service, is sufficient to address this issue. The Plan was implemented beginning in December 2004 and will continue into 2008. The Plan consists of the implementation of a 3-year adult bull trout radio-telemetry study to assess bull trout take in association with the operation of Wells Dam, the PIT-tagging and collection of genetic samples from limited numbers of bull trout collected both on and off-site, continued winter fish passage monitoring, and the assessment of potential stranding areas during significant reservoir fluctuations. The group also agrees that the results of the Plan will be meaningful to relicensing in that it will help determine continued measures to protect bull trout during the new license term.

6.4.1.7 The Wells Project may contribute to the spread of aquatic invasive species.

Issue Determination Statement

Aquatic Invasive Species (AIS) introductions present a significant risk to the Wells Reservoir and the reservoir could contribute to the spread of AIS into other waters within the state. AIS enter western states' waters from a number of different pathways, including recreational watercraft. The potential costs in both economic and environmental impacts of an AIS invasion could be significant.

In 2005, Douglas PUD completed a baseline Aquatic Macroinvertebrate Inventory, a species inventory and distribution mapping study of the Wells Project macrophyte communities, and a limnological investigation that inventoried plankton species within the Wells Project. All three studies, in combination with the recent resident fish assemblage study (1999), suggest that the current Wells Project aquatic community is predominantly composed of native flora and fauna with relatively minimal disturbance from non-native species that were not introduced for specific purposes (i.e., fish introduction for recreational purposes). These studies add to our knowledge of non-native species presence and abundance within the Wells Project and provide sufficient baseline information. Although existing data from baseline studies is sufficient, Douglas PUD will continue monitoring for zebra mussel presence in the Wells Project in coordination with the Washington Department of Fish and Wildlife (WDFW) Aquatic Nuisance Species program. This monitoring program will be helpful in determining whether new species are being introduced to the Project or if prevention programs are working well.

The resource work group agrees that this is not an issue that needs further study during the two-year ILP study period as currently available information and continued activities are sufficient Future needs to monitor, evaluate, and address invasive nuisance species will need to be fully discussed and evaluated along with all other PMEs proposed for aquatic species.

6.4.1.8 The Wells Project should continue resident fish production at the Wells Hatchery.

Issue Determination Statement

The resource work group agrees that continuing the existing off-site resident fish program is important to mitigate for the ongoing Project effects to resident fish. Rationale for conducting this mitigation off-site is tied to potential conflicts with the Wells HCP and ESA recovery goals for anadromous species. Potential on-site conflicts with ESA-listed species include such things as predation, competition and disease transmission. The existing off-site 20,000 lbs. resident fish program adequately mitigates for the ongoing Project effect to resident fish in the Wells Project.

The resource work group agrees that this is not an issue requiring a study during the two-year ILP study period.

6.4.2 Recreation and Land Use RWG

6.4.2.1 Ownership of Project lands and Douglas PUD's Land Use Policy may affect the use and development of the waterfront, adjacent properties and recreational use (eg. hunting, fishing, dock permitting and vegetation management).

Issue Determination Statement

Douglas PUD owns the reservoir shoreline; this is unique among Columbia River hydroelectric projects as most hydro development on the Columbia River has taken place through the acquisition of flowage easements. Douglas PUD's Land Use Policy limits use of Project lands to activities that are consistent with its FERC License and have received the applicable local, state, federal and tribal permits. The Land Use Policy governs all activities on Project lands such as trespassing, the installation of boat docks, water systems, fences, landscaping and agriculture (see Land Use Policy). In addition to the Land Use Policy, the "Reservoir As Habitat" section of the Wells HCP allows resource agencies and tribes to comment on pending permit applications.

Douglas PUD has no plans to divest ownership of any project land holdings within the Wells Project boundary. The resource work group agrees that no additional information is needed to address this issue and a study is not recommended during the two-year ILP study period. Douglas PUD's land management practices will be examined through the license application development process. Further measures to protect the existing recreation and land use resources may be warranted.

6.4.2.2 The development of recreation plans in the new license will consider improvements to the current Recreation Action planning process.

Issue Determination Statement

According to stakeholders, the existing process is overly cumbersome and delays implementation of various actions. A new process should be developed to address these concerns. The new planning process should focus on improving communication between stakeholders, the FERC and Douglas PUD. The current recreation action planning process is a component of the existing license. Recreation planning under the new license, if required by FERC, may be significantly different than the current process.

The resource work group agrees that no new information is needed to address this issue during the two-year ILP study period. However, Douglas PUD will work with stakeholders to examine areas for potential improvements to the current recreation action planning process.

6.4.2.3 The Wells Project may affect the economics of the cities, counties and Colville Tribes adjacent to the reservoir (eg. O&M funds for recreation facilities, municipal and business infrastructure, tax base, emergency services, community services and water table).

Issue Determination Statement

There are many variables that could affect the economic health of a city or county. Studying effects on municipal and business infrastructure, tax base, emergency services and community services, with all possible variables considered, does not have a readily discernible linkage to the Wells Project. Specific individual components of this issue do have an association with the project and its operation, including Operations and Maintenance (O&M) support for recreation facilities located within the counties and within each of the three cities.

The resource work group agrees that a study is not needed during the two-year ILP study period. However, Douglas PUD proposes to work with stakeholders on the issue of O&M funding for existing and potential recreation facilities through the development of Protection, Mitigation and Enhancement (PME) measures.

6.4.2.4 Water use at city parks may affect the availability of water for future city development.

Issue Determination Statement

Under the terms of the original FERC operating license for Wells Dam, Douglas PUD constructed recreational facilities in the cities of Pateros, Brewster and Bridgeport. Douglas PUD has continued to provide funding for major maintenance and improvements to these facilities. Each of the respective Cities provides routine operation and maintenance funding for ongoing operation of the facilities located within their respective communities. One component of this responsibility is to provide water for drinking and for irrigation. Because water rights in the communities are limited, the Cities would like to utilize the water rights being used for the public recreation facilities for other potential development needs.

The parks were originally constructed to provide access to Project lands and waters. Douglas PUD has arranged to provide major maintenance to these facilities to a level that allows continued access to the Project.

The resource work group agrees that a study is not needed during the two-year ILP study period. Douglas PUD proposes to work with the Cities during the relicensing process to develop options for addressing this issue.

6.4.3 Terrestrial RWG

6.4.3.1 Ownership or transfer of Project lands and the implementation of Douglas PUD's Land Use Policy could affect wildlife habitat and species diversity. Project land management activities, such as issuing permits, conducting weed and/or erosion control and other activities may result in different levels of wildlife impacts/protection, including habitat fragmentation and succession.

Issue Determination Statement

Douglas PUD owns land within the Project boundary in fee title. This is unique among Columbia River hydroelectric projects as most hydro development has taken place through the acquisition of flowage easements. Douglas PUD's Land Use Policy limits use of Project lands to activities that are consistent with the policy and have received the applicable local, state, federal and tribal permits. The Land Use Policy governs all activities on Project lands such as the installation of boat docks, water systems, fences, landscaping and agriculture (see Land Use Policy). In addition to the Land Use Policy, the "Reservoir As Habitat" section of the Wells HCP allows resource agencies and tribes to comment on pending permit applications.

Ownership of Project lands has produced greater benefits for wildlife and wildlife habitat compared to what is provided by flowage easements. Therefore, ownership of Project lands is preferred over flowage easements. The group also agrees that Douglas PUD's Land Use Policy effectively regulates impacts to wildlife and wildlife habitat. The group supports Douglas PUD's plan to retain ownership of lands within the Project boundary.

Douglas PUD has completed the following studies related to this issue:

- Wildlife and RTE Inventories (Avian, amphibian, reptile, and small mammal surveys)
- Botanical Resources Studies (Cover type mapping, RTE plant surveys, and invasive species surveys)

Cultural resource assessments, to be conducted during relicensing, will further refine areas to be protected.

Douglas PUD's land management practices will be examined through the license application development process. Measures to protect the existing terrestrial resources will be addressed in the Land Management Plan.

Information provided by the baseline studies is sufficient for development of relicensing measures to address this issue. The resource work group agrees that a study is not needed during the two-year ILP study period.

6.4.3.2 The presence of the Project, specifically the reservoir, is one factor of many that could attract development adjacent to Project lands. Additional development could result in more people using the reservoir and, therefore, could increase disturbances to wildlife and wildlife habitat within the Project.

Issue Determination Statement

Douglas PUD has no legal authority to restrict private development adjacent to the Wells Project but its Land Use Policy does restrict the ability of adjacent landowners to develop and make improvements to Project lands. Douglas PUD owns the shoreline and is required to regulate development within the Project boundary. Douglas PUD actively patrols the reservoir to monitor compliance with the Land Use Policy. Monitoring needs will be considered in the development of the Land Management Plan.

Development activity on adjacent private lands is a function of a myriad of factors including general national and regional economic conditions, demographic trends in public preferences for leisure and recreation, interest rates, property taxes, availability of other nearby lands, proximity to social infrastructure (e.g. schools and hospitals) and numerous other factors. In addition, municipal and county zoning ordinances can significantly affect land development.

Additional information will not resolve this issue or produce results meaningful to relicensing. The resource work group agrees that Douglas PUD should retain ownership in fee title of Project lands and continue implementing its Land Use Policy. The resource work group agrees that a study is not needed during the two-year ILP study period.

6.4.3.3 The frequency, timing, amplitude and duration of reservoir fluctuations may affect wildlife and wildlife habitat.

Issue Determination Statement

In 2005, Douglas PUD completed the following studies that are relevant to this issue:

- Macrophyte Identification and Distribution Study
- Wildlife and RTE Inventory (Avian, amphibian, reptile, and small mammal surveys)
- Botanical Resources (Cover type mapping, RTE plant surveys, and invasive species surveys)

In addition, Douglas PUD has provided information depicting the past operation of the Project related to reservoir fluctuations.

Based on prior studies of wildlife and the recent baseline studies, impacts to wildlife and wildlife habitat due to reservoir fluctuations appears to be limited to waterfowl nesting, specifically Canada goose nesting on the Bridgeport Bar Islands. Reservoir fluctuations also limit the establishment of emergent and shoreline vegetation, reducing habitat for dabbling ducks, geese and other wildlife that utilize riparian and wetland habitat. The resource work group also expressed concerns that future changes to how the project is operated could negatively affect the high quality macrophyte beds located within the Wells Reservoir. These beds are vital to overwintering waterfowl. Overwintering waterfowl are an important food base for bald eagles and are important to outdoor recreation, principally waterfowl hunting.

There is no evidence of negative effects to RTE wildlife species, including bald eagles and white pelicans, which appear to be thriving along the Wells Reservoir.

Canada goose nesting may be impacted on Bridgeport Bar Islands if the Wells Reservoir elevation is lowered during the spring. During low reservoir elevations, predatory mammals are provided easier access to the goose nesting islands adjacent to the Bridgeport Bar Wildlife Area. Canada geese are very abundant in the area, and in some public places, such as parks and golf courses, geese are considered a nuisance. Canada geese are also actively hunted during the fall and winter months and provide an important form of recreational hunting within the Project.

Douglas PUD is not proposing to change future operations of the Wells Project. Douglas PUD recently signed an agreement to continue to participate in the Hourly Coordination Agreement which is the main influence on reservoir fluctuations. The wildlife conditions on Wells Reservoir have evolved under the existing operating regime and will continue under the future regime. Future changes to existing project operations should include an assessment of potential impacts to aquatic vegetation.

The group concludes that the 2005 aquatic vegetation distribution assessment is adequate in documenting the existing aquatic vegetation community. However, periodic monitoring of macrophytes in the reservoir may be beneficial during the term of the new license. Impacts to

riparian and wetland habitats for dabbling ducks, geese and other wildlife are mitigated through the ongoing management and operation of the Wells Wildlife Area.

The resource work group agrees that a study is not needed during the two-year ILP study period because changes in operations are not being proposed and because good baseline information exists.

6.4.3.4 The reservoir could affect the movements and migration abilities of mule deer.

Issue Determination Statement

There is sufficient information pertaining to mule deer movements, migrations and populations in the region. Mule deer are a common and abundant game species in the region, including within the Wells Project, and are actively hunted during fall months.

The resource work group agrees that a study is not needed during the two-year ILP study period to address this issue.

6.4.3.5 The Project could affect winter habitat for mule deer and sharp-tailed grouse.

Issue Determination Statement

Evidence of Project related adverse impacts to mule deer or sharp-tailed grouse have not been identified.

Sharp-tailed grouse populations have declined state-wide and are currently a state-threatened species. Riparian habitat for game and non-game species has increased since the project was built. The Wells Wildlife Area and other lands managed for wildlife purposes have significantly contributed to the preservation and enhancement of game and non-game species within the Project. Both mule deer and sharp-tailed grouse occur on the Wells Wildlife Area, which is funded by Douglas PUD.

No Project operational impacts have been identified on these species. The resource work group agrees that a study is not needed during the two-year ILP study period to address this issue.

6.4.3.6 The Project could affect terrestrial RTE species.

Issue Determination Statement

In 2005, Douglas PUD completed the following studies that are relevant to this issue:

- Wildlife and RTE Inventory (Avian, amphibian, reptile, and small mammal surveys)
- Botanical Resources Studies (Cover type mapping, RTE plant surveys, and invasive species surveys)

The following RTE species have been documented in the Wells Reservoir:

- Bald eagle (*Haliaeetus leucocephalus*) – Federal threatened/State threatened

- Sharp-tailed grouse (*Tympanuchus phasianellus*) – State threatened
- American White Pelican (*Pelecanus erythrorhynchos*) – State endangered
- Little bluestem (*Schizachyrium scoparium*) – State threatened

Future land management, recreation planning and operational decisions will avoid, minimize or mitigate impacts to federal RTE species. Future land management, recreation planning and operational decisions will consider impacts to state RTE species.

The resource work group agrees that a study is not needed during the two-year ILP study period related to federal RTE species on the Wells Reservoir.

6.4.3.7 Changes in funding for operations and maintenance of the Wells Wildlife Area may affect wildlife habitat, wildlife abundance and species diversity.

Issue Determination Statement

The intent of the Wells Wildlife Area was to mitigate for the loss of wildlife habitat due to the construction and operation of the Wells Project. Specifically, the wildlife mitigation agreement was intended to benefit wildlife in close proximity to the Wells Reservoir. The mitigation program was initially focused on providing upland game bird recreation (e.g. quail and pheasant hunting). Originally, the program included the planting of game birds for harvest purposes. The scope of WDFW's program has changed to emphasize habitat improvements for natural production of game birds. This management direction shift has provided additional benefits to a wide assemblage of game and non-game species.

Since 1996, Douglas PUD has provided supplemental annual funding for the operation of the Wells Wildlife Area. Wildlife and wildlife habitat would be adversely impacted if funding for the Wells Wildlife Area is reduced.

Funding for the Wells Wildlife Area expires with the existing license. The level and adequacy of operations and maintenance funding will need to be determined during the PME development phase of relicensing.

The resource work group agrees that a study is not needed during the two-year ILP study period to address this issue.

6.4.3.8 Public use (recreation) of the Project may affect wildlife and wildlife habitat.

Issue Determination Statement

The Project is one of many factors that could attract recreational use. Recreation development activities within the Wells Project are controlled through Douglas PUD's Land Use Policy. Douglas PUD strives to provide safe and efficient access to appropriate Project land and waters. Douglas PUD cannot control recreational use within the Wells Reservoir. The group agrees that recreation activities, including but not limited to, water skiing, boating, fishing, camping and hunting, may have an effect on wildlife within the Project. Any Land Management Plan in the

new license will consider potential impacts of recreational use on wildlife and wildlife habitat. Further measures to protect the existing terrestrial resources may be warranted.

Existing information provided in the baseline studies is sufficient for making future land management decisions. The resource work group agrees that a study is not needed during the two-year ILP study period to address this issue.

6.4.3.9 The Project, as presently operated, contains significant waterfowl habitat that should be protected during the next license. In particular, the Wells Reservoir provides regionally-important winter habitat for waterfowl.

Issue Determination Statement

The Wells Reservoir, under its current operational regime, will continue to provide habitat for waterfowl and other wildlife. This issue could become important if Douglas PUD were to change Project operations. Any significant changes to the operations would require FERC approval and input from state and federal agencies. Douglas PUD is not proposing to change operations under the new license.

Existing baseline information (Macrophyte identification, distribution and abundance and Wildlife inventories) provides sufficient information regarding the need to preserve the existing waterfowl habitat contained within the Wells Project. The resource work group agrees that a study is not needed during the two-year ILP study period to address this issue.

6.4.3.10 Periodic operations of the Wells Reservoir to remove the buildup of sediment at the mouth of the Methow River may affect the development of sand bars, cobble bars and wildlife habitat.

Issue Determination Statement

When Methow River flows are predicted to be above 10,000 cfs, Douglas PUD operates the Wells Reservoir to allow sediment to pass through the Methow River confluence. This occurs approximately every 8-10 years. This is done to prevent sediment buildup at the boat launches and swimming areas and to allow navigation in the confluence of these two rivers. There is no evidence that this practice is impacting specific wildlife species.

The Wells Wildlife Area serves as mitigation for the impacts of the Wells Project on wildlife species including reservoir fluctuations and sediment control operations. Any potential impacts from this activity could be addressed through continued funding of the Wells Wildlife Area program.

The resource work group agrees that a study is not needed during the two-year ILP study period to address this issue.

6.4.3.11 Project caused erosion may influence wildlife habitat and wildlife species abundance and diversity.

Issue Determination Statement

Shoreline conditions vary throughout Wells Reservoir. The majority of shoreline is stable and vegetated, while other areas have varying degrees of erosion.

Erosion is an ongoing natural process, making the influence of the Wells Project difficult to determine. However, there is no evidence that important wildlife species or wildlife habitats are being affected by Project induced erosion.

Douglas PUD has completed the following studies related to this issue:

- Wildlife and RTE Inventory (Avian, amphibian, reptile, and small mammal surveys)
- Botanical Resources Studies (Cover type mapping, RTE plant surveys, and invasive species surveys)
- Lower Okanogan River Erosion Evaluation Project Report

The resource work group has determined that the impacts to wildlife species due to project induced erosion are scattered and, in total, are nominal. The group also has determined that existing information is adequate and a study is not warranted during the two-year ILP study period. Identified occurrences of concern to terrestrial resources will be addressed on a case-by-case basis.

6.4.4 Cultural RWG

There are no Cultural RWG issues identified as not appropriate for study.

7.0 REFERENCES CITED

Access Washington, Official State Government Website. 2003. 2003 Washington State Data Book; County Profiles.
http://www.ofm.wa.gov/databook/county/default.asp (Accessed June 2005)

Alt, D.D. and D.W. Hyndman. 1984. Roadside geology of Washington. Mountain Press, Missoula, MT.

Baxter, C. V., and F. R. Hauer. 2000. Geomorphology, hyporheic exchange, and the selection of spawning habitat by bull trout (Salvelinus confluentus). Canadian Journal of Fisheries and Aquatic Sciences. 57:1470-1481.

Beak Consultants, Inc. and Rensel Associates. 1999. Assessment of resident fish in Lake Pateros, Washington. Final Report. Prepared for Public Utility District No. 1 of Douglas County. Beak Consultants, Inc. in cooperation with Rensel Associates. Arlington, Washington.

Beamish, R.J. 1980. Adult biology of the river lamprey (Lampretra ayersi) and the Pacific Lamprey (Lampetra tridentata) from the Pacific coast of Canada. Canadian Journal of Fisheries and Aquatic Sciences. 37: 1906-1923.

Bechtel Corporation. 1970. Wells Hydroelectric Project - Report on Reservoir Erosion. Prepared by Bechtel Corporation, San Francisco, California, for Douglas PUD. September 1970

Beiningen, K.T. and W.J. Ebel. 1970. Effect of John Day Dam on dissolved nitrogen concentrations and salmon in the Columbia River, 1968. *In:* Chapman, D., C. Peven, A. Giorgi, T. Hillman, and F. Utter. 1995. Status of spring Chinook salmon in the mid-Columbia Region. Don Chapman Consultants, Inc., Boise, Idaho.

Benson, J. R., J. Cook, and G. F. Moura. 1987. Excavations at Site 45OK92: A Prehistoric Site Underlying Astor's Fort Okanogan; Wells Reservoir Archaeological Project Volume 3. Archaeological Report 87-3. Central Washington University Archaeological Survey, Ellensburg.

Bickford, S.A. 1997. Historical hydroacoustic information for Wells Dam 1982 to 1996 and a proposal for the operation of the Wells Bypass system. Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

Bickford, S.A., J. Skalski, R. Townsend, B. Nass, R. Frith, D. Park, and S. McCutcheon. 1999. Project survival estimates for yearling Chinook salmon migrating through the Wells hydroelectric facility. 1998. Research funded by Public Utility District No. 1 of Douglas County, East Wenatchee, Washington. 98 pp.

Bickford, S.A., J. Skalski, R. Townsend, D. Park, S. McCutcheon, and R. Frith. 2000. Project survival estimates for yearling summer steelhead migrating through the Wells hydroelectric facility, 1999. Research funded by Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Bickford, S.A., J. Skalski, R. Townsend, S. McCutcheon, R. Richmond, R. Frith, D. Park, and R. Fechhelm. 2001. Project survival estimates for yearling summer steelhead migrating through the Wells hydroelectric facility, 2000. Research funded by Public Utility District No. 1 of Douglas County, East Wenatchee, Washington. 100 pp.

Bickford, S. and T. Skilingstad. 2000. Movements of Northern Squawfish in the reservoir, forebay, and tailrace of the Wells Hydroelectric Project, mid-Columbia River, Washington. Public Utility District No. 1 Douglas County, East Wenatchee, Washington.

BioAnalysts, Inc. 2004. Movement of Bull Trout within the mid-Columbia River and tributaries, 2001-2004. Prepared for Public Utility District No. 1 of Chelan County, Wenatchee, WA, Public Utility District No. 1 of Douglas County, East Wenatchee, WA, and Public Utility District No. 2 of Grant County, Ephrata, WA.

BioAnalysts, Inc. 2005. Aquatic Macroinvertebrate Inventory. Wells Hydroelectric Project, FERC No. 2149. Prepared for Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

BPA (Bonneville Power Administration), U.S. Army Corps of Engineers, and Bureau of Reclamation. 1994. Columbia River system operation review – Draft environmental impact statement. Bonneville Power Administration, Portland, Oregon.

BPA. 1999. Mid-Columbia coho reintroduction feasibility project. Preliminary environmental assessment. DOE/EA-1282.

BPA, BOR (U.S. Bureau of Reclamation), COE (U.S. Army Corps of Engineers). 2001. The Columbia River System; Inside Story. 2nd Edition. Bonneville Power Administration. Portland, Oregon.

Browman, David L. 1966. Contributions to the Prehistory of the Columbia Plateau: the Indian Dan Site. Unpublished Master's thesis, University of Washington.

Brown, L.G. 1995. Mid-Columbia River summer steelhead stock assessment - A summary of the Priest Rapids steelhead sampling project, 1986-1994 cycles. Progress report by Washington Department of Fish and Wildlife, Anadromous Fish Division, Fish Management Program. AF95-02.

Burley, C.C. and T.P. Poe. 1994. Significance of predation in the Columbia River from Priest Rapids dam to Chief Joseph dam, predator consumption indexing. Contract 430-486. Prepared for PUD No 1 of Chelan County, PUD No. 1 of Douglas County, and PUD No. 2 of Grant County.

Calypso Consulting. 2000. A rare plant survey of the Rocky Reach Reservoir. Report of Calypso Consulting to Chelan PUD, Wenatchee, Washington.

Carlevato, Denise C., B. Cochran, J. A. Draper, D. Huelsbeck and J. M. Welch. 1982. Phase II Testing and Evaluation of the Lake Pateros Wells Reservoir Area Okanogan and Douglas Counties, Washington. Western Heritage Inc. Olympia.

Cassidy, K. M. 1997. Land cover of Washington State: Description and management. Volume 1 in Washington State Gap Analysis Project Final Report (K. M. Cassidy, C. E. Grue, M. R. Smith, and K. M. Dvornich, eds.). Washington Cooperative Fish and Wildlife Research Unit, University of Washington, Seattle, 260 pp.

Cavender, T. M. 1978. Taxonomy and distribution of the bull trout, Salvelinus confluentus (Suckley) from the American Northwest. California Fish and Game. 64:139-174.

Caywood, Louis R., and L. R. Butler. 1954. Excavations at Two Fort Okanogan Sites, 1952. Ms., National Park Service, San Francisco.

CBE (Columbia Basin Environmental). 2003. Wells Dam Spillway Total Dissolved Gas Evaluation. Final Report. Prepared by Columbia Basin Environmental, The Dalles, Oregon for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

CBE. 2004. Wells Dam Spillway Total Dissolved Gas Evaluation. Final Report. Prepared by Columbia Basin Environmental, The Dalles, Oregon for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

CBE. 2006. Wells Dam Spillway total dissolved Gas Evaluation. Final Report. Prepared by Columbia Basin Environmental, The Dalles, Oregon for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

CensusScope, 2006. Census 2000 analyzed by the Social Science Data Analysis Network (SSDAN). http://www.censusscope.org (Accessed May 2006).

Chapman Consultants, Inc. 1988. Summer and winter ecology of juvenile Chinook salmon and steelhead trout in the Wenatchee River, Washington. Available from the Public Utility District No. 1 of Chelan County, Wenatchee, Washington.

Chapman, D., A. Giorgi, T. Hillman, D. Deppert, M. Erho. S. Hays, M. Peven, B. Suzumoto, and R. Klinge. 1994a. Status of summer/fall Chinook salmon in the mid-Columbia Region. Don Chapman Consultants, Boise, Idaho.

Chapman, D., C. Peven, A. Giorgi, T. Hillman, and F. Utter. 1994b. Status of summer steelhead in the mid-Columbia River. Don Chapman Consultants, Boise, Idaho.

Chapman, D., C. Peven, A. Giorgi, T. Hillman, F. Utter, M. Hill, J. Stevenson, and M. Miller. 1995. Status of sockeye salmon in the mid-Columbia Region. Don Chapman Consultants, Inc., Boise, Idaho.

Chatters, James C. (editor). 1986a. Wells Reservoir Archaeological Project, Washington, Volume 1: Summary of Findings. Archaeological Report No. 86–6. Central Washington Archaeological Survey, Central Washington University, Ellensburg.

Chelan PUD (Public Utility District No.1 of Chelan County). 2005. Rocky Reach Water Quality Management Plan. Rocky Reach Hydroelectric Project. FERC Project No. 2145. Public Utility District No. 1 of Chelan County, Wenatchee, Washington.

Chatters, James C. 1992. 1992 Monitoring of Lake Pateros Archaeological District. Letter Report to Douglas County PUD No. 1, East Wenatchee, Washington.

Chatters, James C. 1995a. Washington Archaeological Site Inventory Form for Site 45DO515. On file at the Department of Archaeology and Historic Preservation, Olympia, Washington.

Chatters, James C. 1995b. Washington Archaeological Site Inventory Form for Site 45DO521. On file at the Department of Archaeology and Historic Preservation, Olympia, Washington.

Chatters, James C. 2003. Archaeological Investigations at Okanogan Phase Sites 45DO373 and 45OK420, Okanogan and Douglas Counties, Washington. Prepared for Douglas County PUD. Applied Paleoscience, Bothell, Washington.

COE (U.S. Army Corps of Engineers). 2005. The Columbia-Snake Basin. Technical Management Team. http://www.nwd-wc.usace.army.mil/TMT/basin.html (Accessed June 2005)

Cook, Jacqueline M. 1992. Fort Okanogan: A Case Study in Archaeological Collections Management. Archaeology in Washington IV:17-32.

Close, D. A., M. Fitzpatrick, and H. Li. 2002. The Ecological and Cultural Importance of a Species at Risk of Extinction, Pacific Lamprey. Fisheries; vol. 27, no. 7

Columbia Research. 2005. Proposal for Multi-Year 2005-2007 Pikeminnow Removal Project within Wells Reservoir and Wells Tailrace. Submitted to Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

Confederated Tribes of the Colville. 2005. Confederated Tribes of the Colville Reservation Website. http://www.colvilletribes.com/facts.htm (Accessed July 2005)

Daubenmire, R. 1970. Steppe Vegetation of Washington. Washington Agricultural Experiment Station Technical Bulletin 62, Pullman, 131 pp.

DeVore, J., B. James and R. Beamesderfer. 1999. Lower Columbia River White Sturgeon Current Stock Status and Management Implications. 26 pgs.

Douglas PUD (Public Utility District No. 1 of Douglas County). 2002. Wells Hydroelectric Project Anadromous Fish Agreement and Habitat Conservation Plan. Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Douglas PUD. 2004. Wells Hydroelectric Project Bull Trout Monitoring and Management Plan, 2004-2008. Report prepared by the Public Utility District No. 1 of Douglas County for the Federal Energy and Regulatory Commission.

Douglas PUD. 2005. Wells Dam Total Dissolved Gas Abatement Plan. Prepared for the Washington Department of Ecology. Prepared by Public Utility District No.1 of Douglas County, East Wenatchee, Washington.

Duke (Duke Engineering and Services, Inc.). 2000. Rocky Reach Hydroelectric Project FERC Project No. 2145 RTE Wildlife and Cover Type Mapping Final Report. Report by Duke Engineering and Services for Public Utility District No. 1 of Chelan County, Wenatchee, Washington.

DTA (Devine, Tarbell & Associates). 2006. Recreation Visitor Use Assessment. Wells Hydroelectric Project FERC No. 2149. Prepared by DTA for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

DTA (Devine, Tarbell & Associates). 2006. Effects of Water Level Fluctuations on Natural Resources within the Wells Project: A Review of Existing Information. Wells Hydroelectric Project FERC No. 2149. Prepared by DTA for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Duke. 2001. Rocky Reach fish presence and habitat use survey. Report prepared for the Public Utility District No. 1 of Chelan County, Wenatchee, Washington.

Ebel, W.J., H.L. Raymond, G.E. Monan, W.E. Farr, and G.K. Tanonaka. 1975. Effect of atmospheric gas supersaturation caused by dams on salmon and steelhead trout of the Snake and Columbia Rivers. National Marine Fisheries Services, Seattle, Washington.

EDAW, Inc. 2006a. Cover Type Mapping, Rare Threatened and Endangered Plant Surveys and Invasive Plant Surveys. Report by EDAW, Inc. Consultants for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

EDAW, Inc. 2006b. Avian, Amphibian, Reptile and Small Mammal Surveys. Report by EDAW, Inc. Consultants for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

EES Consulting, Inc. 2006. Comprehensive Limnological Investigation. Wells Hydroelectric Project FERC No. 2149. Prepared by EES Consulting, Bellingham, WA for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

EES Consulting, et. al. 2006. Total Dissolved Gas Production Dynamics Study. Wells Hydroelectric Project FERC No. 2149. Prepared by EES Consulting, Bellingham, WA for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Fielder, P.C. 1982. Food habits of bald eagles along the mid-Columbia River, Washington. Murrelet 63:46-50.

FWS (Fish and Wildlife Service). 1998. Endangered and threatened wildlife and plants; determination of threatened status for the Klamath River and Columbia River distinct population segments of bull trout: Final Rule. Federal Register 63, No. 111 (June 10, 1998):31647.

FWS. 2004. Endangered and threatened wildlife and plants: designation of critical habitat for the Klamath River and Columbia River populations of bull trout. Federal Register 69, No. 193 (October 6, 2004):59996.

Galster, R.W. 1989. Engineering geology of Washington, Volume 1. Washington Division of Geology and Earth Resources Bulletin 78.

Giorgi, A. 1992. Fall Chinook spawning in Rocky Reach pool; Effects of three-foot increase in pool elevation. Don Chapman Consultants, Inc., research report for the Public Utility District No. 1 of Chelan County, Wenatchee, Washington.

Grabert, Garland F. 1964. Interim Report on the Wells Reservoir Salvage Archeology Project – Part I, 1963. Report to National Park Service, San Francisco from Department of Anthropology, University of Washington, Seattle.

Grabert, Garland F. 1965a. Archaeological Excavations at Fort Okanogan, (45OK64), 1964; Interim Report, Part I. Report to National Park Service, San Francisco from Department of Anthropology, University of Washington, Seattle.

Grabert, Garland F. 1965b. Archaeological Excavations at Fort Okanogan, Washington; A Contribution to the Ethno-History of the Sinkaietk. Unpublished Master's thesis, Department of Anthropology, University of Washington, Seattle.

Grabert, Garland F. 1966. Archaeology in the Wells Reservoir, 1965. Report to National Park Service, San Francisco from Department of Anthropology, University of Washington, Seattle.

Grabert, Garland F. 1968a. North–Central Washington Prehistory. Reports in Archaeology No. 1. Department of Anthropology, University of Washington, Seattle.

Grabert, Garland F. 1968b. The Astor Fort Okanogan: A Final Report on Salvage Archaeology in the Wells Reservoir—Part II. University of Washington Department of Anthropology, Reports in Archaeology no. 2. Seattle, August 1968.

Grabert, Garland F. 1970. Prehistoric Cultural Stability in the Okanogan Valley of Washington and British Columbia. Ph.D. dissertation, Department of Anthropology, University of Washington.

Grabert, Garland F. 1973. Early Fort Okanogan Euro-American Impact on the Historic Okanogan Indians. In Historical Archaeology in Northwestern North America, edited by Ronald M. Getty and Knut R. Fladmark, pp. 109-125. Archaeological Association, Calgary.

Grabert, Garland F. and G. Griffin. 1980. A Re-evaluative Survey of Archaeological Resources in the Wells Reservoir (Lake Pateros). Reports in Archaeology, Number 12. Western Washington University, Bellingham, Washington.

Grabert, Garland F. and G. Griffin. 1984. Report of Investigations, Long Range Cultural Resource Management Plan, Lake Pateros Archaeological District, Washington, 180-Day Examination Cycle. Report to Douglas County PUD No. 1, East Wenatchee, Washington.

Grabert, Garland F., G. Griffin, and K. P. Griffin. 1985. Report of Investigations: Long Range Management Plan, Lake Pateros Archaeological District, Washington. Second Annual Examination Cycle, March to April 1985. Report to Douglas County PUD No. 1., East Wenatchee, Washington.

Griffin, Kristin P. and G. Griffin. 1985. Testing and Evaluation of Eight Archaeological Sites in the Wells Reservoir (Lake Pateros) North–Central Washington. Reports in Archaeology 24. Department of Anthropology Western Washington University, Bellingham.

Hallet, M. 1980. 1979 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project FERC No. 2149. Report by Washington Department of Game for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Hallet, M. 1981. 1980 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project FERC No. 2149. Report by Washington Department of Game for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Hallet, M. 1982. 1981 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project FERC No. 2149. Report by Washington Department of Game for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Hallet, M. 1983. 1982 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project FERC No. 2149. Report by Washington Department of Game for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Hallet, M. 1984. 1983 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project FERC No. 2149. Report by Washington Department of Game for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Hallet, M. 1985. 1984 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project FERC No. 2149. Report by Washington Department of Game for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Hallet, M. 1986. 1985 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project FERC No. 2149. Report by Washington Department of Game for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Hallet, M. 1987. 1986 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project Federal Energy Regulatory Commission License Number 2149. Report by Washington Department of Wildlife for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Hallet, M. 1988. 1987 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project Federal Energy Regulatory Commission License Number 2149. Report by Washington Department of Wildlife for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Hallet, M. 1989. 1988 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project Federal Energy Regulatory Commission License Number 2149. Report by Washington Department of Wildlife for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Hallet, M. 1990. 1989 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project Federal Energy Regulatory Commission License Number 2149. Report by Washington Department of Wildlife for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Hallet, M. 1991. 1990 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project Federal Energy Regulatory Commission License Number 2149. Report by Washington Department of Wildlife for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Hallet, M. 1992. 1991 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project Federal Energy Regulatory Commission License Number 2149. Report by Washington Department of Wildlife for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Hallet, M. 1993. 1992 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project Federal Energy Regulatory Commission License Number 2149. Report by Washington Department of Wildlife for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Hallet, M. 1994. 1993 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project Federal Energy Regulatory Commission License Number 2149. Report by Washington Department of Fish and Wildlife for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Hallet, M. 1995. 1994 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project Federal Energy Regulatory Commission License Number 2149. Report by Washington Department of Fish and Wildlife for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Hallet, M. 1996. 1995 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project Federal Energy Regulatory Commission License Number 2149. Report by Washington Department of Fish and Wildlife for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Hallet, M. 1997. 1996 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project Federal Energy Regulatory Commission License Number 2149. Report by Washington Department of Fish and Wildlife for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Hallet, M. 1998. 1997 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project Federal Energy Regulatory Commission License Number 2149. Report by Washington Department of Fish and Wildlife for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Hallet, M. 1999. 1998 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project Federal Energy Regulatory Commission License Number 2149. Report by Washington Department of Fish and Wildlife for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Hallet, M. 2000. 1999 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project Federal Energy Regulatory Commission License Number 2149. Report by Washington Department of Fish and Wildlife for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Hallet, M. 2001. 2000 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project Federal Energy Regulatory Commission License Number 2149. Report by Washington Department of Fish and Wildlife for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Hallet, M. 2002. 2001 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project Federal Energy Regulatory Commission License Number 2149. Report by Washington Department of Fish and Wildlife for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Hallet, M. 2003. 2002 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project Federal Energy Regulatory Commission License Number 2149. Report by Washington Department of Fish and Wildlife for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Hallet, M. 2004. 2003 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project Federal Energy Regulatory Commission License Number 2149. Report by Washington Department of Fish and Wildlife for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Hallet, M. 2005. 2004 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project Federal Energy Regulatory Commission License Number 2149. Report by Washington Department of Fish and Wildlife for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Hartmann, Glenn D. and C. Noll. 2001. Archaeological Monitoring Survey of the Lake Pateros Archaeological District for 2004, Wells Hydroelectric Project, Douglas and Okanogan Counties, Washington. Prepared for Douglas County Public Utilities District No. 1 of Douglas County, Western Shore Heritage Services Technical Report 0110, Bainbridge Island, Washington.

Hartmann, Glenn D. and M. Gill. 2004. Archaeological Monitoring Survey of the Lake Pateros Archaeological District for 2004, Wells Hydroelectric Project, Douglas and Okanogan Counties, Washington. Western Shore Heritage Services Technical Report 210, Bainbridge Island, Washington.

Hartmann, Glenn. D., and M. Berger. 2006. Cultural Resources Data Review for the Wells Relicensing Project, Douglas and Okanogan Counties, Washington. Western Shore Heritage Services, Inc.

Hershler, R., and T.J. Frest. 1996. A Review of the North American Freshwater Snail Genus Fluminicola (Hydrobiidae). Smithsonian Contributions to Zoology 583, iii + 41 pp.

Jackson, A.D., D.R. Hatch, B.L. Parker, M.S. Fizpatrick, D.A. Close, and H. Li. 1997. Pacific lamprey research and restoration annual report 1997. Prepared for the Bonneville Power Administration, Portland, Oregon.

Jacobs Civil, Inc. 2003. Lower Okanogan River Erosion Evaluation Project. Prepared by Demich Engineering for Jacobs Civil, Inc.

Jerald, T. 2006 draft. White Sturgeon (*Acipenser transmountanus*) Population and Life History Assessment, Wells Reservoir. A thesis presented to the graduate faculty program, Central Washington University. Ellensburg, Washington.

King County. 2005. Endangered Species Act. Salmon Conservation & Recovery http://www.metrokc.gov/exec/esa/ecobulltrout.htm (Accessed July 2005)

Lê, B. and S. Kreiter. 2005. Wells Project Macrophyte Identification and Distribution Study, 2005. Public Utility District No. 1 of Douglas County, East Wenatchee, Washington. 71 pgs.

LGL Limited. 2006. Wells bull trout monitoring and management plan, 2005 annual report. Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

McAllister, K.R., W.P. Leonard, D.W. Hays, and R.C. Friesz. 1999. Washington State Status Report for the northern Leopard Frog. Washington Department of Fish and Wildlife. Olympia, Washington.

McGee, J. 1979. Fisheries survey of Wells Reservoir. Unpublished report, Douglas County PUD, East Wenatchee, WA, 18 pgs.

Meekin, T.K. 1967. Fisheries passage problems at Wells Dam in 1968. Washington Department of Fisheries, Research Division. Financed by Douglas County PUD.

Meeuwig, M.H., J.M. Bayer, J.G. Seelye, and R.A. Reiche. 2002. Identification of larval Pacific lampreys (*Lampetra tridentata*), river lampreys (*L. ayresi*), and western brook lamprey (*L. richardsoni*) and thermal requirements of early life history stages of lampreys. Report by U.S. Geologic Survey, Western Fisheries Resources Division, Columbia River Research Laboratory for the Bonneville Power Administration, Project No. 2000-029.

Mierendorf, Robert R. 1983. Assessment of Erosive Effects of a Two-Foot Pool Raise on Cultural Resources Around Lake Pateros. Submitted to the Colville Confederated Tribes, Nespelem, Washington.

Miller, F.K. 1975. Geology of the Chewelah-Loon Lake area, Stevens and Spokane Counties, WA. U.S. Geological Survey Professional Paper 806.

Moser, M. and D. Close. 2003. Assessing Pacific Lamprey Status in the Columbia River Basin. Northwest Science, Vol. 77, No.2, 116-125.

Nass, B., C. Sliwinski, and D. Robichaud. 2005. Assessment of Adult Pacific Lamprey Migratory Behavior at Wells Dam Using Radio-telemetry Techniques, 2004. Prepared by LGL Limited Environmental Research Associates for Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

Nelson , W. A. 1977. Wells Wildlife Recreation Area Inventory. Applied Research Bulletin No. 13. Washington Department of Game.

NMFS (National Marine Fisheries Service), U.S. Fish and Wildlife Service, Washington Department of Fish and Wildlife, Confederated Tribes of the Yakama Indian Nation, Confederated Tribes of the Colville Indian Reservation, Confederated Tribes of the Umatilla Indian Reservation, Chelan County Public Utility District, and Douglas County Public Utility District. 1998. Anadromous Fish Agreement and Habitat Conservation Plan. Rocky Reach Hydroelectric Project, FERC 2145. July 30, 1998.

NMFS, U.S. Fish and Wildlife Service, U.S. Forest Service, WDFW (Washington Department of Fish and Wildlife), Confederated Tribes of the Yakama Indian Nation, Confederated Tribes of the Colville Indian Reservation, Confederated Tribes of the Umatilla Indian Nation, Chelan County Public Utility District, Douglas County Public Utility District, and Grant County Public Utility District. 1998. Aquatic Species and Habitat Assessment: Wenatchee, Entiat, Methow, and Okanogan Watersheds. National Marine Fisheries Service.

NMFS. 2002a. Anadromous Fish Agreements and Habitat Conservation Plans: Final Environmental Impact Statement for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects. U.S. Department of Commerce. National Oceanic and Atmospheric Administration. National Marine Fisheries Service, Northwest Region, Portland, Oregon. December 2002.

NMFS. 2002b. Letter to Frank Cassidy from Bob Lohn regarding the Interim Abundance and Productivity Targets for Interior Columbia Basin Salmon and Steelhead Listed under the Endangered Species Act (ESA).

NMFS. 2005. National Marine Fisheries Service website: http://www.nmfs.noaa.gov/habitat/habitatprotection/efh/index.htm (Accessed June 2005)

NOAA (National Oceanic & Atmospheric Administration). 1997. Endangered and threatened species: listing of several evolutionary significant units (ESUs) of west coast steelhead: Final Rule. Federal Register 62, No. 159 (August 18, 1997):43937.

NOAA. 1999. Endangered and threatened species: threatened status for three Chinook salmon evolutionary significant units in Washington and Oregon: Final Rule. Federal Register 64, No. 56 (March 24, 1999):14307.

NOAA. 2006. Endangered and threatened species: final listing determinations for 10 distinct populations segments of west coast steelhead: Final Rule. Federal Register 71, No. 3 (Jnauary 5, 2006):835.

Normandeau Associates Inc. 2000. An Evaluation of Water Quality and Limnology for the Priest Rapids Project Area. Report prepared for Public Utility District No. 2 of Grant County, Ephrata, Washington.

Pacific States Marine Fisheries Commission. 1992. White sturgeon management framework plan. Report by the White Sturgeon Planning Committee, Pacific States Marine Fisheries Commission, Portland, Oregon.

Parametrix, Inc., and Rensel Associates. 2001. Water Quality Monitoring Report Rocky Reach Reservoir, Water Year 2000. Rocky Reach Hydroelectric Project No. 2145. Prepared by Parametrix, Inc. Kirkland, Washington, in association with Rensel Associates, Aquatic Science Consultants, University of Idaho, for Public Utility District No. 1 of Chelan County, Wenatchee, Washington.

Parsley, J.J. and L.G. Beckman. 1994. White sturgeon spawning and rearing habitat in the lower Columbia River. North American Journal of Fisheries Management 14:812-827.

Peven, C.M. 1992. Population status of selected stocks of salmonids from the mid-Columbia River Basin. Public Utility District No. 1 of Chelan County, Fish and Wildlife Operations, Wenatchee, Washington.

Peven, C.M., R.R. Whitney, and K.R. Williams. 1994. Age and length of steelhead smolts from the mid-Columbia River Basin. North American Journal of Fisheries Management 14:77-86.

PFMC (Pacific Fishery Management Council). 2000. Amendment 14 to the Pacific Coast Salmon Plan, Appendix A: Identification and Description of Essential Fish Habitat, Adverse Impacts, and Recommended Conservation Measures for Salmon. Pacific Fishery Management Council pursuant to National Oceanic and Atmospheric Administration Awarded Number NA07FC0026.

Pleyte, Kay A., S. D. Duncan, and R. B. Phillips. 1992. Evolutionary relationships of the fish genus *Salvelinus* inferred from DNA sequences of the first internal transcribed spacer (ITS 1) of ribosomal DNA. Molecular Phylogenetics and Evolution, 1(3): 223-230.

Reid, Constance and M.K. Zweifel. 1986. Report of Investigations, Long–Range Cultural Resource Management Plan, Lake Pateros Archaeological District, Washington, Third Annual Examination Cycle. Archaeological Report 86–4, Central Washington Archaeological Survey, Ellensburg.

Rensel Associates. 1993. Nutrients, algae and salmon farming in Rufus Wood Lake of the middle Columbia River, final report. Prepared for Pacific Catch Co., Brewster, Washington. Stolt Sea Farm, Port Angeles, Washington.

Rieman, B. E. and J. D. McIntyre. 1993. Demographic and habitat requirements for conservation of bull trout. U.S. Forest Service, Intermountain Research Station. General Technical Report INT-302.

Rieman, B. E., and J. D. McIntyre. 1995. Occurrence of bull trout in naturally fragmented habitat patches of varied size. Transactions of American Fisheries Society. Vol. 124 (3): 285-296.

Rieman, B. E., D. C. Lee and R. F. Thurow. 1997. Distribution, status and likely future trends of bull trout within the Columbia River and Klamath Basins. North American Journal of Fisheries Management. 17(4): 1111-1125.

RMC Environmental Services, Inc. 1993. Unpublished letter to Douglas County Public Utility Disrict from Paul Heisey describing results of a balloon-tag study at the Wells bypass. Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Schroeder, M. and M. Tirhi. 2003. Sharp-tailed grouse. Pages 16-1 – 16-9 *in* E. Larsen, J.M. Azerrad, N. Nordstrom, editors. Management recommendations for Washington's priority species, Volume IV: Birds. Washington Department of Fish and Wildlife, Olympia, Washington.

Sexauer, H. M. and P. W. James. 1993. A survey of the habitat use by juvenile and prespawning adult bull trout, *Salvelinus confluentus*, in four streams in the Wenatchee National Forest. Ellensburg, WA, Central Washington University.

Skalski, J.R. 1993. Additional summaries of 3-year bypass efficiency study at Wells Dam. Center for Quantitative Science, Seattle, Washington.

Spier, Leslie. 1936. Tribal Distribution in Washington. General Series in Anthropology Number 3. George Banta Publishing Company, Menasha.

Stallard, Bruce. 1957. An Archaeological Survey in the Wells Reservoir in the State of Washington. Report of Investigations No. 1, Laboratory of Anthropology, Washington State University, Pullman.

Stoffel, K.L., N.L. Joseph, S.K. Waggoner, C.W. Gulick, M.A. Korosec and B.B. Bunning. 1991. Geologic Map of Washington – Northeast Quadrant. Washington State Department of Natural Resources, division of Geology and Earth Resources. Geologic Map GM-39.

Swanson, Earl H., Jr. 1958. Archaeological Survey of the Methow Valley, Washington. Tebiwa 2(1): 78-82.

Swanson, Earl H., Jr. 1962. Historic Archaeology at Fort Okanogan, Washington, 1957. Tebiwa 5(1): 1-10.

U.S. Census Bureau. 2004. State and County Quick Facts Website, Washington. http://quickfacts.census.gov/qfd/states/53/53017.html (Accessed June 2005)

USFWS (U.S. Fish and Wildlife Service). 1998. Endangered and threatened wildlife and plants; Determination of threatened status for the Klamath River and Columbia River distinct population segments of bull trout. Final Rule. Federal Register 63, No. 111 (June 10, 1998):31647.

Volk, E. C. 2000. Using otolith strontium to infer migratory histories of bull trout and Dolly Varden from several Washington State rivers. Submitted to Olympic National Park in fulfillment of Contract #2550041. Washington Department of Fish and Wildlife, Olympia.

Waitt, R.B. and R.M. Thorson. 1983. The Cordilleran ice sheet in Washington, Idaho, and Montana. In: H.E. Wright, ed., 1983. Late-Quaternary Environments of the United States, V. 1 Univ. of Minnesota Press, Ch. 3, p. 53-70.

Waknitz, F.W., G.M. Matthews, T. Wainwright, and G.A. Winans. 1995. Status review for mid-Columbia River summer Chinook salmon. NOAA Technical Memorandum NMFS-NWFSC-22.

National Marine Fisheries Service, Northwest Fisheries Science Center, Coastal Zone and Estuarine Division, Seattle, Washington.

Washington Department of Game. 1976a. 1975 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project F. P. C. No. 2149. Report by Washington Department of Game for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Washington Department of Game. 1976b Supplement, 1975 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project F. P. C. No. 2149. Report by Washington Department of Game for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Washington Department of Game. 1977. 1976 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project F. P. C. No. 2149. Report by Washington Department of Game for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Washington Department of Game. 1978. 1977 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project F. P. C. No. 2149. Report by Washington Department of Game for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Washington Department of Game. 1979. 1978 Annual Report Wells Wildlife Mitigation Program Wells Hydroelectric Project F. P. C. No. 2149. Report by Washington Department of Game for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

WDOE (Washington Department of Ecology). 1998. Water quality data summary. Ambient monitoring data [online]. Available at: http://www.ecy.wa.gov/programs/eap/fw_riv/rv_main.html. (Accessed August 2005)

WDOE. 1998a. 1998 Section 303(d) list.Washington State Department of Ecology Water Quality Program [online]. Available at: http://www.ecy.wa.gov/programs/wq/303d/1998/1998-index.html (Accessed July 2005)

Welch, Jacqueline M. 1990. Washington Archaeological Site Inventory Form for Site 45CH402. On file at the Department of Archaeology and Historic Preservation, Olympia, Washington.

Welch, Jacqueline M., R. D. Daugherty, and P. Gleeson. 1982. A Resurvey and Assessment of Selected Cultural Resources in the Wells Reservoir. Western Heritage, Inc., Olympia, Washington.

Western Heritage, Inc. 1983. Preliminary report on further Phase II testing of cultural resources in the Lake Pateros Archaeological District. Western Heritage Inc., Olympia, Washington.

Winans, G.A., P.B. Abersold, and R.S. Waples. 1995. Allozyme variability of *Oncorhynchus nerka* in the Pacific Northwest with special consideration to populations of Redfish Lake, Idaho. Transactions of the American Fisheries Society.

Wydoski, R.S., and R.R. Whitney. 2003. Inland fishes of Washington. University of Washington Press, Seattle, Washington. 2nd edition.

Zook, W.J. 1983. Resident fisheries of Wells Pool: A Review. Prepared for Public Utility District No. 1 of Douglas County. Fulton Fisheries Advisors. 61 pgs.